Abstracts and Case Studies From the College of American Pathologists 2011 Annual Meeting (CAP ’11)

Abstract and case study poster sessions will be conducted during the 2011 College of American Pathologists Annual Meeting, which is scheduled for September 11 to 14, 2011. The meeting will take place at the Gaylord Texan, Grapevine, Texas. The poster sessions will occur in the Connection Café and Exhibits Hall. Specific dates and times for each poster session are listed below. Also shown below each poster session listing are the subject areas that will be presented during that session.

POSTER SESSION 100: SUNDAY, SEPTEMBER 11, 2011
9:30 AM–12:30 PM

Gastrointestinal and Liver Pathology; Kidney and Genitourinary Pathology; Dermatopathology

The Correlation Between Budding, Tumor Cytoplasmic Fragments, and Lymph Node Status in Colon Cancer
( Poster No. 1)

Bianca Santoni, MD1 (santonb@ccf.org); Mariana Berho, MD1; Steven D. Wexner, MD.2 Departments of 1Pathology and 2Colorectal Surgery, Cleveland Clinic Florida, Weston, Florida.

Context: The presence of tumor budding and cytoplasmic podia was shown to be associated with lymph node metastasis and poor prognosis.

Design: Hematoxylin-eosin–stained slides from 201 patients diagnosed with colon/rectum adenocarcinoma were retrieved. All patients had tissue specimens evaluated for the presence of budding and podia. The ones with tumor budding and cytoplasmic podia were submitted to immunohistochemistry in paraffin-embedded sections, using CK20, PMS2, MSH2, MSH6, MLH1, and β-catenin. Tumor budding and cytoplasmic podia were counted through the image analyzer after staining with CK20. Staining for PMS2, MSH2, MSH6, MLH1 and β-catenin were graded into positive and negative. They were divided into 2 groups: (1) absence of tumor budding and cytoplasmic podia (n = 133), and (2) presence of tumor budding and cytoplasmic podia (n = 64).

Results: Regression analysis was performed to find the cutoff ratio value of tumor budding and cytoplasmic podia, which would indicate more lymph node invasion. The cutoff value was 1.87 for lymph node metastasis (P = .03) and 2.14 for lymphatic invasion (P = .02). The presence of tumor budding and cytoplasmic podia had a correlation with the location throughout the colon/rectum (P = .02). Lymph node metastases and lymphatic invasion had a positive correlation with the presence of tumor budding and cytoplasmic podia (P = .001) as did the venous invasion (P = .002) and vascular invasion (P = .01). The positivity of MSH2 was also statistically significant (P = .04).

Conclusions: These results suggest that the presence of tumor budding and cytoplasmic podia is predictive of lymphatic invasion and lymph node metastasis.

Primary Anal Melanoma Mimicking Long-Lasting Hemorrhoids
(Poster No. 2)

Maria F. Gonzalez, MD (Maferg13.Gonzalez@ttuhsc.edu); Mitchell S. Wachtel, MD; Irfan Warraich, MD. Department of Pathology, Texas Tech University Health Sciences Center, Lubbock.

Melanoma of the anus is uncommon. We report a case of melanoma of the anus that presented in a 71-year-old woman with 5-year history of rectal mass, which was clinically diagnosed as hemorrhoids. During this time, the patient had intermittent mild hematochezia leading to chronic normocytic-normochromic anemia. The patient consulted to the emergency department owing to a 3-day history of moderate hematochezia. A polypoid formation at the distal rectum was felt on rectal examination. The patient underwent resection of the sigmoid and rectum. This case broadens the differential diagnosis of hematochezia, and nodular lesions of the anal region mimicking hemorrhoids, to include analorectal melanoma. Grossly, the specimen consisted of a 2.5 × 1.5 × 1.2-cm brown nodule and a 6 × 2.5 × 0.4-cm membranous fragment of tissue. The microscopic examination showed anaplastic cells originating in the epithelium of the anus, invading submucosa and lamina propria. Immunohistochemistry was positive for S100, MART1, HMB-45, CD10, CD117, and Ki-67. Lower gastrointestinal bleeding in an elderly patient with chronic anemia is highly suggestive of colon cancer. Spindle cell tumors positive for MART1 are suggestive of melanoma. Melanoma is also known to stain positively for CD117, making gastrointestinal stromal tumor its main differential diagnosis (Figure 1).

Reevaluation of Expression of MUC1, MUC2, MUC4, MUC5AC, and MUC6 in Carcinomas From Various Organs
(Poster No. 3)

Haiyan Liu, MD1 (hliu1@geisinger.edu); Jianhui Shi, MD, PhD1; Yajue Huang, MD2; Fan Lin, MD, PhD.3 Department of Laboratory Medicine, Geisinger Medical Center, Danville, Pennsylvania; 2Department of Pathology, Temple University Hospital, Philadelphia, Pennsylvania.

Context: Studies have been done on the expression of mucin gene products in various carcinomas (CA). However, the data are inconsistent and may not be entirely reproducible. In this study, we reevaluate the expression of MUC1, MUC2, MUC4, MUC5AC, and MUC6 in a large
series of CAs from various organs, using a single staining system (Ventana XT, Tucson, Arizona).

**Design:** Immunohistochemical evaluation of the expression of MUC1, MUC2, MUC4, MUC5AC, and MUC6 in 838 cases of CAs from various organs, using tissue microarray sections, were performed. The staining intensity and distribution were recorded.

### Summary of Immunostaining Results

<table>
<thead>
<tr>
<th>Tumor</th>
<th>MUC1</th>
<th>MUC2</th>
<th>MUC4</th>
<th>MUC5AC</th>
<th>MUC6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung ADC</td>
<td>100 (54)</td>
<td>50 (54)</td>
<td>28 (54)</td>
<td>16 (54)</td>
<td>2 (54)</td>
</tr>
<tr>
<td>Lung squamous cell CA</td>
<td>63 (48)</td>
<td>2 (48)</td>
<td>15 (48)</td>
<td>4 (48)</td>
<td>2 (48)</td>
</tr>
<tr>
<td>Papillary thyroid CA</td>
<td>82 (45)</td>
<td>0 (45)</td>
<td>58 (45)</td>
<td>0 (45)</td>
<td>0 (45)</td>
</tr>
<tr>
<td>Esophageal ADC</td>
<td>27 (30)</td>
<td>7 (30)</td>
<td>37 (30)</td>
<td>43 (30)</td>
<td>40 (30)</td>
</tr>
<tr>
<td>Gastric ADC</td>
<td>14 (22)</td>
<td>17 (22)</td>
<td>22 (22)</td>
<td>0 (22)</td>
<td>0 (22)</td>
</tr>
<tr>
<td>Colonic ADC</td>
<td>16 (38)</td>
<td>55 (38)</td>
<td>74 (38)</td>
<td>26 (38)</td>
<td>8 (38)</td>
</tr>
<tr>
<td>Pancreatic ADC</td>
<td>95 (70)</td>
<td>4 (70)</td>
<td>50 (70)</td>
<td>67 (70)</td>
<td>17 (70)</td>
</tr>
<tr>
<td>Intrahepatic cholangiocarcinoma</td>
<td>55 (11)</td>
<td>0 (11)</td>
<td>9 (11)</td>
<td>0 (11)</td>
<td>9 (11)</td>
</tr>
<tr>
<td>Hepatocellular CA</td>
<td>0 (18)</td>
<td>0 (18)</td>
<td>33 (18)</td>
<td>6% (18)</td>
<td>6 (18)</td>
</tr>
<tr>
<td>Breast ductal CA</td>
<td>96 (178)</td>
<td>2.3% (175)</td>
<td>0 (175)</td>
<td>0 (175)</td>
<td>12 (175)</td>
</tr>
<tr>
<td>Breast lobular CA</td>
<td>100 (76)</td>
<td>0 (76)</td>
<td>0 (76)</td>
<td>0 (76)</td>
<td>17 (72)</td>
</tr>
<tr>
<td>Endocervical ADC</td>
<td>29 (17)</td>
<td>0 (17)</td>
<td>76% (17)</td>
<td>12% (17)</td>
<td>12 (17)</td>
</tr>
<tr>
<td>Ovarian serous CA</td>
<td>93 (15)</td>
<td>0 (15)</td>
<td>64% (14)</td>
<td>0 (15)</td>
<td>0 (15)</td>
</tr>
<tr>
<td>Prostatic ADC</td>
<td>61 (100)</td>
<td>0 (100)</td>
<td>0 (100)</td>
<td>0 (100)</td>
<td>6 (100)</td>
</tr>
<tr>
<td>Urothelial CA</td>
<td>55 (40)</td>
<td>10% (40)</td>
<td>10% (40)</td>
<td>5% (40)</td>
<td>0 (40)</td>
</tr>
<tr>
<td>Clear cell RCC</td>
<td>82 (51)</td>
<td>0 (51)</td>
<td>12% (51)</td>
<td>7% (30)</td>
<td>0 (30)</td>
</tr>
<tr>
<td>Papillary RCC</td>
<td>100 (25)</td>
<td>0 (25)</td>
<td>25% (25)</td>
<td>0 (15)</td>
<td>0 (15)</td>
</tr>
</tbody>
</table>

**Results:** The positive staining results (%) and the number of cases for each entity (n) are summarized in the Table. MUC1 is expressed in the most CAs and not expressed in hepatocellular CA. MUC2 is expressed in colonic adenocarcinoma (ADCA)(55%), with low or no expression in others. MUC4 is expressed in colonic, endocervical ADCs and ovarian serous CA, and is not expressed in breast CA and prostatic ADC. MUC5AC is expressed in pancreatic (67%) and esophageal (43%) ADCs and has low or no expression in others. MUC6 is expressed in esophageal ADC (40%), with low expression (12%-17%) in pancreatic, breast, and endocervical ADC, and nearly no expression in others.

**Conclusions:** These data provide an important reference for the utilization of mucin gene product markers. There is a tendency for each organ system to express particular mucin gene products; however, a significant overlapping of expression is demonstrated. Therefore, caution should be taken when using these markers in making a diagnosis and differential diagnosis.

### Rerevaluation of Expression of Immunohistochemical Markers in Esophageal and Gastric Adenocarcinomas

**Poster No. 4**

Fan Lin, MD, PhD; Jinhong Li, MD; Hanlin L. Wang, MD, PhD; Haiyan Liu, MD

Arch Pathol Lab Med—Vol 135, September 2011

### Summary of Immunostaining Results

<table>
<thead>
<tr>
<th>Antibody</th>
<th>EADC, % (N = 30)</th>
<th>GADC, % (N = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CK7</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>CK20/CDX2</td>
<td>37/43</td>
<td>61/39</td>
</tr>
<tr>
<td>CK19/CK17</td>
<td>63/10</td>
<td>0</td>
</tr>
<tr>
<td>MUC1</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>MUC2</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>MUC4</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>MUC5AC</td>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>MUC6</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>ER/PR/GCDFP15/ Mammoglobin</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Napsin A</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>HepPar1</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>Glypican 3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>S100p/pVHL</td>
<td>73/13</td>
<td>67/0</td>
</tr>
<tr>
<td>Maspin</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>BMP3</td>
<td>57</td>
<td>56</td>
</tr>
<tr>
<td>β-catenin</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>SALL4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>P504S</td>
<td>73</td>
<td>39</td>
</tr>
<tr>
<td>PXA8, RCC, OCT4, TTF1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Strongyloidiasis in a Transplant Patient**

**Poster No. 5**

Nadia K. Burns, MD; Andrew W. DuPont, MD; John D. Milam, MD

1 Pathology and Laboratory Medicine and 2 Internal Medicine, Division of Gastroenterology, Hepatology, and Nutrition, University of Texas Health Science Center at Houston.

We present the case of a 50-year-old white man with a history of diabetes mellitus type 1 and recent pancreatorenal transplant. Fourteen years before receiving a transplant he had lived for 1 year in rural Mexico. Two months after surgery, he was seen for nausea, vomiting, and diarrhea. His esophagogastroduodenoscopy and colonoscopy were nondiagnostic. A duodenal biopsy revealed mild duodenitis and edematous changes in the colon. He was readmitted a month later with worsening abdominal pain. Esophagogastroduodenoscopy and colonoscopy were performed, and duodenal and gastric biopsy specimens were submitted for pathologic review (hematoxylin-eosin staining). Subsequently, esophagus and stomach biopsies were analyzed with Gram and iodine staining, respectively. Diffuse duodenal mucosal ulcerations with exudates were found during colonoscopy. The duodenal biopsy revealed that the lamina propria was heavily infected with *Strongyloides stercoralis*.
larynx and eggs (Figure 2, A). No pathologic change was identified within the gastric fundic mucosa. The sputum (Figure 2, B) and stool (Figure 2, C) examinations revealed *S. stercoralis* larvae. *Strongyloides stercoralis* can manifest subclinically in humans for years after the initial infection. In immunosuppressed hosts, such as transplant patients, disseminated infections may occur owing to autoinfection, leading to a hyperinfection syndrome in which larvae increase reproduction in the duodenum and disseminate to the lungs, causing both pulmonary and gastrointestinal symptoms. The incidence of this rare syndrome in transplant patients is not well elucidated. The initial diagnosis is usually made via stool culture. Thus, the initial diagnosis by duodenal biopsy was unusual in our patient.

**Wagner-Meissner Polyposis Within the Colon: First Report of 2 Cases**

(Poster No. 6)

Andrea L. Barbieri, MD (andrea.barbieri@yale.edu); Barton Kenney, MD; Dhanpat Jain, MD. Department of Surgical Pathology, Yale University, New Haven, Connecticut.

We report 2 cases of polypoid neural proliferations within the colonic lamina propria, composed entirely of Wagner-Meissner corpuscles, a Schwann cell-derived neurosensory unit typically found in glabrous skin. This morphology has not previously been reported in colonic polyps. Given that Wagner-Meissner corpuscles are not normally found within the gastrointestinal tract and have an unusual morphology, difficulty in characterizing these lesions may occur. Both of our cases occurred in adult males: one was undergoing routine screening colonoscopy and the other presented with blood per rectum. The pathologic lesion in both cases was identical and displayed discrete, compact aggregates of plump cells within the lamina propria, which displayed abundant eosinophilic cytoplasm composed of lamellated fibrillar structures (Figure 3). This unusual morphology caused diagnostic confusion, resulting in consultation referral to our institution. Further investigation revealed that the aggregates displayed strong immunoreactivity for S100 and negativity for CD68 and amyloid stains. No ganglion cells were identified. In both cases these neural proliferations were isolated, and patient follow-up has revealed no additional lesions, recurrence, or clinical concern for an underlying syndrome. We believe that these lesions represent a unique and previously unreported morphologic subset of the "Schwann cell hamartoma" described by Gibson et al. Recognition of Wagner-Meissner corpuscle differentiation allows for appropriate characterization of these lesions and prevents undue concern for a syndromic association or confusion with a granulomatous process.

**Lamina Propria Mononuclear Cell Fluorescence In Situ Hybridization for Cyclin D1 and p53 in Ulcerative Colitis Neoplastic Progression**

(Poster No. 7)

Michael Landau, MD1 (landau@ccf.org); Megan L. Settle, BS2; Mary P. Bronner, MD.1,2 Department of Anatomic Pathology, Cleveland Clinic Foundation, Cleveland, Ohio; 2Department of Pathology, University of Utah, Salt Lake City.

**Context:** Ulcerative colitis (UC) predisposes to colorectal carcinoma (CRC). Nondysplastic colonic epithelium in UC colons harboring distant neoplasia has prominent genomic alterations relative to UC colons without neoplasia. In particular, increased chromosomal fluorescence in situ hybridization (FISH) alterations involving *p53* and *cyclin D1* have been demonstrated in epithelial cells specifically. Corresponding lamina propria cells, however, have not been investigated and form the subject of this report.

**Design:** A total of 15 fresh, nondysplastic mucosal samples remote from tumor in surgical resections were analyzed from 11 patients with UC and 4 with Crohn disease. Ten had cancer/dysplasia (progressors) and 5 were without dysplasia/cancer (nonprogressors). Seven had active inflammation and 8, inactive disease. Lamina propria cells were isolated by EDTA washing and collagenase type III and DNAse I digestion in HEPES. Mononuclear lamina propria cells were purified with Ficoll-Hypaque gradient. FISH was performed with dual-color arm and matched centromere probes for *cyclin D1* and *p53*. The proportion of cells with *normal 2 arm* and *2 centromere* signals was determined and differences assessed by t tests according to progressor status, IBD type, and activity.

**Results:** The proportion of cells with normal 2/2 dual-probe FISH counts for both sets of FISH probes did not differ in lamina propria mononuclear cells by progressor status, IBD type, or inflammatory activity levels (see Table).

**Results**

<table>
<thead>
<tr>
<th>Cells With Normal 2 Arm + 2 Centromere FISH Signals, %</th>
<th>Progressors</th>
<th>Nonprogressors</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclin D1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>p53</em></td>
<td>91.2 ± 2.9</td>
<td>92.2 ± 2.2</td>
<td>.51</td>
</tr>
<tr>
<td><em>p53</em></td>
<td>90.6 ± 2.9</td>
<td>90.8 ± 4.9</td>
<td>.92</td>
</tr>
<tr>
<td>UC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crohn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclin D1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>p53</em></td>
<td>91.4 ± 2.6</td>
<td>92.0 ± 3.2</td>
<td>.70</td>
</tr>
<tr>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclin D1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>p53</em></td>
<td>91.1 ± 2.0</td>
<td>91.9 ± 3.2</td>
<td>.61</td>
</tr>
<tr>
<td>UC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crohn</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions:** These findings support that lamina propria cells of nondysplastic UC mucosa from progressors and nonprogressors do not contain the same genomic changes reported in neighboring epithelial cells, indicating the importance of epithelial cell isolation in genomic biomarker studies of UC neoplasia.

**Hepatobiliary Cystadenocarcinoma: Case Report and Review of Literature**

(Poster No. 8)

Ashhad Mahmood, MD (ashhadmahmood@hotmail.com); Surya Guha, MD; Matthew Tortora, MD. Department of Pathology, Saint Barnabas Medical Center, Livingston, New Jersey.
A 72-year-old woman presented to her primary care physician with nausea, vomiting, and epigastric pain. On radiographic evaluation, a partially solid and partially cystic hepatic lesion, measuring 10 cm in greatest dimension, was identified. Upon complete resection by hepatic trisegmentectomy, the cystic component was predominately smooth walled, with small papillary excrescences projecting into the cyst cavity, while the solid component was found to be tan-pink and friable, with no gross invasion into surrounding hepatic parenchyma. Microscopically, the cystic component was lined by simple columnar epithelium with bland, basally located nuclei, reminiscent of bile duct epithelium. Abrupt zones of transition from simple columnar epithelium (indistinguishable from hepatobiliary cystadenoma) to pseudostratified dysplastic epithelium were apparent (Figure 4, A). The solid component of the tumor (cystadenocarcinoma) demonstrated several different architectural patterns including tubulopapillary, cribriform, and focal solid growth. Focal intestinal metaplasia, in the form of goblet cells, was present. Although focal microscopic capsular infiltration was present, no complete capsular penetration or lymphovascular invasion was identified. Subepithelial "mesenchymal stroma" was conspicuously absent. Immunohistochemical staining for Hep Par1 revealed an interesting pattern in which the cystadenoma component of the tumor was negative, while the dysplastic and frankly carcinomatous components showed diffusely strong cytoplasmic staining (Figure 4, B). These findings support the previously reported hypothesis that this group of tumors is histogenetically foregut derived, as opposed to an ovarian origin. We review previous series and case reports with emphasis and discussion on histogenesis and prognosis.

Mixed Sessile Serrated Adenomas and Fibroblastic Polyps of the Colon: Clinicopathologic Analysis of 11 Cases
(Poster No. 9)
Parag Patel, DO (ppatel@carisls.com); Ahmed Bedeir, MD. Department of Anatomic Pathology, Caris Life Sciences, Phoenix, Arizona.

Context: Fibroblastic polyps (FPs) are described as benign lesions characterized by a proliferation of bland spindled cells separating and distorting mucosal crypts that occur in the distal colon and are commonly associated with hyperplastic polyps. Sessile serrated adenomas (SSAs) are polyps that occur throughout the colon and are thought to comprise most polyps found on the right side; however, they have not been described as occurring with FP.

Design: We aim to describe the clinical and pathologic features of 11 cases with mixed SSAs/FPs collected prospectively during several months.

Results: The patients were 7 females and 4 males with ages ranging from 35 to 87 years. The indications for colonoscopy varied from screening, abdominal pain, and a history of polyps requiring follow-up. The lesions ranged in size from 6 to 12 mm and were located in the ascending colon, transverse colon, and sigmoid. Histologically, the mucosal crypts showed the classic features of an SSA, including serrated epithelium with dilated basal crypts. The fibroblastic component showed bland, plump spindle cells with oval nuclei arranged either haphazardly or in bundles parallel to the surface (Figure 5). Immunohistochemically, all cases were positive for vimentin and negative for desmin, smooth-muscle actin, S100, c-Kit, epithelial membrane antigen, cytokeratin AE1/AE3, CD34, and factor XIIIa.

Conclusions: Mixed SSAs/FPs are colon polyps showing the distinct features of both SSAs and FPs. Awareness of this type of polyp is important to convey the benignity of the diagnosis and avoid confusion with other epithelial and mesenchymal lesions of the colon.

Autoimmune Pancreatitis, the University of Miami/Jackson Memorial Medical Center Experience: A Pathologic Case Series with Evaluation of Peripancreatic Extension
(Poster No. 10)
Joseph A. Zeitouni, MD (zeitouni@med.miami.edu); Shaikh A. Mortuza, MD; Monica T. Garcia-Buitrago, MD. Department of Pathology, University of Miami/Jackson Memorial Health System, Miami, Florida.

Context: Autoimmune pancreatitis (AIP) is currently considered the pancreatic manifestation of IgG4-related systemic sclerosing disease. The aim of this retrospective review is to evaluate the frequency of the hallmark histologic features previously described in the literature, IgG4-positive plasma cell count, and the peripancreatic mucosal involvement of AIP.

Design: We reviewed slides from pancreatic specimens obtained from our institutional archives between 2003 and 2010 and diagnosed as AIP. Selected sections were stained for anti-IgG4 antibody (Invitrogen, 1:100, mouse). IgG4-positive plasma cells were quantified in pancreatic and peripancreatic tissue. The presence of venulitis, granulocytic epithelial lesions, ampullary mucosal involvement, and Brunner gland involvement were evaluated.

Results: Nine of 628 pancreatic specimens (1.4%) diagnosed as AIP were retrieved. All 9 cases showed a ductocentric lymphoplasmacytic infiltrate with varying degrees of stromal sclerosis. The next most frequent findings were involvement of ampullary mucosa (5 of 9) and Brunner glands (3 of 9), followed by granulocytic epithelial lesions and venulitis (2 of 9 each). IgG4-positive plasma cell infiltrates, greater than 50/HPF (high-power field), were observed in 8 sections from pancreas (mean, 125/HPF), 4 from ampulla (Figure 6, a and b; mean, 111/HPF), and 3 from Brunner glands (Figure 6, c and d; mean, 131/HPF).
Conclusions: In addition to histologically prominent pancreatic lymphoplasmacytic infiltrates, venulitis, and granulocytic lesions, some patients had peripancreatic mucosal (ampullary and Brunner glands) plasma cell infiltrates. Dense IgG4 immunostaining (>50 positive cells/HPF) had a high sensitivity (89%) for the diagnosis of AIP in our series.

**HER2/neu Expression in Gastric Cancer in Indian Population: An Immunohistochemistry and Fluorescence In Situ Hybridization Study**

(Author name)

**Context:** Human epidermal factor receptor (HER2/neu, also known as neu, ERBB2) protein expression in gastric cancer is associated with poor prognosis, aggressive disease, and poor response to chemotherapy. Trastuzumab, a monoclonal antibody against HER2/neu, in combination with chemotherapy, is currently advocated as a new standard option for patients with HER2/neu-positive advanced gastric and gastroesophageal junction carcinoma. Frequency of HER2/neu new expression in gastric cancer has been reported from different geographic zones, with a wide range of 13% to 91%. There are no reported data of HER2/neu protein expression in gastric cancer tissue from India. We evaluated the frequency of HER2/neu expression in gastric cancer.

**Design:** The frequency of HER2/neu in gastric adenocarcinoma was prospectively evaluated during 6 months at our institute, from January 2010 to July 2010, using immunohistochemistry (IHC) and fluorescence in situ hybridization (FISH) on tissue specimens.

**Results:** A total of 52 patients were included. HER2/neu was confirmed in 44.2% (23 of 52) of patients by IHC. Two patients had equivocal result by IHC (2+), one of whom had a positive result on analysis by FISH. There was no statistical difference in HER2/neu positivity and negativity with gender, age, site, histologic subtype, tumor differentiation, or lymph nodal status.

**Conclusion:** HER2/neu was observed in a significant number of patients with advanced gastric adenocarcinoma. Performing a HER2/new IHC test may be included in the protocol for advanced gastric carcinoma cases that might benefit with trastuzumab in combination with chemotherapy.

**An Autopsy Case Report of Hepatic Angiosarcoma Histologically Mimicking Veno-occlusive Disease**

(Author name)

**Medullary Carcinoma of the Ampulla of Vater With Microsatellite Instability; A Case Study With Clinical Follow-up**

(Author name)

**Withdrawn.**

A Possible Early Precursor of Mixed Endocrine-Exocrine Tumors of the Gastrointestinal Tract

(Author name)

**Histopathologic, Histogenetic, and Immunohistochemical Analysis of Epidermoid Cyst of Spleen**

(Author name)
multiple fractures. She underwent exploratory laparotomy and splenectomy for grade III splenic lacerations. There was incidental discovery of the large splenic cyst. The spleen’s gross weight was 360 g. The cyst measured 13.3 cm in its greatest dimension and had replaced most of the splenic parenchyma. The inner lining of cyst was grayish white, smooth, and glistening. Histologically, the cyst had stratified squamous epithelium and a thick fibrous wall. Some parts of the cystic wall were denuded. The cyst wall had focal collection of hemosiderin-laden macrophages. In the immunohistochemical analyses, the squamous epithelium was positive for carcinoembryonic antigen and CA 19-9, cytokeratin 5/6, focally positive for HBME-1, and negative for calretinin. Then, an epidermoid cyst of the spleen was diagnosed. Nonparasitic cysts are classified as primary (true or epidermoid cyst) or secondary ( pseudocysts). Histopathologic examination plays a key role in diagnosing the exact etiology of the cyst. Histogenesis of a true cyst is not clear, but according to a few studies, it is believed that it is the result of invagination of surface 1, visceral mesothelium with subsequent cystic extension and metaplastic changes. Surgery is recommended in both true and false large cysts for the prevention of complications.

A Case Report of Adenocarcinoma-Carcinoid Collision Tumor of Rectum
(Poster No. 16)

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Collision tumors of the gastrointestinal tract are exceedingly rare and consist of 2 distinct adjacent tumors without intermixture of individual cell types. We report a case of adenocarcinoma-carcinoid collision tumor in the rectum. This is the first adenocarcinoma-carcinoid collision tumor of rectum reported in the English literature. A 69-year-old man presented with rectal bleeding with subsequent colonoscopy and biopsy. Initial biopsy revealed adenocarcinoma. After completing neoadjuvant chemoradiation therapy, a segment of rectum and anus was resected. Grossly, a 4-cm, ill-defined, raised ulcerated lesion was identified in the rectum. Macroscopic examination showed 2 distinct nonoverlapping tumor types: carcinoid tumor and adenocarcinoma. The carcinoid tumor is located at mucosa and inner muscularis propria, and the adenocarcinoma is located in the outer muscularis propria. Each tumor comprises about half of the total mass. Immunohistochemical staining for neuroendocrine markers (NSE, synaptophysin, and chromogranin) shows positivity in the carcinoid tumor component. Immunohistochemical staining for CK20, CEA, and CDX-2 shows positivity in the adenocarcinoma component. Proliferative index (Ki-67) was 90% in the adenocarcinoma component and only 5% in the carcinoid tumor component. The case illustrates that initial diagnosis of collision tumor can be limited owing to sampling error. Histologically, both these tumors display a distinct dual phenotype, but the tumorogenesis of collision tumor has not been defined. Scholars continue to debate whether these tumors develop from a single progenitor cell or as unrelated synchronous neoplasia. New investigations are necessary to elucidate the pathogenesis of these tumors and the impact of these different components on prognosis.

Low-Grade Mucinous Cystadenoma of Appendix
Incidental Finding: A Case Report of a Patient With History of Colon Cancer
(Poster No. 17)

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Mucinous cystadenoma of the appendix is an uncommon clinical finding. It has been generally termed mucocoe of the appendix. Overall, appendiceal mucocoeles make up about 0.3% of appendiceal specimens. We present a case of low-grade mucinous neoplasm of appendix in a 59-year-old woman with a reported remote history of colon cancer. She presented with severe, right lower quadrant abdominal pain. A computed tomography scan suggested a possible ruptured appendix. Appendectomy and incision and drainage of suspected abscess cavity were performed. During surgery a small peritonal nodule was also identified. The appendix was expanded and contained adenomatous epithelium. The peritoneal nodule and abscess cavity contained extravasated acellular mucin without adenomatous epithelium. By the histologic features and the presence of extravasated acellular mucin, this lesion was best characterized as a low-grade mucinous neoplasm of the appendix with low risk of recurrence. Low-grade mucinous neoplasm can spread to the peritoneum as pseudomyxoma peritonei even though they are not invasive in the appendix. The 5-year survival in patients with pseudomyxoma peritonei has been reported to be 53%.

High Level of Oxidative Damage Immunomarker
8-Hydroxydeoxyguanosine (8-OHdG) Is Associated With Biologically Aggressive Hepatocellular Carcinoma and the Progression of Hepatocellular Carcinoma in Human Liver Tissues
(Poster No. 18)

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Context: Reactive oxygen species in human tissue can damage DNA and proteins. Oxidative marker 8-OHdG is a byproduct of DNA lesions. Our goal was to establish levels of 8-OHdG in human liver tissues ranging from normal to cirrhosis to dysplasia to hepatocellular carcinoma (HCC) and to determine if expression is associated with any tumor characteristics.

Design: We designed and analyzed a liver tissue array derived from 158 subjects with cirrhosis (107 without HCC + 43 with HCC) and 8 with normal liver, for expression of 8-OHdG by standard immunohistochemistry. Nuclear 8-OHdG positivity was quantified by Aperio image analysis software (Aperio, Vista, California). Nonparametric statistical tests were used with SPSS Statistics 17.0 (IBM, Armonk, New York).

Results: The 8-OHdG median level in normal liver was 32.3 (n = 8); cirrhosis, 51.75 (n = 106); dysplasia, 60.8 (n = 114); and HCC, 76.4 (n = 43). In subjects with HCC, 8-OHdG levels in HCC areas increased from well-differentiated (40.5) to moderately (63.4) to poorly differentiated tumors (115.7) (P = .001). In subjects without HCC, 8-OHdG levels increased from cirrhosis (54.3) to dysplasia (69.9) (P < .01). In subjects with HCC, 8-OHdG levels increased from cirrhosis (28.1) to dysplasia (36.7) to HCC (76.4) (P = .02) (Figure 8).

Conclusions: This study shows that immunexpression of oxidative damage marker 8-OHdG increases with worsening disease progression and tumor differentiation. 8-OHdG may be a useful biomarker to monitor progression of HCC. Verification in a larger cohort could determine if 8-OHdG is a marker for hepatocarcinogenesis.

Eosophagitis Dissecans Superficialis: A Review of 68 Consecutive Cases During a 16-Month Period
(Poster No. 19)

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Context: Esophagitis dissecans superficialis (EDS) is an unusual pattern of injury characterized by sloughing of the superficial squamous epithelium with necrosis, parakeratosis, and intraepithelial abscesses. This study describes clinicopathologic aspects of EDS (Figure 9).
Liver Transplant Rejection: Retrospective Review of Etiologic Factors from a Single Center (Poster No. 21)

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Context: Histologic assessment plays an important role in the diagnosis and management of liver allograft rejection. Recurrent hepatitis C infection and other causes are common findings in allograft liver rejection biopsies. Hepatitis C infection is characterized by accelerated progression toward cirrhosis and hepatic failure due to the lack of effective immunoprophylaxis with specific antiviral therapy. In contrast, recurrence of hepatitis B is uncommon. In this study, we retrospectively evaluated and compared the influence of hepatitis C infection versus other causes in transplant rejections.

Design: We included 143 patients who underwent liver transplants at our institution from January 2007 to December 2010. Various causes of transplant rejections were reviewed and evaluated. Statistical analysis was performed by using ANOVA in SPSS and was correlated with overall outcome.

Result: Transplant rejection causes included recurrent hepatitis C, hepatitis B, autoimmune, cholestasis, and nonspecific acute and chronic rejections (Figure 10). Hepatitis C-associated rejection was most frequent, 65% (94 of 143), and mean interval between transplant and rejection was 733.01 days (SD, 743.84 days), with hepatitis B, 0.02%; other viral causes, 0.4%; autoimmune, 0.2%; cholestasis, 0.03%; nonspecific acute and chronic rejection, 17%; and other factors, 0.03%. Results between hepatitis C versus other causes were statistically significant (P < .01).

Liver Allograft With Gas Gangrene (Poster No. 20)

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Infection of viscera by gas-producing organisms is rare. Clostridium perfringens and Klebsiella pneumoniae are the most common gas-producing organisms. We report a case of gas gangrene in a liver allograft, which was complicated by local hemorrhage. A 43-year-old white man with chronic liver failure due to alcohol abuse had an orthotopic liver transplant, which failed immediately. Within a year, he received a second orthotopic liver transplant. The immediate postoperative period was complicated by bleeding from the inferior vena cava, intra-abdominal abscess formation, and hepatic artery pseudoaneurysm. Abscess drainage and hepatic artery embolization were performed. Subsequently, the patient developed sepsis, acidosis, liver failure, and coagulopathy. The patient died within 2 months after the second transplant. A green, spongy, crepitant, and buoyant liver weighing 1620 g was present at autopsy. Cut sections of the diffuent liver revealed multiple cystlike spaces with frothy sanguineous contents. Metallic coil and embolic foreign material were present inside the common hepatic artery, along with blood clots at the porta hepatitis. Microscopic examination revealed necrotic liver with numerous bacteria and air spaces. Antemortem and postmortem blood cultures grew K. pneumoniae and Enterococcus faecalis. The gas gangrene was limited to the liver. This is the first case report of gas gangrene of liver allograft after therapeutic embolization of the hepatic artery. Common gastrointestinal bacteria, like K. pneumoniae and E. faecalis, can ascend through the portal system and produce gas gangrene in an ischemic liver.

Human Herpesvirus 6–Associated Spindle Cell Neoplasm Arising in a Liver Transplant (Poster No. 22)

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Spindle cell neoplasms are rarely reported in liver allografts; most are benign and associated with Epstein-Barr virus infection. We present a
case of a human herpesvirus 8–associated malignant spindle cell neoplasm arising in a liver allograft. The patient was a 66-year-old white man who underwent orthotopic liver transplant in 2006 for cirrhosis secondary to nonalcoholic steatohepatitis. In 2008, he presented with vague abdominal complaints, and imaging studies revealed a heterogeneous, hypodense mass in the right lobe of the liver. The patient underwent a right hepatectomy. Gross examination revealed a 10.0 × 9.9 × 7.3-cm, tan-pink, soft, well-delineated, hemorrhagic mass with central cavitation and a second 1.4 × 1.2 × 1.2-cm, tan-white, firm, homogeneous, well-delineated mass. Microscopically, the tumor was composed of spindle cells with mild to moderate nuclear pleomorphism and relatively abundant eosinophilic cytoplasm. There were areas of broad, relatively hypocellular fascicles, whorls, and perivascular pseudosarcomatous. Mitotic activity ranged from 2 to 4 mitotic figures/20-high-power fields. Immunohistochemical stains were positive forEMA (patchy), vimentin (diffuse), CD99 (diffuse), bel-2 (diffuse), cytokeratin (patchy), and HHV8 (diffuse). In situ hybridization results of in situ hybridization stains for Melan-A, S100, desmin, HMB-45, CD35, CD21, CD10, EBV, CD34, glypican-3, podoplanin, CD31, c-kit, PR, SMA, and CD1a were negative. Interphase FISH analysis was negative for a translocation involving the SYT1 gene (18q11). The tumor could not be further classified and we think it represents a novel type of spindle cell neoplasm in immunosuppressed patients. Presently, the liver allograft is functioning well and there is no evidence of tumor progression.

Megacystis-Microcolon-Intestinal Hypoperistalsis Syndrome: Case Report and Review of the Literature  (Poster No. 23)

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Megacystis-microcolon-intestinal hypoperistalsis syndrome (MMIHS) is a rare but severe congenital disease characterized by distended nonobstructed bladder, microcolon, and hypoperistalsis. As the prenatal diagnosis of MMIHS still remains difficult, it is important to report any pathologic findings as a supplement in the diagnosis of MMIHS to understand better the underlying etiology. However, to our knowledge, only 5 publications so far have described the microscopic abnormalities. The results of these reports are highly variable, with reported increased or decreased numbers of ganglion cells and absence or reduced expression of smooth muscle actin in the bowel muscularis propria. Here we report a case of a 15-year-old adolescent boy with previously diagnosed MMIHS who recently underwent a small- and large-intestine transplant with subtotal gastrectomy at Georgetown University Hospital. Gross examination of the gastrectomy and enterectomy specimens reveals a long segment of tortuous, extensively adherent small and large intestines and a dilated stoma (muco). Tissue from the stomach and small and large intestine displays hundreds of pale, round papules, measuring 0.1 to 0.3 cm, which histologically represent intramucosal lymphoid hyperplasia with prominent germinatal centers. Extensive sampling shows ganglion cells present in the myenteric and submucosal plexuses throughout the stomach and small and large intestines. Immunohistochemical staining of smooth muscle actin (SMA) demonstrates positivity in longitudinal and circular muscle layer of the small- and large-bowel tissues. Our pathologic findings did not corroborate the features reported by other investigators. We conclude that the underlying etiology of MMIHS remains obscure. Additional studies are needed to expand our knowledge of this syndrome.

Presentation of B-Cell Lymphoblastic Leukemia/ Lymphoma as Fulminant Hepatic Failure in a Pediatric Patient (Poster No. 24)

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Viral hepatitis is the most common cause of fulminant hepatic failure in pediatric patients. While liver involvement is common in acute leukemia, it is extremely rare for patients with B-cell lymphoblastic lymphoma/leukemia to present with acute liver failure. We report an unusual case of B-cell lymphoblastic lymphoma/leukemia in a previously healthy but obese 15-year-old adolescent boy, presenting as fulminant hepatic failure. He developed vomiting and abdominal pain after returning from a beach vacation. SMA demonstrated positivity in longitudinal and circular muscle areas of broad. Laboratory test results were negative for acute hepatitis panel with markedly increased bilirubin, liver enzymes, and ammonia levels. Except for moderate thrombocytopenia and relative lymphocytosis, blood counts were normal. The patient rapidly progressed to coma, requiring a liver transplant. Intraoperative frozen section of native liver showed extensive hepaticcellular necrosis and marked inflammation. Two days postoperatively the patient became pancytopenic. Microscopic examination of the explant liver revealed moderate involvement of medium-size to large lymphocytes in the portal and periportal areas with prominent histiocytic reaction, extensive hepatocellular necrosis, and cholestasis. Hilar lymph node showed expansion of interstitial areas by the same mononuclear infiltrate, which expressed CD45, CD79a, CD10, FAX5, and TdT by immunohistochemistry, but not CD20, CD34, CD117, or CD123, consistent with B-cell lymphoblastic lymphoma/leukemia. Because of lack of hematologic findings, rapid deterioration of liver function, and histologic picture of submassive necrosis, leukemia was not suspected before transplant. Awareness of this unusual presentation will avoid a diagnostic pitfall with consequences for subsequent management.

A Case of Idiopathic Myointimal Hyperplasia of Mesenteric Veins (IMHVM) Clinically Presenting as an Ischemic Colitis (Poster No. 25)

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Idiopathic myointimal hyperplasia of mesenteric veins (IMHVM) is a rare condition that affects rectosigmoid colon of young males. We present a case of IMHVM that manifested as an ischemic colitis. A 37-year-old man presented with pain in the lower left side of the abdomen and bloody diarrhea. Colonoscopy showed granularity in the sigmoid colon; rectal biopsies revealed hemorrhagic changes. Abdominal computed tomography demonstrated long-segment wall thickening in sigmoid colon, suggestive of ischemic colitis. The patient underwent left-sided colectomy. Sections of the resection specimen did not show mucosal regenerative changes with crypt dropout and lamina propria fibrosis. Mesenteric and submucosal veins demonstrated myointimal hyperplasia. IMHVM was described by Genta and Haggitt in 1991, with only a few cases reported to date. It is seen in young men who present with abdominal pain and bloody diarrhea. Clinical presentation suggests inflammatory bowel disease, yet the biopsies are nonspecific or show ischemic changes. IMHVM is diagnosed by examination of the resection specimen. The intima of the mesenteric and mural veins show marked increase in cells and matrix between the endothelium and internal elastic lamina. Immunoreactivity to muscle-specific actins shows intimal proliferation of smooth muscle cells. Elastic stain confirms that the affected vessels are veins. IMHVM might be caused by injury to the sigmoid mesocolon secondary to torsion, leading to greatly increased pressure within the affected veins. The clinical course is complete recovery after resection. IMHVM is an uncommon and underrecognized entity that presents as a segmental proctosigmoiditis clinically suggestive of IBD or ischemic colitis.

Autoimmune Hepatitis in a Patient Treated With Interferon β-1a (Poster No. 26)

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Autoimmune hepatitis is a self-perpetuating, necroinflammatory disease of the liver of unknown etiology, although multiple drugs and viruses have been implicated. Interferons are a group of related glycoproteins involved in the regulation of antiviral and antiproliferative responses of the host immune system. Interferon (IFN)-β is the standard therapy for relapsing-remitting multiple sclerosis (MS). Literature search revealed no autoimmune complications with IFN-β therapy in large, long-term studies. We present the first case report of hepatic autoimmunity in a patient with MS receiving IFN-β-1a therapy, requiring the cessation of therapy. A 43-year-old woman with normal hepatic function with relapsing remitting MS was treated with IFN-β-1a. She was noncompliant with any other medications. After 3 months of treatment, the patient had jaundice and increased levels of liver enzymes. The liver biopsy showed severe necroinflammatory changes in the parenchyma with parenchyma collapse and bridging necrosis. The drug was withdrawn and the patient made a complete clinical recovery after 1 year. During IFN therapy several autoimmune events may occur, indicating that autoantibodies must be carefully monitored. Even though IFN-β-1a is considered safe, adverse events like autoimmune hepatitis can occur when receiving this therapy. Immunomodulation should be
designed to decrease interferon overactivity. Clinicians should be aware and mindful of this complication and monitor their patients accordingly when interferon-β-1a therapy is administered.

**Multiple Somatostatin-Producing Neuroendocrine Carcinomas Coexisting With Multiple Gastrointestinal Stromal Tumors in the Duodenum: An Unusual Concurrence**

(Poster No. 27)

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Somatostatin-producing endocrine tumors (somatostatinomas) and gastrointestinal stromal tumors (GISTs) are 2 uncommon entities, both of which show an association with neurofibromatosis type 1 (NF-1). However, coexistence of somatostatinoma and GIST is extremely rare, with <10 cases reported in literature, all of which were associated with patients with NF-1. We report a case of multiple somatostatinomas and GISTs in the duodenum of a patient without clinical evidence of NF-1. A 58-year-old woman with no significant medical and family history was referred for an incidental finding of 3 duodenal masses on a computed tomography scan to rule out spinal cord compression. A diagnosis of well-differentiated neuroendocrine neoplasm was made from biopsy specimens of the masses. On physical examination, no classic stigmata of neurofibromatosis were found. A Whipple procedure was performed. Grossly, in addition to 3 tan-white, firm masses (1.3 to 2.5 cm) in the duodenum, multiple small, tan-white, firm nodules (0.5 to 0.9 cm) were found bulging from the duodenal mucosa and serosa. Microscopically, the 3 big masses showed typical cytology and architecture of neuroendocrine tumors (cells with granular cytoplasm, inconspicuous nuclei, and dispersed chromatin arranged in trabecular and solid patterns). Psammoma bodies and lymph node metastasis were present. Immunohistochemically, the cells were positive for synaptophysin, chromogranin, and somatostatin. The multiple small duodenal nodules were composed of interlacing fascicles of spindle cells that were positive for CD34 and CD117 and negative for S100 and SMA. The morphology, in conjunction with immunohistochemical profile, supports the diagnosis of coexistent multiple somatostatinomas and GISTs in the duodenum.

**Primary Gastric T-Cell Lymphoma**

(Poster No. 28)

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Gastric lymphomas are mostly of B cell origin. Primary gastric T-cell lymphomas are rare and frequently associated with human T-cell leukemia virus type 1 (HTLV-1) with poor prognosis. We present a case of primary gastric T-cell lymphoma that is HTLV-1 negative. The patient was a 68-year-old African American man who presented with upper gastrointestinal bleeding and anemia requiring multiple transfusions. Gastric endoscopy showed a large ulcer with the lesser curvature. A biopsy specimen revealed diffuse lymphoid infiltrates consisting of predominantly medium to large atypical lymphocytes with a moderate amount of pale cytoplasm, large nuclei, open chromatin, and multiple nucleoli. The neoplastic cells were positive for CD2, CD3, CD4, CD5, CD7, and CD43 but negative for CD20, CD8, CD10, CD20, ALK1, EMA, TDT, and CD56, with moderate to high proliferation index. Positron emission tomography-computed tomography scan demonstrated fluorescence of a jejunal gastric mass with an adjacent suspicious lymphadenopathy. Serology testing for HIV and HTLV-1 was negative. Partial gastrectomy with regional lymph node dissection confirmed a diagnosis of peripheral T-cell lymphoma, not otherwise specified. With 1 lymph node involvement. Primary gastric T-cell lymphoma is exceedingly rare and poorly characterized, with challenging treatment. Further studies are necessary for more optimal and possibly targeted therapies.

**Adenomatous Hyperplasia of the Vaterian Ducts Associated With Brunner Gland Hyperplasia**

(Poster No. 29)

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A 54-year-old man presented with abdominal pain; endoscopy, ultrasonography, and computed tomography revealed a cystic, multiseptate, nearly circumferential mass involving the duodenal wall with likely extension into the pancreas. Owing to these findings and presentation, a Whipple-type pancreaticoduodenectomy was performed. The patient tolerated the procedure well and remained well at follow-up. Grossly, there was a 5.5-cm, circumferential, broad-based mass lesion of the duodenal mucosa (Figure 11, A, inset). Sections revealed an aggregates of cysts underlying the mucosa, which appeared to extend into the pancreas (Figure 11, A). Microscopically, the cysts, which were centered at the ampulla of Vater, had features of dilated vaterian ducts (Figure 11, B, thin arrows). In addition, there was extensive Brunner gland hyperplasia (Figure 11, B, thick arrows) confined to the mucosal level, but not associated with the cysts. No malignant features were found and a diagnosis of adenomatous hyperplasia of the vaterian ducts associated with Brunner gland hyperplasia was made. Adenomatous hyperplasia of the vaterian duct system is rare, described in the literature as benign with symptoms including abdominal pain and jaundice. Diagnostic difficulties are also noted in the literature and a radical resection is considered a valid, effective treatment. Large areas of Brunner gland hyperplasia can also resemble malignancy, both endoscopically and on imaging. In conclusion, the combination of these 2 benign entities, which has not been previously reported, caused the radiologic and endoscopic imaging to appear ominous. However, owing to symptoms and the diagnostic difficulty of ruling out malignancy, pancreaticoduodenectomy was an appropriate therapy for these benign processes.

**Lymph Node Ratio, Total Node Count, and Preoperative CA 19-9 Levels Predict Overall Survival in Resected Pancreatic Adenocarcinoma**

(Poster No. 30)

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Patients who undergo curative resections for localized adenocarcinoma of the pancreas have a uniformly dismal prognosis. Therefore, clinicopathologic factors that could predict overall survival (OS) would be useful to clinicians and patients. 

**Design:** Patients who had undergone curative resections for histologically confirmed adenocarcinoma of the pancreas were included in this study. Patients were staged by AJCC 7th-edition criteria. Univariate statistical analyses were conducted by using the Kaplan-Meier method or Cox proportional hazard models. Log-rank tests were performed. Significant differences were assessed at a 2-sided 5% significance level.

**Results:** For the 171 patients whose median age was 67.0 years (range, 57.2–72.8 years), with 46% women and 54% men, tumor was located in the pancreatic head (87%) or body/tail (10.5%). Pathologic factors associated with OS included periampullary extension, resection margin status, T stage, N stage, and overall stage grouping. Notably, low histologic grade was associated with an improvement in OS (P = .004). The total number of lymph nodes resected was associated with improved recurrence-free survival (P = .009). The total number of positive lymph nodes and the lymph node ratio were inversely associated with OS and recurrence-free survival (P < .001). Low preoperative CA 19-9 levels (P = .02) and use of adjuvant therapy (chemotherapy or chemoradiation) were also associated with improved OS.

**Conclusions:** In addition to well-established clinicopathologic factors that predict for OS after curative resections of pancreatic cancer (periampullary extension, margins, T, N stage) the tumor grade, total number of nodes resected, nodal ratio, and pretreatment CA19-9 levels can also be used to predict overall survival.

**IgG4 Immunohistochemistry in Primary Biliary Cirrhosis and Primary Sclerosing Cholangitis**

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**Context:** Immunoglobulin (Ig) G4-associated cholangitis (IAC) is the biopsy manifestation of IgG4-related multisystem disorder characterized by multifocal IgG4-rich lymphoplasmacytic infiltrates and increased serum IgG4 levels. However, limited data are available on the specificity of IgG4 immunohistochemistry for diagnosis of IAC. We evaluated the frequency of IgG4 staining of plasma cells in primary biliary cirrhosis (PBC) and primary sclerosing cholangitis (PSC) in order to assess whether IgG4 positive infiltrates were found in other cholestatic diseases.

**Design:** Immunohistochemical staining for IgG4 was performed in explanted livers of 20 patients with PBC and 51 patients with PSC. The number of IgG-positive plasma cells per high-power field (HPF) was counted in 10 HPFs containing the densest lymphoplasmacytic infiltrates. Greater than 10 positive cells per HPF was considered a positive finding.

**Results:** IgG4 immunohistochemistry was negative in patients with PBC. However, for 4 of 51 patients with PSC (7.8%), results showed positive staining. Two patients had a history of ulcerative colitis. All 4 positive cases exhibited histologic features of PSC, with large bile duct injury and periductal fibrosis, and exhibited dense mixed inflammatory cell infiltrates involving large intrahepatic and extrahepatic bile ducts and large numbers of plasma cells.

**Conclusions:** We found no IgG4-positive infiltrates in patients with end-stage PBC, suggesting that immunostaining is helpful in distinguishing PBC from IAC. However, few patients with PSC did have IgG4 positivity. These patients may represent a subset of patients with PSC associated with different prognoses and potential therapeutic response to steroid therapy. However, further studies on diagnostic utility and clinical implications of IgG4 positivity in patients with PSC are needed.

**Evaluation of Subepithelial Fibrosis and Subepithelial Eosinophilia in Differentiating Eosinophilic Esophagitis From Gastroesophageal Reflux Disease in Pediatric Patients**

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**Context:** Recently, subepithelial fibrosis (SEF) has been suggested as a major criterion for diagnosis of eosinophilic esophagitis (EE) and gastroesophageal reflux disease (GERD). This study was conducted to evaluate the significance of SEF and subepithelial eosinophilia (SEE) in distal/midesophageal biopsies of patients with EE and GERD.

**Design:** Esophageal biopsies and medical records of pediatric patients (6 months–15 years) with epithelial eosinophilia (>15/high-power field) during a 5-year period were reviewed. These patients were subdivided as EE and GERD groups on the basis of their clinical presentation and endoscopic findings. Age-matched, histologically normal esophageal biopsies were used as control. Trichrome stain was used to evaluate fibrosis.

**Results:** Subepithelial tissue was present in 30 of 36 EE and 12 of 18 GERD patients. There was no significant difference in presence of SEF (P > .95); SEE (P = .84), degranulation of eosinophils (P > .99), lymphoid aggregate (P = .70), or smooth muscle bundle (P = .74) in mid and distal biopsies in both subgroups. Presence of SEE was statistically significant with SEE (P = .03) and degranulation (P = .02). There was no significant correlation of SEE with the presence of smooth muscle (P = .10). In EE, 6 of 7 patients with dysphagia (85%) had SEE and 20 of 25 patients without dysphagia (80%) showed SEE.

**Conclusion:** SEF and SEE are important criteria in eosinophilic esophagitis in subepithelial tissue and degranulation irrespective of the cause. SEE should not be used as a major criterion for patients with EE, as suggested by recent studies. SEE is present in most patients with dysphagia; however, it is not specific.

**Collagenous Colitis: Cause of Diarrhea in a 3-Year-Old Child**

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Collagenous colitis is characterized histopathologically by an increased subepithelial collagen layer of at least 10 μm in thickness, epithelial damage, and chronic inflammation of the lamina propria of the colon. The prototypic population showing microscopic evidence of collagenous colitis is predominantly females in their sixth to seventh decade of life. They typically present with chronic, nonbloody watery diarrhea, abdominal pain, distension, and weight loss. Some patients have associated autoimmune diseases including the thyroid, rheumatic disease, and celiac sprue. Chronic use of drugs like NSAIDS, lansoprazole, and cemetidine has also been implicated as causative agents. We present a case of a 3-year-old child who presented with watery, nonbloody diarrhea of 1 month duration; a colonoscopy was performed after ruling out infectious, dietary, and other common causes of toddler diarrhea. Random colon biopsy specimens were sent for histologic hematoxylin-eosin staining (H&E), and Masson trichrome staining (Trichrome) was performed on formalin-fixed, paraffin-embedded tissue. Stool cultures/assays were performed to rule out microbial infection, ova and parasites, and causes of malabsorption. H&E sections revealed collagenous colitis characterized by a prominently thickened subepithelial collagen, confirmed with Trich stain. The surface epithelium is frequently denuded with increased intraperitonal lymphocytes. With increased recognition of collagenous colitis in children, it is no longer an exclusive disease in elderly population. A high index of suspicion by general family practitioners/pediatricians, as well as accurate diagnosis by pathologists, is crucial for proper management and to minimize chances of morbidity and mortality secondary to dehydration and growth failure.

**Sarcomatoid Carcinoma of the Colon Presenting as a Lung Spindle Cell Neoplasm**

(Heng Hong, MD iuhong@yahoo.com); Jonathan Boyd, MD. Department of Pathology and Laboratory Medicine, East Carolina University, Greenville, North Carolina.

Sarcomatoid carcinoma is an uncommon biphasic tumor with mixed malignant epithelial and mesenchymal features. We report here an unusual clinical presentation of a case of colonic sarcomatoid carcinoma. An 84-year-old man was identified by computed tomography scan as having a rapidly enlarging left-sided lung mass measuring up to 7.9 cm and focal “masslike” thickening in the colonic hepatic flexure. An open lung biopsy was performed and showed an infiltrating malignant spindle cell neoplasm (Figure 12, A) that stained positively for vimentin, weakly positive for cytokeratins, and negatively for thyroid transcription factor 1 in immunohistochemical studies. Two days later, a hemicolec- tomy was also performed that revealed a 5.4 cm mass in the colon, which was predominantly composed of moderately differentiated adenocarcinoma. In focal areas of this tumor, however, malignant spindle cells admixed with carcinoma component were identified (Figure 12, B). The
spindle tumor cells had similar morphologic and immunostaining features as the lesion identified in the lung. The findings are consistent with a colonic sarcomatoid carcinoma with metastasis of its sarcomatoid component into the lung. The pathologic diagnosis of the lung lesion for this patient could have been very challenging because colonic sarcomatoid carcinoma is very rare, and in this case only the sarcomatoid component of the tumor metastasized to the lung. To our best knowledge, this is the first reported case of colonic sarcomatoid carcinoma with the primary clinical presentation as a malignant spindle cell lung neoplasm.

Extranodal Rosai-Dorfman Disease of Colon: A Case Report With Literature Review (Poster No. 35)

Daniel B. Wimmer, DO, Jae Y. Ro, MD, PhD; Annisa L. Lewis, MD; Mary R. Schwartz, MD; Richard Caplan, MD; Peter J. Schwarz, MD; Alberto G. Ayala, MD. Departments of Pathology, General Surgery, and Gastroenterology, The Methodist Hospital, Houston, Texas.

Rosai-Dorfman disease (RDD) is an uncommon inflammatory disorder that most often involves lymph nodes. We report a case of colonic RDD and a literature review of this uncommon presentation. Our case also had features suggestive of IgG4 sclerosing disease. A 49-year-old woman had a hemicolectomy for presumptive colon cancer after biopsies were inconclusive. Histologic and immunohistochemical evaluation confirmed a diagnosis of colonic RDD with possible associated IgG4 sclerosing disease. A literature review of colonic RDD and its manifestations is presented to increase awareness of this rare entity. Only 10 cases of colonic RDD are reported in the English literature. Patients’ ages ranged from 4 to 79 years, with a female predominance. Involved sites included the ileocecum (2), appendix (2), colon (2), and the "left" colon and rectum (5). Cases had different presentations, variable methods of discovery, and none were recognized preoperatively. Our case also exhibited features of IgG4 sclerosing disease, including sclerosing fibrosis and numerous IgG4-positive plasma cells. Increased IgG4-positive plasma cells have been recently recognized in cutaneous and pulmonary RDD, but not in colonic RDD. Though rare, colonic RDD does occur and clinically may mimic cancer. Thus recognition of this entity has important implications for the appropriate clinical management. Extensive histiocytic infiltration in the colon should prompt consideration of RDD. There are no previous reports of colonic RDD associated with IgG4 sclerosing disease. The increased IgG4-positive plasma cells and stromal fibrosis noted in our patient’s lesion suggest a possible relationship between colonic RDD and IgG4 sclerosing disease.

Microcystic/Reticular Schwannoma of the Proximal Sigmoid Colon: Case Report With Review of Literature (Poster No. 36)

Anshu Trivedi, MD; Ligato Saverio. Department of Pathology, Hartford Hospital, Hartford, Connecticut.

We report a case of microcystic/reticular schwannoma (Figure 13) of the proximal sigmoid colon in a 61-year-old man who presented with a 12-mm polyp while undergoing screening for colorectal neoplasm. This entity was first described in 2008 and is a rare variant of schwannoma, with a predilection for the visceral organs, predominantly the gastrointestinal tract. We also review the other 9 cases of microcystic/reticular schwannomas in the gastrointestinal tract that have been described in literature. Unlike other conventional gastrointestinal schwannomas, which are more common in the stomach, this variant appears to be more common in the large intestine. It is important to recognize this entity as it can be mistaken for a signet ring carcinoma or a myxoid gastrointestinal stromal tumor, particularly on small biopsy specimens. Conventional schwannomas occur most frequently in the stomach, and colorectal locations are uncommon. The microcystic/reticular variant appears to be more common within the colorectal region. The first series of 10 cases of microcystic/reticular schwannomas was first presented by Liegl et al in 2008. Subsequently, 4 more cases of this variant, involving the gastrointestinal tract, have been described. Adding to these recent publications, we report another example of this rare variant, which was identified in our department before the 2008 series publication, and describe for the first time the ultrastructure findings and the significant differential diagnosis considerations.

Primary Rectal Melanoma Arising in a Rectal Polyp (Poster No. 37)

Phil Stephenson, DO; Ross Miller, MD; Ali Jassim, MD, PhD. Department of Pathology, University of South Dakota, Sioux Falls.

Primary rectal melanoma comprises less than 1% of all anorectal cancers and rarely presents as a rectal polyp. Most cases present in the fifth to
seventh decade of life, with a female predominance of nearly 2 to 1. Initial symptoms are often nonspecific and include pain, hepatomegaly, and changes in bowel habits, leading to delayed medical attention and intervention. Diagnosis is often complicated by the fact that 30% of these lesions are amelanotic with varying histologic presentations. Metastasis is common, with 68% of patients demonstrating regional lymph node involvement and approximately 29% showing distant disease at initial presentation. Additional factors contributing to increased mortality are overall tumor size, perineural invasion, and loss of c-KIT expression. Despite advances in surgical and adjuvant treatments, prognosis remains dismal, with a 5-year survival rate of only 10%. We present a case of a 72-year-old woman who experienced small-caliber stools and rectal bleeding for 1 week. Colonoscopy demonstrated a friable 3.0 × 3.0-cm polypoid mass at the distal rectum. Histologic examination showed a rectal polyp with extensive replacement by discohesive, large cells, with prominent nucleoli and an increased mitotic rate (Figure 14). The neoplastic cells displayed strong positivity for S100, HMB-45, and melanoma-associated antigen immunohistochemical stains, confirming the diagnosis of melanoma. We report this case owing to its rarity and as a reminder to consider melanoma when evaluating rectal specimens, including polyps.

Telangiectatic Adenoma of the Liver in a Premature Infant With Kasabach-Merritt Syndrome
(Poster No. 38)

Michael P. Lee, MD (michael.lee.p@gmail.com); Chen-Chih J. Sun, MD; John C. Papadimitriou, MD, PhD; William S. Twaddell, MD. Department of Pathology, University of Maryland Medical Center, Baltimore.

Telangiectatic adenoma is an entity that has recently undergone reclassification after new molecular studies elucidated that it was a melanoma-like proliferation. Telangiectatic adenoma is rare in the pediatric population, with only few case reports described in the perinatal period. We report a case herein of a 4-day-old infant born at 28 weeks’ gestation with a weight of 2140 g (expected, 860 ± 247 g) born to a 25-year-old gravida 2, para 1 white woman. The mother’s history was noncontributory. At birth, the patient had minimal respiratory effort and Apgar scores of 7 and 7 at 1 and 5 minutes, respectively. Neonatal ultrasonography showed replacement of the liver with a very large vascular mass. On the first day of life, the patient developed disseminated intravascular coagulation; she subsequently developed multiorgan failure and died. An autopsy found a poorly defined liver mass (12.5 × 10.5 × 4.6 cm and weight of 259.1 g) with markedly dilated sinusoid-like spaces lining expanded hepatocellular cords that interdigitated with the surrounding normal liver. Portal-tract-like structures in the abnormal areas showed dystrophic vessels with direct communication into the sinusoidal system. These areas showed a paucity of bile ducts and the endothelial linings were positive for CD34 immunostain, while results for the normal liver were negative. There was marked extramedullary hematopoiesis. No central scar was identified. This is the first case of a telangiectatic adenoma in a critically ill newborn infant with rapid progression and a clinical picture of Kasabach-Merritt syndrome.

Angiogenesis in the Progression of Nonalcoholic Steatohepatitis
(Poster No. 39)

Yuliya Chayka, PhD (julia0403@rambler.ru); Elena Gavrylyuk, PhD. Department of Pathology, Lviv National Medical University, Lviv, Ukraine.

Context: Nonalcoholic steatohepatitis (NASH) may cause fibrosis and cirrhosis; however, the exact mechanism of disease progression is not fully understood. Angiogenesis has been shown to play an important role in the progression of chronic liver disease. The aim of this study was to elucidate the role of angiogenesis in progression of NASH.

Design: Thirty-seven autopsy cases of steatohepatitis performed in Lviv Regional Hospital in 2008–2010 were analyzed and paraffin-embedded slides stained with hematoxylin-eosin. The stage of fibrosis was evaluated by using NASH Clinical Research Network system. The monoclonal antibody anti-CD34 (clone QBEnd 10, DakoCytomation) was used to identify newly formed blood vessels. CD34 expression was analyzed in portal tracts, lobules, septa, and total slides. Statistical analysis was carried out by using criteria Newman-Keuls.

Results: Histologic analysis revealed stage 2, perportal fibrosis in 7 cases (18.9%); stage 3, bridging fibrosis in 22 cases (59.5%); and stage 4, cirrhosis in 8 cases (21.6%). The number of newly formed blood vessels was positively associated with fibrosis stage. The relationship was evident in the portal tracts and fibrous septa (P = .01 and P = .02, respectively). Intraportal angiogenesis was more common in cases with mild fibrosis, stage 2, but this association was not statistically significant.

Conclusions: Our observations suggest that liver fibrosis in cases with nonalcoholic steatohepatitis and cirrhosis is associated with formation of new blood vessels in portal tracts and septa. Intraportal angiogenesis probably is important at the early stages of disease.

Cytomegalovirus Inclusions Within a Colonic Tubular Adenoma: First Case Report
(Poster No. 40)

Andrea L. Barbieri, MD (andrea.barbieri@yale.edu); Katharine Van Patten, MD. Department of Surgical Pathology, Yale University, New Haven, Connecticut.

Cytomegalovirus (CMV) intranuclear and intracytoplasmic inclusions are occasionally identified within endothelial, stromal, and more rarely, epithelial cells of the colonic mucosa of immunosuppressed patients. We report the first case of classic CMV inclusions within the colonic epithelium of a tubular adenoma. The patient is a 92-year-old woman with a past medical history of altered mental status and a recently diagnosed cranial meningioma being treated with 4 mg of dexamethasone 3 times a day. She presented to the emergency department with bright red blood per rectum. Flexible sigmoidoscopy revealed a 1-cm ulcer within the distal rectum and a 1-cm flat polyp at 30 cm. Microscopically, the polyp is a tubular adenoma with numerous epithelial intranuclear and intracytoplasmic inclusions within the adenomatous glands (Figure 15). These inclusions are strongly positive for CMV immunostain. Interestingly, no such inclusions were noted on hematoxylin-eosin stain or CMV immunostain within the underlying endothelial or stromal cells. The rectal ulcer biopsy specimen displayed ulcerated colonic mucosa and failed to reveal histologic evidence of CMV, and the CMV immunostaining results were negative. There are no prior reports of CMV inclusions within peneoepithelial or neoplastic colonic epithelium. The significance of this unusual finding is unclear. It is possible that mutations acquired in the neoplastic epithelial cells make them more susceptible to infection by CMV, particularly in the setting of immunosuppression. Although the ulcer failed to reveal evidence of CMV, given the presence of the inclusions elsewhere, the patient was treated with valganciclovir and has remained asymptomatic.

Distinctive Clinicopathologic Variability of Hepatic Sarcoidosis Before and After Clinically Established Diagnosis of Sarcoidosis
(Poster No. 41)

Jennifer L. Detloff, MD (jennifer_detloff@rush.edu); Shriram Jakate, MD. Department of Pathology, Rush University Medical Center, Chicago, Illinois.

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Sarcoidosis may be responsible for one-fourth of granulomatous hepatitis cases. However, this relationship can be either known before biopsy or established after the initial biopsy. We compared the clinicopathologic features of sarcoidosis in these 2 settings.

**Design:** We searched our medical center’s databases from 2000–2010 for cases of granulomatous hepatitis and sarcoidosis. Cases with the diagnoses of primary biliary cirrhosis, nonalcoholic fatty liver disease, and hepatitis C virus were excluded. A total of 22 cases were selected (patient age, 31–69; 13 females and 9 males), 18 of 22 (82%) with prior diagnosis of sarcoidosis (postsarcoid group) and 4 of 22 (18%) with sarcoidosis being diagnosed after biopsy (presarcoid group). These cases were reviewed for the following: indications for the biopsy, imaging data, LFTs, degree of hepatic fibrosis, pattern of granulomatous hepatitis, and splenomegaly.

**Results:** All 4 presarcoid-group patients had liver biopsies to investigate increases in GGT/ALP and showed no hepatomegaly, splenomegaly, or hepatic fibrosis. In the postsarcoid group, apart from increased GGT/ALP levels, 5 of 18 cases also showed increases in transaminases. Six of 18 cases had hepatomegaly, 8 of 18 cases had splenomegaly, and 10 of 18 cases had periporal or bridging fibrosis, including 2 with cirrhotic nodularity. Between groups, granulomas were similar in amount and distribution.

**Conclusions:** Hepatic sarcoidosis is more frequently detected in patients with known sarcoidosis (82%) than in patients biopsies leading to the diagnosis of sarcoidosis (18%). Granulomatous hepatitis is identical between groups, but fibrosis, splenomegaly, hepatomegaly, and transaminitis are often limited to patients with a prior diagnosis of sarcoidosis. These differences most likely signify a fibrosing and organomegalic stage of advanced disseminated sarcoidosis.

**Metastatic Head and Neck Squamous Cell Carcinoma to Percutaneous Endoscopic Gastrostomy Tube Site: A Rare and Unique Presentation of Metastatic Disease (Poster No. 42)**

Lanjing Zhang, MD, MS; Stephanie A. Dean, MD; Gregor S. Weinstein, MD; Virginia A. LiVolsi, MD; Kathleen T. Montone, MD. Departments of 1Pathology and Laboratory Medicine and 2Otorhinolaryngology, University of Pennsylvania Medical Center, Philadelphia.

**Context:** Fewer than 50 cases of metastatic carcinoma to percutaneous endoscopic gastrostomy (PEG) tube sites have been reported. The largest series included 2 patients. We report for 4 patients the clinical and pathologic characteristics of metastatic squamous cell carcinoma (SCC) to PEG tube sites.

**Design:** A retrospective review of our database (2002–2011) and medical records for metastatic malignancy to PEG tube sites was done.

**Results:** Four patients were identified (Table), each with at least moderately differentiated primary head and neck keratinizing SCC (tongue, 3; posterior pharyngeal wall, 1), and treated with postoperative chemoradiation. Two patients were assigned T2 N2 M0 cancer and 2 had unresectable masses.

<table>
<thead>
<tr>
<th>Presenting symptom</th>
<th>Primary SCC site</th>
<th>Primary SCC grade</th>
<th>Treatment for primary tumor</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>Posterior pharyngeal wall</td>
<td>Moderately differentiated</td>
<td>Chemoradiation and neck dissection</td>
</tr>
<tr>
<td>PEG tube reflux</td>
<td>Left lateral and tip of tongue</td>
<td>Moderately to poorly differentiated</td>
<td>Resection, chemoradiation, and neck dissection</td>
</tr>
<tr>
<td>NA</td>
<td>Base of tongue</td>
<td>Moderately differentiated (per chart)</td>
<td>Chemoradiation and neck dissection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metastatic SCC grade</th>
<th>PEG tube site metastatic SCC grade</th>
<th>Treatment for PEG-tube-site metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately differentiated</td>
<td>Moderately differentiated with hepatoid features</td>
<td>Partial gastrectomy</td>
</tr>
<tr>
<td>5.3</td>
<td>6.4</td>
<td>Partial gastrectomy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metastatic SCC grade</th>
<th>PEG tube site metastatic tumor size, cm</th>
<th>Treatment for PEG-tube-site metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>6.4</td>
<td>Partial gastrectomy</td>
</tr>
</tbody>
</table>

**Conclusions:** All 4 presarcoid-group patients had liver biopsies to investigate increases in GGT/ALP and showed no hepatomegaly, splenomegaly, or hepatic fibrosis. In the postsarcoid group, apart from increased GGT/ALP levels, 5 of 18 cases also showed increases in transaminases. Six of 18 cases had hepatomegaly, 8 of 18 cases had splenomegaly, and 10 of 18 cases had periporal or bridging fibrosis, including 2 with cirrhotic nodularity. Between groups, granulomas were similar in amount and distribution.

**Metastatic Head and Neck SCC to Percutaneous Endoscopic Gastrostomy (PEG) Tube Site**

<table>
<thead>
<tr>
<th>Patient Initial</th>
<th>R</th>
<th>H</th>
<th>D</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at the time of PEG tube placement, y</td>
<td>76</td>
<td>80</td>
<td>59</td>
<td>64</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>White</td>
<td>Hispanic-white</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Presenting symptom</td>
<td>NA</td>
<td>PEG tube reflux</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Primary SCC site</td>
<td>Posterior pharyngeal wall</td>
<td>Left lateral and tip of tongue</td>
<td>Base of tongue</td>
<td>Base of tongue</td>
</tr>
<tr>
<td>Primary SCC grade</td>
<td>Moderately differentiated</td>
<td>Moderately to poorly differentiated</td>
<td>Moderately differentiated (per chart)</td>
<td>Poorly differentiated</td>
</tr>
<tr>
<td>Primary tumor, neural and vascular invasion</td>
<td>No (on biopsy)</td>
<td>No</td>
<td>NA</td>
<td>Lymphovascular invasion present, no neural invasion</td>
</tr>
<tr>
<td>Primary tumor size, cm</td>
<td>NA</td>
<td>3.5</td>
<td>NA</td>
<td>1.5, plus 0.5 (at reexcision)</td>
</tr>
<tr>
<td>Primary tumor stage</td>
<td>Unresectable mass</td>
<td>T2 N2 M0</td>
<td>Unresectable mass</td>
<td>T2 N2 M0</td>
</tr>
<tr>
<td>Treatment for primary tumor</td>
<td>Chemoradiation and neck dissection</td>
<td>Resection, chemoradiation, and neck dissection</td>
<td>Chemoradiation and neck dissection</td>
<td>Resection, chemoradiation, and neck dissection</td>
</tr>
<tr>
<td>PEG tube site metastatic SCC grade</td>
<td>Moderately differentiated</td>
<td>Moderately differentiated with hepatoid features</td>
<td>Moderately differentiated</td>
<td>Poorly differentiated</td>
</tr>
<tr>
<td>PEG tube site metastatic tumor size, cm</td>
<td>5.3</td>
<td>NA (no resection done)</td>
<td>6.4</td>
<td>4.5</td>
</tr>
<tr>
<td>Treatment for PEG-tube-site metastasis</td>
<td>Partial gastrectomy</td>
<td>None</td>
<td>Partial gastrectomy</td>
<td>Partial gastrectomy</td>
</tr>
<tr>
<td>Metastatic time from PEG tube placement, mo</td>
<td>7</td>
<td>12</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Overall survival after metastasis, mo</td>
<td>34</td>
<td>0.5</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Overall survival after PEG tube placement, mo</td>
<td>41</td>
<td>12.5</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Metastatic tumor of other site at the time of PEG tube site metastasis</td>
<td>None (according to limited chart review)</td>
<td>None</td>
<td>None</td>
<td>Metastasis to omental lymph node (PET CT report)</td>
</tr>
</tbody>
</table>

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Primary Biliary Cirrhosis and Granulomatous Hepatitis: A Case Report of a Patient With Bladder Carcinoma Post Bacille Calmette-Guérin Treatment

(Poster No. 43)

Lucy C. Harn, MD (lucy.harn@gmail.com); Janet McNaughton, MD; Shuan C. Li, MD. Department of Pathology, Orlando Health, Orlando, Florida.

Primary biliary cirrhosis (PBC) is a chronic disease that is characterized by biliary duct damage, portal lymphocyte infiltration and epitheloid cells centered around septal and interlobular bile ducts. Granulomas are usually present within portal lymphocytic infiltrates and less commonly in the hepatic lobules. Intravesical instillation of immunotherapeutic bacille Calmette-Guérin (BCG) is an important and safe adjunct treatment to bladder cancer, but its use can cause granulomatous cystitis.

Our patient is a 74-year-old man with a history of bladder cancer. He has been treated with monthly intravesicular BCG and interferon for 1 year. Shortly after his last dose, he presented with fever, chills, confusion, and moderately elevated liver function tests, which led to a liver biopsy. The biopsy demonstrated multiple poorly circumscribed epithelioid granulomas in both portal and lobular area. Together with positive antimitochondrial antibody E2 and ductal destruction, a diagnosis of PBC was rendered. However, since lobular granuloma is rare in PBC, we suspected an infectious cause. Indeed, these granulomas contained numerous acid-fast–positive bacilli, most likely secondary to the BCG therapy (Figure 16). Thus, a dual diagnosis of PBC and bacille Calmette-Guérin (BCG) is an important and safe adjunct treatment to bladder cancer, but its use can cause granulomatous cystitis.

Multiple Pulmonary Metastases From an Intraductal Papillary Mucinous Neoplasm of the Pancreas

(Poster No. 44)

Audrey Sato, DO (audrey.sato@us.army.mil); Michael C. Royer, MD. Department of Pathology, National Capital Consortium, Bethesda, Maryland.

We report a rare case of pancreatic intraductal papillary mucinous neoplasm with pulmonary metastasis in a 71-year-old man with a history of prostate adenocarcinoma. The primary pancreatic neoplasm was incidentally found on computed tomography scan during an evaluation of acute pyelonephritis. The patient underwent a distal pancreatectomy, splenectomy, and lymph node resection. The resection margins, spleen, peripancreatic and splenic hilar lymph nodes were negative for malignancy. A follow-up endoscopic ultrasonography 3 years later revealed a pancreatic ductal mass that was suggestive of malignancy. Shortly after the discovery of the recurrent mass, an electron beam computed tomography scan performed for coronary artery disease screening revealed diffuse ground-glass opacities of the lower lung lobes and multiple pulmonary nodules. Transbronchial biopsies were performed, which showed metastatic adenocarcinoma; comparison to the previous distal pancreatectomy specimen showed similar morphology of columnar epithelium with a papillary growth pattern and admixed goblet cells, nuclear pleomorphism, and mitoses. Both the previous pancreatic neoplasm and the lung biopsy specimens stained positively for CK7 and negatively for CD20. In addition, the lung biopsy specimens stained negatively for TTF-1 and PSA. With the immunophenotype and morphology similar to the pancreatic neoplasm, the diagnosis from the lung biopsy specimens was metastatic adenocarcinoma from a primary pancreatic papillary mucinous neoplasm. The patient was unwell when offered further therapy and was subsequently lost to follow-up after being transferred to hospice care. To date, only 1 other case of intraductal papillary mucinous neoplasm metastatic to the lungs has been reported.

Mesenteric Paraganglioma Mimicking Nodal Metastasis in a Patient With Colon Adenocarcinoma: A Diagnostic Pitfall

(Poster No. 45)

Bettye Cox, MD (bcos@bcm.edu); Yve Huttenbach, MD; Mary R. Schwartz, MD. 1Department of Pathology and Immunology, Baylor College of Medicine, Houston, Texas; 2Department of Pathology, The Methodist Hospital and Baylor College of Medicine, Houston, Texas.

Extra-adrenal paragangliomas are uncommon tumors that can arise from the parasympathetic or sympathetic paraganglia. Most extra-adrenal intra-abdominal paragangliomas are periaortic, and some occur around the urinary bladder. To the best of our knowledge, we report the first case of a mesenteric paraganglioma found incidentally in a colon cancer resection. A 76-year-old woman without a significant past medical history presented with 3 episodes of bright red blood per rectum during a 48-hour period. A computed tomography scan of the abdomen demonstrated a 2-cm polyloid mass in the ascending colon; a right hemicolectomy was performed. Microscopic examination revealed a low-grade invasive adenocarcinoma arising in a tubulovillous adenoma. A 0.6-cm, ovoid, mesenteric pericolonic nodule macroscopically resembling a lymph node histologically showed nests of cells with granular cytoplasm and round nuclei. No identifiable lymphoid tissue was present. Immunohistochemical studies performed on the nodule demonstrated expression of chromogranin and synaptophysin in most of the cells, with rare S100-positive spindled sustentacular cells. The lesion did not express CK7 or CD20, mitigating against metastatic colon adenocarcinoma to this "lymph node." The overall findings were interpreted as a paraganglioma. This patient was appropriately staged as having stage I (pT1 N0 M0) adenocarcinoma of the colon by American Joint Committee on Cancer criteria. Had the paraganglioma been interpreted as a nodal metastasis, the tumor could have been overstaged as stage IIIA (pT1 N1a M0), leading to unnecessary postoperative chemotherapy and presumed worse prognosis. This case report emphasizes the importance of recognizing incidental benign lesions in patients with cancer. Misinterpretation can adversely impact clinical management and perceived prognosis.

Impact of Race on Predicting Recurrence Risk in Gastrointestinal Stromal Tumors

(Poster No. 46)

Shilpa Jain, MD (drjsinghal@gmail.com); Muhammad Rasul, MD; Moy Fred, PhD, MBA; Humayun K. Islam, MD, PhD; Umadevi Katta, MD. 1Department of Pathology, Westchester Medical Center at New York Medical College, Valhalla; 2Department of Digestive Diseases, Basic Medical Sciences, Pathology, New York Medical College, Valhalla.

Context: Gastrointestinal stromal tumors (GISTs) are rare tumors of the gastrointestinal tract, with an estimated annual incidence of 6.8 per million. The risk of recurrence after surgery is related to the tumor size, site, and mitotic rate, which has been recently stratified by the National Comprehensive Cancer Network (NCCN). The impact of race on recurrence risk has not been studied.

Design: The clinicopathologic features of 32 GISTs diagnosed between 2005 and 2010 were reviewed. Recurrence risk for each tumor was determined as per NCCN criteria based on tumor size, site, and
The mean age of patients was 63.3 years (range, 29–86 years),

This study directs that African Americans have numer-

The incidence of synchronous tumor lesions is low

Archival slides from pancreatectomy specimens collected

J. Dumot, MD

25 months of primary resection.

in African Americans and 2 of 3 (66%) had recurrence after 18 and

Most cases with a recurrence risk of

other sites, with no significant racial differences. Overall, 13 of 32 GISTs

19) 21% had synchronous malignant

percent of patients had synchronous malignant and benign lesions, 40%

Conclusions: This study directs that African Americans have numer-

mitotic index. Racial differences were accessed by comparing recurrence

risk in each racial group.

Results: The mean age of patients was 63.3 years (range, 29–86 years),

with equal sex distribution. Of those diagnosed, 19 were white (59%); 9,

African American (28%); and 4, Hispanic (12%). Twenty-five GISTs (78%)

were located in the stomach, 5 (16%) in the small intestine, and 2 (6%) in

other sites, with no significant racial differences. Overall, 13 of 32 GISTs

(41%) had no recurrence risk, with very low to moderate risk in 12 of 32

(37%) and high risk in 7 of 32 (22%). Most cases with a recurrence risk of

<25% were asymptomatic and incidental findings. Risk stratification

based on race is shown in the Table. High-risk GISTs were more frequent

in African Americans and 2 of 3 (66%) had recurrence after 18 and

31 months of primary resection.

Conclusions: Risk stratification based on race proved useful in prediction of

recurrence, with 22% of patients with high or moderate risk developing

a recurrence in the 7-year follow-up period. In conclusion, GISTs in

African Americans have a higher recurrence rate and therefore require

closer follow-up than in Caucasian patients.

Risk Stratification Based on Race

<table>
<thead>
<tr>
<th>Total Cases (N = 32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White, No. (%) (N = 19)</td>
</tr>
<tr>
<td>N N/low/ moderate NCCN risk (&lt;25%)</td>
</tr>
<tr>
<td>High NCCN risk (≥25%)</td>
</tr>
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</table>

Hepatocellular adenomas are benign lesions that often share histologic features with hepatocellular carcinoma or focal nodular hyperplasia. We report a case of a 50-year-old woman who was diagnosed with hepatic adenomatosis after a computed tomography scan revealed numerous nodules (2–5 cm) in her liver. The diagnoses of hepatocellular adenomas were made on subsequent biopsy. The patient underwent embolization. A recent scan revealed that 2 of the adenomas had increased in size with hypervascular changes. Right lobectomy was performed. Microscopically, the nodules contain areas with disrupted hepatic architectures, scattered unpaired arteries, and an absence of portal tracts. Adjacent to these are other areas that range from small foci to large areas of prominent ductular proliferation intermixed with fibrosis and occasional large vessels. Reticulin staining showed focal marked loss of reticulin. This histologic finding caused initial confusion. Loss of reticulin staining raised the question of hepatocellular carcinoma, while the finding of ductular proliferation and fibrosis necessitated the entry of focal nodular hyperplasia into the differential. Only after a clinical discussion with surgeons, immunostaining for CD34 and glypican-3, and further scrutiny of the slide, which revealed intravascular emboli, was the correct diagnosis of “therapy-associated reactive changes in hepatocellular adenomas” made. It is important to recognize that therapeutic changes in hepatocellular adenomas can mimic focal nodular hyperplasia and hepatocellular carcinoma. Clinical correlation is paramount in making correct diagnoses in such events. Figure 17 shows hepatocellular adenoma with marked ductular proliferation and fibrosis mimicking focal nodular hyperplasia.

**Hepatocellular Adenoma With Therapeutic Reactive Changes Mimicking Focal Nodular Hyperplasia**

(Poster No. 48)

Kevin O. Turner, DO; Yu Liang, MD; Jiang Wang, MD. Department of Pathology and Laboratory Medicine, University of Cincinnati, Cincinnati, Ohio.

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2007. In 2008, a new surveillance biopsy specimen from an area of stricture revealed squamous cell carcinoma of the distal esophagus approximately 1 year after cryoablation. The neoplasm was positive for p53 and cytokeratin 5/6, negative for polyclonal CEA and mucin. This is the first report of squamous cell carcinoma occurring after endoscopic ablation for Barrett neoplasia. Careful follow-up is necessary in any endoscopic ablation program owing to the risk for recurrent neoplasia.

**Hepatobiliary Cystadenomas and Cystadenocarcinomas: Understanding the Stroma Influence in its Origin**

(Poster No. 50)

Daniela Allende, MD1 (allendedaniela@hotmail.com); Lisa Yerian, MD, 2 Department of Anatomic Pathology, Cleveland Clinic Florida, Weston, Florida; 3 Department of Anatomic Pathology, Cleveland Clinic, Cleveland, Ohio.

**Context:** Hepatobiliary cystadenomas (<5% of cysts) and cystadenocarcinomas are infrequent cystic liver lesions. The significance and origin of the stroma are unclear, and a detailed immunohistochemical characterization has not been clearly stated in the literature.

**Design:** Twenty-three hepatobiliary cystadenomas, 3 cystadenocarcinomas, and 16 biliary cysts were studied from our files (from 1988 to 2008). Immunohistochemical staining for CK19, CK7, ER, chromogranin, CD117, SMA, and CD34 was performed, and H&E slides were reviewed.

**Results:** Cases involving females included 22 of 23 cystadenomas, 2 of 3 cystadenocarcinomas, and 12 of 16 simple biliary cysts. Patient ages ranged from 12 to 96 years. None of the hepatobiliary cystadenomas showed dysplastic epithelium. No cystadenocarcinomas, but most cystadenomas (22 of 23), contained ovarian-type stroma. All cases showed positivity in the epithelial component with CK7 and CK19. Neuroendocrine markers were found in the epithelium. ER staining was positive in the ovarian-type stroma of 19 of 23 hepatobiliary cystadenomas but was negative in the cystadenocarcinomas and biliary cysts. CD117 staining was positive in 1 of 3 cystadenocarcinomas and 1 of 16 biliary cysts. SMA was reactive in the stroma of all the lesions. CD34 and CD117 were reactive in the outer half of the stroma of 11 of 23 cystadenomas (all involving females). None of the biliary cysts showed coexpression of those markers.

**Conclusions:** Coexpression of epithelial and mesenchymal markers has been described in ductal plate developmental abnormalities as well as secondary to chronic inflammatory conditions. The presence of these markers (CK7, CD34, and SMA) in the stroma of hepatobiliary cystadenomas, as well as neuroendocrine cells in the epithelium and CD117 in carcinomas, has not been previously described.

**A Case of Caroli Disease of the Liver With a Spectrum of Ductal Plate Malformation Presenting as a Radiographic Mimicker of Cholangiocarcinoma**

(Poster No. 51)

Olga Speck, MD (ospeck@unh.unc.edu); Dimitri Trembath, MD, PhD. Department of Pathology and Laboratory Medicine, University of North Carolina, Chapel Hill.

Caroli disease is a rare congenital disorder characterized by the dilatation of intrahepatic bile ducts with subsequent increased risk for hepatolithiasis and cholangitis. Two forms of Caroli disease have been described. The simple form, or Caroli disease proper, is marked by ectasias of the larger intrahepatic bile ducts without additional histologic abnormalities. The other form, Caroli syndrome, features the combination of the segmental intrahepatic duct dilatation with periportal fibrosis of the congenital hepatic fibrosis type. Both are thought to result from deranged remodeling of the embryonic ductal plate but at different levels of the biliary tree. In Caroli syndrome, however, the predominant clinical features are related to hepatic fibrosis and portal hypertension rather than biliary obstruction. In the past 30 to 40 years, Caroli disease has been diagnosed almost exclusively by radiographic studies owing to advances in cholangiography. There has been little reliance on histopathology. Here we present a case of segmental bile duct ectasia with associated fibrosis presenting with high-grade biliary obstruction mimicking cholangiocarcinoma radiographically. Caroli disease was suspected on the basis of examination of the gross specimen, while microscopic examination revealed localized fibrosis of the surrounding hepatic parenchyma and features of ductal plate malformation without the classic findings of congenital hepatic fibrosis. This case illustrates the existence of a spectrum of ductal plate malformation disorders rather than 2 discrete categories. Without pathognomonic radiographic findings for entities along the spectrum, the diagnosis of biliary ductal plate malformations may fall on the pathologist who must be familiar with their features.

**Differences in Alcian Blue/Periodic Acid–Schiff Staining Are Associated With Differences in Expression of Immunohistochemical Markers, Transcriptional Intermediary Factor 1y, and CD44 in Diffuse-Type Gastric Adenocarcinoma**

(Poster No. 52)

Sofia Taboada, MD (taboa01@nyumc.org); Cristina H. Hajdu, MD; Lili Lee, MD; Xiangtian Kong, MD; Ruijiang Xu, MD, PhD. Department of Pathology, New York University, New York.

**Context:** Diffuse type (poorly differentiated) gastric adenocarcinoma is characterized by rapid disease progression, high metastatic potential, and a poor prognosis. Recent studies demonstrate the loss of E-cadherin as a frequent molecular pathway. Yet, preneoplastic stages have not been recognized. Alcian blue/periodic acid–Schiff staining (AB/PAS) is a commonly used and affordable stain that differentiates acid mucosubstances versus neutral polysaccharides. Intestinal goblet cells stain blue and gastric mucous cells stain pink. This study was performed in an effort to determine the value of AB/PAS staining in the differentiation of diffuse-type gastric adenocarcinomas into subtypes with differences in expression of molecular markers TIF1y, CD44, and E-cadherin.

**Design:** Eighteen cases of diffuse-type adenocarcinoma were retrospectively analyzed from the NYU Langone Medical Center from 2005 to 2009. Cases with areas of intestinal-type gastric adenocarcinoma were excluded. AB/PAS staining and immunohistochemistry was performed with TIF1y, CD44, and E-cadherin. Three independent observers evaluated staining and scored immunoreactivity.

**Results:** Results were analyzed by Fisher exact test. Loss of E-cadherin expression was not significantly different between blue-staining and pink-staining diffuse-type gastric adenocarcinomas (P > .05). TIF1y overexpression and CD44 overexpression were significantly higher in pink-staining diffuse-type gastric adenocarcinomas (P > .05).

**Conclusions:** These data suggest that differences in AB/PAS staining may indicate biologically different subtypes of diffuse-type gastric adenocarcinoma. This categorization has clinical implications because pink-staining diffuse-type adenocarcinomas are associated with the expression of the poor prognostic factors TIF1y and CD44. Further research using a prospective study design, clinical prognosis, and additional molecular markers is warranted.

**Cautery Artifact Mimicking Lymphangioma in Liver**

(Poster No. 53)

Brett Baskovich, MD (brett@bull.edu); Chen Liu, MD, PhD. Department of Pathology, University of Florida, Gainesville.

A 53-year-old woman presented to an outside hospital with right upper quadrant pain. An ultrasonography demonstrated cholelithiasis as well as fatty infiltration of the liver. Laboratory test results included...
Russell Body Gastritis in an HIV-Positive Patient: Case Report and Review of Literature

Poster No. 54

Amarpreet Bhalla, MD1 (Amarpreet.Bhalla@danhop.org); Diana Mosteau, MD2; Steven Gorelick, MD3; Hani El-Fanek, MD.1 Department of 1Pathology and Laboratory Medicine, 2Internal Medicine, and 3Gastroenterology, Danbury Hospital, Danbury, Connecticut.

Russell body gastritis is characterized by localized accumulation of plasma cells filled with Russell bodies, along with inflammatory infiltrate. Twelve cases have been reported in the English-language medical literature previously. Association with Helicobacter pylori gastritis or immunosuppression is known. The present case is the third to be reported in association with HIV infection and the first to be associated with collagenous colitis. An 82-year-old man presented with dyspepsia, loose stools, weight loss, and loss of appetite. Past medical history was significant for HIV infection, cerebrovascular accident, chronic kidney disease, peripheral vascular disease, hypertension, depression, and diabetes mellitus type 2. Computed tomography scan showed esophageal and gastric wall thickening. Gastrointestinal endoscopy revealed gastritis. Microscopic examination of the biopsy specimen revealed fragments of gastric mucosa with diffuse plasma cell infiltration in the lamina propria associated with large eosinophilic Russell bodies (Figure, left). Immunoperoxidase stains revealed positivity for CD138 (Figure, right middle) and λ and κ chains (Figure, right top and bottom), implying polyclonality. Results with special stain for H. pylori and immunostain for CD68 were negative. The differential diagnoses include plasmacytoma and mucosa-associated lymphoid tissue lymphoma with plasmacytic differentiation. Human immunodeficiency virus causes polyclonal B-cell activation, plasmacytosis, hypergammaglobulinemia, and formation of circulating immune complexes. Accumulation of immunoglobulins in Russell body gastritis may be a manifestation of the immunologic abnormality. The association with collagenous colitis may be coincidental. Awareness of this entity is important to prevent confusion with neoplasia.

Met-Enkephalin Immunoreactivity Is Related to Disease Severity in Liver Transplant Patients With Recurrent Hepatitis C Virus Infection

Poster No. 55

Justin D. Fender, MD1 (jdfender@unc.edu); Thomas Schiano, MD2; Nora V. Bergasa, MD3; M. I. Fiel, MD.1 Departments of 1Pathology and 2Division of Liver Diseases, Mount Sinai Medical Center, New York, New York; 3Department of Medicine, Metropolitan Hospital Center, New York, New York.

Context: Met-enkephalins are endogenous opioid peptides that are increased within hepatocytes and bile ducts in cholestatic diseases and in patients with chronic hepatitis C (HCV). Studies show that morphine and met-enkephalin, which bind to opioid receptors, enhance HCV RNA expression. We evaluated whether increased met-enkephalin immunoreactivity (MEIR) would correlate with more severe disease in patients with HCV after liver transplant (LT).

Design: Immunostaining for met-enkephalin was performed on formalin-fixed, paraffin-embedded sections from 47 post-LT patients with recurrent HCV. MEIR expression in hepatocytes and bile ducts was graded from 0 (negative) to 4+ (strong). On the basis of clinical outcome data, the patients were then classified according to their recurrent HCV status: group 1 = 19 slow progressors characterized by <1 stage of fibrosis advancement within 5 years; group 2 = 19 patients with rapid fibrosis progression leading to cirrhosis within 2 to 5 years and 9 additional patients with fibrosing cholestatic hepatitis leading to liver failure.

Results: Age and gender were similar in both groups. Mean time from LT to biopsy was 88.2 months in group 1 versus 37.9 months in group 2 (P < .001). The mean hepatic MEIR in group 1 versus group 2 was 3.04 in group 2 (P < .01). The mean MEIR in bile duct cells was 0.79% in group 1 versus 1.75% in group 2 (P = .02).

Conclusions: These data indicate that MEIR is greater in the livers of patients with more aggressive recurrent HCV, suggesting an increase in opioid receptors within the hepatocytes and bile duct cells in these patients.

Relationship of Tumor Grade and Recurrence in the Context of Mismatch Repair Status, Tumor Location, Grading Schema, Mucinous Histology, and the 12-Gene Recurrence Score in 504 Patients With Stage II Colon Cancer Treated With Surgery Alone at the Cleveland Clinic

Poster No. 56

Gioia Iezza, MD1; Frederick L. Baehner, MD2; Margarita Lopatin, PhD2; Carl Millward, MD3 (cmillward@genomichealth.com); Kim Clark-Langone, PhD4; Mark Lee, MD, PhD5; Ian C. Lavery, MD.1 Department of Pathology, University of California, San Francisco; 2Department of Development, Genomic Health, Inc, Redwood City, California; 3Department of Colorectal Surgery, Cleveland Clinic, Cleveland, Ohio.

Context: High tumor grade has not been associated with higher recurrence risk in recent large studies of stage II colon cancer. We characterize the relationship of grade and recurrence risk in the context of mismatch repair (MMR) status, tumor location, grading schema, mucinous histology, and recurrence score.

Design: Two academic GI pathologists (P1, P2) independently graded primary tumors by percentage of gland formation: well differentiated (95%), moderately differentiated (50%–95%), poorly differentiated (<50%). P1 used this 3-tier system. P2 used 2-tiers: low grade (well/moderately differentiated) and high grade (poorly differentiated). All mucinous tumors were high grade by P2 but not P1. Relationship to recurrence-free interval was assessed by Cox regression.

Results: Of 504 stage II colon cancers treated with surgery alone, 18% (P1) and 31% (P2) were high grade. High-grade tumors were more likely right sided (60%) and MMR deficient (35%) (all, P < .001). Proportion of mucinous tumors was similar for high and low grade by P1 (25% versus 21%, P < .39). Neither grade was significantly associated with higher risk of recurrence for all patients (P1: P < .46; P2: HR, 0.63, P < .10) or in subsets defined by MMR, tumor location, or mucinous histology. Neither grade was associated with recurrence (P < .30) after controlling for recurrence score, MMR, location, and histology. Using the 2-tier scheme, interpathologist agreement was low (κ, 0.30; 95% CI, 0.21–0.39) overall and moderate with mucinous tumors excluded (κ, 0.52; 95% CI, 0.40–0.64).
Conclusions: High-tumor grade was not found to predict higher recurrence risk in stage II colon cancer and exhibited only modest reproducibility. Other markers validated as predictors of recurrence risk in stage II colon cancer (eg, MMR, RS) should be considered.

**Predictive Value of Histologic Findings in Postperfusion Liver Biopsy for Onset of Rejection and Hepatitis C Recurrence in Liver Allografts** (Poster No. 57)

Fumiko Konno, MD (fumiko.konno@nyumc.org); Xiangtian Kong, MD; Jinhua Wang, MD; Cristina H. Hajdu, MD; Ruijiang Xu, MD. Department of Pathology, NYU Langone Medical Center, New York, New York.

**Context:** Liver transplant has become a major treatment modality for patients with end-stage liver disease associated with chronic hepatitis C. Rejection and recurrent hepatitis are common adverse posttransplant complications. There are controversies whether the histologic findings in the postperfusion liver biopsy specimen may predict the onset of rejection and the recurrence of hepatitis C. We analyzed the postperfusion liver biopsy specimen to determine if there are any predictive histologic features for the above conditions.

**Design:** We analyzed 63 postperfusion liver biopsy specimens from transplant recipients with hepatitis C. We determined the number of various inflammatory infiltrates, degree of lobular neutrophilic infiltrate, postperfusion injury/ischemia, steatosis, fibrosis, and number of portal tracts present. We then compared these histologic parameters in the following patient groups: (1) early and late rejection; (2) no rejection and rejection; and (3) early hepatitis C recurrence and late recurrence.

**Results:** Recipients with no rejection or late rejection tend to have less frequency and low numbers of plasma cells in the portal tracts; however, there are no statistical differences (P > .05) in the histologic findings between recipients with late or no rejection and with early rejection, and between those with early and late recurrent hepatitis C.

**Conclusions:** Our data show there is a limited value in predicting rejection or hepatitis C recurrence in liver allografts, based on histologic findings in postperfusion biopsy specimens. However, the trend of decreased and frequency and number of portal tracts of the postperfusion biopsy specimens with late or no rejection is noteworthy and deserves further investigation.

**Selective Internal Radiation Therapy—Induced Extrhepatic Injury** (Poster No. 58)

Angela M. Wright, MD1 (amwright@tmhs.org); Mukul Divatia, MD1; R. M. Ghobrial, MD, PhD2; Morris A. Weiner, MD2; Mary R. Schwartz, MD. Departments of Pathology “Transplantation Surgery, and “Interventional Radiology, The Methodist Hospital, Houston, Texas.

**Context:** Selective internal radiation therapy (SIRT) using yttrium-90 microspheres is an established therapeutic approach for the treatment of primary and secondary hepatic malignancies. This therapy is generally considered to have low morbidity, but a small number of extraportal complications have been reported. We report our experience with extraportal SIRT microsphere migration causing tissue injury.

**Design:** Four cases of SIRT-related extraportal tissue damage from microspheres were identified on retrospective review of medical records and slides of patients who had undergone therapeutic radioembolization of malignant primary and metastatic hepatic tumors at our institution from 2006 to 2011.

**Results:** Of the patients with microspheres identified on biopsy and/or resection, 2 patients had SIRT-related antral ulcers, 1 patient had SIRT-related ulcerative cholecystitis, and 1 patient had both SIRT-related gastritis and chronic cholecystitis. Gastritis and chronic cholecystitis were diagnosed 1 to 14 months (median, 10 months) after the SIRT procedure. Ulceration, fibrinous exudate, granulation tissue, foveolar hyperplasia, and reactive epithelial changes were identified in gastric ulcer cases. One gallbladder had ulcerative cholecystitis with mural necrosis.

**Conclusions:** The incidence of SIRT-related gastrointestinal damage is likely to increase with greater utilization of radioembolization of malignant hepatic tumors. Recognition of the associated histologic findings is essential, since these complications are potentially life-threatening and aggressive management of SIRT-related gastrointestinal ulceration is critical. Clinical awareness of this entity is necessary for early identification, thereby decreasing morbidity and mortality. Careful mapping of the vasculature may provide options for minimizing the possibility of nontarget embolization in the gastrointestinal tract.

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**Increased Eosinophils in Gastrointestinal Biopsy Specimens: The Etiology in an Urban Hospital’s Experience** (Poster No. 59)

Gina Elhammady, MD (gelhamma@msmc.com); Eric Liss; Antonio E. Martinez, MD. Department of Pathology, Mount Sinai Medical Center and the Herbert Wertheim College of Medicine Florida International University, Miami Beach, Florida.

**Context:** Eosinophilic infiltrates in gastrointestinal (GI) biopsy specimens are a nonspecific finding commonly described in association with allergies, drug reactions, or parasitic infestations. We aim to evaluate the causes of increased eosinophils in GI biopsy specimens seen in our institution, which provides health care to patients from different parts of the world.

**Design:** We retrospectively analyzed 39 patients’ GI biopsy specimens for which the final diagnosis included “increased eosinophils.” Eosinophil quantification was done manually on the H&E-stained sections. Clinical data for correlation were obtained from patient medical records.

**Results:** The most common diagnosis associated with increased eosinophils in GI biopsy specimens was inflammatory bowel disease, ulcerative colitis being more common than Crohn disease (Table). Other diagnoses included diverticulitis, Helicobacter pylori gastritis, nonspecific gastritis, colonic adenocarcinoma, and peripheral eosinophilia, not otherwise specified. One patient was later diagnosed with hyperthyroidism, who initially underwent biopsy for intractable vomiting and diarrhea. The eosinophilic infiltrate was most prominent in ulcerative colitis, with a count of more than 100 eosinophils per high-power field in several cases. However, the 2 peripheral eosinophilia cases had a higher average of eosinophils per high-power field.

**Most Common Diagnosis Associated With Increased Eosinophils**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of Cases</th>
<th>Average Eosinophils/HPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulcerative colitis</td>
<td>10</td>
<td>68</td>
</tr>
<tr>
<td>Crohn disease</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
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<td></td>
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<td>IBD colitis</td>
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<td>60</td>
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<tr>
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<tr>
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<td>Eosinophilia</td>
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<td>78</td>
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<tr>
<td>Other diagnoses</td>
<td>11</td>
<td>36</td>
</tr>
</tbody>
</table>

**Conclusions:** In evaluating eosinophilic infiltrates in GI biopsy specimens, we found inflammatory bowel disease to be the most common cause. Ulcerative colitis was more commonly observed than Crohn disease. Several cases had increased eosinophils before the subsequent diagnosis of inflammatory bowel disease. This raises the importance of recognizing the more common associations of the nonspecific finding of eosinophilic infiltrates in GI specimens.

**Incidental Primary Pancreatic Leiomyosarcoma With Involvement of the Spleen and Stomach** (Poster No. 60)

Baoying Weng, MD, PhD (bweng@conemaugh.org); Curtis S. Goldblatt, MD; Lian Qian, MD, PhD. Department of Pathology, Conemaugh Memorial Medical Center, Johnstown, Pennsylvania.

Primary pancreatic leiomyosarcoma is a very rare mesenchymal tumor, with only 39 cases documented worldwide to date. We report an unusual case of high-grade primary leiomyosarcoma arising from pancreatic tail infiltrating into the spleen and stomach. The patient was a 58-year-old white man with a history of hypertension who was admitted to our hospital with complaints of chest pain. A computed tomography scan incidentally revealed an ill-defined pancreatic tail mass extending into the splenic hilum. He underwent distal pancreatectomy, splenectomy, partial gastrectomy, and partial omentectomy. Grossly, the tumor was an 11.0-cm, white, solid lobulated mass situated in the tail of the pancreas, involving the spleen hilum, part of the great curvature of the stomach, and adjacent greater omentum. Microscopically, the tumor was composed of pleomorphic spindle cells arranged in interlacing fascicles.
with an infiltrating growth pattern and up to 50 mitotic figures per 10 high-power fields. Hemorrhage, necrosis, and angiolympathic invasion were present. Tumor cells were strongly positive for smooth muscle actin, vimentin, and desmin; weakly positive for epithelial membrane antigen; and negative for CD117, pankeratin, CD68, CD99, S100, and CD54. Proliferative index Ki-67 was up to 60%. The morphologic and immunohistochemical features of the tumor were consistent with high-grade smooth muscle sarcoma. Primary pancreatic leiomyosarcoma is an aggressive neoplasm characterized by short survival and a high rate of metastases. This case demonstrates the aggressive clinical behavior of primary pancreatic leiomyosarcomas. It may be asymptomatic and present late in advanced stage.

**Schistosoma mansoni Infection Mimicking Bladder Cancer**

(Poster No. 61)

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There is evidence that some bacterial and parasitic infections are associated with cancer development. A high level of evidence exists for the association of *Schistosoma haematobium* with bladder cancer. The inflammation associated to schistosomiasis can be aggressive and mimic bladder cancer under cystoscopic examination. Interestingly, in our case, the microscopic examination showed *Schistosoma* organisms with lateral spur, which are characteristic of *Schistosoma mansoni*. We present the case of a 52-year-old African man who consulted owing to several months of gross hematuria. The patient reported no other associated symptom. The physical examination results were normal except for mild abdominal defense by palpation of the hypogastrum. A urinalysis revealed microscopic hematuria. A cystoscopy showed multiple intracytric lesions. Several small ulcerative and 1 large lesion were also seen. Several bladder tumor chips were submitted for microscopic examination. The specimen consisted of a friable, brown-black tissue. The microscopic examination showed intensely inflamed, eosinophil-laden granulation tissue heaps, bearing numberless parasites with a lateral spur (Figure 20). Reactive urothelial changes were predominant. The present case permits one to broaden the differential diagnoses of tumoral and ulcerative lesions in the urinary bladder. Schistosomiasis can mimic malignancy at cystoscopy. Microscopic examination is a fundamental part to rule out malignancy. Interestingly, in our case, the microscopic examination showed schistosomes with lateral spur, which are characteristic of *S. mansoni*.

**Polyomavirus-Associated Nephropathy in the Expained Failed Renal Allograft**

(Poster No. 62)

Romualdo V. Talento, MD, MPH1 (talentor@ecu.edu); Jamal Jackson2; Lorita M. Rebello-deVente, PhD3; Karlene Hewan-Lowe, MD1. 1Department of Pathology and Laboratory Medicine, Brody School of Medicine at East Carolina University, Greenville, North Carolina; 2Department of Biology/Chemistry, Johnson C. Smith University, Charlotte, North Carolina.

Context: Polyomavirus-associated nephropathy (PVAN) is an important cause of allograft dysfunction in renal transplant and is associated with the introduction of potent immunosuppression. Most cases of PVAN are caused by polyomavirus hominis type 1 (BKV). A rigorous BKV screening and intervention program lowers the rate of graft loss. We evaluated the effectiveness of our screening program, primarily by determining the prevalence of BKV in explanted failed renal allografts.

Design: Forty-seven renal explants during the period 2003–2009 were evaluated. Sections were immunostained for SV-40 anti-Tag by using 2 primary monoclonal antibodies: AB1 (PAB101, Santa Cruz Biotechnологии, Inc) and AB2 (MRQ-4, Cell Marque Corporation). Morphologic features were assessed by using the Banff classification system, with electron microscopy performed on BKV immunopositive samples. Serologic evaluation for HLA antibodies was performed on the Luminex platform with Labscreen single antigen beads. Serum BKV load results were obtained from patient records.

Results: The explants showed acute and chronic rejection. With AB1, 17 of 47 explants were immunopositive for BKV and 0 of 47 were immunopositive with AB2. Electron microscopy results were negative for BKV. Twenty-seven patients had donor-specific antibody testing; 24 of 27 had donor-specific antibodies to MHC antigens. Only 1 patient had a positive BKV serology finding, with treatment resulting in clearance of BKV before explantation.

Conclusions: Detection methods for BKV in the renal explants did not give conclusive evidence of graft failure due to PVAN. Rejection is the most likely explanation of graft failure. A rigorous screening and intervention program, such as the one in our institution, appears to be successful in preventing PVAN and subsequent allograft loss.

**Paraganglioma of the Urinary Bladder**

(Poster No. 63)

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Paraganglioma of the urinary bladder is a rare neoplasm. We report here a case of a large paraganglioma in a 42-year-old African American man. He presented with gross hematuria. His noticeable previous history was hypertension and transabdominal excision of a large paraganglioma 9 years previously. He has done well since then. The computed tomography scan revealed evidence of a filling defect in the bladder. Cystoscopy confirmed a solid nodular-appearing mass, about 5.5 cm, involving the right side of the bladder wall. Transurethral resection of the tumor was performed. Atypical cells were identified on frozen sections. Permanent sections showed that the neoplastic cells were arranged in discrete nests. “Zellballen” pattern, separated by a prominent vascular network. The cells were round with a clear, amphophilic cytoplasm and ovoid nuclei. Three mitoses per 10 high-power fields were seen. The tumor invaded into the muscularis propria. Immunohistochemical staining showed that the tumor was positive for synaptophysin and chromogranin. S100 protein highlighted focal, flattened sustentacular cells at the periphery of tumor nests. Staining with CK5/6, CK7, CK20, HMW keratin, P63, and CD10 yielded negative results. Based on the clinical history, histology, and immunohistochemical pattern, a diagnosis of paraganglioma of the bladder was rendered. The patient did well after the surgery. In conclusion, the second paraganglioma may occur after the excision of the first one. Close follow-up of patients with paraganglioma may be necessary.

**Low Level of Prostate-Specific Membrane Antigen Expression Is Associated With ERG Expression in Gleason Score 7 Prostate Cancer**

(Poster No. 64)

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Context: Prostate-specific membrane antigen (PSMA) has been suggested to be related to prostate cancer (PCa) development and recurrence. TMPRSS5:ERG gene rearrangement is highly specific for and present in approximately 90% of PCAs. Positive immunoreactivity with a novel anti-ERG antibody was highly correlated with TMPRSS5:ERG gene...
rarrangement status. This study was undertaken to explore the expression of PSMA, ERG, and possible association with biochemical recurrence in PCa.

**Design:** PSMA (clone 3E6, catalogue No. N1611, Dako) and ERG (anti-ERG monoclonal antibody; clone EPR 3864, Epitomics) immunoreactivity were assessed in prostate tissue microarrays containing 165 PCas with Gleason score (GS) 7 from patients treated by radical prostatectomy. H score of PSMA protein expression was calculated. Nuclear immunoreactivity for ERG was interpreted as either positive or negative. PSMA and ERG expression was correlated with patients' clinicopathologic characteristics, including GS (3 + 4 versus 4 + 3), pathologic stage, and biochemical recurrence.

**Results:** GS 3 + 4 and GS 4 + 3 were seen in 113 and 52 cases, respectively. PSMA and ERG protein expression was detected in 97% and 37% of PCas, respectively. Low PSMA H score was significantly associated with ERG expression (Pearson correlation coefficient, −0.24, P = .004). Neither PSMA nor ERG protein expression correlated to GS, pathologic stage, or risk of biochemical recurrence.

**Conclusions:** This study demonstrated for the first time that low levels of PSMA expression correlate with ERG expression in GS 7 PCa or ERG gene rearrangement, although neither PSMA nor ERG immunoreactivity was associated with pathologic stage or biochemical recurrence, suggesting a possible commitment role in PCa development, rather than PCa progression.

**A Carcinosarcoma of the Bladder**

(1 Poster No. 65)

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Carcinosarcomas arising in the bladder are very rare. The exact incidence is unknown, but it is estimated at 1 per 500,000, with a male predominance and a mean age of 75 years. The risk factors are similar to those for urothelial carcinoma and include smoking, male sex, sixth to seventh decade of life, prior cyclophosphamide therapy, and pelvic radiation. Carcinosarcomas usually present at an advanced stage and have a worse prognosis than conventional urothelial carcinomas owing to their aggressive behavior. Given the low incidence of primary carcinosarcoma of the bladder, well-established treatment protocols are lacking. In most cases, radical cystectomy is the only treatment; however, prolonged survival has been documented with adjuvant radiotherapy. Grossly, the tumors typically demonstrate a single, exophytic, polypoid, necrotic, ulcerating mass. Microscopically, they show intimately admixed malignant epithelial and mesenchymal components. The most common epithelial components are urothelial carcinoma, squamous cell carcinoma, adenocarcinoma, and small cell carcinoma. The mesenchymal components are usually an undifferentiated, high-grade spindle cell neoplasm, osteosarcoma, chondrosarcoma, leiomyosarcoma, rhabdomyosarcoma, liposarcoma, or angiosarcoma. Our case is that of an 80-year-old woman with a history of smoking 15 packs per year, presenting with recurrent pleomorphic, vimentin+/villin− adenocarcinoma (Figure 21).

**Immunohistochemical Analysis of Ezrin-Radixin-Moesin-Binding Phosphoprotein 50 in Prostatic Adenocarcinoma**

(1 Poster No. 66)

Tanner Bartholow, BS (bartholow.tanner@medstudent.pitt.edu); Anil Parwani, MD, PhD; Michael Becich, MD, PhD, Department of Pathology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania.

**Context:** Ezrin-radixin-moesin-binding phosphoprotein 50 (EBP50) is an adapter protein that plays a role in a wide variety of cellular processes, including interactions with proteins related to both tumor suppression and oncogenesis. Here we use immunohistochemistry to evaluate EBP50’s expression in normal donor prostate, benign prostatic hyperplasia, high-grade prostatic intraepithelial neoplasia (HGPIN), normal tissue adjacent to prostatic adenocarcinoma (NAC), primary prostatic adenocarcinoma (PCa), and metastatic prostatic adenocarcinoma (Mets).

**Design:** Tissue microarrays were immunohistochemically stained for EBP50, with the staining intensities quantified by using automated image analysis software. The data were statistically analyzed with 1-way ANOVA with subsequent Tukey test for multiple comparisons. Eleven cases of normal donor prostate, 37 cases of NAC, 15 cases of benign prostatic hyperplasia, 35 cases of HGPIN, 103 cases of PCa, and 36 cases of Mets were analyzed in the microarrays.

**Results:** Specimens of PCa and Mets had the lowest absolute staining for EBP50. Mets staining was significantly lower than normal donor prostate (P < .05), benign prostatic hyperplasia (P < .01), HGPIN (P < .001), and PCa (P < .006). Additionally, HGPIN staining was significantly higher than NAC (P = .009) and PCa (P < .001).

**Conclusions:** To our knowledge, this represents the first study comparing the immunohistochemical profiles of EBP50 in PCa and Mets to specimens of HGPIN, benign prostatic hyperplasia, normal donor prostate, and NAC and suggests that EBP50 expression is decreased in Mets. Given that PCa also had significantly higher expression than Mets, future studies are warranted to assess EBP50’s potential as a prognostic biomarker for prostate cancer.

**Immunohistochemical Staining of Slit2 in Primary and Metastatic Prostatic Adenocarcinoma**

(1 Poster No. 67)

Tanner Bartholow, BS (bartholow.tanner@medstudent.pitt.edu); Anil Parwani, MD, PhD; Michael Becich, MD, PhD, Department of Pathology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania.

**Context:** Conflicting roles for Slit2, a protein involved in mediating the processes of cell migration and chemotactic response, have been previously described in prostate cancer. Here we use immunohistochemistry to evaluate the expression of Slit2 in normal donor prostate (NDP), benign prostatic hyperplasia, high-grade prostatic intraepithelial neoplasia (HGPIN), normal tissue adjacent to prostatic adenocarcinoma (NAC), primary prostatic adenocarcinoma (PCa), and metastatic prostatic adenocarcinoma (Mets).

**Design:** Tissue microarrays were immunostained for Slit2. The staining intensities were quantified by using automated image analysis software. The data were statistically analyzed with 1-way ANOVA with subsequent Tukey test for multiple comparisons or a nonparametric equivalent. Eleven cases of NDP, 35 cases of NAC, 15 cases of benign prostatic hyperplasia, 35 cases of HGPIN, 106 cases of PCa, and 37 cases of Mets were analyzed.

**Results:** Specimens of PCa and HGPIN had the highest absolute staining for Slit2. Significant differences were seen between PCa and NDP (P < .05) and NAC (P < .05) and HGPIN and NDP (P < .05) and NAC (P < .05). While the average Mets staining was not significantly different from that of the other categories, several individual Mets cases also featured high-intensity staining.

**Conclusions:** To our knowledge, this represents the first study comparing the immunohistochemical profiles of Slit2 in PCa and Mets to specimens of HGPIN, benign prostatic hyperplasia, NDP, and NAC. These findings suggest that Slit2 expression can be increased in HGPIN and PCa and in select cases of Mets, making it a potentially important biomarker for prostate cancer.

**Immunohistochemical Profiles of Claudin-3 in Primary and Metastatic Prostatic Adenocarcinoma**

(1 Poster No. 68)

Tanner Bartholow, BS (bartholow.tanner@medstudent.pitt.edu); Anil Parwani, MD, PhD; Michael Becich, MD, PhD, Department of Pathology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania.
Context: Claudins are integral membrane proteins involved in forming cellular tight junctions. Claudin-3 has been shown to be overexpressed in breast, ovarian, and pancreatic cancer. Here we use immunohistochemistry to evaluate its expression in benign prostate hyperplasia (BPH), prostate intraepithelial neoplasia (PIN), normal tissue adjacent to prostatic adenocarcinoma (NAC), primary prostatic adenocarcinoma (PCa), and metastatic prostatic adenocarcinoma (Mets).

Design: Tissue microarrays were immunohistochemically stained for claudin-3, with the staining intensities subsequently quantified and statistically analyzed with a 1-way ANOVA with subsequent Tukey test for multiple comparisons or a nonparametric equivalent. Fifty-three cases of NAC, 17 cases of BPH, 35 cases of PIN, 107 cases of PCa, and 55 cases of Mets were analyzed in the microarrays.

Results: PCa and Mets had the highest absolute staining for claudin-3. Both had significantly higher staining than BPH (P < .05 in both cases) and NAC (P < .05 in both cases). PIN had a lower, but nonsignificant, staining score than PCa and Mets, but a statistically higher score than both BPH and NAC (P < .05 for both cases). No significant differences were observed between PCa, Mets, and PIN.

Conclusions: To our knowledge, this represents one of the first studies comparing the immunohistochemical profiles of claudin-3 in PCa and NAC to specimens of PIN, BPH, and Mets. These findings provide further evidence that claudin-3 may serve as an important biomarker for prostate cancer, both primary and metastatic, but does not provide further evidence that claudin-3 can be used to predict risk of metastasis.

Renal Replacement Lipomatosis—A Rare Renal Pseudotumor: Case Report and Literature Review
(Poster No. 69)

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Renal replacement lipomatosis (RRL) is a rare benign condition in which renal parenchyma is replaced by mature adipose tissue owing to marked renal atrophy from various causes including inflammation and nephrothlitis. RRL may present as a unilateral renal mass mimicking a tumor on radiology. We report a case of a 61-year-old man with a growing left-sided renal mass, hematuria, and flank pain. Imaging studies (magnetic resonance imaging, computed tomography, and MAG3 Lasix renogram) revealed bilateral nephrothlitis and an enhancing soft-tissue mass infiltrating the left renal pelvis (Figure 22, A) and collecting system, with filling defect suggesting a neoplastic versus inflammatory mass. The function of the left kidney was poor and left radical nephrectomy was performed. Grossly, the kidney was atrophic with mildly dilated pelvis and calyces. The renal pelvis and parenchyma were replaced by an irregular mass (5 × 4 × 3.5 cm) of adipose tissue (Figure 22, B) containing areas of chronic inflammation and fibrosis (Figure 22, C) with severe chronic and acute pyelonephritis and marked vascular nephrosclerosis (Figure 22, D). No tumor or stones were present (possibility that stones are being passed in urine). RRL may clinically present as a renal mass and the main radiographic differential considerations include malakoplakia, xanthogranulomatous pyelonephritis, fat-containing tumors (liposarcoma, lipoma, and angiomylipoma), and carcinoma of renal parenchyma or pelvis. This case is presented to increase the awareness of this rare benign lesion among radiologists and surgeons in the differential diagnosis of renal masses with lipomatous radiographic features and to plan treatment according to the functional capacity of the affected kidney.

Adult Nephroblastoma (Wilms Tumor)
(Poster No. 70)

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Nephroblastoma (Wilms tumor) arises from metanephric blastema, which differentiates into triphasic or sometimes biphasic or monophasic patterns including blastemal, epithelial, and stromal lineages. Overall a rare neoplasm, it represents <1% of all cancers in children but is the most common pediatric genitourinary cancer. Nephroblastoma is extremely rare in adults, with an incidence of only approximately 0.2 cases/million/year, and most cases are diagnosed before the age of 6. We report the case of a 24-year-old white man who presented with abdominal pain on the left side of increasing intensity of 6 to 7 months’ duration. A computed tomography scan demonstrated a large 17.2-cm, left-sided, enhancing, renal mass with periaortic lymphadenopathy. Subsequent computed tomography scans revealed bilateral, peripheral, uncalcified, pulmonary nodules, suggestive of metastasis. A radical nephrectomy was performed; a large polyloid tumor protruded into a dilated pelvicalyceal system and extensively invaded perinephric adipose tissue, the adrenal gland, and the renal vein.

Histologically, the tumor had a biphasic morphology consisting of blastemal and stroma components with diffuse anaplasia. The patient was additionally treated with chemotherapy and radiation, but persistence of the pulmonary metastases resulted in bilateral metastasectomies (Figure 23). Unfavorable prognostic factors include unfavorable histology (anaplasia), adult age at diagnosis, and high-stage tumor. Anaplasia is not sine qua non for aggressive neoplastic behavior, but these cases tend to be resistant to chemotherapy. In general, adults tend to have a poorer outcome stage for stage as compared to children. Furthermore, hematogenous metastasis, including the lungs, confers stage IV disease, for which the prognosis is grim in adults.

A Variant Morphology of Mucinous Tubular and Spindle Cell Carcinoma of the Kidney With Extensive Oncocytic Changes
(Poster No. 71)

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Mucinous tubular and spindle cell carcinoma (MTSC) of the kidney is a rare variant of renal cell carcinoma, with favorable prognosis. A variety of morphologic features have been described in MTSCs. These tumors have received more attention owing to the recognition of apparently low-grade, distal, nephron-derived carcinomas and their overall favorable prognosis. Recognition of MTSC has been expanded to include tumors with morphologic variability. A 53-year-old woman underwent a right nephrectomy for a renal mass. The radiologic imaging was reviewed along with gross and microscopic examinations of the renal mass. Radiology highlighted a 5.4-cm, heterogeneously enhancing renal mass on the right side. The gross specimen revealed a 6.4 × 5.8 × 5.2-cm, bulging, well-delineated mass located in the midpole. Cut surfaces were variegated, bright yellow-white, with foci of hemorrhage and necrosis. Histologically, the tumor consisted of closely packed areas of small tubules with oncocytic cytoplasm, papillary structures, focal clear cell changes, paucity of spindle cell differentiation, intertubular focal stromal and paucicellular clacification in a background of mucinous stroma. The oncocyic changes involved more than 90% of the tumor cells. We report an unusual variant of MTSC with minimal spindle cell proliferation and extensive oncocytic changes of tubular epithelium. Unusual histologic picture of this tumor can be misdiagnosed as an aggressive form of renal cell carcinoma. Owing to variations in histologic features, renal tumors with features of MTSC require careful histologic examination and judicious use of immunohistochemical stains to exclude other histologic types of renal cell carcinoma.

Paraganglion Cells Stain Positively for OCT4: A Potential Pitfall in Assessing Retroperitoneal Lymph Node Dissection Specimens for Germ Cell Tumor Metastasis (Poster No. 72)

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Context: Paraganglia are collections of neuroendocrine cells that are seldom reported in retroperitoneal lymph node dissection (RPLND) specimens performed for the management of testicular germ cell tumors (GCTs). Histologically, paraganglia may appear similar to GCTs, especially seminomas, and can be confused with metastasis. OCT4 is often used in RPLNDs in the detection of GCT metastasis and is expressed in nuclei of seminoma and embryonal carcinoma cells. In this study, we evaluated OCT4 immunostaining pattern in paraganglia.

Design: Twelve RPLND specimens containing paraganglia were selected consecutively from June 2010 to March 2011. All specimens were stained with OCT4, as well as with synaptophysin and S100, to confirm the cells of interest as paraganglia.

Results: All 12 cases were from male patients with histories of testicular GCTs who had undergone RPLND. Their ages ranged from 20 to 63 years (mean, 40 years). In all 12 cases (100%), the paraganglion cells showed strong cytoplasmic staining for OCT4, as well as with synaptophysin and S100. OCT4 staining, while paraganglia show cytoplasmic OCT4 staining, which can be intense with nuclear overshadowing. The characteristic staining pattern is helpful in the correct diagnosis; however, a novice observer can easily misinterpret it as metastatic GCT. We recommend diligence when examining RPLND and when using OCT4 staining, especially with suspected GCT in extranodal soft tissue, to avoid a potential diagnostic pitfall and false upstaging. Furthermore, S100 and synaptophysin can help distinguish paraganglia.

Prostatic Tissue in Male Teratomas and Germ Cell Tumors (Poster No. 73)

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Context: The presence of prostatic differentiation as part of a teratoma is very unusual, with less than 20 cases reported, all but 1 in ovarian teratomas. Its incidence and characteristics have not been established.

Design: We reviewed available mixed germ cell tumors and pure teratomas in male patients from 1990 to 2008.

Results: Forty-five cases were identified, including 19 testicular, 20 retroperitoneal, 5 mediastinal, and 1 pulmonary resection, obtained from male patients, 15 to 48 years old (mean age, 28.8 years). Review of hematoxylin-eosin–stained sections did not identify glands consistent with prostatic differentiation. Immunohistochemical stains performed in 10 cases with small glandular and/or tubular structures revealed 1 case positive for PSA, PSAP, and protein/P501S, while keratin 903 and p63 highlighted basal cells in the same glands. The prostatic component represented less than 5% of the tumor tissue. Review of additional slides from a retroperitoneal lymph node dissection from the same patient showed glands consistent with prostatic differentiation and confirmed by immunostains (PSA, PSAP, and protein/P501S). The patient is alive without disease 53 months after the original orchectomy.

Conclusions: Our findings demonstrate immunohistochemically confirmed prostatic differentiation in testicular teratomas. The incidence is low at 2%. The presence of these structures did not appear to adversely affect the patient’s prognosis. Immunostains can be of utility in detection of morphologically unsuspected prostatic differentiation in male germ cell tumors. This study raises the possibility that prostatic differentiation, difficult to recognize by morphology alone, might be more commonly present than previously reported in male germ cell tumors.

Metastatic Renal Cell Carcinoma Presenting as Gastric Polyps (Poster No. 74)

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Renal cell carcinoma (RCC) accounts for approximately 3% of adult malignancies and is responsible for over 13,000 deaths in the United States annually. The fatalities are largely due to distant metastasis, with lung, liver, bone, and brain being the most commonly affected organs. Gastric metastasis from RCC is a rare event, with less than 20 cases reported in the English-language literature to date. Here we report a case of metastatic RCC presenting as gastric polyps. The patient was a 60-year-old African American woman with a history of clear cell RCC (pT1 N0 M0). She underwent esophagogastroduodenoscopy and colonoscopy 5 months after nephrectomy because of anemia. Two nonulcerated, 0.6-cm polyps were found at the greater curvature of the gastric body, which were subsequently removed. Histologic examination of the polyps revealed nested collections of vacuolated epitheloid cells in a background of delicate, arborizing vasculature, immediately beneath the congested and hyperplastic foveolar epithelium. The lesions appeared to be confined to the lamina propria, with an infiltrative growth pattern at the periphery. The cells exhibited clear cytoplasm and round to oval nuclei with finely granular chromatin, inconspicuous nucleoli, and occasional mitotic figures. The lesional cells were immunoreactive with pan-cytokeratin, vimentin, and PAX-2. The histologic features and the immunophenotype resulted in a diagnosis of metastatic RCC. To our knowledge, this is the third recorded case describing a metastatic RCC presenting as gastric polyps. Our case suggests that a careful follow-up should be conducted in patients with a history of RCC who present with gastrointestinal manifestations.

Ewing Sarcoma/Primitive Neuroectodermal Tumor of the Kidney: A Case With Fine-Needle Aspiration Findings and Critical Literature Review (Poster No. 75)

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Ewing sarcoma/primitive neuroectodermal tumor (EWS/PNET) of the kidney is a rare entity with poor prognosis. It poses a diagnostic challenge with fine-needle aspiration (FNA) specimens. There are only 4 reported renal EWS/PNET cases with FNA findings. We present the fifth case with both cytologic and histologic findings. A 32-year-old man presented with a large renal mass on the right side. Computed tomography–guided FNA showed aggregates of loosely cohesive small-sized tumor cells with scant cytoplasm, round to oval nuclei, and inconspicuous nucleoli. Occasional Homer-Wright rosettes were noted. Nephrectomy specimen revealed sheets and nests of small-sized monotonous tumor cells with occasional Homer-Wright rosettes. The neoplastic cells showed strong expression of CD99 and vimentin and were negative for AE1/AE3 and chromogranin. The diagnosis of renal EWS/PNET is substantiated by the presence of EWSR1 translocation. Flow cytometry demonstrated a single cell population. Immunohistochemistry plays an important role in tissue triage and therapeutic decisions. Potential pitfalls associated with renal FNA include lack of onsite evaluation by pathologists, inexperienced FNA performer, sampling of...
### Clinicopathologic Features of Renal EWS/PNET Cases With the EWSR1 Gene Translocation

<table>
<thead>
<tr>
<th>Clinicopathologic Features</th>
<th>Findings</th>
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<tbody>
<tr>
<td>No. of cases</td>
<td>31, including the current case</td>
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<tr>
<td>Age distribution</td>
<td>Mean age, 24 years, ranging from 5 to 65 years; 77% of patients (24 of 31) are between 15–45 years old</td>
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<tr>
<td>Male to female ratio</td>
<td>1.7:1 (19 versus 11)</td>
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<tr>
<td>Tumor size</td>
<td>Average, 12.8 cm, ranging from 4.6 to 20 cm</td>
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<tr>
<td>Immunohistochemical markers (% of positivity)</td>
<td>CD99 (97%); pan-cytokeratin (13%); Synaptophysin (38%); chromogranin (5%); NSE (96%); desmin (0%).</td>
</tr>
<tr>
<td>Methods for detecting EWSR1 translocation</td>
<td>FISH (dual-fusion probe, break-apart probe); RT-PCR; Karyotyping</td>
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necrotic foci, and inadequate sampling precluding tissue triage for ancillary studies. Owing to the morphologic and immunophenotypic resemblance with other small blue cell tumors, detection of EWSR1 translocation is now considered as the gold standard for diagnosing EWS/PNET. However, nearly half of reported renal EWS/PNET cases lack this type of study. To address this crucial issue, we reviewed 30 renal EWS/PNET cases with explicit evidence of EWS translocation (Table). In summary, EWS/PNET needs to be considered in the differential diagnosis for young patients with a large renal mass.

### Unusual Clinical, Pathologic, and Molecular Findings in Tubulocystic Variant of Renal Cell Carcinoma (Poster No. 76)

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Tubulocystic renal cell carcinoma (TRCC) is a recently recognized entity, not yet incorporated in the World Health Organization classification. TRCC is a relatively indolent subtype of RCC that has carried a good prognosis in the limited case series so far. We present a case of TRCC with unusual clinical, pathologic, and molecular findings. We reviewed consult slides of a TRCC in an adult woman, which was initially misdiagnosed as a clear cell RCC. The unusual clinical findings included local tumor recurrences after radical nephrectomy and brain metastasis. Sections from the local recurrence confirmed TRCC but exhibited focal solid growth pattern and appreciable cytologic atypia, which was not described in the prior studies. A genome-wide molecular invasion probe (MIP) technology was used to detect potential gene copy aberrations and allelic imbalance. A panel of 24 037 MIP single-nucleotide polymorphism (SNP) probes was used, and a copy number loss in 4 chromosome regions was identified. Constitutional benign copy number variations (CNVs) were observed (4 p16.1 and 17q21.31-q21.32), in both the tumor and the normal tissue. The loss of entire chromosomes 9 and 18, 15q11.2-q26.3, and 2q32.3 was only observed in the tumor. The loss of chromosomes 18, 15q11.2-q26.3, and 2q32.3 has not previously been reported. This spectrum of unusual clinical, pathologic, and molecular findings is unique and could probably indicate a tendency for tumor recurrence and poorer prognosis, as in our case. The molecular findings might be of significance to identify unique novel targets for developing alternate therapies in the future.

### Prostate-Cutting Apparatus: A Novel, Handy Tool for Cutting Fresh Prostate for Tissue Procurement and Histologic Diagnosis (Poster No. 77)

Wei Huang, MD (whuang@uwhealth.org) Department of Pathology, University of Wisconsin, Madison.

Context: Cutting fresh prostate for tissue procurement, while maintaining the quality of sections for histologic diagnosis, can be challenging.

Design: The prostate-cutting apparatus includes a prostate slicer and a tissue clamp. The prostate slicer is fabricated out of AISI-SAE 6061 aluminum, featuring a 1.5-in-long sliding side that moves along a t-track in the base, as seen in the final design (Figure 24). The sliding side can be locked in place. On either side of the base, the 2 sides have slits spaced 3 mm apart, allowing a prostate to be sliced at 3-mm intervals. A tissue clamp consisting of 2 porous polycarbonate plates (8 × 5 × 0.095 in.) and steel clips secures the prostate tissue slices so that formalin can permeate the specimen and fixation is attained without distortion.

Results: After inking and shaving bladder neck and apical margins, a prostate is loaded onto the slicer, with the apical plane aligned with the stationary side of the slicer (Figure 24) and cut into 5 to 7 slices with a Sadie-Riggs tissue blade. The slices produced are ideal for histologic assessment: flat and well fixed with an intact capsule (Figure 24, A: prostate loaded onto the slicer; B, fresh slices; C, slices in the clamp; and D, fixed slices).

Conclusions: The prostate-cutting apparatus is safe and easy to use and cuts fresh prostate slices in a standardized fashion, enabling us to meet the demand of procuring quality fresh prostate tissue and producing quality sections for histologic assessment of prostatectomy specimens.

### A Study in Predicting Progression in Lamina Propria (pT1) Invasive Urothelial Carcinoma of Urinary Bladder With Immunohistochemical Markers CD44, bcl2, MIB1, and p53 (Poster No. 78)

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Context: Lamina propria invasion (pT1) in urothelial carcinomas is a significant risk factor for progression into muscle invasive disease. Various biomarkers have been studied in this subgroup (pT1) to predict recurrence/progression. We studied a cohort of pT1 cases based on immunohistochemical markers CD44, MIB1, bcl2, and p53.

Design: All histologically confirmed consecutive superficial urothelial (pTa and pT1) carcinomas between years 2005 and 2007 were reviewed; confirmed pT1 urothelial carcinoma cases were included in the study. Cases were followed for 2 years. Resected primary tumor and any further specimen from these cases (recurrences/progression) were subjected to immunohistochemistry. With the use of statistical models, cutoffs for p53 and MIB1, as threshold for recurrence/progression, were estimated.

Results: Of 100 pT1 cases reviewed, 66 were confirmed as pT1 urothelial carcinomas. Thirty-four were high-grade carcinomas and 32 were low-grade carcinomas. Thirty-one were recurrent and 35 were nonrecurrent cases. In 9 cases, disease progressed and patients underwent cystectomy. Thirty-three cases had p53 < 20% (P = .02) and MIB1 > 10% (P = .02). Sixty-six percent of these cases had 1 or more recurrences, whereas only 34% of cases having p53 < 20% and MIB1 < 10% recurred. Six (32%) of the 19 cases having p53 > 30% and MIB1 > 20% progressed. Interestingly, 85% of these progressed cases had a loss...
of CD44 expression. On the contrary, only 8% of the 40 cases having p53 < 30% and MIB1 < 20% progressed. Loss of CD44 expression was seen in recurrent (15 of 31) as compared to nonrecurrent (9 of 28) cases. Loss of bcl2 expression was seen in nonrecurrent, recurrent, and cases that progressed.

Conclusions: Urothelial carcinoma has a propensity to recur/progress. The degree of immunoexpression of p53, MIB1, and CD44 could help in stratifying pT1 urothelial carcinoma into low and high risk for progression.

A Case of Prostatic Stromal Hyperplasia With Atypia Combined With Urothelial Carcinoma of the Urinary Bladder
(Poster No. 79)

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Prostatic stromal hyperplasia with atypia is a rare lesion characterized by stromal proliferation typically presenting with obstructive symptoms, abnormal digital rectal examination findings, and elevated levels of prostate-specific antigen. There are no reports of malignant behavior in this lesion to date. We report a case of prostatic stromal hyperplasia with atypia combined with urothelial carcinoma of the urinary bladder. The patient was a 69-year-old man with obstructive urinary symptoms caused by his enlarged prostate (12 × 9 cm on imaging). Outside biopsy reportedly showed prostatic stromal tumor of uncertain malignant potential. Recent transurethral resection of the urinary bladder revealed noninvasive high-grade papillary urothelial carcinoma. Cystoprostatectomy with salvage biopsy was performed. The prostate was grossly and symmetrically enlarged to 11.5 × 9.2 × 9.5 cm. The cut surface was tan-white and ranged from sponglike to cystic without hemorrhage or necrosis. Histologically, a dominant circumscribed nodule involving the transition and peripheral zones was composed of benign and cystically dilated glands embedded within stroma and containing numerous atypical spindle cells including bizarre giant cells with pleomorphic nuclei. Mitotic figures were not readily seen. These atypical spindle cells were immunoreactive for desmin, smooth muscle actin, and vimentin. Some tumor cells were positive for progesterone receptor (10%), estrogen receptor (1%), and Ki-67 (1%–2%). Extensive chronic ulceration was noted in the bladder with no residual carcinoma. Recognition of this entity that lacks reported malignant potential is important, since it must be distinguished from other benign and malignant prostatic lesions including prostatic stromal sarcoma, leiomyosarcoma, and atypical leiomyoma.

Renal Oncocytoma Masquerading as Renal Cell Carcinoma: A Case of Mistaken Identity
(Poster No. 80)

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Cystic neoplasms in the kidney present a diagnostic challenge, with complex cysts most commonly associated with renal cell carcinoma. These findings are rarely reported in oncocytomas. We present 2 cases of cystic oncocytoma, which preoperatively were considered as renal carcinoma but were found to be cystic oncocytomas on pathologic assessment. Case 1: During a routine workup for hematuria, a 55-year-old woman was noted to have a right-sided renal mass on abdominal ultrasonography. A computed tomography scan was read as a 5.9-cm exophytic mass of the kidney “enhancing, consistent with renal cell carcinoma.” A right partial nephrectomy was done. Microscopic examination revealed an oncocytoma that contained dilated, blood-filled capillaries. Case 2: A 54-year-old man was seen by his internist, who noted a large left-sided renal mass on ultrasonography. A computed tomography scan was read as a 5.9-cm exophytic mass of the kidney “enhancing, consistent with renal cell carcinoma.” A left partial nephrectomy was done. Microscopic examination revealed an oncocytoma that contained dilated, blood-filled capillaries. The magnetic resonance imaging showed a 14-cm mass, which was heterogeneous in signal intensity. The impression was of a “large necrotic left renal mass” suggestive of renal cell carcinoma. The patient underwent a radical nephrectomy. Microscopic examination revealed an oncocytoma with hemorrhage within tubular cysts. Rarely, oncocytoma can present as a renal mass with cysticification and hemorrhage on computed tomography scan and ultrasonography. As illustrated in these 2 cases, this unusual presentation can lead to oncocytoma being confused radiologically and histologically with renal cell carcinoma.

Primary Peritoneal Mesothelioma Presenting as a Vesicovaginal Fistula
(Poster No. 81)

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We present a case of a 56-year-old woman with a 7-year-history of vulvar intraepithelial neoplasia (VIN) 1 that progressed within 3 years to VIN 3 and currently VIN 2, anal intraepithelial neoplasia (AIN) 1, and a remote history of cervical intraepithelial neoplasia (CIN) 1. She had no known history of asbestos exposure. Two months before diagnosis, the patient presented with a mass on cystoscopy with vesicovaginal fistula. The cystoscopic biopsy specimens were CK7+ and CK5/6+, and were interpreted as sarcomatoid carcinoma of the bladder. The radical cystectomy specimen revealed diffusely thickened bladder wall, with an exophytic mass at the posterior dome and associated serosal perforation. On histology, the tumor was composed of a biphasic proliferation of spindled cells admixed with hobnail-shaped cells forming sharply angulated glands; a diagnosis of primary peritoneal mesothelioma was rendered (PPM) (Figure 25). A broad panel of immunohistochemical stains was performed in support of the diagnosis, with results as follow: CK7+, CK5/6+, D2-40+, calretinin (focally +), WT-1+, CK20−, TTF-1−, CD2 + , CD31 + , CD34 + , p53−, and mucicarmine−. This case highlights the diagnostic dilemma of rendering a diagnosis of PPM when it presents in an unusual manner and location, such as in our case. This challenge is further complicated by the histologic features of PPM when a sarcomatoid, spindle cell, or glandular pattern is prominent. In addition, this case serves as a reminder that mesothelioma is not solely associated with asbestos exposure but also with various other conditions.

Analysis of Tocopherol-Associated Protein Expression in Prostate Cancer and Its Correlation With Clinicopathologic Features
(Poster No. 82)

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Context: Tocopherol-associated protein (TAP) has been reported to act as a tumor suppressor in prostate cancer. We investigated the correlation between TAP immunohistochemical staining of prostate cancer and clinicopathologic features in patients who had undergone radical retropubic prostatectomy.

Design: Retrospective review was performed on 114 patients undergoing radical retropubic prostatectomy between 1997 and 2003. Immunohistochemical stains were performed on prosstatic adenocarcinoma and benign glands from each specimen with a TAP monoclonal
Primary Penile Desmoplastic Melanoma: Report of a Case With Literature Review (Poster No. 84)

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Desmoplastic melanoma is a rare type of spindled cell melanoma associated with prominent collagen production and most common on the sun-exposed skin. We report a case of primary penile desmoplastic melanoma, initially misdiagnosed as squamous cell carcinoma. A 72-year-old white man with neonatal circumcision presented with progressive urinary obstruction and acute kidney injury. Meatal stenosis was noted clinically with firm glans penis. A biopsy of the meatus was performed at an outside hospital and a diagnosis of squamous cell carcinoma was made. The patient was referred to UCIMC for distal penectomy. Cross examination revealed scattered, flat, dark-brown discoloration of the skin and ill-defined firmness of the entire glans. Cross sections showed a poorly circumscribed, white firm tumor measuring 1.5 × 1.3 cm. Microscopically, the tumor is composed of haphazardly arranged spindle cells infiltrating the dermis and corpus spongiosum (Figure 27). Moderate nuclear pleomorphism, rare mitosis, and abundant collagen were present with evident neurotropism. The overlying skin showed focal atypical melanocytic proliferation and pseudoepitheliomatous hyperplasia. The differential diagnosis includes spindle cell carcinoma, leiomyosarcoma, and desmoplastic melanoma. The tumor cells were positive for S100 protein and vimentin, negative for AE1/AE3, HMB-45, Melan-A, and smooth muscle actin (SMA). The atypical melanocytic cells at the epidermal-dermal junction were positive for HMB-45 and Melan-A, and smooth muscle actin (SMA). The atypical melanocytic cells at the epidermal-dermal junction were positive for HMB-45 and Melan-A. A diagnosis of desmoplastic melanoma of the penis was made. Review of the previous biopsy specimen showed similar morphology with pseudoepitheliomatous hyperplasia of overlying skin. Given the high recurrence rate of desmoplastic melanoma if not adequately excised, making an accurate diagnosis would lead to appropriate management.

Diagnostic Utility of p63 and P501S Dual Immunohistochemical Stain in Differentiating Urothelial Carcinoma From Prostate Carcinoma (Poster No. 85)

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Context: Distinguishing urothelial from prostate carcinoma is important owing to potential therapeutic implications. However, this can be a diagnostic challenge when there is limited material and in high-grade tumors. p63 has been shown in several studies to be a marker of urothelial carcinoma. P501S is a prostate-specific protein, and unlike other prostate markers, its expression is unrelated to Gleason grade. We evaluated the diagnostic utility of a dual immunohistochemical stain comprising p63 and P501S, applied sequentially on a single slide and visualized by double-chromogen reaction, in differentiating these 2 cancers.

Design: Archival material from 132 patients with high-grade urothelial carcinoma (tissue microarrays and routine sections) and 23 patients...
In mild ATI, KIM-1 expression was focal and weak (0 to 1+). and 2 (6%) had 4 expression of CD68 was found. In moderate and severe 0.001). P501S staining was 2 to 3. There were dually immunostained Departments of

Our results confirm the findings that both KIM-1 and P

immunohistochemical

dual p63/P501S immunostain is highly specific in

Studies have indicated that younger patients with prostate cancer that both KIM-1 and

P

immunohistochemical

profile had 96% sensitivity, 100% specificity, and 100% positive predictive value for prostate carcinomas.

Characteristics of Prostate Cancer in Patients Aged 45 Years or Younger

(Poster No. 87)

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Context: Studies have indicated that younger patients with prostate cancer have less favorable outcomes than older counterparts. However, earlier screening for prostate cancer has been implemented over the years. The current study examines recent cases of prostatic adenocarcinoma in patients aged 45 years or younger to determine the clinicopathologic features in the younger population.

Design: Cases from 2005 to 2010 with prostatic adenocarcinoma diagnosed by biopsy were reviewed. Patients aged 45 years or younger at the time of diagnosis, who were subsequently treated by laparoscopic radical prostatectomy, were selected. Then, clinicopathologic characteristics of the tumors in these patients were evaluated.

Results: Thirty-three men aged 45 years or younger underwent prostatectomy at our institution. The average preoperative PSA level was 5.4 ng/ml (range, 1.68 to 11.1). Of the 33 cases, 1 (3%) had a Gleason score of 3 + 2, 25 (76%) had 3 + 3; 5 (15%) had 3 + 4; and 2 (6%) had 4 + 3. There were 3 cases (9%) with extraprostatic extension, but none had seminal vesicle involvement. Therefore, 3 cases were staged as pT3a and the rest were pT2. Lymphovascular invasion and positive surgical margins, as well as lymph node metastasis, were not identified in any of the cases. No biochemical recurrence was observed in all 26 patients having follow-up visits at our institution. Additionally, 5 men aged 45 years or younger with prostatic adenocarcinoma (all Gleason score 3 + 3) diagnosed by biopsy were treated at outside institutions.

Conclusions: The clinicopathologic features of patients aged 45 years or younger with prostatic adenocarcinoma suggest that this population tends to present with favorable tumor characteristics.

Xanthogranulomatous Pyelonephritis: A Potential Pitfall

(Poster No. 88)

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A 54-year-old man presented to a outside institution with complaints of malaise, fulflike symptoms, and unintentional 40-lb weight loss. Abdominal computed tomography showed a suspicious, 10-cm, left-sided renal mass. An ultrasound-guided biopsy performed at our institution showed a specimen containing numerous fibroblasts with accompanying chronic inflammatory cells, consistent with a reactive process. However, no renal parenchyma was identified and it was believed this most likely represented the periphery of the lesion. The patient subsequently underwent a left radical nephrectomy and adrenalectomy with intraoperative consultation. Grossly, there was a 15.5-cm mass, centered in the perirenal fat extending into the psoas muscle, renal parenchyma, and I of the minor calices. Microscopically, it was an ill-defined mass, consisting of a proliferation of fibroblasts, abundant histiocytes, and chronic inflammatory cells. Special stains for myofibroblasts yielded negative results. Smooth muscle actin highlighted the myofibroblastic proliferation. ALK-1 staining was negative. Overall, this lesion was most consistent with xanthogranulomatous pyelonephritis (XGP). XGP is an uncommon inflammatory process usually occurring in the setting of chronic obstruction and suppuration. The histologic differential is broad and includes clear cell carcinoma and both benign and malignant spindle cell tumors. This case highlights the difficulty of making this diagnosis, especially on limited biopsy material. Knowledge of this entity is important because its destructive growth pattern can clinically and radiologically mimic a neoplasm. In addition, the preoperative diagnosis is difficult and rarely made.

A Case of Primary Ewing Sarcoma/Primitive Neuroectodermal Tumor of the Kidney

(Poster No. 89)

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Extraosseous primary Ewing sarcoma/primitive neuroectodermal tumors have been described in many locations within the human body, although most of these primary sites are rare. We report a case of primary renal Ewing sarcoma/primitive neuroectodermal tumor. A 32-year-old Hispanic man presented with rapid weight loss, 1 week of gross, painless hematuria, intermittent left flank pain, and a progressive increase in blood pressure over 2 years. Physical examination revealed a mass in the left upper quadrant. Magnetic resonance imaging revealed a superior pole, left-sided renal mass, 12.5 cm in maximum dimension with apparent hemorrhage, central necrosis, and extension to renal vein and vena cava. The patient received a left renal artery embolization and underwent subsequent nephrectomy. The nephrectomy specimen contained an infiltrating, golden-yellow, nodular, tumor mass with solid, cystic, and hemorrhagic composition. There was overt invasion into the perirenal adipose tissue, renal vein, and inferior vena cava, with no adrenal gland involvement. Microscopically, sheets of small blue tumor cells were arranged in a loose lobular architecture with large areas of necrosis and invasion into the perirenal tissue. Tumor cells were strongly immunoreactive for CD99, sparsely positive for S100 and CD117, and negative for synaptophysin, WT-1, pancytokeratin, and CK7/CK20. Immunostains for CD34, CD68, CD1a, and EMA were positive. Overall, the differential diagnosis includes a primary renal Ewing sarcoma/primitive neuroectodermal tumor. A 32-year-old Hispanic man presented with rapid weight loss, 1 week of gross, painless hematuria, intermittent left flank pain, and a progressive increase in blood pressure over 2 years. Physical examination revealed a mass in the left upper quadrant. Magnetic resonance imaging revealed a superior pole, left-sided renal mass, 12.5 cm in maximum dimension with apparent hemorrhage, central necrosis, and extension to renal vein and vena cava. The patient received a left renal artery embolization and underwent subsequent nephrectomy. The nephrectomy specimen contained an infiltrating, golden-yellow, nodular, tumor mass with solid, cystic, and hemorrhagic composition. There was overt invasion into the perirenal adipose tissue, renal vein, and inferior vena cava, with no adrenal gland involvement. Microscopically, sheets of small blue tumor cells were arranged in a loose lobular architecture with large areas of necrosis and invasion into the perirenal tissue. Tumor cells were strongly immunoreactive for CD99, sparsely positive for S100 and CD117, and negative for synaptophysin, WT-1, pancytokeratin, and CK7/CK20. Fluorescence in situ hybridization confirmed the fusion EWSR1 gene, which is a less common translocation in Ewing sarcoma/primitive neuroectodermal tumor. Small blue cell tumors can be seen in the kidney. Although metastatic tumor should be considered, Ewing sarcoma/primitive neuroectodermal tumor should not be forgotten.

Cell Adhesion Molecules in Noninvasive and Invasive Carcinoma of the Urothelium: Caderhins E, N, P and Catenins α and β

(Poster No. 90)

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Cell adhesion molecules (CAMs) are of great importance for morphology and aggressiveness of tumors. The role of E-cadherin in urothelial carcinomas is well known, but the other CAMs are less understood, especially with respect to their sublocalization in the tumor.

**Design:** Immunohistochemical study of 20 superficial, papillary in situ and myoinvasive carcinomas was performed with antibodies for E-cadherin (EP7000), β-catenin, and actin. The E-cadherin was seen only in basal cells. Papillary tumors were negative, but CIS and invasion front of myoinvasive carcinomas were highly positive. P-cadherin was only expressed together with E-cadherin, and both had the same distribution. The level of β-catenin in cell membranes was high in normal transitional cells and low-grade tumors. Myoinvasive- and high-grade tumors were negative or showed low levels and deposition in the cytoplasm. α-Catenin, the linking E-cadherin, and actin are expressed in most tumor cells; only high-grade tumors lose α-catenin.

**Conclusions:** Morphologic features associated with cadherins in urothelial carcinomas include loss of E- and P-cadherin and a shift to N-cadherin in invasion front and epithelomesenchymal transition zone; in high-grade carcinomas, there is a transition of β-catenin from cell membrane to cytoplasm. Loss of α-catenin is associated with progressive features. Cadherins and catenins may contribute to the prognostication of urothelial carcinomas with respect to recidivism and progression.

**Refractive Index as Marker for Gleason Grading of Prostate Cancer**

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**Context:** In 2010, there were 217,730 new cases of prostate cancer in the United States. Gleason grading has been established as a reliable score for prostate cancer prognosis and is achieved using fixation and staining of tissue. We present a method in which we use the optical properties of the tissue to determine the Gleason grade.

**Design:** We perform label-free imaging of cancer tissue microarrays by using spatial light interference microscopy (SLIM), which quantitatively maps the refractive index of the tissue. With this spatially resolved map, different cell types and their arrangement can be distinguished, and we can identify cancerous areas from benign areas and state the Gleason grade of the cancerous area.

**Results:** The imaging time for a slide with 30 cores at ×10 magnification with SLIM was 8 minutes. From the 30 cases presented to us, we identified 9 cores as benign and identified areas of Gleason grade 3 in 10 cores, grade 4 in 10 cores, and grade 5 in 4 cores. The SLIM images compare very well with hematoxylin-eosin–stained tissue, as seen in Figure 28, in which Gleason grade 5 and grade 4 areas from a core are magnified on the left and right, respectively.

**Conclusions:** The preliminary results for the use of SLIM for label-free imaging look promising. However, our method is still subjective. We are working on using statistical measures from scattering mean free path and anastomosis maps to reduce interobserver and intraobserver variability in Gleason grading.

**Frozen Section Diagnosis and Testicular-Sparing Surgery for Testicular/Paratesticular Fibrous Pseudotumors**

Kristina Subik, MD; Andre Kajdacsy-Balla, MD, PhD. Departments of Pathology, University of Rochester Medical Center, Rochester, New York.

**Context:** Fibrous pseudotumors of the testicle and paratesticular tissues are fibroinflammatory reactive lesions that can mimic neoplasms. Very little is known about the role of frozen section analysis for these lesions in terms of intraoperative surgical management.

**Design:** We retrospectively reviewed our pathology database from 1998–2011 for patients with testicular/paratesticular fibrous pseudotumors in which a specimen was sent for frozen section diagnosis. We evaluated whether a frozen section diagnosis was able to determine the nonneoplastic nature of the lesion and thereby change the decision for radical orchectomy.

**Results:** We identified 10 patients (mean age, 42 years; range, 26–69 years) with testicular/paratesticular fibrous pseudotumors for whom frozen sections were used to demonstrate the nonneoplastic nature of the lesion. The clinical presentations for the lesions included mass, testicular pain, and/or scrotal swelling. Four patients presented with a testicular/paratesticular mass (range, 0.6–3.6 cm). Three patients had an associated hydrocele on ultrasonography. In 7 cases, frozen section analysis resulted in a testicular-sparing surgery. The remaining 3 cases ultimately underwent radical orchectomy. The decision for radical surgery was due to questionable viability of the testicle in 2 cases and in 1 case the clinical concern for a lymphoproliferative malignancy. None of the 10 patients developed recurrent lesions.

**Conclusions:** Urologists should be aware of testicular/paratesticular pseudotumors mimicking testicular neoplasms. Clinical suspicion should be raised in cases of a diffuse fibrous proliferation encasing the testicle. In select cases, intraoperative frozen section analysis is helpful in obviating radical orchectomy.

**Clear Cell Papillary Renal Cell Carcinoma With Unique Morphology and Immunohistochemical Staining Pattern**

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Clear cell papillary renal cell carcinoma is a newly defined entity and was initially thought to be associated with end-stage renal disease. We herein report a case of this tumor in non–end-stage renal disease with immunohistochemical profiling. The patient is a 70-year-old woman with history of hematuria. Computed tomography scan revealed a cystic mass in the right kidney and fine-needle aspiration features of that area were suggestive of renal cell carcinoma. She subsequently underwent right nephrectomy. There was a 2.3-cm cystic space in the midportion of the kidney that contained red-tinged solid area emanating from the cystic wall. Microscopically, the carcinoma was confined within the cystic space circumscribed by a fibrous wall. The inner lining of the cystic wall also consists of single layer of cells similar to those in papillae. Within the cystic space, the tumor was composed of branching papillae with fibrovascular cores. The papillae were uniformly covered by single layer of bland cuboidal cells with abundant clear cytoplasm. Some fibrovascular cores were markedly expanded by myxoid-appearing substance but no foamy cells were seen. Immunohistochemically, the tumor cells were diffusely positive for cytokeratin 7, EMA, high-molecular-weight actin, and deposition in the cytoplasm. Myoinvasive and high-grade tumors were negative or showed low levels and deposition in the cytoplasm. α-Catenin, the linking E-cadherin, and actin are expressed in most tumor cells; only high-grade tumors lose α-catenin.

**Conclusions:**: The preliminary results for the use of SLIM for label-free imaging look promising. However, our method is still subjective. We are working on using statistical measures from scattering mean free path and anastomosis maps to reduce interobserver and intraobserver variability in Gleason grading.

**Frozen Section Diagnosis and Testicular-Sparing Surgery for Testicular/Paratesticular Fibrous Pseudotumors**

(Poster No. 92)

Kristina Subik, MD (Kristina_Subik@urmc.rochester.edu); Jennifer Gordetsky, MD, Hiroshi Miyamoto, MD. Department of Pathology, University of Rochester Medical Center, Rochester, New York.

**Context:** Fibrous pseudotumors of the testicle and paratesticular tissues are fibroinflammatory reactive lesions that can mimic neoplasms. Very little is known about the role of frozen section analysis for these lesions in terms of intraoperative surgical management.

**Design:** We retrospectively reviewed our pathology database from 1998–2011 for patients with testicular/paratesticular fibrous pseudotumors in which a specimen was sent for frozen section diagnosis. We evaluated whether a frozen section diagnosis was able to determine the nonneoplastic nature of the lesion and thereby change the decision for radical orchectomy.

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**Conclusions:** Urologists should be aware of testicular/paratesticular pseudotumors mimicking testicular neoplasms. Clinical suspicion should be raised in cases of a diffuse fibrous proliferation encasing the testicle. In select cases, intraoperative frozen section analysis is helpful in obviating radical orchectomy.
cytokeratin, and vimentin; focally positive for CD10; negative for p63 and racemase (P504S); and were consistent with those of clear cell papillary renal cell carcinoma, as described by Gobbo et al. Recent studies indicate that conventional clear cell renal cell carcinoma, papillary renal cell carcinoma, and clear cell papillary renal cell carcinoma are separate entities, each with unique morphology, immunohistochemical profile, and cytogenetic characteristics.

**Lymphatic Vessels of the Prostate and the Organization of Their Network Explain the Prognostic Importance of Seminal Vessel Invasion in Prostatic Cancer** (Poster No. 94)

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**Context:** In spite of century-long research, the zonal architecture of the prostate was first discovered in 1968 (McNeal); intraprostatic distribution and organization of lymphatic vessels in normal and neoplastic prostate are unknown in spite of their oncologic importance.

**Design:** Twenty prostatectomy specimens (each consisting of 40–50 blocks) were analyzed with lymphatic vessel marker D2-40 (DCS Hamburg, Germany), an antibody reacting with an O-linked sialoglycoprotein epitope of lymphatic vessels, strictly oriented and analyzed for localization, direction, and diameter of lymphatic vessels.

**Results:** Density of intraprostatic lymphatic vessels is low in contrast to other organs. The lymphatic vessels of the transition zone are small and oriented parallel to the urethra; they drain to the lymphatics of the prostatic apex and, perhaps to a lesser extent, to the mural lymphatics of the bladder. Apparently, they do not connect to the lymphatics of central and peripheral zones. In its apical part, the central zone shows paraurethral oriented vessels and in the basal parts, radially oriented lymphatic vessels, draining into the radially oriented lymph vessels of the peripheral zone. In the outer subcapsular muscle coat of the prostate, lymphatic vessels show a circumferential orientation, draining to the large network of vertically oriented lymphatic vessels in vicinity of seminal vesicles and from here, to the network of the pelvis.

**Conclusions:** Prostatic lymphatic vessels show a highly oriented architecture, explaining the various patterns of intraprostatic and periprostatic tumor cell propagation, central and transitional zone carcinomas to prostatic apex and bladder neck, peripheral tumors to lymphatics of prostatic “capsule” and seminal vesicles, the last station of nearby prostatic lymph vessels.

**Role of Immunohistochemistry in Subtyping Renal Cell Carcinoma—Are the Stains Specific for the Cells of Origin?: A Preliminary Report** (Poster No. 95)

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**Context:** Renal cell carcinoma (RCC) can be histologically classified into many types. Although histopathologic features can overlap, immunohistochemical stains are helpful in differentiating these subtypes. We review various subtypes of renal cell carcinomas and their immunohistochemical profiles to verify if the stains are specific to the site of origin of the cancer.

**Design:** From our electronic medical records, we selected 50 cases of renal cell carcinomas, which had been worked out with frequently used kidney-related immunohistochemical markers RCC, PAX-2, AMACR, CK7, CD10, and vimentin. We reviewed the staining characteristics of each stain in the nonneoplastic areas to identify the normal structures being stained. The intensity of staining was given an objective score on a scale of 1 to 4, with 1 being variable staining and 4 being strongly positive.

**Results:** Staining for RCC immunomarker was positive in 96.4%. (27 of 28) of conventional renal cell carcinomas and showed strong positivity in proximal tubules (n = 13); CD10 staining was positive in 75% (3 of 4) of conventional renal cell carcinomas with strong reactivity to proximal tubules (n = 4); CK7 staining was positive in 90.9% (10 of 11) of papillary renal cell carcinomas with strong reactivity to cells of loop of Henle and collecting ducts. PAX2, AMACR, and vimentin were positive in 95% of conventional renal cell carcinoma and in papillary and chromophobe renal cell carcinoma. However, these stains were not specific for the cells of origin.

**Conclusions:** A panel of immunohistochemical stains can be used to subtype renal cell carcinomas and ascertain their cells of origin.

**Interfocal and Intrafocal ERG Expression in Prostate Cancer** (Poster No. 96)

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**Context:** ERG heterogeneity has been documented in prostate cancer (PCA). We investigated ERG protein expression in distinct PCA foci and extensive tumors from radical prostatectomies (RP).

**Design:** Five hundred forty-seven RPs were reviewed by a single pathologist. A systematic prostate map was available in all cases. Forty-six were selected for this study: 33 with 2 separate cancer foci (bifocal PCA), and 13 with cancer involving almost the entire gland (extensive PCA). A representative section of each distinct cancer focus and 2 far-apart sections of extensive PCA were stained with p63/ERG cocktail (clone 4A4, Dako/clone EPR 3864, Epitomics). ERG staining was scored as positive or negative. Intrafocal heterogeneity (>10% of ERG-negative tumor cells within a positive tumor section) was not considered.

**Results:** Of 46 patients, 65% had at least 1 ERG-positive tumor focus: 64% bifocal PCA and 65% extensive PCA. When individual tumors were analyzed, a bifocal and/or extensively positive PCA was observed in 57% of bifocal and 52% of extensive PCA, respectively. In 29 patients (88%), both tumor foci were concordantly positive or negative. In the remaining 4, one tumor focus was positive and the other was negative. Of 13 extensive PCAs, 11 (85%) showed discordant expression of ERG in separate sections and 2 displayed discordant expression of ERG. Intrafocal heterogeneity was observed in 6 of 38 bifocal PCAs and in 5 of 9 extensive PCAs. In 2 cases, negative areas otherwise positive PCA were located in the transition zone.

**Conclusions:** Although interfocal and intrafocal heterogeneity exists, ERG expression would not qualify as a good marker of clonality, given the high concordance between different tumor foci in the same prostate.

**Bilateral Metachronous Renal Cell Carcinomas With Drop Metastasis: Virtual Karyotyping With Single-Nucleotide Polymorphism Microarray and Gene Expression Assay for Differential Diagnosis** (Poster No. 97)

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Metachronous bilateral renal cell carcinomas (RCCs) are rare but well known. The pathologic diagnosis can be challenging especially when the histologic appearance is atypical. We present a case of metachronous bilateral RCCs, for which the pathologic diagnosis was confirmed with single-nucleotide polymorphism microarray and gene expression assay. Our patient was a 53-year-old man who presented with right-sided upper quadrant pain, leading to acute renal failure and bilateral RCCs. A CT showed a large pedunculated tumor emanating from the right ureteral orifice, which filled the entire ureter and collecting system on a retrograde pyelogram, and was biopsied. His past medical history was significant for left renal nephrectomy for RCC 13 years previously and a right-sided renal pelvic mass found 8 months later, for which renal pelvic washing was performed and revealed a poorly differentiated carcinoma. Histologically, the biopsied right ureteral tumor demonstrated sheets of poorly differentiated cancer cells composed of a mixture of spindled and clear cell components. The histoologic differential diagnosis included a poorly differentiated RCC versus metastatic renal cell carcinoma. The microarray revealed a markedly complex karyotype, characterized by a gain of chromosome arms 3q, 7q, and 8q and a loss of 3p, 8p, 9, 14, and 18. This finding was consistent with an RCC, as was a profile of the gene expression assay. PAX-8 immunoreactivity of this tumor further supported the diagnosis. This report shows the application of molecular tests to identify and/or confirm the primary site of a malignancy of unknown origin.

**Pure Form of Yolk Sac Tumor of Testis in Adult** (Poster No. 98)

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The pure form of yolk sac tumor (YST) is the most frequent (80%) tumor of germ cell of the testsis in childhood, but occurs rarely in adults.
We describe here a case of pure yolk sac tumor of the testis. A 22-year-old man was admitted to our hospital for consultation from a different hospital, with a diagnosis of YST. All biopsy materials and pathology reports were reviewed again. The clinical stage was stage I and serum levels for AFP were elevated. We processed all 24 paraffin blocks, and all slides with tumor were evaluated. Papillary and solid cords were the dominant pattern. Microrn cystic pattern and several Schiller-Duval bodies were also observed. No other germ cell tumor component was found. Tumor cells showed immunoreactivity for α-fetoprotein but not for CD30. The histologic reports confirmed the diagnosis of pure YST of the testis. The patient had high antibodies against orchitis and retroperitoneal lymphadenectomy and did not receive chemotherapy. The patient was alive and well, without evidence of YST at a follow-up visit 28 months later. In adult patients, in whom pure forms of YST are rare, confusion with embryonal carcinoma and seminoma can occur, especially if the tumor is completely in solid pattern. Immunohistochemically, all tumor cells react strongly with cytokeratin antibodies, and, unlike embryonal carcinoma, they react negatively with CD30. To avoid a wrong diagnosis, a generous sampling is advised.

Tri-Color Break-Apart Fluorescence In Situ Hybridization Assay for TFE3 Rearrangements at Xp11.23 in Alveolar Soft Part Sarcoma and Renal Cell Carcinoma

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Context: Alveolar soft part sarcoma typically has an unbalanced t(X;17) (p11.23;q25.3), resulting in TFE3/ASPCR1 fusion. TFE3 rearrangement also occurs with multiple partners in a rare renal cell carcinoma variant. Although these tumors can present a pathologic diagnostic challenge, a fluorescence in situ hybridization (FISH) probe is not commercially available for evaluating TFE3 rearrangements to aid tumor classification.

Design: A tri-color break-apart probe strategy was developed to detect rearrangements of TFE3 at Xp11.23 in formalin-fixed, paraffin-embedded tissues (green, 3'-TFE3; orange, 5'-TFE3; and aqua, X centromere). An atypical pattern was thought to result from fusion of TFE3 and ASPCR1 (at 17q25.3) on the der(X), but loss of the der(X) and gain of an additional normal X chromosome were confirmed with a single-fusion strategy probe set (green, 3'-TFE3; orange, ASPCR1; and aqua, X centromere). FISH analysis was performed on 25 normal samples from each gender, and 21 tumor samples, including 9 tumors in the differential diagnosis, were analyzed in a blinded manner with standard FISH methodology.

Results: Of the 10 diagnostic alveolar soft part sarcomas, 4 had no rearrangement, 2 had balanced TFE3 separation, and 4 had an atypical TFE3 separation confirmed with the ASPCR1 probe set. Of the 2 diagnostic renal cell carcinomas, 1 was normal and 1 had an atypical TFE3 rearrangement, without fusion with ASPCR1. Rearrangements of TFE3 were identified in 50 normal patient specimens or 9 tumor mimics.

Conclusions: Our laboratory developed and validated a FISH assay that accurately detects rearrangement of TFE3 and identified an unexpected atypical pattern in 5 tumors.

Myeloma-like Cast Nephropathy in a HIV Patient

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True myeloma cast nephropathy is an obstructing disorder of renal tubules, caused by precipitation of Bence Jones proteins with Tamm-Horsfall protein and other filtered proteins in the form of angulated and brittle casts. Myeloma-like cast nephropathy occurs occasionally in nonmyeloma patients with history of antibiotic therapy, immunosuppressive therapy, and in patients with some forms of carcinoma. Here we describe a rare case of cast nephropathy in a 30-year-old HIV patient without plasma cell dyscrasia. The patient was admitted to the hospital with worsening facial cellulitis. Skin biopsy of the facial lesion revealed coccidioidomycosis. Subsequently, the patient tested positive for HIV. On immunofixation, there was an increase in polyclonal IgG levels in the absence of monoclonal gammapathy. Renal biopsy showed moderate tubular atrophy with focal cystic dilatation and eosiophilic casts in collecting ducts. The casts elicited an intense cellular reaction with macrophages and neutrophils. The interstitium showed diffuse, focally dense, mixed inflammatory infiltrate, with moderate fibrosis. Electron microscopy exhibited diffuse effacement of foot processes with no evidence of immune complex or organized protein deposits. Rare casts were weakly stained by both α and λ light chains with monoclonal restriction. Myeloma-like cast nephropathy and true myeloma cast nephropathy have similar destructive effects on renal parenchyma. We present, to our best knowledge, the first case of myeloma-like cast nephropathy in a patient with HIV infection.

Rhabdoid Tumor of the Kidney With Unusual Cytogenetic Abnormalities

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Rhabdoid tumor (RT) of the kidney is a rare pediatric neoplasm characterized by a mutation or deletion of INI1 gene on chromosome 22q11. We report a case of a 9-year-old girl with RT of the kidney with atypical features including unreported cytogenetic abnormalities. The patient presented with lower back pain and weight loss. Computed tomography scan demonstrated a heterogeneously enhancing left renal mass (17 cm) with involvement of the left adrenal gland as well as metastases in bilateral lungs and T1 vertebral body. Examination of the nephrectomy specimen revealed a hemorrhagic and necrotic neoplasm, composed of pleomorphic cells with vesicular nuclei, prominent nucleoli, and moderate amount of eosinophilic cytoplasm. Rhabdoid cells were rare. Histologic features were compatible with both rhabdoid and medullary carcinoma. Unlike typical RT, the neoplasm demonstrated strong and diffuse staining for keratins; however, complete loss of BAF47 (gene product of INI1) was detected by immunohistochemistry. Polymerase chain reaction analysis of the DNA extracted from neoplastic cells revealed a stop codon 40 in exon 2 of the INI1 gene. In addition, there was complete loss of the normal copy of chromosome 22 and duplication of 1q, loss of distal 5p, duplication of distal 11q, and deletion of long arm of chromosome X, the latter abnormalities not previously reported in RT. The patient did not respond to aggressive chemotherapy and died 8 months after initial diagnosis. Autopsy examination revealed widely metastatic RT involving lungs and abdominal cavity.

IgA Mesangial Deposition Among Kidney Donors: A Comprehensive Study

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Context: The frequency and the significance of IgA mesangial deposition (IgA-mes) in kidney donors in the United States are unknown. Among Asians, IgA-mes was identified in 16% and 24% of kidney donors and recipients, respectively.

Design: We studied 283 postperfusion biopsies from deceased donors (53%), living unrelated donors (23%), and living related donors (24%), performed at the Methodist Hospital in Houston between 2009 and 2010. The biopsy findings including IgA-mes were evaluated and correlated with clinical findings.

Results: Of 283 postperfusion biopsy specimens, 34 (12%) had IgA-mes. Donors (mean age, 42 ± 14 years) were white (55%), Hispanic (24%), and African American (14%). Living donors accounted for 34% of the positive biopsies, despite thorough predonation screening. The incidence of IgA-mes was not different in the deceased versus living donors (14% versus 8%, P = .10). The recipients’ profile was as follows: mean age, 49 ± 13 years; 59% females; 47% white, 30% African American, and 23% Hispanic. IgA intensity was graded ≥2 (scale, 0–3) in 25 of 34 positive biopsy specimens and was accompanied by IgM and C3 in 23 biopsy specimens. Mild nephrosclerosis, defined as ≥10% interstitial fibrosis and/or ≥10% glomerulosclerosis, was present in 40% of the biopsy specimens. Recipients of kidneys with IgA-mes had a 12% incidence of delayed graft function and mean serum creatinine levels of 1.4 ± 0.09 mg/dL at 6 months and 1.3 ± 0.03 mg/dL at 1 year.

Conclusions: Occult IgA is present in 12% of kidney donors at Methodist Houston. One-third of these kidney donors are procured from living donors. Aggressive monitoring for hypertension and proteinuria of these living donors may be warranted.
Compensatory Glomerulomegaly Occurs in Obese Renal Transplant Recipients (Poster No. 103)

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Context: We studied the impact of body mass index (BMI) of donors and recipients on glomerular area in renal grafts. We hypothesize that obesity of renal donors would have an effect on the graft in the form of glomerulomegaly.

Design: Paired renal biopsy specimens were studied, of which the first was obtained within 3 months of transplant and the other at least 6 months later from renal transplant recipients. The body mass index of the recipient at the time of transplant, as well as the body mass index of the donor, was noted. Renal biopsy specimens from the following donor and recipient groups were studied: nonobese to nonobese (4), nonobese to obese (8), obese to obese (4), and obese to obese (2). Surface areas of at least 7 glomeruli (in each biopsy) and average surface areas were obtained. The difference between the average surface area of the pairs was divided by the time elapsed between biopsies to give the average surface area change per year.

Results: Recipient characteristics include an average age of 49.1 ± 17.2 years, 70% male, 47% Hispanic, 41% African American, and 53% with diabetes. Average recipient BMI was 31.7 kg/m². Average time between biopsy was 0.47 ± 0.35 years. Change in surface area for the entire cohort over time was 32.77 ± 122.659 μm²/y. The changes in surface area over time (μm²/y) for each group are as follows: nonobese/nonobese, 22 989 ± 41 073 μm²/y; nonobese/obese, 1044 ± 44 188 μm²/y; obese/nonobese, 9048 ± 34 188 μm²/y; and obese/obese, 14 005 ± 16 986 μm²/y (P = .80).

Conclusions: Glomerulomegaly is observed in renal transplants. The differences between groups are not inconsistent with the hypothesis. Extending the cohort size is indicated.

Largest Unilateral Renal Angiomyolipoma: A Case Report and Review of the Literature (Poster No. 104)

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Renal angiomyolipomas can arise in 1 or both kidneys, can be associated with tuberous sclerosis, and either be incidental findings or symptomatic. They can range in size from a few centimeters up to 20 cm or more. The larger renal angiomyolipomas most commonly present with abdominal or flank pain, hematuria, or chills and fever. We describe the case of a 37-year-old woman without tuberous sclerosis with a massive unilateral renal angiomyolipoma (total tumor: 1875 g, 33 cm in greatest dimension) who presented with left-sided abdominal pain and nausea; a malignant process was initially suspected. Our case presents the largest known unilateral renal angiomyolipoma in a patient without tuberous sclerosis. A review of the literature is performed for symptomatic angiomyolipomas and mimicry of malignant neoplasms.

Extragonadal Yolk Sac Tumor of the Retroperitoneum (Poster No. 105)

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Yolk sac tumors are rare malignant tumors of germ cell origin that recapitulate the primary, embryonal, yolk sac tissue and most commonly arise from the gonads. Primary extragonadal germ cell tumors are very rare. The main distribution of extragonadal yolk sac tumors is located along the midline of the body in the mediastinum, central nervous system, or retroperitoneum. This is a case of a 58-year-old white man with an underlying stage 4, intra-abdominal germ cell tumor with metastasis and bowel obstruction. There was no clinical evidence of testicular involvement at the time of presentation. The pathology laboratory received a segment of small intestine with attached mesentery and a tumor mass. The tumor grossly arose from the retroperitoneum, extended into the mesenteric region beside the small intestine, but had no continuity with the small intestinal wall. Microscopic evaluation suggested a pure yolk sac tumor (Figure 29). Later, clinical testicular evaluation was undertaken and a right testicle was received and revealed a firm, tan nodule at the lower pole of the testicle. Microscopic evaluation revealed a small, 1-mm focus of atypical cells with morphology resembling that of the previous tumor with a nearby focus of neoplastic, mature cartilage. The presence of atypical cells and neoplastic cartilage in the testicle may have represented a malignant mixed germ cell tumor that presented as a retroperitoneal, pure, yolk sac tumor with no obvious clinical evidence of testicular involvement at the time of presentation. This case represents a very uncommon presentation of a yolk sac tumor in an adult.

Diagnostic Utility of PAX2 and PAX8 in Differentiating Renal Cell Carcinoma, Pheochromocytoma, and Adrenal Cortical Neoplasms (Poster No. 106)
Metastatic Renal Cell Carcinoma Presenting as a Solitary Colonic Polyp: Case Report and Review of Literature
(Poster No. 107)

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The biologic and clinical behavior of renal cell carcinoma (RCC) is characteristicly variable. Although notorious for its propensity to metastasize to unusual sites, colonic metastases from RCC are exceedingly rare, with only 22 cases reported in the literature to date. We report a rare case of an 80-year-old woman in whom a metastasis arising from RCC developed in a cecal polyp. The patient presented with a chief complaint of constipation. She underwent a nephrectomy for RCC in 2002 and had been doing well since that time. Physical examination showed occult blood in her stool. A colonoscopy revealed an 8-mm polyp in the cecum, which was subsequently excised. Histologic evaluation of the biopsy specimen showed irregularly shaped, clear cells, with moderate nuclear atypia and prominent nucleioli, arranged in a nested architectural pattern. No adenomatus changes were identified. Immunohistochemistry showed the tumor to be positive for pancytokeratin, CK7, CD10, and vimentin, while negative for CK20 and CDX-2. The morphologic features and immunohistochemical profile confirmed the diagnosis of metastatic RCC to the colon. In conclusion, we present a patient with an unusual, rather late recurrence of metastatic RCC manifesting as a solitary colonic polyp 8 years after resection of the primary tumor. This case highlights that although metastatic RCC to the colon is a rare occurrence, it should always be considered in the differential diagnosis, owing to its unpredictable behavior and the possibility of long disease-free intervals, to prevent misclassification, potentially resulting in inappropriate clinical management.

Hyperplastic Arteriolitis Supports the Presence of Humoral Rejection in Renal Transplants
(Poster No. 108)

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Humoral rejection occurs in renal transplants in individuals who have undergone mismatched transplants. We observed the presence of hyperplastic arteriolitis in specimens from 2 renal biopsies performed in patients with an increase in serum creatinine levels. Subsequently, the presence of strong C4d positivity supported the presence of humoral rejection in these subjects. One of the patients had a B-cell–positive crossmatch and had received a living donor renal transplant. The other patient had received a cadaveric transplant and the C4d positivity was unexpected. Thus, the hyperplastic arteriolitis was explained by the presence of humoral rejection in this biopsy specimen. We propose that the use of this histologic feature is helpful to suggest the presence of endothelial injury caused by humoral rejection and that the presence of this feature in an otherwise unexplained biopsy specimen should instigate testing for C4d and a request for crossmatch.

Tumor-to-Tumor Metastasis: A Rare Case of Cutaneous Melanoma Metastatic to a Parathyroid Adenoma
(Poster No. 109)

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Tumor-to-tumor metastasis is an uncommon occurrence and is of considerable interest to the pathologist owing to its clinical significance, pathogenesis, and the unusual and often unexpected histologic appearance. Although melanoma is well known for its high potential for metastatic spread, melanoma metastasis to other coexisting tumors has rarely been described. We report a case of parathyroid adenoma harboring metastatic melanoma, which, to the best of our knowledge, is only the second such case mentioned in literature. An 80-year-old man with history of hyperparathyroidism underwent a neck exploration, during which a 1200-g (normal, 30–70g) right inferior parathyroid gland was removed. Microscopic examination revealed a parathyroid adenoma, within which a discrete proliferation of sheets of epithelioid and spindle cells with fully transformed malignant features, abundant mitoses, and areas of necrosis were identified. This proliferation marked as a lesion of melanocytic lineage, strongly expressing MART-1 in addition to HMB-45 and S100 protein. A subsequent review of the patient’s medical record revealed that a Clark level 3 melanoma had been excised from the back 2 years previously. This exceptional case of melanoma metastatic to a parathyroid adenoma caused a diagnostic challenge due to the absence of melanin pigment, the unknown history of the primary tumor at first encounter, and the rarity of the presentation. Awareness of the neoplasm-to-neoplasm metastasis phenomenon, recognition of a second population of cells as foreign to the indigenous tumor, knowledge of the patient’s past medical history, and use of appropriate immunohistochemical stains are imperative in avoiding an erroneous diagnosis in such cases.

Condyloma Acuminatum: Clinical Correlation, Histopathology, and HPV Genotype
(Poster No. 110)

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Context: The condyloma acuminata (CAS) are lesions produced by human papilloma virus (HPV). CA is the most frequent STD worldwide and affects mainly young people. The purpose of this study is to determine the HPV genotype among the patients with genital warts (CAS) and its correlation with several epidemiologic, clinical, histopathologic, and molecular parameters.

Design: We conducted a noncomparative prospective study of 181 lesions with the clinical diagnostic of CA. Diagnostics included histopathology, HPV type by polymerase chain reaction (real-time polymerase chain reaction; Figure 30), and direct sequencing.

Results: Of the cases, 51% occur during the third decade of life and the most frequent locations are vulva, penis, and perianal zone.

Tumor-to-Tumor Metastasis: A Rare Case of Cutaneous Melanoma Metastatic to a Parathyroid Adenoma
(Poster No. 109)

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Tumor-to-tumor metastasis is an uncommon occurrence and is of considerable interest to the pathologist owing to its clinical significance, pathogenesis, and the unusual and often unexpected histologic appearance. Although melanoma is well known for its high potential for metastatic spread, melanoma metastasis to other coexisting tumors has rarely been described. We report a case of parathyroid adenoma harboring metastatic melanoma, which, to the best of our knowledge, is only the second such case mentioned in literature. An 80-year-old man with history of hyperparathyroidism underwent a neck exploration, during which a 1200-g (normal, 30–70g) right inferior parathyroid gland was removed. Microscopic examination revealed a parathyroid adenoma, within which a discrete proliferation of sheets of epithelioid and spindle cells with fully transformed malignant features, abundant mitoses, and areas of necrosis were identified. This proliferation marked as a lesion of melanocytic lineage, strongly expressing MART-1 in addition to HMB-45 and S100 protein. A subsequent review of the patient’s medical record revealed that a Clark level 3 melanoma had been excised from the back 2 years previously. This exceptional case of melanoma metastatic to a parathyroid adenoma caused a diagnostic challenge due to the absence of melanin pigment, the unknown history of the primary tumor at first encounter, and the rarity of the presentation. Awareness of the neoplasm-to-neoplasm metastasis phenomenon, recognition of a second population of cells as foreign to the indigenous tumor, knowledge of the patient’s past medical history, and use of appropriate immunohistochemical stains are imperative in avoiding an erroneous diagnosis in such cases.
cases, a high-risk HPV genotype was found. However, most of the cases showed low-risk HPV genotypes as well (Figure 30). The HIV patients presented mainly high-risk HPV genotypes.

Cutaneous Rosai-Dorfman Disease Mimics Subcutaneous Panniculitis-like T-Cell Lymphoma by Histology
(Poster No. 111)

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Rosai-Dorfman disease is a benign idiopathic histiocytic proliferative disorder that commonly involves the lymph nodes and may secondarily involve the skin. However, rare cutaneous diseases without lymphadenopathy or internal organ involvement have been reported. We describe an unusual case of cutaneous Rosai-Dorfman disease, which demonstrated some clinical and histologic features reminiscent of subcutaneous panniculitis-like T-cell lymphoma. The patient was a 48-year-old woman with no prior history of malignancy, who was found to have 2 subcutaneous masses. A large 10-cm mass located on the right lateral hip was confirmed to be lipoma by biopsy examination. A smaller 3-cm mass was located on the right sacral area. Microscopic examination of the excised sacral lesion showed subcutaneous infiltration of mixed inflammatory cells including many foamy histiocytes with round nuclei, voluminous cytoplasm, and notable emperipolesis. In addition, marked stromal fibrosis was present, separating histiocytic inflammatory infiltrate into lobular compartments with intercalating fat cells, which is seen in subcutaneous panniculitis-like T-cell lymphoma. While lymphocytes consisted of mixed T cells and B cells, no rimming of CD8-positive T cells was noted by immunohistochemistry. The large voluminous histiocytes were positive for CD163 and S100, the latter of which highlighted emperipolesis in their voluminous cytoplasm. These findings supported a diagnosis of Rosai-Dorfman disease. The patient thus received no additional treatment after excision of the lesions. This case illustrates an unusual constellation of clinical and histopathologic presentation in cutaneous Rosai-Dorfman disease and emphasizes immunohistochemical studies to exclude possibilities of lymphoid neoplasia.

Primary Mucoepidermoid Carcinoma of the Skin
(Poster No. 112)

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We describe a case of primary cutaneous MEC in a 52-year-old man who presented with a swelling on his back of 2 months’ duration. The salivary glands were normal. The excisional biopsy specimen measured 2.5 × 2 × 2 cm in size. Cut section showed a solid grayish-white neoplasm with a slimy or mucoid feel. There was no gross involvement of the attached ellipse of skin. Histopathology showed, subjacent to an unremarkable epidermis (Figure 31), a solid, circumscribed, unencapsulated neoplasm occupying the mid and lower dermis. The neoplasm was composed of lobules of polygonal (epidermoid) cells with vesicular, slightly hyperchromatic, irregular nuclei and prominent nucleoli. Admixed with the epidermoid cells were clusters or scattered mucin-producing cells having abundant vacuolated cytoplasm and eccentrically compressed hyperchromatic nuclei. Dense fibrosis between the tumor cell lobules and occasional glandular structures were present. Transitions between the 2 cell populations were frequent. Frequent mitoses were encountered. Necrosis and neural and/or vascular invasion were absent. Epidermal attachment could not be demonstrated in the several sections studied. Mucin stains highlighted the mucigenic cells and immunohistochromy revealed positivity for epithelial membrane antigen, pan-cytokeratin, and polyclonal carcinoembryonic antigen. These features were similar to MEC of salivary gland. We believe that cutaneous adenosquamous carcinoma represents a separate entity and MEC of the skin should be regarded as a tumor of cutaneous appendages. We would recommend that pathologic distinction should be made between these 2 neoplasms for prognostic purposes.

Pathologic Evaluation of Positron Emission Tomography/Computed Tomography–Positive Lesions in Patients with Cutaneous Melanoma
(Poster No. 113)

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Context: Positron emission tomography/computed tomography (PET/CT) is used for the detection of metastasis in patients with melanoma. This procedure has the advantage of both functional and anatomic delineation of lesions. The pathologic findings of the lesions detected have not been analyzed.

Design: Fifty-five patients diagnosed with stage II to IV cutaneous melanomas were studied. Of these, 17 patients had PET/CT and subsequent pathologic examination by fine-needle aspiration and/or surgical excisions of the lesions detected. This resulted in 27 fine-needle aspiration/excisions. The pathologic findings of these specimens were analyzed.

Results: Three patients had biopsies of multiple lesions. Metastatic melanoma was seen in 12 specimens (8 PET positive, 4 PET negative). Eight specimens were negative (2 PET positive, 6 PET negative). Seven PET-positive specimens showed a new neoplasm. These included 4 metastatic lung carcinomas, a squamous cell carcinoma of the skin, and 2 Warthin tumors of parotid. The standardized uptake values (SUV) of malignant lesions ranged from 3.1-23.4 (mean, 10.5) and negative/benign lesions were 2.1-18.8 (mean, 6.5). PET/CT had a specificity of 60% and a sensitivity of 70% for the diagnosis of malignancy. The positive predictive value for malignancy was 85% and the negative predictive value for malignancy was 54%.

Conclusions: PET/CT is very useful in detecting metabolically active lesions, but not all PET-positive lesions are metastases. Pathologic evaluation of these lesions is mandatory for diagnostic accuracy. Benign entities like Warthin tumor can also be PET positive. A new primary tumor must also be considered in the differential diagnosis of PET-positive lesions.

Histologic Growth Pattern of Locally Advanced Squamous Cell Carcinoma of the Scalp Impacts Gross Assessment of Margin Status
(Poster No. 114)

Lisa Duncan, MD (llduncan@utmck.edu); Lynn Ferguson, MD. Department of Pathology, University of Tennessee Graduate School of Medicine, Knoxville.

Context: Locally advanced squamous cell carcinoma of the scalp presents challenges in surgical management. These tumors have a histologic growth pattern characterized by deep dermal and subcutaneous invasion extending beyond grossly apparent surgically resected margins. Microscopic extent of disease is larger than grossly apparent tumor, impacting accuracy of gross margin assessment, efficacy of intraoperative frozen section margin analysis, and immediate reconstructive surgery.

Design: Nine cases of locally advanced squamous cell carcinoma having a wide local excision were identified by an anatomic pathology database search. Each case’s slides and reports were reviewed to document the growth pattern of tumor. Gross lesion size, microscopic lesion size, depth of invasion, and margin status were recorded.
Results: Gross lesion size varied between 2 to 7 cm. Microscopic lesion sizes varied between 3.8 to 7.5 cm. In 8 of 9 cases there was a difference between gross and microscopic lesion size (differences range from 0.5 to 3.5 cm). Five cases had positive margins, all associated with cords of infiltrating tumor cells in deep dermal and subcutaneous tissue underlying normal squamous epithelium. Growth pattern appeared to be influenced by the galea aponeurotica.

Conclusions: Our study describes the unique histologic growth pattern of locally advanced squamous cell carcinoma of the scalp. Complete histologic evaluation of all margins is needed to ensure adequacy of excision, making frozen section analysis of margins impractical in these cases. If delayed reconstruction is not an alternative, presurgical mapping punch biopsies taken at the periphery of the skin lesion will provide information to guide the extent of surgical excision.

Dedifferentiation of Spindle Squamous Cell Carcinoma of the Skin With Resulting Metastasis to the Pleura (Poster No. 115)

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We report a case of cutaneous spindle squamous cell carcinoma of the frontal scalp in an 87-year-old man, which recurred 8 months after excision, as 2 nodules, then metastasized to the pleura 18 months later, resulting in the death of the patient. In contrast to the primary tumor, which was composed of mildly pleomorphic spindle cells, the recurrent scalp nodules consisted of markedly pleomorphic spindle cells and had brisk mitotic activity including atypical mitoses. Eighteen months later, the patient was admitted with a loculated pleural effusion. Biopsy of the pleural space showed a histologically similar lesion to the dedifferentiated scalp nodules. The patient died 1 week after the pleural metastasis was found. An autopsy was not performed. While the primary tumor expressed cytokeratins (AE1/AE3, MNF116, CK5/6) and p63, focal cytokeratin expression was detected in the recurrent tumor only with antibody AE1/AE3. MNF116. No epithelial markers were detected in the pleural metastasis. In contrast, all 3 tumors expressed smooth muscle actin. We were unable to find in the literature another similar case of a spindle squamous cell carcinoma that dedifferentiated and metastasized to the pleura.

Correlating Tumor-Infiltrating Lymphocytes and Melanin Content in Melanomas on Hematoxylin-Eosin–Stained Sections (Poster No. 116)

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Context: Intermediates of the melanogenic pathway are immunosuppressive. Indeed, inhibitors of the melanogenic pathway have been demonstrated to increase toxicity of lymphocytes against melanoma cells in vitro, suggesting that inhibition of this pathway may serve as an adjuvant measure in immunotherapy of melanoma. Here we measured the correlation between the extent of tumor-infiltrating lymphocytes and the amount of melanin pigment, final product of melanogenesis, to test whether the melanogenic potential of melanoma can affect lymphocyte responses in situ.

Design: Whole-slide images were obtained for 36 melanoma cases containing vertical phases. We measured the amount of melanin pigment by using the positive pixel count algorithm in the melanoma areas. The extent of tumor-infiltrating lymphocytes was categorized as either “absent” or “present.”

Results: Interestingly, the average melanin pigment density was significantly lower in the “absent” group and higher in the “present” group (P < .05), indicating higher lymphocytic response toward more melanized melanomas in the skin.

Conclusions: The likely explanation for this interesting result is that the increased expression of melanogenesis-related proteins (tyrosinase, MART-1, etc) responsible for efficient melanin production make the tumor more immunogenic, since their peptide fragments are known to be recognized by lymphocytes. Therefore, in situ melanogenic apocrine glands may exert predominantly stimulatory effects, via melanogenesis-related proteins, and inhibitory effects, via intermediates of melanogenesis, on lymphocytic response. This leads to the exciting possibility that if we block melanogenesis, while still maintaining high levels of melanogenesis-related proteins, we might effectively promote the anti-melanoma lymphocytic response.

Hematopathology; Transfusion Medicine and Coagulation; Neuropathology; Informatics

Fifty-Five-Year-Old Patient Presenting With Burkitt Leukemia and Unilateral Deafness (Poster No. 1)

Andre Pinto, MD (apintro1@med.miami.edu); Francis O. Ikpatt, MD; Jennifer Chapman-Fredericks, MD. Department of Pathology, Jackson Memorial Hospital/University of Miami, Florida.

We present a case of a 55-year-old white man who presented with right axillary “mass,” weight loss, and a progressive hearing loss involving the right ear. On examination, no lymph node enlargement was obvious (he underwent excisional axillary node biopsy at another institution). Laboratory findings showed anemia (HB, 9.3 g/dL), elevated white blood cell count (47.5 x 10^9/L), thrombocytopenia (PLT, 41 x 10^9/L), and elevated levels of LDH (3227 U/L) and uric acid (12.6 mg/dL). In the peripheral smear there were increased circulating blasts of intermediate size, with vacuolated basophilic cytoplasm and open nuclei (77%). MRI of the brain was compatible with hemorrhagic labyrinthitis. Bone marrow aspirate showed a prominent population of intermediate-sized blasts with a high N/C ratio, vesicular chromat in pattern, prominent nucleoli, and a PAS-positive vacuolated cytoplasm. Bone marrow biopsy sample was hypercellular (95%), consisting of blasts virtually replacing all normal hematopoietic cells. Biopsy of the axillary mass demonstrated an enlarged lymph node with disrupted architecture; cells expressed CD20, CD10, BCL6, and surface k light chain, with a high proliferative index (Ki-67 expression) by immunohistochemistry. Flow cytometry revealed a population of B cells that exhibit k-restricted surface immunoglobulin light chains and express CD79a, CD19, CD20, CD22, HLA-DR, and CD10. There was no expression of either CD34 or Tdt. Molecular/cytogenetic tests using bone marrow aspirate showed rearrangement of MYC gene at 8q24 region (33.5% of cells examined), IGH/MYC fusion (33%), and additional signal for IGH gene (26.5%). Signals for IGH/BCL2 fusion were not detected. A diagnosis of Burkitt lymphoma/leukemia was made.

Mast Cell Sarcoma: A Rare Clinicopathologic Entity (Poster No. 2)

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Mast cell disorders encompass a wide variety of clinical features ranging from cutaneous lesions to accumulation of neoplastic mast cells within several organs, signifying aggressive multisystem involvement.
Mast cell sarcoma is a rare entity, which is usually distinguished by localized, yet destructive neoplastic cell expansion. Point mutations in KIT proto-oncogene have been detected in most cases of mast cell disorders. We report a case of a 1-year-old male infant who presented with a right-sided ear mass at 8 months of age. The mass was initially diagnosed as masto-ctyoma. Subsequent imaging showed a large, locally aggressive right temporal bone tumor. Biopsy specimen demonstrated infiltrating sheets and clusters of medium-sized to large atypical histiocytes, with nuclear contour irregularity, many of which exhibited prominent nuclear clefting and hyperlobation and abundant eosinophilic cytoplasm (Figure 32). These atypical cells were positive for CD25, CD117, CD68, and tryptase and were nonreactive for CD1a and SI100. Furthermore, flow cytometry revealed presence of an atypical mast cell population. However, molecular analysis of the tumor did not show the characteristic KIT mutation. Nevertheless, the clinical, radiographic, morphologic, and immunophenotypic features were most consistent with mast cell sarcoma. To our knowledge, only 4 cases of mast cell sarcoma have been reported in the literature thus far, and unlike our case, none of the documented cases occurred in infancy. Thorough clinical follow-up and multimodal approach are imperative in accurately diagnosing this rare entity, particularly in differentiating it from benign lesions, or other neoplasms presenting in this age group.

Primary Pulmonary CD30-Positive T-Cell Lymphoma in the Setting of Mycobacterium tuberculosis Infection
(Poster No. 3)
Clifford R. Blieden, MD (cblieden@med.miami.edu); Cesar A. Llanos, MD; Jennifer R. Chapman, MD; Offiong F. Ikпат, MD, PhD. Department of Pathology, University of Miami/Jackson Memorial Hospital, Miami, Florida.
We describe the clinical course and pathologic findings of a 60-year-old woman with primary pulmonary CD30-positive T-cell lymphoma arising in the setting of ongoing treatment for proven tuberculosis. The patient initially presented to the University of Miami Hospital with complaints of shortness of breath. She had a known history of recent tuberculosis for which she was undergoing treatment. She was suspected of having immune reconstitution syndrome and was treated with steroids. She improved and was discharged after 2 weeks. She returned to the emergency department 1 month later in respiratory distress and with partial obstruction of the right main bronchus. Biopsy revealed a pleomorphic population of cells infiltrating the pulmonary parenchyma that were positive for CD45, CD3, CD30, and CD8 (locally) by immunohistochemistry. They were negative for CD4, CD68, ALK, EMA, TTF-1, and keratin. DNA studies demonstrated clonality of the T-cell receptor. To the best of our knowledge, this is the first documented case of concomitant tuberculosis infection with primary pulmonary CD30-positive T-cell lymphoma. In general, infectious agents and antigenic stimulation have both direct and indirect roles in hematolymphoid tumorigenesis. However, tuberculosis as a clear causative agent has not play a role in the curing of plasma cell myeloma.

Absence of HER2/neu Membrane Expression by Immunohistochemistry Study in Plasma Cell Myeloma
(Poster No. 4)
Xiaohong M. Zhang, MD, PhD1 (xzmzhang@geisinger.edu); Kai Zhang, MD, PhD2; Patrick Dorion, MD3; Myra Wilkerson, MD1; Department of Pathology, Geisinger Health System, Wilkes-Barre, Pennsylvania; 1Department of Pathology, Geisinger Health System, Danville, Pennsylvania.
Context: Overexpression of HER2/neu has been detected in some human cancers, which provides the target for treatment with the monoclonal antibody trastuzumab (Herceptin). The expression of HER2/neu on plasma cells is rare. We report a histologically benign neoplasm, which demonstrated immunohistochemical evidence of HER2/neu expression.
Design: A total of 183 cases of plasma cell myeloma diagnosed at Geisinger Health System from 2000 to 2010 were retrieved. The specimens include 175 bone marrow biopsy samples, 4 bone resection specimens, 2 lung resection specimens, and 2 pleural biopsy samples; all the specimens were formalin-fixed and paraffin-embedded. HER2/neu expression was measured by using commercially available immunohistochemistry with Dako HercepTest.
Results: None of the 183 specimens of plasma cell myeloma revealed HER2/neu expression on the cell membrane. Two of 175 bone marrow biopsy specimens showed cytoplasmic staining of HER2/neu in plasma cells, which is considered a nonspecific stain.
Conclusions: On the basis of immunohistochemistry tests conducted on these cases, human plasma cell myeloma does not express HER2/neu on the cell membrane. Therefore, treatment targeting HER2/neu would not play a role in the curing of plasma cell myeloma.

Mantle Cell Lymphoma In Situ With Minimal Marrow Involvement
(Poster No. 5)
Talmeena Ahmed, MD1; Yuanming Zhang, MD1,2 (yuanzhang@notes.cc.sunysb.edu); Fengshuo Lan, MD1,2; Marc Golightly, PhD1,3; Youjun Hu, MD,1 Departments of 1Pathology and 2Medical Oncology, State University of New York at Stony Brook.
Previously reported rare in situ mantle cell lymphomas involve the lymph nodes only. We describe a case of clinically indolent mantle cell lymphoma in which both the marrow and the lymph nodes were only minimally involved. The patient was a 66-year-old man who was found to have moderate thrombocytopenia 12 months before the biopsy during a routine examination. His platelet count fluctuated between 108,000 and 65,000/DL. He did not show systemic lymphadenopathy. The marrow, while morphologically unremarkable, showed a small percentage (1%) of CD5-positive, monoclonal B cells by flow cytometric analysis. Cells were negative for CD23. Additional tests were not performed since his condition was otherwise unremarkable. Ten months later he was found to have a 3-cm left axillary lymph node and underwent a biopsy. Morphologically, the biopsied lymph node was extensively replaced by fatty tissue. There was no expansion of the mantle zones. Flow cytometric analysis indicated 6% of monoclonal B lymphocytes that were positive for CD5, CD19, CD20, and CD38 in the marrow. Surface immunoglobulin intensity was moderate. CD23 staining was negative. Immunostaining for cyclin D1 on the tissue section was positive; however, chromosomal translocation (11;14) by fluorescence in situ hybridization was negative. After the diagnosis of mantle cell lymphoma insitu was made for the lymph node biopsy specimen, cyclin D1 immunostaining was performed on the marrow biopsy sample and was positive in scattered lymphocytes. The patient has been hemodynamically stable, has not developed any lymphadenopathy, and has not been treated for mantle cell lymphoma.

Prognostic Value of 1p36 and p16 Deletions in Diffuse Large B-Cell Lymphoma in Predicting Survival and Response to R-CHOP
(Poster No. 6)
Mohammad O. Hussaini, MD1 (mhusaini@path.wustl.edu); AlejandrO Gru, MD1; Amanda Cashen, MD1; John Frater, MD1,2; Anjum Hassan, MD1; Tu-Dung Nguyen, MD, PhD; Friederike Kreisel, MD.1 Departments of 1Pathology and Immunology and 2Medicine, Washington University, Saint Louis, Missouri.
Context: The impact of prognostic markers in diffuse large B-cell lymphoma (DLBCL) is largely reported for treatment with CHOP before the incorporation of rituximab. With R-CHOP now considered first-line treatment, validation of survival differences between prognostically different DLBCL subgroups is necessary.
Design: Thirty-two cases of DLBCL treated with R-CHOP were evaluated for 1p36 and p16 deletions (using FISH analysis). There were no cases showing HER2/neu overexpression in human multiple myeloma and in human myeloma cell line. However, the largest report of multiple myeloma included only 31 cases, among which 2 cases revealed HER2/neu overexpression. The purpose of this study is to evaluate HER2/neu expression in plasmacytoma in a broad population.
Results: Sixty-nine percent of DLBCLs showed BCL-2 expression and 28% displayed the germinal center B-cell immunophenotype. p16 and 1p36 losses (deletions or homozygous deletions) were found in 34% and 35% of cases, respectively. 1p36 and p16 losses were more common in the chemoresistant group (40% versus 33% and 60% versus 23%), but this relationship was not statistically significant (P > .99 and P = .06).
Overall, there was no statistical difference between different prognostic groups with regard to chemotherapy responsiveness or overall survival.

Conclusions: Our findings indicate that addition of rituximab to conventional CHOP therapy may overcome novel (1p36 loss) and previously recognized adverse prognostic markers, such as BCL-2 expression, activated B-cell status, and p16 deletions. Hence, many of the predictors of outcome in DLBCL may need to be reevaluated for the post-rituximab era.

**Plasma Cells With Strong CD31 Expression Associated With Adenopathy and Extensive Skin Patch Overlying a Plasmacytoma Syndrome**

(Poster No. 7)

Steven C. Cordero, MD;]{(sxcc75277@gmail.com)} Anis Miladi, MD; Clovis Pitchford, MD; Colleen Gijsland, MD. Departments of Pathology and Laboratory Services and Dermatology, Walter Reed National Military Medical Center, Bethesda, Maryland.

Overproduction of a vascular endothelial growth factor secreted by neoplastic cells in some plasma cell neoplasms is postulated to be responsible for POEMS syndrome as well as the rarer adenopathy and extensive skin patch overlying a plasmacytoma (AESOP) syndrome. Although commonly thought of as a vascular cell marker, CD31 is expressed by reactive plasma cells as well as some cases of plasmacytoma. It has more recently been shown to be involved in angiogenesis. We present a case of a 57-year-old man who initially presented with a 2 × 1 cm erythematous left flank skin patch that demonstrated a subdermal vascular proliferation on punch biopsy. Eighteen months later, the patch had doubled in size and an underlying tumor mass was palpable within the 10th rib on imaging. The skin biopsy specimen again demonstrated increased vascularity with perivascular lymphocytes. The patient was without systemic symptoms and the rib mass was resected. Despite the plasmacytoid appearance of the tumor, immunohistochemical evaluation included CD31 and CD34 owing to the initial clinical concern for a vascular tumor. Surprisingly, the tumor cells were negative for the plasma cell markers CD38 and CD79a, but strongly positive for CD31. Because of a strong resemblance to plasma cells and because staining pattern consistent with a light chain restriction was demonstrated, tissue antigen degradation due to the extensive decalcification was suspected. Additional tumor was shelled out of the bone and processed without decalcification and the tumor cells stained positively for CD31 and light chains.

**A Rare Variant Translocation t(20;21)(q11.2;q22) Involving AML1 Gene Rearrangement, Resulting in Transformation of Chronic Myeloid Leukemia to Myeloid Blast Crisis**

(Poster No. 8)

Arun Gopinath, MD; Jennifer Costanzo, MA; Kathleen Bober-Sorcinelli, MD; Stuart E. Seropian, MD; Laila O. Mnayer, PhD, FACMG. Departments of Pathology, University of California, San Diego; Department of Pathology, University of California, San Diego, VA San Diego Health System, San Diego.

Mental cell lymphoma (MCL) is a mature B-cell lymphoma with 4 morphologic variants recognized by the current World Health Organization classification. Marginal zone-like MCL (MZ-MCL) is the rarest variant, which could be a potential diagnostic pitfall owing to its deceiving “monocytoid” appearance. We report a case of MZ-MCL in a 70-year-old man with a past history of squamous cell carcinoma of the lip, presenting with a mass at tongue base and lymphpadenopathy on imaging. Orpharyngeal biopsy was done to rule out possible metastatic squamous cell carcinoma. However, there were diffuse submucosal lymphoid infiltrates of small to medium-sized lymphocytes with a monocytoid appearance (Figure 34, A). The neoplastic cells were k-restricted B cells without expression of CD5 and CD10 but showed diffuse nuclear positivity for BCL1 (Figure 34, B and C). The diagnosis of MCL was further substantiated by the presence of t(11;14)(q13;q32) involving BCL1 and IgH by fluorescence in situ hybridization. SOX11 is a new immunohistochemical marker highly specific for classic MCL, but negative in the indolent form of MCL. Interestingly, our case showed rare kinase domain mutation assay has confirmed the 35-nucleotide insertion mutation in the BCR kinase with no other mutations, this has never been implicated in CML transformation to blast crisis. These findings implicate t(20;21) involving AML1 gene in the progression of CML to myeloid blast crisis, a phenomenon that has been reported only twice previously (Figure 33).

**Lack of SOX11 Expression in a Marginal Zone-like Mantle Cell Lymphoma: Is It an Indolent Variant?**

(Poster No. 9)

Xiangdong Xu, MD, PhD (xxu@ucsd.edu); Huan-You Wang, MD, PhD; Hooman H. Rashidi, MD; Anna K. Wong, MD. Department of Pathology, University of California, San Diego; Departments of Pathology, University of California, San Diego, VA San Diego Health System, San Diego.

A 70-year-old man with a past history of squamous cell carcinoma of the lip, presenting with a mass at tongue base and lymphadenopathy on imaging. Orpharyngeal biopsy was done to rule out possible metastatic squamous cell carcinoma. However, there were diffuse submucosal lymphoid infiltrates of small to medium-sized lymphocytes with a monocytoid appearance (Figure 34, A). The neoplastic cells were k-restricted B cells without expression of CD5 and CD10 but showed diffuse nuclear positivity for BCL1 (Figure 34, B and C). The diagnosis of MCL was further substantiated by the presence of t(11;14)(q13;q32) involving BCL1 and IgH by fluorescence in situ hybridization. SOX11 is a new immunohistochemical marker highly specific for classic MCL, but negative in the indolent form of MCL. Interestingly, our case showed rare
with cytotoxic features. T-cell receptor (TCR) β gene was clonally rearranged, consistent with a monoclonal T cell population. Further laboratory, radiographic, and bone marrow evaluations were negative for involvement by lymphoma. This is a report of an extremely rare case of cutaneous intravascular T-cell lymphoma with anaplastic large cell morphology and phenotype, a different entity not considered a subtype of intravascular lymphoma by World Health Organization classification.

### T-Lymphoblastic Leukemia/Lymphoma After Treatment With 2-Chlorodeoxyadenosine for Hair Cell Leukemia: A Case Report and Review of the Literature

**Reactivity**

<table>
<thead>
<tr>
<th>Antibody</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD45, CD2, CD43, CD30, TIA-1</td>
<td>Positive</td>
</tr>
<tr>
<td>CD20, CD3, CD4, CD8, CD56, CD57, CD117, CD68, S100</td>
<td>Positive</td>
</tr>
<tr>
<td>Mart-1, pan-cytokeratin, CEA, EMA, PLAP, EBV, Alk-1</td>
<td>Negative</td>
</tr>
</tbody>
</table>

**Summary**

- **Reactivity**: The lymphoid cells were positive for CD5, CD20, and CD30, with negative expression of CD4, CD8, CD56, and CD57.
- **Antibody**: The diagnosis was confirmed by the presence of positive reactions for CD5, CD20, and negative reactions for CD4 and CD8.

**Results**

- The bone marrow evaluation revealed a hypercellular marrow with erythroid hyperplasia, dyserythropoiesis, dysmegakaryopoiesis, and rare atypical large lymphocytes immunoreactive for CD20.
- Immunohistochemistry for CD5 highlighted these atypical large cells and small clusters of slightly smaller atypical lymphocytes having irregular to lobulated nuclei and abundant cytoplasm located within and confined to the lumina of intravascular vessels. Some cells showed features of hallmark cells with eccentric horseshoe-shaped nuclei. Immunophenotypic study (Table) was consistent with T-cell or NK-cell origin of the tumor cells.

**Intravascular Lymphoma: A Case Report of Anaplastic Large T-Cell Lymphoma**

**Reza Setoodeh, MD; Lubomir Sokol, MD, PhD; Maria Surowiecka, MD**

- **Departments of Pathology, University of South Florida, Tampa; Departments of Hematologic Malignancies and Hematopathology, Moffitt Cancer Center, Tampa, Florida.**

Intravascular lymphoma (IVL), first reported in 1959 as “angioendotheliosis proliferans systemisata” and considered to be a neoplasm of endothelial cells, is now defined as the proliferation of clonal lymphocytes mainly lodged in the lumina of small or intermediate-sized vessels with little or no involvement of the organ parenchyma. Most cases are of B-cell origin; however, rare cases of T-cell or NK-cell lineage have also been reported in the literature, of which extremely rare cases show anaplastic morphology and cytotoxic phenotype. We report the case of a 69-year-old man with a 5-month history of a 1.8-cm, dark-purple, indurated skin lesion on right cheek, with no lymphadenopathy, hepatosplenomegaly, fever, weight loss, or mental status changes. His past medical history was significant for a remote stroke, atrial fibrillation, and warfarin therapy. Skin biopsy revealed highly pleomorphic large atypical lymphoid cells with irregular nuclear contour, conspicuous nucleoli, and abundant cytoplasm located within and confined to the lumina of intradermal vessels. Some cells showed features of hallmark cells with eccentric horseshoe-shaped nuclei. Immunophenotypic study (Table) was consistent with T-cell or NK-cell origin of the tumor cells.
that these lymphocytes were hematogones, with a normal spectrum of B-cell maturation by CD20, CD10, and CD34, and not recurrent leukemia.

A bone marrow biopsy performed 11 months later showed persistent hematogone hyperplasia (40%) with no evidence of recurrent leukemia. Our patient remains in remission for 4.5 years from initial count recovery. To our knowledge, this is the most marked persistent hematogone hyperplasia reported in an adult treated for B-lymphoblastic leukemia. This phenomenon deserves clinical attention to prevent misdiagnosis of relapsed B-cell lymphoblastic leukemia.

Utility of bcl-2, PD1, and CD25 Expression in the Diagnosis of T-Cell Lymphoma

(Poster No. 14)

Vladislav Chizhovsky, MD (vchiz@clarientinc.com); Dorothy Chang; Christina Guidice; Anselm Hii, MD; Todd Barry, MD; Sing-Tsung Chen, MD; Dennis O’Malley, MD. Department of Pathology, Clariant Pathology Associates, Aliso Viejo, California.

Context: The diagnosis of T-cell lymphoma can be challenging. Immunohistochemical stains have often been used to support a diagnosis. There have been anecdotal reports in the past about the loss of bcl-2 as a supportive finding in T-cell lymphoma diagnosis. We evaluated bcl-2 expression in 125 well-characterized T-cell lymphomas. In addition, we evaluated expression of CD25, the IL-2 receptor, and PD1, a relatively new marker that is positive in T cells of follicular helper origin.

Design: We selected 125 cases of T-cell lymphoma with slides available for immunohistochemical staining. We performed staining for bcl-2, PD1, and CD25 in these cases by using standard methods. Included in the study were peripheral T-cell lymphoma (PTCL; 41); angioimmunoblastic T-cell lymphoma (AITL; 24); anaplastic large cell lymphoma (ALCL), ALK1 positive (21); ALCL, ALK1 negative (26); and small numbers of other types.

Results: Results are summarized in the Table.

<table>
<thead>
<tr>
<th>Type</th>
<th>N</th>
<th>bcl-2−, %</th>
<th>PD1−, %</th>
<th>CD25−, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AITL</td>
<td>24</td>
<td>29</td>
<td>63</td>
<td>43</td>
</tr>
<tr>
<td>ALCL ALK+</td>
<td>21</td>
<td>90</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>ALCL ALK−</td>
<td>28</td>
<td>64</td>
<td>3</td>
<td>67</td>
</tr>
<tr>
<td>PTCL</td>
<td>41</td>
<td>39</td>
<td>21</td>
<td>39</td>
</tr>
<tr>
<td>All cases</td>
<td>125</td>
<td>48</td>
<td>22</td>
<td>48</td>
</tr>
</tbody>
</table>

Conclusions: We found that a significant percentage of T-cell lymphomas had loss of bcl-2 expression (48%). Further, there were important differences in the frequency in different subtypes. We also found significant variation of PD1 expression and CD25 within subtypes. This study supports the finding that loss of bcl-2 expression is an important ancillary tool in the diagnosis of T-cell lymphomas.

A Lymphoblastic Leukemia/Lymphoma With L3 Morphologic Relapse

(Poster No. 15)

Withdrawn.

Acquired Expression of CD30 and CD15 as Well as Loss of Pan–T-Cell Antigens in a Case of Large T-Cell Lymphoma Transformed From Mycosis Fungoides: An Ambiguous Phenotypic Alteration Resembling Classical Hodgkin Lymphoma

(Poster No. 16)

Deepti M. Reddi, MD (deepti.reddi@duke.edu); Endi Wang, MD, PhD. Department of Pathology, Duke University Medical Center, Durham, North Carolina.

Additional antigen markers are acquired when mycosis fungoides transforms into large T-cell lymphoma, but usually T-cell immunophenotypic profile is retained. We report an unusual case of regional nodal involvement by large cell transformation of mycosis fungoides, which demonstrated Hodgkin-like immunophenotype. The patient was an 80-year-old man with past medical history significant for prostate carcinoma and cutaneous basel cell carcinoma. He was diagnosed with mycosis fungoides on the basis of a 2-year history of erythematous, patchy pruritic cutaneous eruptions on lower trunk and extremities, and on histologic evaluation. He was initially treated with topical steroids and phototherapy, with partial response. Subsequently the patient developed a tumor-like lesion on his right thigh, which was confirmed to be CD30-positive large T-cell lymphoma. Interferon α and phototherapy was initiated and the patient was responding to treatment. The 37 months’ follow-up evaluation revealed a right inguinal lymphadenopathy. Excisional lymph node biopsy demonstrated effacement of nodal architecture by nodular proliferation of pleomorphic large cells with abundant cytoplasm in a background of histiocytes, small lymphocytes, and fibrosis. Immunohistochemically, the large cells were positive for CD30, CD20, CD15, CD45, CD43, MUM1, and TIA-1, but were negative for all the B-cell or T-cell antigens tested. Polymerase chain reaction–based gene rearrangement studies demonstrated a clonal rearrangement of T-cell receptor γ gene, but no B-cell clone was detected. Although acquired CD30 expression is common in transformed mycosis fungoides, gain of CD15 and loss of all pan–T-cell antigens are unusual and have not been reported in the English literature. The clinical significance of this conversion remains to be elucidated.

Angioimmunoblastic T-Cell Lymphoma Mimicking Hodgkin Lymphoma: A Diagnostic Dilemma

(Poster No. 17)

Sweety L. Nagori, MD (sweety.nagori@stjohn.org); Michelle Bonnett, MD. Department of Pathology, St John Hospital and Medical Centre, Detroit, Michigan.

Angioimmunoblastic T-cell lymphoma (AITL) is a rare disease that constitutes 1% to 2% of non-Hodgkin lymphomas. This report describes a patient that presented with lymphadenopathy and was diagnosed with angioimmunoblastic T-cell lymphoma. Lymph node biopsy and a bone marrow biopsy were performed and samples from both showed similar histologic features. The core biopsy specimen was nearly 100% cellular. Most of the bone marrow space was occupied by an infiltrate of small lymphocytes, histiocytes, and scattered large lymphocytes with prominent nucleoli. The large atypical cells were CD20− and CD79a− and were negative for CD15 and CD30. The large atypical B cells were also EBER positive. The atypical cells in this case resemble the “رار” cells of nodular lymphocyte–predominant Hodgkin lymphoma, Reed-Sternberg cells of classical Hodgkin lymphoma, and the large cells in T-cell/histiocyte–rich large B-cell lymphoma. It is important to include angioimmunoblastic T-cell lymphoma in a differential diagnosis with Hodgkin lymphoma and T-cell/histiocyte–rich large B-cell lymphoma, as it may present with similar morphologic features.

Hairy Cell Leukemia in a Patient With Chronic Myelogenous Leukemia Treated With Imatinib is a Clonally Unrelated Secondary Neoplasm

(Poster No. 18)

Deniz Peker, MD; Lynn Moscinski, MD; Ling Zhang, MD; Andrew L. Feldman, MD; Reza Setoodeh, MD (reza.setoodeh@gmail.com); Hajir H. Derakhshani, MD, PhD. 1Department of Hematopathology, Moffitt Cancer Center, Tampa, Florida; 2Department of Laboratory Medicine and Pathology, Mayo Clinic, Rochester, Minnesota; 3Department of Pathology, University of South Florida, Tampa.

Chronic myeloid leukemia (CML) is a myeloproliferative neoplasm originating from pluripotent stem cells harboring BCR-ABL fusion gene in the Philadelphia chromosome. Differentiation capacity is preserved in CML and these patients usually have leukocytosis with granulocytosis, anemia, and splenomegaly. The standard initial treatment of CML is BCR-ABL tyrosine kinase inhibitors (TKIs) such as imatinib, dasatinib, or nilotinib. TKIs produce high cytogenetic remission rates with favorable safety profiles; however, maintenance therapy is recommended to decrease the risk of relapse. We present a case of a 54-year-old man diagnosed with CML in 2006 for which he received imatinib and was in remission until 2008 when he developed pancytopenia with marked neutropenia. Imatinib was adjusted and then switched to dasatinib, and later nilotinib, without any improvement in pancytopenia. Bone marrow biopsy in June 2010 showed minimal residual CML and emergence of a second malignancy: hairy cell leukemia (HCL). Cytogenetic and fluorescence in situ hybridization (FISH) analysis demonstrated t(9;22) and BCR-ABL1 fusion signals, respectively, and polymerase chain reaction revealed p210 BCR-ABL1. Immuno-FISH demonstrated BCR-ABL1 translocation in granulocytes but not in hairy cell leukemia cells, indicating that the CML and HCL in this patient were genetically unrelated to each other. HCL developed as an independent primary neoplasm after treatment for CML with TKI. Review of the literature revealed 2 cases of coexistent HCL and CML. In summary, HCL occurs rarely in patients with CML and may be difficult to differentiate from...
TKI-induced cytopenia clinically. HCL develops from B cells unrelated to pluripotent stem cells with BCR-ABL fusion gene.

**An Unusual Splenic Diffuse Red Pulp Small B-Cell Lymphoma With a Coexistent Clonal Proliferation of Large Granulocytic T-Lymphocytes: Report of a Rare Case**
(Poster No. 19)

Reza Setoodeh, MD1 (reza.setoodeh@gmail.com); Haipeng Shao, MD, PhD,2 1Department of Pathology, University of South Florida, Tampa; 2Department of Hematopathology and Laboratory Medicine, Moffitt Cancer Center, Tampa, Florida.

Splenic diffuse red pulp small B-cell lymphoma is a rare B-cell lymphoma with diffuse involvement of the splenic red pulp by small monomorphous B lymphocytes and has been recognized as a provisional entity in the 2008 World Health Organization classification of hematopoietic and lymphoid neoplasms. Almost all cases have massive splenomegaly with diffuse involvement of the red pulp by a monomorphous population of small to medium-sized CD20+, CD5-, and CD10+ lymphoma cells. Large granulocytic lymphocytes (LGLs) are frequently CD57-expressing cytotoxic T cells with diminished or lost CD5 and/or CD7 expression. Other than T-cell LGL (T-LGL) leukemia, clonal expansion of T-LGLs has been seen in association with B-cell lymphomas and autoimmune disorders. We present the case of a 73-year-old woman with pancytopenia, chronic hemolytic anemia, and massive splenomegaly with a remote history of IgA deficiency, recurrent infections, and vitiligo. Peripheral blood morphology and flow cytometry showed a small population of T-LGLs. In regard to severe fatigue, B symptoms, and abdominal fullness, splenectomy was performed (2339 g), which revealed a diffuse replacement of the red pulp by monoclonal small lymphoid cells with round nuclei, infiltrating splenic cords, and sinuses. Immunohistochemistry revealed B lymphocytes negative for CD5, CD10, and MUM-1, and also a second population of CD57+ cytotoxic T cells. Flow cytometry showed x-restricted clonal B cells with no CD5, CD10, CD25, or CD103 expression, and a small population of CD57+ T cells with weak CD5 and CD7 expression. Polymerase chain reaction studies also identified clonal TCR-β, TCR-γ, as well as IgH and Ig light-chain gene rearrangements, supporting the coexistence of 2 clonal B- and T-cell populations in the spleen.

**Acute Promyelocytic Leukemia With a Novel Variant (15;17) Rearrangement**
(Poster No. 20)

Michael Bellone, DO (mbeillon@notes.cc.sunysb.edu); Ann-Leslie Zaslav, PhD; Youjun Hu, MD. Department of Pathology, State University of New York at Stony Brook.

Acute promyelocytic leukemia (APL) is associated with reciprocal translocation of chromosomes (15:17)(q22;q21), resulting in the fusion of the PML and RARA genes. We describe a case of a 67-year-old man with APL carrying a novel variant of (15;17) translocation. The marrow showed typical APL morphology except for absence of Auer rods. Flow cytometry analysis was consistent with APL. Reverse transcription-polymerase chain reaction confirmed the PML/RARA transcripts. Standard G-banding analysis on marrow cells demonstrated a karyotype of 46,XY.del(17)(q12q21).1jins(15;17)(q22;c21.2q25.3)[18]/46,XY[2]. Fluorescence in situ hybridization using the dual-color, dual-fusion PML (15q22, orange)/RARα/17q21, green) probe also showed a variant abnormal pattern (Figure 35). The cells of typical patients with APL have 1R (red), 1G (green), and 2F (fusion or yellow) signals. Our patient had 1.5% of cells with the typical abnormal pattern; however, 85% of the cells had 20:1G:1F signals. The results demonstrated that the RARA/PML fusion was absent from chromosome 17. PML remained on the der(15) and PML/RARA was inserted or translocated into the der(15). To our knowledge this abnormality has not been described before. The patient was treated with the Cancer and Leukemia Group B (CALGB) protocol 9710 regimen. His response to ATRA has been slow. The patient will be closely monitored. His clinical progress should add to our knowledge of the prognostic significance of this novel variant rearrangement.

**Spontaneous Regression of a Primary Diffuse Large B-Cell Lymphoma of Breast**
(Poster No. 21)

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Spontaneous regression is rare in malignant lymphomas and particularly so in high-grade lymphomas such as diffuse large B-cell lymphoma (DLBCL). Here we report the case of a previously healthy 50-year-old woman who presented with a 2-week history of a right breast lump. Ultrasonography showed a multilobulated solid mass measuring at least 4.4 cm. Fine-needle aspiration biopsy showed only normal breast tissue. A simultaneous core biopsy revealed DLBCL invading breast tissue in 1 core and normal breast tissue in another core (Figure 36). The tumor cells had centroblast-like morphology and were positive for CD45, CD20, CD10 (weak), Bcl-6, MUM1, and Bcl-2 and negative for CD5, CD3, and keratin. The MIB1 index was 80%–90%. Fluorescence in situ hybridization analysis was negative for MYC gene rearrangement. MRI and PET scans carried out within 2 months after the biopsy showed no residual tumor. Results of blood counts, bone marrow biopsy, and blood chemistry, including LDH, were all normal. Owing to the negative findings, the possibility of a specimen mix-up with the initial biopsy was raised. DNA analysis performed on the bone marrow biopsy specimen and the lymphoma showed identical DNA short-tandem-repeat profiles. The patient declined treatment, and at 5 months, MRI results continued to be negative. DLBCL is an aggressive lymphoma, and spontaneous regression has been reported only rarely. This case is an example of spontaneous regression occurring within weeks of a biopsy procedure, and it raises important questions regarding the mechanism and permanence of regression.
Unusual Cytoplasmic Crystalline Inclusions in a Patient With Acute Myeloid Leukemia With Myelodysplasia-Related Changes: A Rare Finding
(Poster No. 23)

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A 70-year-old healthy man presented with abdominal pain. A complete blood cell count revealed increased white cells with circulating blasts (22%), moderate anemia, and a normal platelet count. Fibrinogen levels were elevated (570 mg/dL). A bone marrow biopsy revealed a markedly hypercellular bone marrow with trilineage dysplasia and an increased number of myeloblasts (58%). In addition to abundant cytoplasmic eosinophilic granules and globules, the myeloblasts also contained eosinophilic square (Figure 37), rhomboid, and rectangular crystals. Occasional Auer rods were also seen. On immunophenotyping, the blasts were strongly positive for myeloperoxidase and CD33 and negative for CD34. The myeloperoxidase staining was noted in the cytoplasmic granules, globules, as well as in the crystalline inclusions. Flow cytometric analysis demonstrated that the blasts were weakly positive for HLA-DR and negative for CD34 and CD13. Chromosomal analysis revealed an abnormal male karyotype; however, results of fluorescence in situ hybridization for PML-RARA (t(15;17) and myelodysplastic syndrome panel, including probes for t(8;21), were negative. While cytoplasmic eosinophilic granules are characteristically seen in acute myeloid leukemias with recurrent genetic abnormalities, specifically t(15;17) and t(8;21), these leukemias were ruled out by molecular studies. According to the World Health Organization classification (2008), this leukemia would be best classified as "acute myeloid leukemia with myelodysplasia-related changes." Although rhomboid inclusions consisting of immunoglobulin have been described in plasma cell myeloma, to the best of our knowledge, they have not been reported in myeloblasts. In our opinion, these inclusions are related to Auer rod–like material and probably represent a manifestation of myelodysplastic syndrome/neoplasm.

T-Cell Lymphoblastic Leukemia With Aberrant Expression of Myeloperoxidase
(Poster No. 24)

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A 17-year-old previously healthy adolescent girl was admitted with several weeks of worsening lethargy, lymphadenopathy, a white blood cell count of 193 k/μL, a hemoglobin level of 4.3 g/dL, and a platelet count of 20 k/μL. The smear showed blasts with an L1 morphologic, high nuclear to chromatin ratio, fine chromatin, and indistinct nucleoli. Additionally, there was a smaller population of cells with irregular nuclear contours, abundant agranular cytoplasm, and prominent nucleoli. Flow cytometry revealed a population of CD34+ blasts expressing early T-cell markers CD3, CD2, cTDT, CD7, and HLA-DR. Also, a subpopulation expressing myeloperoxidase, CD13, and CD117 was seen. Interestingly, this smaller population of cells, encompassing 10% of the total blasts, showed cytochemical myeloperoxidase that supported the flow cytometry measurements. Mixed phenotype acute leukemia is characterized by expression of myeloid and lymphoid lineage markers, straddling a diagnostic category between acute myeloid leukemia and acute lymphoblastic leukemia (ALL). Classically, the myeloid lineage expresses myeloperoxidase, CD3, CD3, and CD117, while the T-cell lineage expresses CD3, CD2, CD7, and HLA-DR. Our diagnostic dilemma was the following: Does a 10% population of myeloperoxidase positive blasts suffice for diagnosing mixed phenotype acute leukemia? Because the diagnostic criteria pertaining to the level of myeloperoxidase expression necessary to distinguish between mixed phenotype acute leukemia and T-cell ALL with aberrant myeloid expression are ambiguous, we chose the latter diagnosis owing to the constellation of presenting signs and symptoms. Ultimately, treatment with T-cell regimen was effective at eradicating the patient’s disease. Hopefully, future clarification of the mixed phenotype acute leukemia diagnostic criteria will decrease the present diagnostic uncertainty.

The Transdifferentiation of Germ Cell Tumor Cells Into a Myeloid Neoplasm Mimicking Postchemotherapy Myelodysplastic Syndrome/Acute Myeloid Leukemia
(Poster No. 25)

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The cellular origin of hematopoietic malignancies observed in patients with nonseminomatous germ cell tumors and the role of previous chemotherapy in these conditions is not completely clear. We report the case of a primary mediastinal nonseminomatous germ cell tumor (GCT) demonstrating transdifferentiation to a myeloid neoplasm in the bone
marrow. A 26-year-old man with a primary mediastinal nonseminomatous GCT with embryonal, yolk sac, and teratomatous elements was treated with chemotherapy followed by complete surgical resection. Examination of the bone marrow, prompted by the development of anemia and thrombocytopenia 12 months later, demonstrated hypercellularity, myeloid and erythroid atypia, myeloid left shift, and atypical immunophenotype of the myeloid blast cells. Genotypic examination showed near-tetraploid karyotype and fluorescence in situ hybridization confirmed presence of multiple copies of chromosome 5, 7, 8, and 20 in 50% to 92% of cells. Immunohistochemical staining failed to reveal any germ cell antigens in the bone marrow cells. While stem cell transplantation and therapy-related myelodysplastic syndrome was being considered, the patient succumbed to respiratory mediatinal and chest wall disease 1 month after this bone marrow examination. The chest tumor demonstrated a dimorphic histology (spindle and rhabdoid cells). The mediastinal tumor demonstrated mixed teratomatous elements and cytogenetic changes similar to the antemortem bone marrow. Postmortem examination revealed hypercellularity and increased immature cells, consistent with acute leukemia. The myeloid transdifferentiation of malignant germ cells may create a diagnostic pitfall by mimicking the blood and marrow findings of postchemotherapy myeloid neoplasm and may delay appropriate treatment.

A Practical Approach for Subclassifying High-Grade B-Cell Lymphoma: A Study of 64 Cases Examining the Role of Ki-67 and Fluorescence In Situ Hybridization

Pose No. 26

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Context: High-grade B-cell lymphomas (HG-BCLs) are aggressive tumors encompassing a biologic spectrum between diffuse large B-cell and Burkitt lymphoma. The diagnostic approach and subclassification of these malignancies remains controversial. This study correlated clinicopathologic data with Ki-67 expression and selected fluorescence in situ hybridization (FISH) probes to propose an inexpensive, clinically useful approach to categorizing these lymphomas.

Design: Sixty-four cases of HG-BCL with large- or intermediate-cell morphology and Ki-67 ≥ 50% were studied. Cases were categorized into germinal center (GC) and nongerminal center phenotypes and then analyzed for MYC (8q24), BCL2 (18q21), and BCL6 (3q27) rearrangements by FISH.

Results: Cases were grouped by their Ki-67 expression: <75% (A = 16 cases); 75%-90% (B = 24 cases); and >90% (C = 24 cases). The proportion of GC lymphomas increased with Ki-67 (A = 40%, B = 59%, and C = 80%). Twenty-four cases (37.5%) had morphologic features intermediate between large cell and Burkitt lymphoma and demonstrated high Ki-67 index. Of those, 4 cases (6.3%) showed MYC rearrangements. Regarding the remaining cases, 11 revealed MYC amplifications. This subset showed high Ki-67 expression but was associated with similar survival rates as those cases without MYC abnormalities (with equivalent Ki-67 percent). Of 18 patients who had died of disease, 12 (67%) showed Ki-67 of ≥85% and short survival (<1 year).

Conclusions: Initial evaluation of HG-BCL should include Ki-67. FISH analysis may then be focused on cases with high proliferation rates. These tumors commonly show MYC abnormalities; however, even when absent, survival appears similar at equivalent levels of Ki-67 expression. Further studies are necessary to determine if these aggressive lymphomas will benefit from more intensive therapies.

Plasmablasts as an Indicator of Poor Prognosis in Plasma Cell Leukemia

Pose No. 27

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Context: Plasma cell leukemia (PCL) is a rare disorder of clonal plasma cells in the peripheral blood that is considered primary if present at the time of diagnosis and secondary if seen in the course of plasma cell myeloma. A small subpopulation displays plasmablastic morphologic, the significance of which has not been elucidated in the literature to our knowledge. Here we compare the clinical outcomes, and morphologic and immunophenotypic features, of 5 PCL cases with and without plasmablasts.

Summary of Results

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Morphology</th>
<th>CD56/ CD20</th>
<th>Form of PCL</th>
<th>Survival After Diagnosis</th>
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<td>2 days</td>
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<td>2</td>
<td>Plasmablasts</td>
<td>+/-</td>
<td>Primary</td>
<td>5 months</td>
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<tr>
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<td>--/--</td>
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<td>LTF, 5 months</td>
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<td>Mature plasma cells</td>
<td>+/-</td>
<td>Primary</td>
<td>19 months*</td>
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<tr>
<td>5</td>
<td>Mature plasma cells</td>
<td>--/--</td>
<td>Secondary</td>
<td>LTF, 2 years and 5 months</td>
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Design: We conducted a computerized search for pathology cases with a diagnosis of PCL and/or with the terms “plasmablasts” or “plasmablastic” within the pathology report in our institution during the past 11 years.

Results: Five PCL cases were found, 3 primary and 2 secondary. Two of the 3 primary and 1 of the secondary PCLs displayed plasmablastic morphology. The 2 patients with primary PCL with plasmablastic morphology had the shortest survival times after initial diagnosis. The 3 cases with plasmablastic morphology showed plasma cells with immature features including basophilic cytoplasm, dispersed chromatin, and prominent nucleoli. All cases were positive for CD38 and/or CD138 and negative for CD20. Two of the cases with plasmablastic morphology were negative for CD56 (Table).

Conclusions: PCL with plasmablastic morphology can be associated with a rapidly fatal disease course, especially if primary. Prior studies have suggested that secondary PCL is associated with a worse prognosis than its primary counterpart, but in our series, survival times were shorter in primary PCL. Cases of PCL can be negative for CD20 and have aberrant expression of CD56.

A Case of Double-Positive CD4/CD8 Mycosis Fungoides

Pose No. 28

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In Western countries, T-cell lymphomas represent <10% of all non-Hodgkin lymphomas. Cutaneous T-cell lymphomas represent 80% of all skin lymphomas, and approximately 50% of cutaneous T-cell lymphomas are classified as mycosis fungoides (MF). Clinically, the designation of MF is used to describe cases in which tumors have slowly evolved from patches and plaques. Immunophenotypically, MF is most commonly characterized by clonal tumor cells that express a mature T-helper phenotype (ie, CD3+, CD4+, CD8−). A minority of patients reportedly has a CD4+ CD8+ immunophenotype and an even rarer group of individuals belong to a CD4/CD8 double-negative group. To our knowledge, cases of CD4/CD8 double-positive MF have not been described. We report a unique case of a 38-year-old white woman with CD4/CD8 double-positive MF identified by immunohistochemistry and flow cytometry in biopsy specimens of skin, inguinal lymph node, and peripheral blood, all within 1 month of the initial diagnosis of cutaneous T-cell lymphoma. Furthermore, an analysis of both T-cell β as well as γ chain polymerase chain reaction confirmed the presence and relatedness of the T-cell clone in all 3 aforementioned samples. Not only is this the first case of CD4/CD8 double-positive MF reported in the literature, this distinctive variant is identified in a relatively young female, in contrast to the elderly population that is more typically affected with MF. The prognostic significance of this CD4/CD8 double-positive variant is not established.

Clinical follow-up is ongoing.

An Unusual Case of Blastic Plasmacytoid Dendritic Cell Neoplasm With Recurrence as a Nasal Polyp: A Case Report and Review Of Literature

Pose No. 29

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Blastic plasmacytoid dendritic cell neoplasm (BPDCN) is a rare hematopoietic malignancy characterized by clonal expansion of precursors of interferon-producing plasmacytoid dendritic cells. The tumor usually presents as skin lesions in the elderly with a diffuse dermal infiltrate of medium-sized blast cells showing immunoreactivity for CD4, CD56, CD123, TCL1, and CD68. Lymphadenopathy, peripheral blood involvement, and bone marrow infiltration are variably present and more common as the disease progresses, and a leukemic phase ultimately occurs in most advanced cases. We present the case of an 80-year-old man who initially presented with a periocular cutaneous nodule in 2008 diagnosed as BPDCN. Within a short period of time, the patient developed multiple skin lesions. Staging bone marrow study revealed myelodysplastic syndrome, classified as refractory anemia with excess blasts-1 (RAEB-1) with a normal karyotype. Considering the patient’s age and coexistent myelodysplasia, he received palliative radiation therapy to the cutaneous lesions with flattening of some nodules. The patient developed epistaxis and further examination showed a polypoid nodule within the right nasal cavity. Biopsy showed BPDCN with intense diffuse infiltration of the squamous submucosa by sheets of blastoid cells with irregular nuclei, occasional nucleoli, and scant cytoplasm. Tumor cells were immunoreactive for CD4, CD56, CD123, and TdT, but negative for CD20, CD3, and EBER. Review of the literature reveals BPDCN tends to present or relapse in the skin, hematolymphatic organs, and soft tissue, but this is the first case report of a BPDCN involving nasal mucosa, an atypical site of recurrence for this tumor.

Bone Marrow Metastasis of Anaplastic Oligodendroglioma: Case Report and Review of the Literature
(Poster No. 30)

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Oligodendrogliomas (OGs), classically described in 1929 by Bailey and Bucy, are infrequent primary brain neoplasms. Typically located in the cerebral hemispheres, these diffusely infiltrating neoplasms are composed of cells recapitulating oligodendrogliola with frequent deletions of chromosomal arms 1p and/or 19q. Gliomas are believed to rarely metastasize owing to their relatively rapid presentation and clinical course and difficulty of the intracerebral environment to select out clones capable of metastasis. We report the case of a 52-year-old woman with a left frontal anaplastic OG who initially presented with nausea, vomiting, and word-finding difficulties in 2008. The diagnosis was confirmed with fluorescence in situ hybridization showing deletion of 1p36 and 19q13. She underwent near-total resection, radiotherapy, and chemotherapy with temozolomide (Temodar). She was stable until early 2010 when she developed lower back pain, thrombocytopenia, and transfusion-dependent anemia. Magnetic resonance imaging suggested diffuse replacement of the pelvic bone marrow by tumor; however, biopsy analysis revealed a hypocellular fibrotic marrow with extensive necrosis, infarction, and no overt evidence of metastatic tumor. With continuation of symptoms, second and third marrow biopsies were performed; the latter showed viable cells immunophenotypically consistent with a metastasis. Review of the literature showed that extraneural OG, although extremely rare, may occur through 3 routes of spread: local, hematogenous, and via the CSF. Hematogenous spread can lead, as in our case, to diffuse marrow involvement and pancytopenia. The recent increase in reported metastasis is thought to be secondary to increased survival with current therapies. When patients with central nervous system tumors present with cytopenias, metastasis should be considered.

An Unusual Presentation of High-Grade Lymphomatoid Granulomatosis: A 19-Year-Old Man With Hematemesis, Hematochezia, and Extensive Bone Marrow Involvement
(Poster No. 31)

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Lymphomatoid granulomatosis (LYG) is a rare extranodal Epstein-Barr virus (EBV)-related lymphoproliferative disorder characterized by angiocentric, angiodestructive growth. LYG commonly involves the lungs, brain, kidneys, liver, and skin. The bone marrow, gastrointestinal tract, and lymph nodes are rarely involved. Our patient is a 19-year-old HIV-negative man who presented with hematemesis and hematochezia. Imaging revealed bilateral pulmonary masses without lymphadenopathy. Papulonodular skin lesions were noted on the abdomen and ulcerative lesions were seen on colonoscopy. Quantitative EBV DNA analysis revealed 3.9 million copies/mL in serum. Sections of lung showed centrally necrotic nodules surrounded by large lymphocytes with immunoblastic or plasmacytoid morphology and angiocentric growth (Figure 38). A variable inflammatory background was also present. The infiltrate was immunoreactive for CD45, CD20 (subset), CD79a, CD138 (subset), bcl-2, and CD30 (focal) by immunohistochemistry. Light-chain restriction was demonstrated and numerous large cells were EBV positive by in situ hybridization (>50 cells/high-power field) (Figure 38, inset). Skin and colon biopsies showed a similar polymorphous infiltrate with occasional EBV-positive cells. The bone marrow demonstrated a predominantly plasmacytoid infiltrate with scattered EBV-positive large cells. The findings were that of LYG with possible transformation to EBV-positive diffuse large B-cell lymphoma. Chemotherapy was initiated; however, the patient died of his disease 19 days after diagnosis. This case of LYG demonstrates the histologic spectrum, need for extensive immunophenotypic studies, and importance of clinicopathologic correlation to establish this challenging diagnosis. The atypical presentation, including bone marrow and gastrointestinal involvement, may further suggest histologic progression and poor prognosis.

Concomitant Gaucher Disease and Multiple Myeloma: More Than Mere Coincidence?
(Poster No. 32)

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A 62-year-old man presented 7 years prior with symptoms of peripheral neuropathy. Serum and urine immunoprotein studies revealed an IgAκ monoclonal gammapathy. Bone marrow studies showed 30% plasmacytosis and Gaucher cells. Abdominal fat pad biopsy findings were positive for amyloidosis. The patient was diagnosed with IgAκ multiple myeloma stage 1 with peripheral neuropathy secondary to amyloidosis. He was subsequently treated with several myeloma regimens, with variable response. Three years after the initial diagnosis of myeloma, Gaucher disease type 1 was confirmed on the basis of decreased enzyme levels of glucocerebrosidase and markedly elevated chitotriosidase levels. A brief course of imiglucerase therapy was given, but discontinued owing to treatment-related side effects. After an excellent response to a new myeloma treatment, consideration was given to autologous stem cell transplant. Repeated bone marrow aspirate showed 30% plasmacytosis and increased histiocytes with Gaucher morphology. Flow cytometry results confirmed monoclonal cyttoplasmic light chain-positive, CD45, CD38, CD56, and CD19+ plasma cells. Skeletal survey showed calvarial and bilateral humeral shaft lucencies compatible with myelomatous lesions. Leukocyte enzyme studies were positive for Gaucher disease.
Gaucher disease type 1 has been associated with monoclonal gammopathy of uncertain significance and multiple myeloma. A plausible explanation is that IL-6, a cytokine secreted by the macrophages of Gaucher disease, is a growth factor for plasma cells, which may lead to clonal proliferation. Further study of the relationship between Gaucher disease and myeloma may help shed light on the triggers for development of plasma cell dyscrasias and their malignant transformation.

**Hodgkin Transformation of Small Lymphocytic Lymphoma Presenting as Acute Appendicitis**

(Poster No. 33)

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Chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) usually becomes diffuse large B-cell lymphoma (Richter syndrome, 2%-8% of cases) when it transforms. In these cases, molecular and immunophenotypic evidence indicates that the transformed cells derive from the same clone as the CLL/SLL. SLL transforms into Hodgkin lymphoma much less commonly, reportedly 0.4% of cases. Some of these cases are derived from the original clone, while others are likely to be separate. We present a rare clinical scenario of a 64-year-old woman who had a history of CLL/SLL, treated with standard chemotherapy, who presented with acute appendicitis 16 months after initial diagnosis. On microscopic examination, the appendix showed acute serositis associated with 2 zonal atypical lymphoid infiltrates: one was composed of a monotonous population of small lymphoid cells with clumped nuclei and scant cytoplasm that expanded the lamina propria of the appendix; and one consisted of numerous Reed-Sternberg–like cells in a matrix of polymorphous inflammatory cells, including predominantly histiocytes and small lymphocytes through the wall of the appendix. Immunohistochemical staining and in situ hybridization demonstrated 2 distinct phenotypic features: (1) the PAX5+/CD5+/CD23+/CD15+/-CD30+/-cyclin D1+ neoplastic B cells, compatible with SLL; and (2) the CD30+/CD15+/CD45+/-EBER-classical Hodgkin lymphoma. Immunohistochemistry also confirmed that the small lymphocytes surrounding the Reed-Sternberg-like cells were T cells. According to the infiltrate distribution, the case is consistent with so-called type-2 transformation, in which the Reed-Sternberg-like cells are found in a polymorphous inflammatory background and separate from SLL cells, whereas in type-1 transformation, the Reed-Sternberg-like cells are distributed among SLL cells.

**Mixed Phenotype Acute Leukemia: A Rare Case of Acute Leukemia With B/T-Lymphoid Immunophenotype**

(Poster No. 34)

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Mixed phenotype acute leukemias (MPALs), as defined in the 2008 World Health Organization (WHO) classification of hematopoietic tumors, include bilineal and biphenotypic leukemias. The diagnosis is established by flow cytometric immunophenotyping. Cases that qualify as MPAL include myeloid/T-lymphoid or myeloid/B-lymphoid leukemias. To date, cases of MPAL with a B/T-lymphoid mixed phenotype have not been reported. We report a first such case of MPAL with mixed B/T phenotype in an 82-year-old man who presented with pancytopenia. Clinically, the patient was stable with no symptoms. The aspirate smears showed a single population of 66% blasts with lymphoblastic cytomorphology (Figure 39, B). Flow cytometric immunophenotyping revealed a homogeneous blast population expressing CD45, CD34, CD10, HLA Dr, and TdT. The blasts coexpressed T-lymphoid lineage markers (cytoplasmic CD3 and CD7), B-lymphoid lineage markers (CD19 and CD22), and myeloid markers (CD13, CD117, and CD15). Staining results with CD5, CD11b, CD14, CD33, CD56, CD61, CD79a, CD235a, and myeloperoxidase were negative (Figure 39, A). Based on the revised criteria proposed in the 2008 WHO classification for lineage assignment to single blast population, our case has strong evidence of T (cyto CD3) as well as B (CD19, CD22, and CD10) markers on the blasts, thus consistent with MPAL B/T phenotype. With lack of myeloperoxidase, expression of other myeloid markers is less specific for designation of myeloid lineage. Alternatively, considering the complex immunophenotype with B/T and some myeloid marker expression, this may also represent trilineage acute leukemia. In summary, we report a unique case of mixed phenotype leukemia. Interestingly, cytogenetics did not reveal any abnormalities.

**Chronic Myelogenous Leukemia With Concurrent Chronic Lymphocytic Leukemia: A Rare Association**

(Poster No. 35)

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Chronic leukemias can arise from either myeloid or lymphoid lineage. However, it is rare to have both lineages in 1 patient. We report a case in which a patient was diagnosed with chronic myelogenous leukemia and chronic lymphocytic leukemia. A 66-year-old man was referred to our hospital for evaluation of asymptomatic persistent lymphocytosis of 12 years and new onset neutropenia, eosinophilia, and basophilia. Peripheral blood flow cytometry was ordered, which confirmed the diagnosis of B-Cell chronic lymphocytic leukemia (Rai stage I), CD38-. The patient was not treated at this time. At the 1 month follow-up, in order to rule out concurrent myeloproliferative disorder, Jak-2 mutation evaluation was ordered and results were negative. Three months later, when the patient was reevaluated, the peripheral smear was highly suggestive of chronic myeloid leukemia. Fluorescence in situ hybridization analysis for 9;22 translocation was positive. Bone marrow showed myeloid hyperplasia on the smear (Figure 40, A) and

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lymphoid aggregates in the bone biopsy (Figure 40 B). Molecular testing for BCR-ABL fusion protein confirmed chronic myeloid leukemia, chronic phase. Flow cytometry confirmed chronic lymphocytic leukemia. The patient was treated with imatinib mesylate and had morphologic, cytogenetic, and molecular remission of chronic myelogenous leukemia within 6 months. The B-CAF chronic lymphocytic leukemia is in chronic phase and is being monitored without any therapeutic intervention. To our knowledge, this is only the 11th case of chronic lymphocytic leukemia and sequential chronic myelogenous leukemia. It is the fourth case occurring without previous chronic lymphocytic leukemia treatment. However, this is the first case with chronic myelogenous leukemia treated with imatinib mesylate with complete remission.

Extranodal Involvement by Hodgkin Lymphoma: A 10-Year Institutional Experience (Poster No. 36)

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Context: Although not uncommon, extranodal involvement by Hodgkin lymphoma (HL) is not well characterized within the literature. We performed a 10-year institutional review to further elucidate this entity.

Design: Patients diagnosed with HL from January 2000 to June 2010 were identified in a departmental record search. Clinical information regarding patients with extranodal involvement was obtained from institutional electronic medical records.

Results: Ninety-nine of 654 patients (15%) diagnosed with HL during this period had extranodal involvement. These patients ranged in age from 11 to 87 years (median, 47 years) and had an overall mortality of 24%. While 4% of these patients had primary extranodal HL, 4% had extranodal transformation to HL from a low-grade B-cell lymphoma, and 3% had insufficient medical records for further characterization. Most (89%) had secondary extranodal disease. The most commonly involved extranodal sites were bone marrow (49.5%), lung (21%), liver (9%), and spleen (6%). Seventy-five percent of patients with primary extranodal HL were reported to have no remission or had responded favorably. Of patients with transformation of low-grade lymphoma to HL, 75% died within a year of diagnosis. Forty-nine percent of patients with secondary involvement of extranodal sites had 1 or more recurrences of their disease, with 25% having died or entered hospice care.

Conclusions: Extranodal involvement occurs in a significant fraction of patients with HL and is associated with high overall mortality. Extranodal HL lesions representing transformation from lower-grade lymphomas are associated with particularly poor outcomes. Primary extranodal HLs are rare (<1%) and show a relatively favorable outcome.

Hepatitis C Infection and Lymphoma: Distinct Clinical Characteristics (Poster No. 37)

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Context: Although the mechanism of neoplastic transformation is not clear, hepatitis C virus (HCV) infection reportedly carries increased risk for non-Hodgkin lymphoma (NHL). Our institution has a patient population that includes many patients infected with human immunodeficiency virus (HIV) and HCV. We conducted this retrospective study to investigate the distinctive clinical presentations and classifications of lymphomas occurring in HCV-infected, HIV-infected, and uninfected patients.

Design: Medical records of patients with lymphoma diagnosed from 2001–2010 were reviewed to identify those diagnosed by cytology and/or biopsy in conjunction with flow cytometry and immunohistochemistry. Patients were stratified into 3 groups: HCV positive, HIV positive, and control (HCV negative, HIV negative). Lymphomas were classified, within certain limitations, using the World Health Organization classification system. Age, sex, site of presentation (nodal versus extranodal), and stage were compared for the 3 groups.

Results: Patients in the HCV and the HIV group were similar with respect to sex, extranodal occurrences, percentage of high-grade B-cell NHLs, and other factors at diagnosis. Interestingly, the group had only 1 case (5%) that primarily involved the liver in comparison to 2 (11%) cases in the HCV-positive group and 3 (19%) cases in the HIV-positive group.

A Diagnostic Challenge: Concurrent Secondary T-Cell Lymphoma With Therapy-Related Chronic Myelomonocytic Leukemia in a Patient With a History of High-Grade Follicular Lymphoma Complicated by Colitis (Poster No. 39)

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More than one secondary malignancy can follow a primary tumor but rarely in the same site. Composite malignancies are often a diagnostic
JAK3, p53, and 13q14 (retinoblastoma gene). 3 DLBCL in a 1+1 gene deletion, or a Evan L. Kulbacki, MD +1 (variation- Department of 12 (zyuanming@hotmail.com); Peihong Flow cytometric analyses of myeloid neoplasms spanning This series noted an association between high CD45 gene deletion. The TP53 ATM The average (partial), CD38 gene 1145.62). t DLBCL) in the elderly is an EBV-driven B-cell neoplasm related to 1+1 present with left front lobe mass and progressive leukocytosis. His chronic lymphocytic lymphoma for 2 years and no prior treatment an unusual t(14;18) translocation. A 64-year-old man with a history of of chronic lymphocytic lymphoma/small lymphocytic lymphoma for 2 years and no prior treatment presented with left front lobe mass and progressive leukocytosis. His white blood cell count was 103.8 x 10^9/L. The peripheral blood and bone marrow aspirates showed absolute lymphocytosis (peripheral blood, 89%; bone marrow, 61%) composed mainly of small-sized lymphoid cells with clumped chromatin. Some of the lymphocytes showed cleaved nuclei. Flow cytometry revealed an 85% population of predominantly small cells with the following immunophenotype results: CD5 (variable), CD10, CD19, CD20 (partial), CD38 (predominantly), CD23, FMC-7, surface immunoglobulin-negative to equivocally dim, and λ. Immunohistochemical stain on bone marrow clot showed many clusters of CD79a-positive B cells coexpressing CD5 but lacking BCL6. These findings are consistent with persistent chronic lymphocytic lymphoma/small lymphocytic lymphoma. However, cytogenetic studies revealed an abnormal male karyotype containing a (14;18) translocation in 6 of 26 small lymphocytic lymphoma. However, cytogenetic studies revealed an abnormal male karyotype containing a (14;18) translocation in 6 of 26 cases. Fluorescence in situ hybridization (FISH) study results had been negative for band 8q24, BCL2/IGH (t(14;18), 17p13 (p53 gene), and 13q14 (retinoblastoma gene). One and half years later, he presented with a pelvic mass and marrow disease. By flow cytometry, identical phenotypes were seen in the pelvic mass and the marrow and results were positive for CD19 and CD38. In contrast to the initial presentation, CD10, CD20, CD34, CD38, surface immunoglobulin, and TdT results were now negative. Morphologically, the current leukemic cells showed more prominent cytoplasmic vacuoles mimicking Burkitt lymphoma cells. Chromosomal studies still showed multiple numeric and structural abnormalities but not exactly the same as in the initial diagnosis. The initial study indicated new abnormalities, such as variable additional copies of 8q24 (MYC) and 14q32 (IGH). To our knowledge, this unique presentation and profound changes in phenotype and cytogenetics have not been described before. This case also emphasizes the importance of having access to pertinent clinical history, especially when the patient is transferred from a different institution.

An Epstein Barr Virus–Positive, Diffuse Large B-Cell Lymphoma Presenting as Multiorgan Failure: A Catastrophic Lymphomatosis With Fulminant Visceral Organ Dissemination Resulting in a Precipitous Death of a Patient With No Identifiable Etiology for Immunodeficiency (Poster No. 43)

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Epstein Barr Virus (EBV)–positive, diffuse large B-cell lymphoma (EBV+ DLBCL) in the elderly is an EBV-driven B-cell neoplasm related to age-associated debility in immunity. The clinical course is aggressive, with median survival of 24 months. We report a case of EBV+ DLBCL in a 59-year-old woman who presented initially with a diffuse and fulminant dissemination of lymphoma cells to visceral organs resulting in multiorgan failure and a precipitous death. The patient, who had an unremarkable past medical history, presented with fever, fatigue, malaise, and weight loss during a 1 week period. After unsuccessful treatment with antibiotics, the patient developed liver function test results. A viral infection with septic shock was considered, and she was treated with antibiotics and antiviral medications. Radiographic imaging revealed hepatomegaly, splenomegaly, and

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Utility of Lymphoid-Specific Helicase in Differentiating Follicular Hyperplasia From Follicular Lymphoma

(Poster No. 44)

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Context: Lymphoid-specific helicase (HELLS or LSH) is an enzyme, belonging to the SNF2 family of helicases, encoded by the HELLS gene. This protein regulates transcription, heterochromatin formation, and transposon splicing through cooperation with DNA methyltransferases. HELLS/LSH is highly expressed in lymphoid precursor cells and studies have shown that HELLS is expressed in germinal-center B cells. Recent studies have evaluated the utility of HELLS as a diagnostic marker in selected B-cell lymphomas. The aim of our study was to evaluate the utility of HELLS in differentiating follicular hyperplasia (FH) from follicular lymphoma (FL).

Design: We retrieved 32 cases of FH and FL from the archives of our pathology department. These included 15 tonsils with FH and 17 lymph node biopsies with FL. We performed immunohistochemical staining with a polyclonal antibody directed against HELLS on these cases. Of 17 cases of follicular lymphoma, 3 (18%) were grade 1; 8 (47%) were grade 2; and 6 (35%) were grade 3. We determined whether there was any difference in pattern and intensity of staining between these FH and FL cases. The pattern of staining was graded as diffuse and focal, and intensity was graded as weak, moderate, or strong.

Results: We observed that HELLS was strongly and diffusely expressed in germinal centers of reactive follicles. HELLS expression was significantly more intense in peripheral dark zones compared with central light zones of the germinal centers. On the contrary, in FL, there was significantly decreased HELLS staining when compared with FH. Loss of polarity in the neoplastic follicles in FL was readily identified. On close examination of the follicles in FL, we observed that the only positive cells were centroblasts, which displayed moderate staining intensity. There was no staining of centrocytes or follicular dendritic cells.

Conclusions: Loss of expression of HELLS may help distinguish reactive from neoplastic follicles especially in BCL2- FL, as previously reported. In our study, we also found that, in FL, HELLS expression was lost in the centrocytes but was still present in centroblasts. Grading of FL can be challenging in some cases, especially with suboptimal hematoxylin-eosin staining and small tissue biopsies. In this setting, HELLS may help in making a more accurate estimation of the number of centroblasts and facilitate grading of FL. HELLS may thus be useful as a secondary marker for the diagnosis and grading of challenging FL cases.
We propose that positive CD41 staining pattern in bone
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The analysis for immunophenotypic abnormalities by flow
cytometry in myelodysplastic syndrome (MDS) may offer a valuable tool
for its classification and prognosis. Unlike peripheral blood platelets,
there are no established immunophenotypic abnormalities for megakaryo-
cytes or platelets in bone marrow evaluations.

Leptomeningeal Relapse After Stem Cell Transplantation in
(Poster No. 47)
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Plasma cell myeloma is an incurable, clonal B-cell neoplasm of
terminally differentiated plasma cells. Patients with this neoplasm have
a median survival of 3 to 4 years by conventional chemotherapy.
High-dose chemotherapy followed by autologous stem cell transplantation
(auto-SCT) has been associated with improved survival. Central nervous
system (CNS) involvement by myeloma after SCT is a rare manifestation.
We report on 2 cases with CNS relapse following SCT. The first case involves
a 47-year-old man diagnosed with plasma cell leukemia demonstrating band 13q deletion in 2007. He underwent an allogeneic SCT in 2008 after multiple relapses and 2 auto-SCTs. Three months after allogeneic SCT, he presented with altered mental status and neurologic deficits. Cytology and flow cytometry testing of cerebrospinal fluid confirmed leptomeningeal involvement. The second case involves a 67-
year-old woman with stage 3A myeloma diagnosed in 2004. She received auto-SCT in 2005 and remained in remission until she presented with nasal cavity mass to spine with CNS involvement (confirmed by cytology and flow cytometry) in early 2009. One possible pathway to CNS involvement by myeloma may be hematogenous spread, which would explain why plasma cell leukemia is considered a risk factor for CNS myeloma, as seen in our first case. However, as in our second case, it can occur in patients without circulating plasma cells; high-risk chromosomal abnormalities, such as 13q or 17p deletion; plasmablastic features; or absence of CD56 expression on plasma cells and suggest other pathways such as contiguous osseous or spine involvement. More cases continue to be reported.

GPIIb (CD41) Expression on Megakaryocytes: A Marker of Dysplasia in Patients With Myelodysplastic Syndrome
(Poster No. 48)
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Context: The analysis for immunophenotypic abnormalities by flow
cytometry in myelodysplastic syndrome (MDS) may offer a valuable tool
for its classification and prognosis. Unlike peripheral blood platelets,
there are no established immunophenotypic abnormalities for megakaryo-
cytes or platelets in bone marrow evaluations.

Design: We performed GPIIb (CD41) staining during a 26-month period on 159 bone marrow biopsies submitted for unexplained anemia at our institution. The history and follow-up of these patients was reviewed.

Results: Of 159 biopsies, MDS was diagnosed in 62 (39%), and of these, 36 (56%) were negative for CD41 staining. Of the remaining 26 biopsies, 17 (65%) had positive CD41 staining as an ill-defined, small population, whereas 9 of 26 (35%) showed positivity as a homogeneous cluster that stained bright. CD41 expression has a sensitivity of 41.9% and specificity of 100% for MDS. The positive predictive value is 100% with a risk ratio of 3.69. Abnormal karyotype was noted in 8 of 26 patients, 5 with a homogenous CD41 staining pattern. Moderate to severe anemia was seen in the 26 cases. Most (23 of 26; 88%) had thrombocytopenia, whereas 3 (12%) showed thrombocytosis. Megakaryocytic dysplasia was present in the biopsy of 26 patients. Of follow-
up, 4 of 26 patients died after transformation to acute leukemia (Figure 43).

Conclusions: We propose that positive CD41 staining pattern in bone
marrow flow cytometry is associated with MDS and may serve as
immunophenotypic criteria for the diagnosis. The presence of a
homogenous CD41 staining population is associated with thrombocyto-
enia and the presence of a cytogenetically identifiable clone.

Seroma-Associated, Primary Anaplastic Large Cell
Lymphoma of the Breast Following Bilateral Breast Cancer
(Poster No. 49)
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A 62-year-old woman, who had a lumpectomy and radiation therapy
for ductal carcinoma in situ of the right breast in 1993, followed by right
completion mastectomy for local recurrence in 1996, was diagnosed in
early January 2011 with infiltrating lobular carcinoma of the left breast.
She subsequently underwent left mastectomy and right capsulotomy
in late January 2011, given a history of seroma formation and infection
following implant rupture and removal. The histologic slides from this
procedure were received in consultation at Vanderbilt University
Medical Center. The slides from the left mastectomy showed residual,
invasive lobular carcinoma measuring 3 cm at greatest extent. Sections
from the right breast demonstrated large, highly atypical cells free-
floating within and lining the seroma cavity but without infiltration into
the wall or the surrounding tissue. Immunohistochemistry showed the
neoplastic cells to express CD45, CD43, and CD30. Results were negative
for ALK1, CD3, CD8, CD5, TIA-1, CD20, CD31, CD94, CD68, and
cytokeratin AE1/AE3. These findings were consistent with a diagnosis of
seroma-associated, primary anaplastic large cell lymphoma. Non-
Hodgkin lymphoma of the breast is unusual. Most cases are of B-cell
lineage. A recent meta-analysis and other reviews revealed about 30
cases of implant-related, primary anaplastic large cell lymphoma in
the literature. These neoplasms are typically ALK1 negative and have an
indolent course. Recently, this association has garnered attention in the
lay press. This case, with its detailed clinical history, helps to further
the understanding of this newly recognized entity.

Novel, Extended Red Blood Cell and Platelet Parameters
Have Age- and Sex-Specific Reference Ranges and Predict
Bone Marrow Pathology in Anemia Due to Myelodysplasia
(Poster No. 50)
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Extended red blood cell (RBC) and platelet parameters are new investigative measurements of reticulocytes and reticulated platelets in peripheral blood. These values are generated on the Cell-DYN Sapphire hematology analyzer (Abbott Laboratories, Abbott Park, Illinois) through optical fluorescence analysis. Initial studies focused on evaluating bone marrow engraftment following transplantation; however, reference ranges and their clinical utility in classifying anemia and thrombocytopenia remain to be determined.

**Design:** Age- and sex-specific reference ranges were determined from whole blood samples from 171 healthy adults (18–88 years old) for extended parameters, including mean reticulocyte volume (mRCV), mean reticulocyte hemoglobin (mMCH), mean reticulocyte hemoglobin concentration (mCHC), and percentage of reticulated platelets. Values from 27 patients with anemia and/or thrombocytopenia and myelodysplastic syndrome (MDS) were then compared with their age-matched reference ranges.

**Results:** In healthy males, mRCV and mRCH gradually increased, peaking after age 70, whereas tRCH steadily declined. In healthy females, mRCH and tRCH were relatively constant; mRCV varied according to menopausal status (premenopausal, lowest; postmenopausal, highest). The percentage of reticulated platelets was stable throughout adulthood, irrespective of sex. In patients with MDS-related anemia (average hemoglobin, 9.9 g/dL), mRCV was increased (≥8 fL) compared with age-matched reference levels, despite reticulocytopenia. In patients with thrombocytopenic MDS (average platelet count, 65,000/L), the percentage of reticulated platelets was generally elevated.

**Conclusions:** Extended RBC and platelet parameters show age- and sex-specific trends, which require consideration when establishing reference ranges. In anemic patients, reticulocytopenia with elevated mRCV suggests ineffective hemopoiesis characteristic of MDS. The unexpected percentage of reticulated platelets elevations observed in MDS-related thrombocytopenia requires further investigation. Additional studies will determine whether these novel parameters aid in managing and classifying anemia and thrombocytopenia.

**A Case Report of Splenic Diffuse Red Pulp Small B-Cell Lymphoma With Transformation to Multifocal Diffuse Large B-Cell Lymphoma** (Poster No. 51)

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Splenic diffuse red pulp small B-cell lymphoma is a provisional entity in the world Health Organization classification. Morphologically, this hematopoietic malignancy diffusely involves the red pulp of the spleen, sparing the white pulp. The neoplastic lymphocytes are monotonous, small to medium in size, with round vesicular nuclei, and occasional distinct nucleoli. Bone marrow findings include intrasinusoidal infiltration and possible interstitial/nodular infiltration patterns. Lymphocytes within the peripheral blood often have short cytoplasmic villi. Characteristic immunophenotype results are as follows: positive for CD20, CD10, CD5, CD38, and CD52. Fluorescence in situ hybridization analysis revealed a rearrangement of the IGH locus, although the translocation partner was not identified. A systemic positron emission tomography scan showed bilateral hypermetabolic posterior level IIb cervical lymphadenopathy; there was no enlarged lymph node in the chest, abdomen, or pelvis. A bone marrow biopsy was also negative for lymphoma involvement. The patient responded well to combined chemotherapy. However, the biological and clinical significance of aberrant CD8 expression in B-cell lymphoma remains unclear, and further studies are required.

**Megakaryocyte Size, Separation, and Clustering in Bone Marrow Biopsies: An Analysis of Digitized Images** (Poster No. 53)

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**Context:** Changes in megakaryocyte numbers, size, and distribution are described in myeloproliferative syndromes. We analyzed digital images to quantify these changes.

**Design:** Two polycythemia vera (PV), one essential thrombocythemia (ET), one chronic idiopathic myelofibrosis (CIM), and 2 healthy control cases were identified. Megakaryocytes were stained with antibodies to CD45, CD19, CD20, CD10, CD123, CD52, IgD, annexin A1, cyclin D1, and tartrate-resistant acid phosphatase. This entity generally has an indolent course with a 93% 5-year survival rate. We present a 62-year-old man with a history of polycythemia vera who was found to have a low-grade B-cell lymphoproliferative disorder with characteristics of a variant hairy cell leukemia or marginal zone lymphoma (including splenic). Two years later, he developed marked splenomegaly (3975 g) and was ultimately diagnosed with splenic diffuse red pulp small B-cell lymphoma. Two months after diagnosis, the patient had escalating liver enzymes. Subsequent computed tomography scan showed extensive bilateral pulmonary nodules, 2 nodules in the liver (3 and 15 cm), mesenteric nodularity suggestive of lymphoma, and bilateral renal masses. A liver biopsy showed involvement by diffuse large B-cell lymphoma. Currently, less than 10 total cases have been described to undergo transformation. Transformation to diffuse large B-cell lymphoma has only been reported in one other case (Figure 44).

**Pediatric Diffuse Large B-Cell Lymphoma With Aberrant Expression of CD5 and CD8** (Poster No. 52)

Jalida Pellicier, MD; Linsheng Zhang, MD; Sally E. Self, MD. Department of Pathology, Medical University of South Carolina, Charleston.

The aberrant expression of T-cell antigens in B-cell non-Hodgkin lymphoma is well recognized. The most commonly seen aberrantly expressing antigens are CD5, CD7, and CD2. CD8 and CD3 expression in B-cell lymphoma is rare, and expression of CD8 in pediatric B-cell lymphoma has never, to our knowledge, been reported in the literature. We report a case of diffuse large B-cell lymphoma in a 4-year-old boy with aberrant expression of both CD5 and CD8. The patient presented with a large right cervical lymph node not responding to antibiotic therapy. The lymph node was biopsied. The histology showed a near-complete effacement of lymph node architecture with diffuse infiltration of large lymphocytes, which were positive for CD20, CD10, CD5, and BCL-2 by immunohistochemistry stain. Flow cytometry immunophenotyping revealed 67% light chain-restricted B cells expressing CD5, CD19, CD20, and CD10, which confirmed the diagnosis of diffuse large B-cell lymphoma. The monoclonal B cells also expressed CD5, CD8, CD38, and CD52. Fluorescence in situ hybridization analysis revealed a rearrangement of the IGH locus, although the translocation partner was not identified. A systemic positron emission tomography scan showed bilateral hypermetabolic posterior level IIb cervical lymphadenopathy; there was no enlarged lymph node in the chest, abdomen, or pelvis. A bone marrow biopsy was also negative for lymphoma involvement. The patient responded well to combined chemotherapy. However, the biological and clinical significance of aberrant CD8 expression in B-cell lymphoma remains unclear, and further studies are required.
was 30%; for ET, 23%; for CML, 24%; and for the control, 20%. Analysis of variance did not show statistical significance.

Conclusions: Image analysis may be used to quantify megakaryocyte changes in myeloproliferative syndromes. Analysis of additional cases is suggested to determine whether such analysis is diagnostically informative.

T-Lymphoblastic Leukemia/Lymphoma Associated With Graves Disease
(Poster No. 54)
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A 12-year-old, African American boy with a 1-year history of Graves disease refractory to medical management presented with a 2-week history of tachycardia after going off medication in preparation for radioablation. The decision was made to perform a curative thymectomy. During the procedure, cervical lymphadenopathy was identified, and a lymph node biopsy was obtained. A large mediastinal mass had been identified radiographically but was initially thought to represent thymic hyperplasia, a finding sometimes associated with Graves disease. Results of a peripheral blood smear were unremarkable. Sections of the lymph node demonstrated completely effaced architecture by a diffuse infiltrate of intermediate-sized, immature lymphoid cells admixed with tingible body macrophages in a “starry sky” appearance. Immunophenotyping by flow cytometry was performed and revealed a predominant population of T lymphoblasts (CD1a−, CD3+, CD5+, CD7+, CD10+, CD19, CD25+, TdT+) consistent with T-lymphoblastic leukemia/lymphoma (T-LBL). A bilateral bone marrow examination was performed and identified only focal involvement by T-LBL in one of the biopsy fragments. The thymectomy specimen and cerebrospinal fluid were not involved. The patient was treated with intravenous induction chemotherapy, and the result of repeat bone marrow biopsy was negative. There is a well-known association between autoimmune conditions and peripheral B-cell lymphomas, and T-LBL has been documented in rare case reports after some autoimmune conditions. The occurrence of T-LBL with Graves disease, however, has not, to our knowledge, been previously described.

β-Globin Gene Sequencing of Hemoglobin Austin Revises the Historically Reported, Electrophoretic-Migration Pattern
(Poster No. 55)
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Context: Hemoglobin Austin was defined in 1976, using amino acid sequencing of samples from 3 unrelated Mexican-Americans, as a substitution of arginine for serine at position 40 of the β-globin chain (Arg40Ser). Its electrophoretic migration on both cellulose acetate (pH 8.4) and citrate agar (pH 6.2) was reported to be between hemoglobins F and A, and this description persists in reference literature.1

Design: Samples from 5 unrelated individuals, all with Hispanic surnames, were submitted for abnormal hemoglobin identification between June 2010 and January 2011. High-performance liquid chromatography, isoelectric focusing (IEF), citrate agar electrophoresis, and bidirectional DNA sequencing of the entire β-globin gene were performed.

Results: DNA sequencing confirmed all 5 individuals to be heterozygous for hemoglobin Austin (Arg40Ser). Retention time on high-performance liquid chromatography and migration on citrate agar electrophoresis were consistent with that identification. Migration on IEF, however, was not between hemoglobins F and A, as predicted from the report of cellulose acetate electrophoresis. By IEF, hemoglobin Austin migrated anodal to (“faster than”) hemoglobin A.

Conclusions: Hemoglobin Austin (Arg40Ser) appears on IEF as a “fast,” anodally migrating, hemoglobin variant, just as would be expected from its amino acid substitution. The cited historic report is, at best, not applicable to IEF and probably erroneous. Our observation of 5 unrelated individuals in 8 months suggests that this variant may be relatively common in some Hispanic populations, making its recognition important. Furthermore, gene sequencing is proving itself a very powerful and reliable tool for definitive identification of hemoglobin variants.
We present a case of hepatic GVHD resembling relapsed T-cell lymphoma after hematopoietic stem cell transplantation. A 63-year-old man presented with supraclavicular and axillary lymphadenopathy. Biopsy and imaging confirmed a diagnosis of stage IV, peripheral T-cell lymphoma with cytotoxic T-cell immunophenotype (CD5+/CD8+/CD45−/CD19−/CD25+). After a failed autologous hematopoietic stem cell transplant, the patient received salvage chemotherapy and subsequent female allogeneic hematopoietic stem cell transplant. On day 108 of this second bone marrow transplant, the patient presented with a rash, increased serum liver enzymes, and increased bilirubin. A computed tomography–positron emission tomography scan showed multiple liver lesions, and sound-guided liver biopsy demonstrated portal tracts bearing prominent lymphocytic infiltrates associated with subtle endothelialitis, bile duct injury, and secondary cholestasis. There was a small area of necrosis and minimal fibrosis. By immunohistochemistry, the lymphocytes were predominantly CD8+ T cells. The differential diagnosis included GVHD and relapsed T-cell lymphoma. The overlapping histologic and immunophenotypic findings make this distinction particularly challenging. Fluorescence in situ hybridization for sex chromosomes was performed and showed that the portal lymphocytes were predominantly donor cells (XX), whereas the background hepatocytes were recipient cells (XY). This study further emphasizes the importance of ancillary studies in the diagnosis of hepatic GVHD in the clinical setting of suspected relapse of T-cell lymphoma.

Asymptomatic, Pregnant Woman Doubly Heterozygous for Hemoglobin S and Hemoglobin Kenya

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We describe an asymptomatic, Ugandan woman with compound heterozygosity for hemoglobin (Hb)-Kenya and HbS. A blood sample was received from a 29-year-old, pregnant, Ugandan woman who presented for her first prenatal evaluation at 29 weeks of an uneventful pregnancy. Laboratory tests revealed the following values: Hb, 12.9 g/dL; mean corpuscular volume, 86.4 μm³; serum ferritin, 168 ng/mL; and a positive sickle cell solubility test. Her peripheral blood smear did not reveal any erythrocyte morphologic abnormalities. The patient’s medical history did not reveal any chronic anemia or episodes of pain crisis or hemolysis. The Hb analysis by capillary zone electrophoresis revealed the following: Hb, 79%; HbF, 19.3%; HbA2, 1.7%; and high-performance liquid chromatography results were the following: HbS, 60.2%; HbA2, 19.3%; HbA1c, 1.7%; and presumed Hb-Kenya, 18.8%. On high-performance liquid chromatography Hb-Kenya coelutes with HbA2 on “BioRad Variant” (Bio-Rad Laboratories, Hercules, California) and coelutes with HbA on “Primus Ultra2” (Primus Diagnostics, Kansas City, Missouri). On capillary zone electrophoresis, it coelutes with HbS. On acid-agarose electrophoresis, it migrates between HbF and HbA. Confirmatory diagnosis was performed with DNA extracted from peripheral leukocytes using a gel-polymerase chain reaction test designed specifically to detect Hb-Kenya. Hb-Kenya is due to a hybrid γβ-globin gene with crossover between codons 81 and 86 of the γ-globin and β-globin genes, resulting in a deletion of 22.7 kb between the γ-globin and β-globin genes. Hb-Kenya is functionally normal and is associated with elevation of HbF; this explains why this patient who, in spite of having no HbA, has not had a sickling crisis.

Plasmablastic Lymphoma of the Ascending Colon

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Plasmablastic lymphoma (PBL) is a rare, aggressive variant of diffuse large B-cell lymphoma arising most frequently in the oral cavity of patients with human immunodeficiency virus (HIV)/AIDS. Rare cases have been reported in extracranial sites. To our knowledge, there are only 14 case reports of extracranial PBL in a 10-year period. We report a case of PBL in an HIV+ 62-year-old man presenting with a colon mass and left periaortic lymphadenopathy. Histologic examination of a biopsy of the colon mass; cytologic, histologic, and flow cytometric examination of the lymph node; and examination of peripheral blood, bone marrow aspirate, and biopsy were performed. The lymph node biopsy showed an atypical, large cell population with prominent nucleoli that was negative for CD45, CD3, CD20, PAX5, and CD79a stains and positive for CD138 and CD43. The neoplastic cells from the colon biopsy showed large, round to ovoid, pleomorphic nuclei with prominent nucleoli, and numerous mitotic figures. The neoplastic cells from the colon biopsy were negative for CD5, CD20, CD10, CD45, and CD56 and positive for CD38, CD43, and CD138. Bone marrow morphologic examination revealed a marked increase in bone marrow plasma cells (6%), but no monoclonal protein was detected in the serum or urine by routine protein electrophoresis. This is a rare case of PBL involving the ascending colon without bone marrow involvement arising in an HIV+ patient.

Plasma Cell Myeloma Associated With Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma

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Although sharing common clinical and biological features, the occurrence of both malignancies in a single individual is rare. We report a case of a patient associated with both PC and SLL/SLL in an 81-year-old man who presented with weight loss and fatigue. Laboratory tests revealed moderate, normocytic anemia. Serum protein electrophoresis demonstrated free light chains, and Bence Jones protein was identified in the serum or urine by routine protein electrophoresis. This is a rare case of PBL involving the ascending colon without bone marrow involvement arising in an HIV+ patient.

Plasma Cell Myeloma Associated With Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma

Poster No. 62

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Pulmonary Crystal-Storing Histiocytosis: An Unusual Presentation

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Abstracts
Epstein-Barr Virus–Positive Plasmablastic Lymphoma Arising Adjacent to Low-Grade Follicular Lymphoma: Transformation or a Second Process? (Poster No. 64)

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Follicular lymphoma (FL) is generally an indolent disease; however, a substantial proportion of cases transform into high-grade lymphoma. We report a case of a 67-year-old man with a long history of FL who developed Epstein-Barr Virus (EBV)–positive plasmablastic lymphoma (PBL) that appears to have arisen from an FL clone. This is the second reported case of such a transformation. The patient is HIV-negative with a low-grade FL diagnosed 6 years before, which had responded well, with several recurrences, to radiation and R-CHOP therapy. He presented to our center with cervical and occipital lymphadenopathy. Lymph node biopsy revealed a diffuse interfollicular proliferation of large, highly proliferative (MIB-1, 90%) plasmablastic (CD20, CD79a, CD138, and MUM1 positive) cells enveloping and infiltrating nodules of low-grade follicular lymphoma (CD20, CD10, and BCL2 positive). In situ hybridization for EBV (EBER) demonstrated diffuse positivity in the large cells. Concurrent bone marrow studies demonstrated marrow involvement by the EBV-positive, large cell component. Cytogenetic studies on bone marrow revealed complex karyotypic changes, including t(14;18; 47;X,Y; add(3)(p23), der(6)(p23(6)(q23)q23q25), t(12;19)(q22,q13.3), t(14;18)(q32;q21), and +18 translocation. The finding of a single clone population supports the concept that the PBL represents a true transformation from the initial FL. It is possible that the PBL arose as a de novo process in the setting of iatrogenic immunosuppression (ie, R-CHOP therapy). Studies are ongoing to determine the clonal relationship between the PBL component and the FL component. The histologic spectrum of FL transformation will expand markedly if a clonal relationship is proven.

Measurement of Single Erythrocyte Oxygenation State, Morphology, and Hemoglobin Concentration (Poster No. 65)

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Context: Quantitative phase imaging (QPI) is capable of providing detailed morphologic analysis as well as several novel, clinically relevant parameters for red blood cells. However, because the optical phase shift through a red blood cell is a function of both thickness and refractive index, a priori knowledge of the hemoglobin concentration has, so far, been necessary for QPI techniques. This limits the reliability, accuracy, and scope of single-cell analysis using such technologies.

Design: By combining the quantitative phase information measured using a spatial light interference microscope with bright field absorption measurements, it is possible to quantitatively determine single-cell hemoglobin concentration, oxygenation state, and cell morphology.

Results: It is possible to use QPI in combination with absorption measurements as a label-free smear analysis technique that provides more information than current automated analyzers. Figure 45 shows an absorption measurement of a typical smear at (a) 450 nm and (b) a quantitative phase map.

Conclusions: Such an instrument may be deployed as a standalone blood smear analyzer in a clinical setting without relying on external measurements of hemoglobin concentrations as in previous blood-screening QPI instruments. The additional set of parameters measured may offer the ability for earlier diagnosis and could lead to the automated detection of conditions that currently require manual smear analysis.

Splenic Marginal Zone Lymphoma With t(8;14)(q24;q32)/MYC Rearrangement (Poster No. 66)

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Splenic marginal zone lymphoma (SMZL) is a distinctive, low-grade B-cell lymphoma that typically involves spleen, bone marrow, and peripheral blood. The most frequent cytogenetic aberration in SMZL is deletion of 7q21–32. Other rare cytogenetic alterations include +6, +9q, +12q, +18, +20q, and t(11;14). We present a unique case of SMZL with the sole genetic abnormality of (t(8;14)(q24;q32); this finding has not, to our knowledge, been previously reported in SMZL. The patient is a 42-year-old woman with asymptomatic lymphocytosis and splenomegaly. Splenectomy was performed and gross examination showed an enlarged spleen (997 g) with numerous, small, round, white pulp nodules throughout. Microscopically, the infiltrate consisted of medium-sized lymphocytes surrounding and replacing germinal centers with expansion into the red pulp. Bone marrow showed multiple nodular lymphocytic infiltrates. Both specimens showed uniform, low-grade cytologic features and a low Ki-67 (~10%). Flow cytometry and immunohistochemistry studies identified monotypic λ B lymphocytes with immunophenotype CD20+/FMC7+/CD5–/CD10–/CD23+. Together the morphology and immunophenotype are most consistent with SMZL. In bone marrow and spleen, (t(8;14)(q24;q32) was identified as the only cytogenetic aberration by standard karyotyping analysis with fluorescence in situ hybridization confirmation of MYC gene rearrangement. The (t(8;14) with MYC/IgH rearrangement is most commonly associated with Burkitt lymphoma. This translocation can also be seen in other aggressive, high-grade B-cell lymphomas, such as lymphoblastic lymphoma, diffuse large B-cell lymphoma, and plasmablastic lymphoma. The significance of (t(8;14) in SMZL is currently unknown; it may be associated with an aggressive clinical course. More studies are needed to elucidate the significance of this finding.

Anemia With Increased Bone Marrow Ringed Sideroblasts After Bariatric Surgery Mimicking Myelodysplastic Syndrome: More Than Just Iron and Copper Deficiency? (Poster No. 67)

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We describe a 46-year-old woman who presented with chronic refractory anemia and a prior history of gastric bypass surgery for controlling obesity-related comorbidities. She was treated with iron supplementation and multiple blood transfusions, without sustained response. The bone marrow biopsy showed dysplastic erythroid and myeloid precursors and adequate marrow iron stores with 15% abnormal ringed sideroblasts. Bone marrow karyotype was normal. Evaluations of her nutritional status revealed borderline-low, normal serum iron with serum copper in the reference range (Table). The patient received oral iron and copper supplements and also provided a prior history of Chinese herbal medication (a mixture of different minerals and multiple vitamins) use. However, her hematologic abnormalities persisted.
A Multifocal Myeloid Sarcoma Presenting Concurrently With a Pure Erythroid Leukemia in an Infant
(Poster No. 68)
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Pure erythroid leukemia (M6b by the French-American-British classification) is a rare subtype of acute myeloid leukemia with an aggressive clinical course. It is defined by more than 80% of the marrow cells being composed of immature erythroid elements with an undifferentiated or proerythroblastic appearance and no significant myeloblastic component. We report a case of a 4-month-old, male infant who presented with multifocal extramedullary myeloid sarcomas (intratemporal orbital and testicular masses) concurrent with a pure erythroid leukemia. To our knowledge, this is only the second pure erythroid leukemia presenting as a myeloid sarcoma described in the English-language literature. The patient initially presented with an intratemporal orbital mass. An incisional biopsy revealed a poorly differentiated malignancy most consistent with a myeloid sarcoma (positive findings for CD43, CD33, and CD4 by immunohistochemistry; negative results for B-cell and T-cell markers, MPO, CD34, ALK, CD42, CD61, AE1/3, MyoD1, and desmin). A bone marrow biopsy, complete blood cell count, and biopsy of a previously unmentioned testicular mass were subsequently performed. The bone marrow studies revealed a prominent erythroid blast population (CD45 dim, glycophorin A+) representing more than 85% of all nucleated elements. Peripheral smear examination revealed 19% erythroblasts. The testicular mass revealed an infiltrative population of blasts that expressed CD117 and CD235a (glycophorin A) by immunohistochemistry (Figure 46). This case highlights the importance of careful morphologic and flow cytometric analysis and expands the spectrum of presentations for pure erythroid leukemias. The young age of this patient adds to the rarity of this presentation.

Blastic Plasmacytoid Dendritic Cell Neoplasm of the Skin: A Case Report and Review of the Literature
(Poster No. 69)
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Blastic plasmacytoid dendritic cell neoplasm is an extremely rare hematologic tumor and even more rare among children. Up to the present, fewer than 30 pediatric cases have been described in the English literature. This unique neoplasm has been recently established as a distinct pathologic entity. In most cases, the tumor involves skin and subcutaneous tissue; however, it also may affect bone marrow, lymph nodes, and the liver. The differential diagnosis of acute lymphoblastic lymphoma/leukemia is often considered, but blastic plasmacytoid dendritic cell neoplasm has a unique immunohistochemical profile that is different from acute lymphoblastic lymphoma/leukemia. The prognosis in children appears to be more favorable than it is in adults, and an acute lymphoblastic leukemia treatment protocol is currently used. We describe a 7-year-old boy who presented with a fast-growing subcutaneous lesion of the anterior thigh. The lesion was excised, and the diagnosis of blastic plasmacytoid dendritic cell neoplasm was rendered. The patient underwent acute lymphoblastic lymphoma/leukemia treatment protocol with complete remission, followed by allogeneic bone marrow transplantation. To our knowledge, this is the second case of blastic plasmacytoid dendritic cell neoplasm treated with this modality. The immunohistochemical profile of the tumor, biologic behavior, and diagnostic challenges will also be discussed.

Erdheim-Chester Disease and Associated Paraproteinemia: First Reported Case
(Poster No. 70)
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Erdheim-Chester disease (ECD) is a rare, non-Langerhans cell histiocytosis. It is a multigorgan disease process characterized by proliferation of foamy histiocytes. As of yet, to our knowledge, there are no reports of monoclonal proteinemia or lymphoma accompanying ECD. We herein report a case of ECD associated with a marginal zone lymphoma with monoclonal proteinemia in a young man. He presented with a 2-week history of constitutional symptoms including malaise, night sweats, decreased appetite, dyspnea on exertion, and shortness of breath. Computed tomography, magnetic resonance imaging, and positron emission tomography (PET) scans revealed extensive adenopathy and abnormal PET uptake within the lymph nodes of the neck, supraclavicular region, chest, abdomen, and pelvis. An antemortem cervical lymph node biopsy was also performed and revealed an effaced lymph node with a dimorphic morphologic picture. A portion of the node demonstrated a proliferation of small lymphocytes with plasmacytic features. The remainder of the lymph node demonstrated a diffuse proliferation of histiocytic cells with bland morphologic features. Both immunohistochemical and morphologic profile findings were suggestive of a marginal zone lymphoma and ECD. Identification of additional cases of ECD with monoclonal immunoglobulins may be useful in identifying physiologic links between the processes.

Composite Low-Grade Follicular Lymphoma and Nodular Lymphocyte Predominance Hodgkin Lymphoma
(Poster No. 71)
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Nodal or extranodal involvement by 2 or more lymphomas is uncommon and has been described as composite lymphoma. We report on a case of an unusual composite lymphoma consisting of follicular lymphoma (FL) and nodular lymphocyte predominant Hodgkin lymphoma (NLPHL). A 65-year-old man presented with a slowly enlarging, subcutaneous lymph node reaching 2.6 cm in diameter during a period of 1 year. He had no other lymphadenopathy, organomegaly, or reported B symptoms. The histopathologic examination of the excisional lymph node biopsy showed an architecture largely effaced by closely packed, enlarged follicles without reactive germinal centers. The follicles were composed of cleaved centrocytes with rare admixed centroblasts. A separate, small, well-delineated area was also identified that demonstrated a distinctly different morphology from the remainder of the lymph node. Numerous large, vague nodules composed of small lymphocytes, histiocytes, and scattered larger atypical cells with
prominent multilobated nuclei and prominent nucleoli, lymphocyte predominant cells were present. A diagnosis of low-grade FL was rendered based on the morphology and immunophenotype including positive staining with CD20, CD10, and BCL6 as well as BCL2 rearrangement demonstrated by molecular studies. Within the described small, well-delineated area, lymphocyte predominant cells were highlighted by CD20, BCL6, and OCT-3 in the background of CD3-positive T cells, consistent with NLPHL. Based on these findings, a diagnosis of composite lymphoma consisting of FL and NPLHL was rendered. The NPLHL has an increased risk of diffuse large B-cell lymphoma; however, coexistence with FL is very uncommon with, to our knowledge, one reported case to date.

Correlation of 2 Methods in Quantifying M-Spike Proteins in Serum Protein Electrophoresis
(Poster No. 72)

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Context: Monoclonal immunoglobulins (M-spikes) are currently quantified by densitometric scanning of serum protein electrophoresis gels. The current practice is to delimit the M-spike component based on the projected gel image on screen (method A). However, the M-spike might not be accurately delimited by the borders of the scanned curve (method B). We, therefore, compared the 2 approaches with a defined, purified M-protein to determine which method corresponds more accurately to the actual M-spike concentration.

Design: Forty-one consecutive samples submitted for serum protein electrophoresis from 2010 to 2011 with positive M-spikes were analyzed simultaneously with methods A and B. Serum monoclonal immunoglobulin G (IgG), from a patient with myeloma and essentially no background polyclonal immunoglobulins, was purified by protein G sepharose column and quantified by ultraviolet spectrophotometry. The measured concentration of purified IgG by methods A and B was compared with that from ultraviolet spectrophotometry.

Results: The measurements of 41 M-spikes showed that method B yielded results that were consistently greater than they were with method A by 49% (24%) (mean [SD]). Measurements of the purified monoclonal IgG in serum showed that the results of method B correlated more closely to the true values, obtained with ultraviolet spectrophotometry.

Conclusions: The revised method (B), based on sharp change in the scanned curve, more accurately reports the level of an M-spike. It appears that the current densitometric method (A) systematically underestimates the M-spike. We suggest that laboratories consider modifying the current method of quantifying M-spikes.

Systemic Lupus Erythematosus Presenting as Necrotizing Lymphadenitis With Prominent Hematoyxlin Bodies
(Poster No. 73)

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Systemic lupus erythematosus is associated with a broad spectrum of clinical manifestations affecting virtually every organ system. Although lymphadenopathy is a common finding in lupus, it is rarely the primary presenting manifestation. We report the case of a 33-year-old, Hispanic woman with an unremarkable past medical history who originally presented with a 6-week history of fever, fatigue, and weight loss. Her initial laboratory results showed pancytopenia, and physical examination revealed axillary, cervical, and supraclavicular lymphadenopathy. *Ehrlichia* immunoglobulin M was weakly positive, whereas results for other infectious disease serologies were negative. She was started on doxycycline without improvement in her symptoms. Fine-needle aspiration of a right supraclavicular lymph node was consistent with reactive lymphoid hyperplasia. A bone marrow evaluation showed no evidence of a neoplastic or infectious process. Because a positron emission tomography-computed tomography scan showed extensive lymphadenopathy, which was highly concerning for lymphoma, 2 right axillary lymph nodes were excised. One of the lymph nodes was largely necrotic, whereas the other was partially necrotic. The viable areas exhibited hyperplastic features, including paracortical hyperplasia, sinus histiocytosis, and scattered secondary follicles. Both lymph nodes contained prominent, subcapsular, and perivascular hematoyxlin bodies (Figure 47), which strongly suggested lupus lymphadenitis. Special staining for fungi and acid-fast bacteria was negative. Subsequently, a high-titer ANA and antidual-stranded DNA were identified. The patient was started on methylprednisolone and hydroxychloroquine with rapid clinical improvement. In patients presenting with necrotizing lymphadenitis, the differential diagnosis should include systemic lupus erythematosus in addition to Kikuchi disease, infection, and neoplastic diseases.

Comparison of Prothrombin Time–International Normalized Ratio Values Derived From Point-Of-Care Devices Versus Coagulation Instrument Results in a Multisite, Anticoagulation Clinic Setting
(Poster No. 74)

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Context: The long-term management of anticoagulation with warfarin requires reliable measurements of prothrombin time–international normalized ratio (PT-INR) for maintenance of patients within therapeutic ranges. The Geisinger Health System multisite, pharmacy-managed anticoagulation clinic has 8143 patients at 16 sites where routine fingerstick PT-INR, patient evaluation, and Coumadin dose adjustments are performed by a doctor of pharmacy (PharmD). The laboratory medicine point-of-care testing (POCT) section is responsible for instrument selection, method validation, personnel training, and proficiency testing. Recent occurrences of unexpectedly high results with the i-STAT (Abbott Laboratories, Abbott Park, Illinois) led us to perform a comparison of the i-STATs, first with simultaneous venipuncture samples on Stago instruments (Diagnostica Stago, Parsippany, New Jersey) and then with the CoaguChek (Roche Diagnostics, Indianapolis, Indiana) device.

Design: In the first phase, 38 samples were analyzed by i-STAT versus Stago throughout a range of 1.01 to 3.18 INR. Deming regression yielded Y = 1.51 × X − 0.705, where Y = INR i-STAT and X = INR Stago. The second phase was performed with 78 patients at 3 clinic

<table>
<thead>
<tr>
<th>Comparison</th>
<th>INR Range</th>
<th>No.</th>
<th>Deming Regression</th>
<th>Correlation Coefficient, r</th>
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<tbody>
<tr>
<td>i-STAT</td>
<td>1.29 to 4.72</td>
<td>78</td>
<td>i-STAT = 1.412 × (Stago INR)</td>
<td>0.838</td>
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<tr>
<td>Stago</td>
<td></td>
<td></td>
<td>−0.808</td>
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<tr>
<td>CoaguChek</td>
<td>1.29 to 4.72</td>
<td>76</td>
<td>CoaguChek = 1.27 × (Stago INR) − 0.547</td>
<td>0.913</td>
</tr>
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</table>

Abbreviations: INR, international normalized ratio.
Primary Splenic Mantle Cell Lymphoma: A Variant Form and Potential Diagnostic Pitfall

(Poster No. 75)

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Context: Primary splenic mantle cell lymphoma (MCL) is an uncommon finding that is limited to single case reports and may be confused with other mature B-cell neoplasms in the spleen.

Design: A 5-year retrospective search of the pathology database was performed to identify cases of MCL, which presented initially as splenomegaly. The morphologic and immunophenotypic features were evaluated to confirm the diagnosis of MCL and to distinguish MCL from other mature B-cell neoplasms more commonly seen in the spleen.

Results: The age of patients ranged from 52 to 77 years (median, 62), and all cases (100%) involved men. Four cases (50%) showed an immunophenotype atypical for MCL with loss of CD5 in 3 cases (37.5%) and expression of CD23 in 1 case (12.5%); however, all cases demonstrated cyclin D1 positivity, supporting a diagnosis of MCL. Of the 4 cases with an atypical immunophenotype, 3 were initially misdiagnosed as splenic marginal zone lymphoma. All patients are still living; with 5 patients (62.5%) having a follow-up time of greater than 36 months and 2 patients (25%) having a follow-up time of greater than 84 months.

Conclusion: Primary splenic MCL is an uncommon observation primarily seen in older men. An atypical immunophenotype occurs in half of cases, but cyclin D1 staining is retained in all cases. Cases with an atypical immunophenotype and morphology were frequently confused with splenic marginal zone lymphoma. Although MCL carries a poor prognosis, primary splenic presentations appear to have a better outcome than do presentations in other sites.

Loss of Light Chain Expression in a Case of B-Cell Lymphoma With Features Intermediate Between Diffuse Large B-cell Lymphoma and Burkitt Lymphoma

(Poster No. 76)

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A 66-year-old woman had a 5-month history of fatigue, weight loss, fevers, and night sweats. Peripheral blood counts found the patient to be anemic and thrombocytopenic. Bone marrow biopsy revealed a markedly hypercellular marrow (100%) that was extensively replaced by atypical lymphocytes of intermediate size. The lymphocytes had variably dispersed chromatin with frequent cytoplasmic vacuoles. By immunohistochemistry, they were positive for CD19, CD20, CD10, and BCL2 (weakly); they were negative for CD5 and TdT. Ki-67 revealed a proliferative index of greater than 90%. Flow cytometry analysis revealed an atypical lymphocytic population that expressed CD19, CD20, and CD10 without expression of surface and intracellular κ or λ light chains. Fluorescence in situ hybridization studies demonstrated t(8;14) in 96% and MYCq/8q24 in 99% of cells without t(14;18). Cytogenetics revealed a complex karyotype with hyperdiploidy (53 chromosomes) with complex rearrangement of the 8;14 translocation involving the short arm of chromosome 1, resulting in a t(8;14)(1 rearrangement. Additionally, there was a derived chromosome 3 from a t(3;14)(q27‐q32). The combined morphologic, phenotypic, and genotypic findings indicate a B-cell lymphoma with features intermediate between diffuse large B-cell lymphoma and Burkitt lymphoma. Our case of MYC/8q24 breakpoints in combination with BCL6/3q27 breakpoint, a double-hit lymphoma is favored. This is a rare case of double-hit lymphoma with complete absence of surface and intracellular immunoglobulin expression.

Splenic Diffuse Red Pulp Small B-Cell Lymphoma With Large Cell Transformation: A Rare Presentation of a Provisional Entity

(Poster No. 77)

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Under the 2008 World Health Organization classification, splenic diffuse red pulp small B-cell lymphoma has been categorized as a provisional entity. The classification specifies that this diagnosis should be restricted to characteristic cases that fulfill the major features described under the provisional entity. All cases are diagnosed at clinical stage IV, with splenic red pulp, peripheral blood, and bone marrow involvement. It is considered a leukemic neoplasm, usually showing mild lymphocytosis and is considered incurable. However, it is usually indolent with a good response after splenectomy.

We present a case of a 57-year-old woman who was diagnosed with marginal zone lymphoma on a bone marrow biopsy in 2006. After chemotherapy failed, her splenomegaly did not improve, and a splenectomy was performed in January 2011. The final diagnosis of splenic diffuse red pulp small B-cell lymphoma was made by histology, immunohistochemistry, and flow cytometry. Two months after her splenectomy, she came to the emergency room with confusion and fatigue. A complete blood cell count showed a white blood cell count greater than 400,000 x 10^9/L and 64% atypical lymphoid cells. A bone marrow biopsy demonstrated almost complete marrow replacement by enlarged, pleomorphic, atypical lymphoid cells; the diagnosis was confirmed by immunohistochemistry, flow cytometry, and cytogenetics. This indicates that the indolent small cell lymphoma had transformed into a higher-grade, large cell lymphoma. The patient expired 2 weeks after admission to the hospital. To our knowledge, it is extremely rare for this entity to have a large cell transformation and be associated with a rapid demise.

Gastric Peripheral T-Cell Lymphoma, γδ Type: A Rare Case

(Poster No. 78)

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Peripheral T-cell lymphomas, not otherwise specified (PTCL-NOS), are classified as mature T-cell neoplasms in the World Health Organization classification of hematolymphoid malignancies. Most PTCLs express γδ type of T-cell receptors. Only rare cases have been shown to express γδ T-cell receptors, with most being in stomach, small intestine, colon, thyroid, lung, larynx, and nose. We report a case of 77-year-old woman who presented with abdominal pain, nausea, and shock-like symptoms. A partial gastrectomy revealed a large, perforated ulcer measuring 3.4 x 2.4 cm with thickened gastric folds. Histologically, sections showed ulceration with adjacent lymphoid infiltrates filling the lamina propria and permeating the muscularis propria. The atypical lymphoid cells were positive for CD2, CD3, CD8, CD43, granzyme, and TIA-1. There was partial loss of CD5 and CD7, and these cells were negative for βf-1. A γδ T-cell origin was favored by a lack of expression for αβ T-cell receptors. γδ Type PTCL-NOS of the stomach is extremely rare. To the best of our knowledge, only 2 cases have been reported previously.

Hemophagocytic Lymphohistiocytosis Associated With a Rare Case of CD4+, CD8+ Peripheral T-Cell Lymphoma, Not Otherwise Specified

(Poster No. 79)

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Hemophagocytic lymphohistiocytosis (HLH) is an acute, life-threatening syndrome. The clinical features, such as fever, jaundice, pancytopenia, hepatosplenomegaly, coagulopathy, and central nervous system manifestations, as well as the pathologic findings of hemophagocytosis, are the result of excessive activation of monocytes/macrophages by hyperproduced cytokines. Cases of HLH have been associated with infectious, genetic, and lymphoproliferative diseases. We report a case of HLH associated with an advanced peripheral T-cell lymphoma, not
otherwise specified (PTCL-NOS). A 56-year-old man with a history of prostatic carcinoma, after prostatectomy and chemotherapy, presented with fever, body aches, malaise, and weight loss for a month. He was found to have pancytopenia, markedly elevated levels of ferritin and lactate dehydrogenase, abnormal liver function test result and lipid profile, and generalized lymphadenopathy. Clinical and laboratory findings strongly favored a diagnosis of HLH. A bone marrow biopsy and aspiration was performed and revealed a population of pleomorphic cells with vesicular chromatin, prominent nucleoli, and small amount of cytoplasm. The proliferation index (Ki-67) was 60% to 80%. Immunophenotyping by flow cytometry and immunohistochemistry showed these cells were immunoreactive for CD2, CD3 (membranous), TIA-1, and granzyme and were negative for CD4, CD8, CD3, CD7, and IFI1. In situ hybridization for Epstein-Barr Virus–encoded RNA (EBER) was negative. Most cases of PTCL-NOS are CD4+, CD8+. The double-negative CD4-/CD8– immunophenotype is rare and has been reported to be associated with an unfavorable prognosis. More studies are warranted to confirm whether the double-negative immunophenotype is an independent factor associated with unfavorable prognosis.

**Pseudoaneurysm in Long-Term Care Facilities**

(Roster No. 80)

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**Context:** Anemia is very common in the geriatric population. The definition of anemia relies heavily on the complete blood count (CBC) count and specifically hemoglobin and hematocrit, which are affected by several factors: ethnic background, sex, altitude, and physiologic fluctuation of plasma volume. It has been shown that posture can cause change in the results for some blood indices.

**Design:** The CBC specimens were collected from residents in long-term care facilities early in the morning when the patients were still in bed. Another set of CBC specimens were collected from the same patients in the afternoon. The patients’ position was noted, and CBC results were collected using Coulter LH 780 impedance/cell sizing counter (Beckman Coulter, Fullerton, California). Statistic calculations were performed using Statistica (StatSoft, Tulsa, Oklahoma). We considered any P < .05 to be statistically different.

**Results:** All the samples showed an increase in CBC values between early morning (patient in bed) and afternoon (patient has been moving). The most statistically significant difference was with hemoglobin followed by hematocrit, red blood cells, platelets, and white blood cells.

<table>
<thead>
<tr>
<th>Test</th>
<th>AM, No. (SD)</th>
<th>PM, No. (SD)</th>
<th>P</th>
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<tbody>
<tr>
<td>White blood cell count, No./µL</td>
<td>8.74 (4.1)</td>
<td>10.02 (5.3)</td>
<td>&lt; .001*</td>
</tr>
<tr>
<td>Red blood cell count, ×1012/µL</td>
<td>3.46 (0.59)</td>
<td>3.64 (0.66)</td>
<td>&lt; .001*</td>
</tr>
<tr>
<td>Hemoglobin, g/dL</td>
<td>10.55 (1.65)</td>
<td>11.07 (1.82)</td>
<td>&lt; .001*</td>
</tr>
<tr>
<td>Hematocrit, %</td>
<td>31.8 (4.7)</td>
<td>33.63 (5.65)</td>
<td>&lt; .001*</td>
</tr>
<tr>
<td>Platelet count, ×1012/µL</td>
<td>266.6 (136.1)</td>
<td>285.7 (143.8)</td>
<td>&lt; .001*</td>
</tr>
</tbody>
</table>

* Statistically significant.

**Conclusion:** Our results confirm the notion that a change in posture causes changes in some of the blood indices; posture changes the hydrostatic pressure that leads to a change in the movement of fluid between interstitial space and intravascular space and causes physiologic fluctuations in blood volume. Physicians should give more attention to this fact, especially in severely anemic patients, where the difference in posture may alter the hemoglobin result or indicate a need for more aggressive treatment (blood transfusion).

**B-Lymphoblastic Leukemia With a Novel t(11;15)(q23;q15) Rearrangement and Unique Burkittoid Morphologic and Immunophenotypic Findings**

(Roster No. 82)

Megan C. Smith, MD1 (megan.c.smith@vanderbilt.edu); Megan Kressin, MD2; Eric Crawford, PhD, DABMG3; Mary Lowery Nordberg, PhD2; Annette Kim, MD, PhD.1 1Department of Pathology, Vanderbilt University Medical Center, Nashville, Tennessee; 2Department of Cytopathology, Genetics, Nashville, Tennessee; 3Department of Medicine, New York University School of Medicine, New York.

**Results:** The double-negative CD4-/CD8– immunophenotype is rare and has been reported to be associated with an unfavorable prognosis. More studies are warranted to confirm whether the double-negative immunophenotype is an independent factor associated with unfavorable prognosis.

**Hemoglobinopathies are frequently discovered during prenatal evaluations. A 26-year-old, pregnant woman (gravida 1, para 0) was screened for hemoglobinopathy and anemia during a routine prenatal evaluation. Initial laboratory studies showed the following values: hemoglobin, 12%; hematocrit, 34%; mean corpuscular volume, 84 µm3; red blood cell distribution width, 13; and unremarkable red blood cell morphology. High-pressure liquid chromatography demonstrated an unusual peak that eluted ahead of hemoglobin A at 1.8 minutes, but no variant bands were detected by citrate agar or cellulose acetate gels. The high-pressure liquid chromatography detected the following: hemoglobin A, 72%; variant hemoglobin, 24.3%; hemoglobin A2, 2.1% and hemoglobin F, 0.9%. Genomic DNA was extracted from peripheral blood leukocytes. Her β-globin and α-globin genes were amplified by polymerase chain reaction separately, the amplicons purified, and direct nucleotide sequencing was performed. No mutations were found in the patient’s β-globin genes. The patient was found to be heterozygous for a β-globin gene mutation at codon 89 (CAC→GAG or formylmethionine). Although this mutation was initially reported as a novel β-globin gene mutation, it was subsequently identified as Hb Buffalo. This finding emphasizes the importance of screening pregnant patients for hemoglobinopathies.

**Isolated Intracranial Myeloid Sarcoma Mimicking Lymphoblastic Lymphoma in a 2-Year-Old Girl**

(Roster No. 83)

Huazhang Guo, MD, PhD (huazhang.guo@gmail.com); Humayun Islam, MD, PhD; Alex Braun, MD; Fouzia Shakil, MD, PhD. Department of Pathology, Westchester Medical Center, Valhalla, New York.

**Results:** Isolated intracranial myeloid sarcomas without bone marrow involvement are extraordinarily rare, especially in children. The initial diagnosis can be challenging. Here, we report an isolated central nervous system (CNS) myeloid sarcoma in a 2-year-old girl. She presented with grand mal seizures. Peripheral blood tests showed negative results. Computed tomography scan showed extensive intracranial hemorrhage in bilateral frontal lobes. Magnetic resonance imaging revealed a large extra-axial mass in the frontal lobes bilaterally. Abundant blast–appearing cells with moderate amounts of cytoplasm were found in cerebrospinal fluid (CSF). Initial flow cytometry of the CSF was done with limited markers because of the low cell count, and only lymphoid markers were studied, revealing negative results. Results of bone marrow studies were negative. A biopsy of...
the mass was performed by frontal craniotomy. The biopsy showed sheets of immature mononuclear cells with a moderate amount of cytoplasm, predominantly rounded nuclei, smudgy to open chromatin, and frequent prominent nucleoli. Immunohistochemical study showed the cells were positive for CD4, CD56, CD68, and CD15; they were negative for MPO. Flow cytometry concerning with myeloid sarcoma with monocytic differentiation. Cytogenetic analysis revealed a normal female karyotype. After systemic and intrathecal chemotherapy, CSF was cleared of the tumor cells, and the frontal mass disappeared. During the 3 months follow-up, the patient remained disease-free. Results of multiple bone marrow studies during this period were negative, confirming an isolated extramedullary myeloid sarcoma. We suggest that the initial workup of a suspected pediatric hematolymphoid malignancy in CNS should include both myeloid and lymphoid markers.

Refractory Anemia With Excess Blast-2 With Basophilia and Plasmacytoid Dendritic Cell Neoplasm
(Poster No. 84)

Niti Manglik, MBBS, MD (nitmanglik@gmail.com); Judith P. Brody, MD. Department of Pathology, North Shore Long Island Jewish Health System/Hofstra North Shore-Long Island Jewish School of Medicine, New Hyde Park, New York.

Plasmacytoid dendritic cell (PDC) nodules have been described in association with chronic myelomonocytic leukemia and few other myeloid neoplasms. Some studies have provided evidence that these nodules, apart from being clonal, are also associated with underlying myeloid disorder. Very few cases of PDC nodules have been reported in myelodysplastic syndrome, and to the best of our knowledge, only 3 of these cases were refractory anemia with excess blast (RAEB). We hereby describe a case of a 64-year-old woman with a history of myelodysplastic syndrome who presented with the complaints of recent onset fever and shortness of breath. Peripheral blood examination was significant for the following: hemoglobin, 10.8 g/dL; platelet count, 38,000/µL, with 5% blasts and 1% basophils. The bone marrow aspirate showed 14% myeloblasts, 57% granulocytes, 18% basophils, and a small number of cells with PDC morphology. Flow cytometry showed 15% myeloblasts and positivity for HLA-DR, CD34, CD117, CD33, CD13, dim CD11b, CD56, and partial CD15. In addition, increased basophils (7%) were present. Bone marrow biopsy revealed interstitial, immature infiltrate (CD34-positive; 10%–20% of cells), mononuclear cell aggregates, myeloid maturation, absent erythroid precursors, megakaryocytes with dysplastic morphology, marked basophilia, and increased iron stores. Interstitial and nodular infiltrate results were positive for CD123, CD45, CD68, CD4, and dimly for CD56 and were negative for CD3, CD20, CD34, CD117, CD15, and myeloperoxidase, consistent with PDCs. Karyotyping showed deletion 5q, trisomy 21, monosomy 7, and isochromosome Xp, and fluorescence in situ hybridization showed 5q31 deletion in 78% of the cells. The above findings are consistent with RAEB-2 with basophilia and plasmacytoid dendritic cell neoplasm. The patient progressed to acute myeloid leukemia within 3 months and expired.

Sézary Syndrome Incidentally Identified by Bone Marrow Examination: A Rare Disease in “Atypical” Presentation
(Poster No. 85)

Xiangrong Zhao, MD, PhD (xzhaor@berkeley.edu) Department of Pathology, New York University Langone Medical Center, New York.

Sézary syndrome (SS) is a rare disease primarily affecting the middle-aged and elderly with a male predominance. It is defined by the triad of circulating Sézary cells (clonally related neoplastic T cells with characteristic cerebriform nuclei), erythroderma, and lymphadenopathy. Bone marrow (BM) involvement is uncommon, and, when present, the infiltrates are often sparse. This is a report of a case of SS “incidentally” identified by BM examination. An 82-year-old, white man had persistent mononuclear cell aggregates, myeloid dyscrasia, revealed trisomy 1; 1q duplication; hyperdiploidy of chromosomes 3, 5, and 9; and multiple unusual patterns. Flow cytometry of the bone marrow aspirate showed 12% CD4+ CD7− T cells. The BM morphology review demonstrated hypercellular bone marrow largely effaced by a T-cell lymphoproliferative disorder, with intermediate to large cells exhibiting highly convoluted nuclei and abundant cytoplasm (Figure 48). These cells were uniformly CD3− with strong coexpression of CD4 (Figure 48, inset) and CD5, and loss of CD7 expression. The CD4/CD8 ratio was elevated to more than 10, with CD8 highlighting small, scattered T cells only. There was no expression of ALK-1, CD30, or CD25. Given the poor prognosis of SS, high surveillance and good workup strategy are desirable, especially for cases with “atypical” presentations.

Acquired Type IIA von Willebrand Disease Mimicking the Inherited Coagulation Disorder: A Diagnostic Challenge
(Poster No. 86)

Sarah Barnhard, MD (sarah.barnhard@ucdmc.ucdavis.edu); Robert Gosselin, CLS; Mingyi Chen, MD, PhD. Department of Pathology and Laboratory Medicine, University of California Davis, Sacramento.

von Willebrand disease (vWD) is an inherited qualitative or quantitative abnormality of von Willebrand factor (vWF), a multimeric glycoprotein serving as the carrier protein of coagulation factor VIII. Type IIA vWD, an autosomal-dominant trait, is characterized by a deficiency of high molecular weight vWF multimers with a decreased vWF activity to antigen ratio in spite of factor VIII and vWF antigen levels within reference range. We report a case of a 47-year-old, African-American man who presented with the complaints of recent onset fever and shortness of breath. Peripheral blood examination was significant for the following: hemoglobin, 10.8 g/dL; platelet count, 38,000/µL, with 5% blasts and 1% basophils. The bone marrow aspirate showed 14% myeloblasts, 57% granulocytes, 18% basophils, and a small number of cells with PDC morphology. Flow cytometry showed 15% myeloblasts and positivity for HLA-DR, CD34, CD117, CD33, CD13, dim CD11b, CD56, and partial CD15. In addition, increased basophils (7%) were present. Bone marrow biopsy revealed interstitial, immature infiltrate (CD34-positive; 10%–20% of cells), mononuclear cell aggregates, myeloid maturation, absent erythroid precursors, megakaryocytes with dysplastic morphology, marked basophilia, and increased iron stores. Interstitial and nodular infiltrate results were positive for CD123, CD45, CD68, CD4, and dimly for CD56 and were negative for CD3, CD20, CD34, CD117, CD15, and myeloperoxidase, consistent with PDCs. Karyotyping showed deletion 5q, trisomy 21, monosomy 7, and isochromosome Xp, and fluorescence in situ hybridization showed 5q31 deletion in 78% of the cells. The above findings are consistent with RAEB-2 with basophilia and plasmacytoid dendritic cell neoplasm.

Sézary syndrome (SS) is a rare disease primarily affecting the middle-aged and elderly with a male predominance. It is defined by the triad of circulating Sézary cells (clonally related neoplastic T cells with characteristic cerebriform nuclei), erythroderma, and lymphadenopathy. Bone marrow (BM) involvement is uncommon, and, when present, the infiltrates are often sparse. This is a report of a case of SS “incidentally” identified by BM examination. An 82-year-old, white man had persistent mononuclear cell aggregates, myeloid dyscrasia, revealed trisomy 1; 1q duplication; hyperdiploidy of chromosomes 3, 5, and 9; and multiple unusual patterns. Flow cytometry of the bone marrow aspirate showed 12% CD4+ CD7− T cells. The BM morphology review demonstrated hypercellular bone marrow largely effaced by a T-cell lymphoproliferative disorder, with intermediate to large cells exhibiting highly convoluted nuclei and abundant cytoplasm (Figure 48). These cells were uniformly CD3− with strong coexpression of CD4 (Figure 48, inset) and CD5, and loss of CD7 expression. The CD4/CD8 ratio was elevated to more than 10, with CD8 highlighting small, scattered T cells only. There was no expression of ALK-1, CD30, or CD25. Given the poor prognosis of SS, high surveillance and good workup strategy are desirable, especially for cases with “atypical” presentations.
American man with a history of heart failure because of severe aortic stenosis. He presented with persistent bleeding after tooth extractions in preparation for aortic valve replacement. Laboratory studies revealed a normal platelet count, platelet morphology, prothrombin time, international normalized ratio, fibrinogen, and coagulation factor assays. Platelet aggregation in response to thrombin, collagen, arachidonic acid, and ristocetin were normal. The platelet function assay closure times in response to both epinephrine and ADP were markedly prolonged. The vWF activity and antigen were within reference range, but the ratio was markedly decreased, a finding typically associated with type II vWD. The vWF activity to antigen ratio normalized within 48 hours. The vWF activity in plasma obtained immediately after the valve replacement, confirming the diagnosis of acquired type IIA vWD (Table). Increased shear stress in aortic stenosis may enhance the direct cleavage of vWF, resulting in a loss of high molecular weight VWF multimers. This condition is known as acquired type IIA vWD because it mimics the inherited disorder. Recognition of this rare, acquired coagulation abnormality in patients with valvular stenosis is critical to prevent misdiagnosis and establish appropriate treatment.

**A Testing Panel for Lupus Anticoagulant With Improved Sensitivity**

Alyaa Al-Ibraheemi, MD (alyaa.q.alibraheemi@uth.tmc.edu); Andy Nguyen, MD. Department of Pathology, University of Texas, Houston, Texas.

**Context:** Testing for Lupus anticoagulant (LA) remains problematic because of the lack of a single test that is both sensitive and specific. Laboratories typically have to use a panel consisting of a screening test and a confirmatory test. The most widely used tests are the dilute Russell viper venom time (dRVVT) and the hexagonal phospholipid neutralization (HPN) for screening and confirmation, respectively. Our anecdotal experience showed that this particular panel had missed a significant number of cases with LA. In this study, we design a new panel and assess the improvement in testing sensitivity.

**Design:** Our new panel calls for testing of both dRVVT and HPN. If both results are negative or positive, this indicates the absence or presence of LA. If any one of the 2 results is positive, a platelet neutralization procedure (PNP) would be performed. A positive PNP would support the presence of LA and vice versa. After implementation of the new panel, we prospectively evaluated 41 patients with prolonged dRVVT or HPN.

**Results:** Using the results of the new panel as a gold standard, the specificity of the old panel is 100%. However, the sensitivity of the old panel is quite low (12%). Further analysis showed that this low sensitivity was mostly due to the low sensitivity of HPN and, in some cases, the low sensitivity of dRVVT.

**Conclusions:** The improvement in sensitivity with the new panel (dRVVT, HPN, and PNP), as shown in this study, suggests that this panel may be considered an optimal method to diagnose LA.

**Neonatal Hemochromatosis: A Case Report of Successful Treatment With Exchange Transfusion and Intravenous Immunoglobulin**

Kelly L. West, MD, PhD (kelly.west@duke.edu); Evelyn Lockhart, MD. Department of Pathology, Duke University Medical Center, Durham, North Carolina.

Neonatal hemochromatosis (NH) is a rare disease that presents with hepatic failure and extraparenchymal siderosis in a manner similar to hereditary hemochromatosis, yet differs greatly in its pathophysiology. The NH is believed to be an alloimmune process wherein maternal antibodies directed against a yet-unidentified fetal liver antigen cause hepatic injury and secondary siderosis. We report the case of a 5-day-old neonate born to a primigravida who presented with coagulopathy of concern for disseminated intravascular coagulation. Workup revealed elevated alkaline phosphatase, γ-glutamyl transferase, ferritin, α-fetoprotein, and serum amino acid levels but normal results for alanine aminotransferase and aspartate aminotransferase levels. Salivary gland biopsy showed extraparenchymal siderosis, confirming the diagnosis of NH. The patient was successfully treated with a regimen that included exchange transfusion and intravenous immunoglobulin. Medical therapy for NH has focused on oxidative injury induced by iron overload and has included antioxidants and iron chelators. However, the effectiveness of medical therapy is limited, and often neonatal liver transplant is necessary. In general, the survival of patients with NH is poor, with an average life expectancy of days to weeks. With recent advances in our understanding of the pathophysiology of NH, newer approaches are targeting suspected alloimmune etiologies. Success has been reported with gestational intravenous immune globulin for pregnancies known to be at risk. A second approach is exchange transfusion in the neonate; however, experience with this modality is limited. We report a case of successful treatment of NH with exchange transfusion and intravenous immunoglobulin, adding to the repertoire of knowledge about treatment of this rare, devastating disease.

**Another Approach to Rapidly Thaw Frozen Plasma—Texas Style**

Walter Linz, MD (Wlinz@swmail.sw.org); Michael Weaver, MLS (ASCP); Cynthia Glover, MT (ASCP) SBB. Department of Clinical Pathology, Scott & White Healthcare, Temple, Texas.

**Context:** Recent studies have suggested that resuscitation of patients requiring massive transfusion support is best accomplished with a 1:1 ratio of red blood cells to plasma to platelets. To address rapid turnaround of fresh-frozen plasma and to conserve resources, we hypothesized we could safely decrease thaw time by freezing plasma in a large transfer bag, thus increasing the surface area of the product and decreasing subsequent thaw time in a standard water bath.

**Design:** Whole blood is collected in compliance with all applicable FDA regulations in an IMUFLEX WB-RP Blood Bag (Terumo Corporation, Tokyo, Japan). After the plasma is separated from the whole blood, the plasma bag is connected to a 2000-mL Teruflex Transfer bag (Terumo) using a sterile docking technique. The transfer bag is placed flat in a ~18°C freezer overnight. The product was thawed in a conventional 37°C water bath. Time to thaw was measured for 9 large 2000-mL bags and compared with 9 routine-size 400-mL bags. Preliminary demographic data for the calendar year of data were also acquired.

**Results:** The mean thaw time for large bag rapid-thaw plasma units was 5.81 (±0.34) minutes, whereas the routine fresh-frozen plasma units had an mean thaw time of 16.86 (±0.22) minutes. Rapidly thawed plasma was primarily supported to request the cardiac thoracic service (45.7%) and trauma (26.1%) service.

**Conclusion:** A large (2000 mL) bag of frozen plasma product can be thawed in considerably less time than routine frozen plasma products, making possible quicker thawed plasma response.

**Discovery of a Rare Anti-Js<sup>+</sup> Antibody Due to Incompatible Crossmatch**

Jamie Odem, MD (odemj@missouri.edu); Marian Petrides, MD. Department of Pathology, University of Missouri, Columbia.

Js<sup>+</sup> was first identified as a “new” blood group antigen in blacks in 1958. Since then, the antigen frequency of the Js<sup>+</sup> antigen has been shown to be 20% in the black population, whereas the antigen frequency in whites is far lower (0.01%). Because most donors are white and, therefore, Js<sup>+</sup>-negative, anti-Js<sup>+</sup> is rarely encountered. Although rare, anti-Js<sup>+</sup> can be clinically significant, causing moderate hemolysis and mild to severe hemolytic disease of the newborn. We describe the case of a 22-year-old, black man with sickle cell disease receiving C-, E-, and K-matched red cell exchange transfusions monthly for stroke prevention, who had an unexpectedly incompatible immunoglobulin crossmatch. Upon further evaluation, he was found to have anti-Js<sup>+</sup>. His initial antibody workup demonstrated only anti-E. However, the anti-Js<sup>+</sup> became apparent when crossmatch of 12 E-negative red cell units revealed 3 units to be crossmatch-incompatible. Further evaluation eventually defined the specificity to be anti-Js<sup>+</sup>. This case highlights that anti-Js<sup>+</sup> can be a clinically significant antibody and underscores the rationale behind requiring a full (antiglobulin) crossmatch whenever the antibody screen is positive, even if antigen-negative units are being crossmatched. In addition, this case serves as a reminder that, although Js<sup>+</sup> is a rare antigen in white blood donors (0.01%), it occurs with higher frequency in blacks (20%). Therefore, the possibility of anti-Js<sup>+</sup> must be considered, particularly when a low-incidence antibody is detected in a sickle cell patient receiving partially antigen-matched units from black donors.

**Does Concurrent Measurement of Fibrinogen Degradation Products Add Value to D-Dimer Testing?**

Sterling T. Bennett, MD (sterling.bennett@mail.org). Department of Pathology, Intermountain Medical Center, Murray, Utah.

**Context:** The quantitative D-dimer test has largely supplanted the semiquantitative fibrinogen degradation products (FDP) test because of the greater sensitivity and specificity of D-dimer in disseminated
Comparison of FDP and D-Dimer Results

<table>
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<th>FDP+, No.</th>
<th>FDP-, No.</th>
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<td>Negative, No.</td>
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<td>31</td>
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<td>94.0</td>
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<td>Frequency, %</td>
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Intravascular coagulation and venous thromboembolism, but FDP continues to be ordered by physicians affiliated with Intermountain Healthcare. The frequency and concordance of concurrent tests for D-dimer and FDP and the influence of positive FDP results on clinical decisions in real-world medical practice were retrospectively evaluated.

Design: Instances of concurrent measurement of FDP (FDP Plasma, Diagnostica Stago, Inc., Parsippany, New Jersey) and D-dimer (STA Liatest D-Dx, Diagnostica Stago) during 2009-2010 were identified in the enterprise data warehouse. Test results were extracted and classified as negative or positive. Concordance was assessed using the McNemar test for correlated proportions. Electronic medical records were reviewed to assess the effect of positive FDP results on clinical decision-making when D-dimer was negative.

In 542 of 821 orders (66.3%) for FDP, D-dimer was also ordered. As shown in the Table, FDP and D-dimer values were concordant in 424 of 521 pairs (81.4%). In the 97 discordant pairs, D-dimer was positive in 86 (88.7%) and FDP was positive in 11 (11.3%) (P < .001). Chart reviews did not identify any instances where a positive FDP value overrode a negative D-dimer value in diagnostic or therapeutic decisions.

Conclusions: Concurrent measurement of FDP and D-dimer adds little, if any, value over D-dimer alone.

Unusual Collision Tumors: Cervical Carcinoma and Burkitt Lymphoma Metastatic to Meningioma

Elena Vrotsos, DO (elena.choumikina@msmcm.com); Alicia Hirzel, MD; Lydia Howard, MD. Department of Pathology, Mount Sinai Medical Center, Miami Beach, Florida.

The simultaneous occurrence of carcinoma within a meningioma, a form of collision tumor, is a rare, but well-described event. The most common site of the primary carcinoma is breast and lung. We describe 2 cases of metastatic carcinoma to a meningioma. The first case involves a 52-year-old woman diagnosed with cervical cancer 4 years previously. She presented to the emergency department with left-sided weakness. Magnetic resonance imaging revealed a mass in the left parietal region. Histologic and immunohistochemical analysis revealed metastatic squamous cell carcinoma to a meningioma. This was previously reported in the literature in 1977, but this is the second report of metastatic cervical carcinoma to a meningioma. In addition, we describe the vascularity and receptor status of meningioma, which may make them susceptible to metastases. Our second case involves a 48-year-old woman diagnosed with scleroderma 16 years previously. Approximately 4 years ago, she began treatment with Imuran (azathioprine, GlaxoSmithKline, King of Prussia, Pennsylvania). In August 2010, she noticed a rapidly growing mass in her left axilla, which was subsequently diagnosed as Burkitt lymphoma. Additionally, a 2-cm, dural-based mass was identified and biopsied. The mass was diagnosed as a meningioma at frozen section; however, on close review of permanent sections, there were multiple microscopic foci demonstrating cells with a high Ki-67 index and atypia. These cells additionally demonstrated positivity for CD10 and Pax5 and negative staining for CD3 and CD20, consistent with the patient’s previously diagnosed Burkitt lymphoma.

Primary Medulloblastomas Express Functional CD1d and Can Be Targeted for Immunotherapy With NKT Cells

Liping Song, MD, PhD1 (lp2014@gmail.com); Daofeng Liu, PhD2; Leonid Metelitsa, MD, PhD. 2Department of Pathology, University of Texas Health Science Center, Houston; 2Department of Hematology/Oncology, Texas Children’s Hospital, Houston.

Context: Current therapies for medulloblastoma (MB) are not curable for a third of patients and have debilitating long-term toxicity.

Immunotherapy has the potential to overcome the side effects of conventional treatments by eliciting patients’ immune responses. Type I natural killer T cells (NKTs) are CD1d restricted and mediate antitumor immune responses as demonstrated in multiple models of cancer as well as in recent oncology clinical trials.

Design: Investigate CD1d expression and function in primary medulloblastoma tissues from 40 patients and 5 medulloblastoma cell lines.

Results: In the initial screen of potential targets for immunotherapy, we performed gene expression analysis of 20 primary MB tumors and found that 9 of them (45%) expressed high levels of CD1d RNA. Nearly all tumor cells in the corresponding specimens expressed CD1d protein on the cell surface. Two of 5 analyzed MB cell lines (40%; DAOY and MHH-MED-8A) also were CD1d+. Functional experiments demonstrated that both cell lines effectively presented α-galactosylceramide (α-GalCer) to activate NKT-cell cytotoxic production, proliferation, and cytotoxicity. An α-GalCer as target ratio as low as 2:1 was sufficient to kill an invasion of MB cells in vitro. The cytotoxicity was CD1d-restricted because it was inhibited by an anti-CD1d blocking monoclonal antibody. A single intracranial injection of 2 x 106 ex vivo, expanded human NKT cells and α-GalCer or 7W8D-5 in nonobese, diabetic/severe combined immune deficiency mice with 6-day-established xenografts of luciferase-transduced DAOY cells resulted in rapid tumor regression with 30% cure rate. The therapy was well-tolerated.

Conclusions: CD1d+ MB could be targeted for immunotherapy with NKTs, which have a curative potential.

Rare Presentation of Myxofibrosarcoma in the Brain

Syed M. Gilani, MD (magilani@hotmail.com); Michelle Bonnett, MD. Department of Pathology, St John Hospital and Medical Center, Detroit, Michigan.

Sarcomas in the brain are very rare; however, myxofibrosarcoma is even rarer. We report a case of myxofibrosarcoma in the brain of a 36-year-old man with a known history of squamous cell lung carcinoma, AIDS, and hepatitis B. He presented with numbness of the left half of his body and mental status changes. Magnetic resonance imaging of the brain showed multiple bilateral hemorrhagic-enhancing masses located in the frontal, parietal, and temporal lobes. Metastatic tumor was suspected. He underwent craniotomy with debulking of one lesion from the left temporal lobe. Histologic sections showed tumor cells that were highly pleomorphic, multinucleated, and varied from spindled to round. Mitotic figures and extensive necrosis were identified. Immunohistochemical stains showed the malignant cells were positive for vimentin and negative for CD45, CD30, ALK, smooth muscle actin, desmin, S100, cytokterin AE1/AE3, cytokterin 5/6, P63, CD31, HHV8, and GFAP. The best diagnosis in this case, based on the histologic features and immunohistochemical staining pattern, was thought to be high-grade myxofibrosarcoma. It is unclear whether these lesions represent metastases from an unknown primary or whether this represents a primary brain lesion, such as synchronous overgrowth of a gliosarcoma. However, because of the number and bilaterality of the lesions, metastasis is most likely. Malignant fibrous histiocytoma is one of the most common sarcomas but rarely involves the head, neck, and skull. Myxofibrosarcoma is a myxoid variant of malignant fibrous histiocytoma and occurs in older adults, typically presenting in the subcutaneous and superficial soft tissues of the extremities.

T-Cell Lymphoblastic Lymphoma/Leukemia Presenting as a Pituitary Mass Lesion

Andrea L. Wiens, DO (andiewiens@gmail.com); Matthew C. Hagen, MD, PhD; Jose M. Bonnin, MD; Kathryn A. Rizzo, MD, PhD. Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis.

Primary lymphomas of the pituitary gland are exceedingly rare. Approximately 20 cases have been reported in the literature during the past 20 years and most of them were of B-cell origin. We report a case of a 58-year-old woman who initially presented with headaches, right-sided ptosis, and cranial nerve III palsy. She subsequently developed polyuria, polydipsia, and hyperglycemia. Magnetic resonance imaging revealed a large, heterogeneously enhancing intrasellar/suprasellar lesion displacing the optic chiasm and extending into the right cavernous sinus. Biopsy was attempted; however, these findings were thought to represent a pituitary adenoma. Periorbital craniotomy and subtotal tumor resection were performed. Histopathologic examination revealed a T-cell lymphoblastic lymphoma/leukemia (T-LBL) admixed with pituitary cortico-
troth cell hyperplasia. Computed tomography scans of the chest, abdomen, and pelvis showed no evidence of systemic disease. Analysis of peripheral blood and bone marrow, including flow cytometry, demonstrated no involvement by T-LBL. Follow-up magnetic resonance imaging of the spine revealed abnormalities in the distal thoracic spinal cord and conus medullaris suspicious for leptomeningeal dissemination. Only 5 single case reports of T-cell lymphoma arising in the sellar/suprasellar region have been previously described, 4 of which were associated with hypopituitarism and/or concurrent pituitary adenoma. To our knowledge, our case represents the third reported occurrence of a primary pituitary T-LBL and is the first report of a primary pituitary T-cell lymphoma associated with adenohypophyseal hyperplasia.

**Intracranial Metastasis From Cervical Cancer: Case Report and Review of the Literature**

Reza Setoodeh, MD; Arshadish Hakam, MD, MBA; Jesse Kresak, MD (jkresak@health.usf.edu); Puya Alikhani, MD; Frank Shan, MD, PhD. Departments of 1Pathology and 2Neurosurgery and Brain Repair, University of South Florida, Tampa; Departments of 3Anatomic Pathology and 4Gynecologic Pathology and 5Anatomic Pathology and Neuro-pathology, H. Lee Moffitt Cancer Center, Tampa.

Cervical cancer is a major malignancy of the female genital tract and typically spreads to adjacent organs and pelvic lymph nodes. Hematogenous spread to distant organs may also occur, most commonly in lungs, liver, and bones. Brain metastases from cervical cancer are extremely uncommon. We report a 53-year-old woman diagnosed with cervical cancer who was transferred to our center with a large right-side hemispheric and bilateral suprasellar mass. Medial history of the patient was significant for vaginal bleedings during the past 5 years with no medical interventions. Radiology workup showed widespread metastatic cancer with spread to liver, lungs, and brain. Brain magnetic resonance imaging revealed multifocal intracranial lesions with extensive surrounding vasogenic edema and a left to right midline shift. The patient underwent craniotomy and debulking of the large left parietal lesion to reduce the mass effect. Review of the cervical biopsy slides revealed poorly differentiated adenocarcinoma, and histologic examination of the brain mass revealed poorly differentiated carcinoma with features of glandular and squamous differentiation, infiltrating the brain parenchyma and consistent with metastasis from the primary cervical cancer. Immunohistochemistry studies revealed immunoreactivity of tumor cells for polyclonal CEA, P16, and P63, confirming the diagnosis. This case shows that any new-onset, neurologic deficits in patients with widespread cervical cancer should alert the clinician of the possibility of central nervous system metastasis. Review of the literature shows gynecologic malignancies have a very low predilection for the central nervous system, and this case represents an example of extremely rare brain metastases from cervical cancer.

**Metastatic Gastrointestinal Stromal Tumor: An Unusual Case Mimicking Meningioma**

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Gastrointestinal stromal tumor (GIST) is the most common mesenchymal tumor of the gastrointestinal tract. It arises from an unknown progenitor cell, usually from a gain-of-function mutation of the tyrosine kinase receptor, Kit. The GISTs are most common in middle-aged to older adults and are rare in young adults and children. The GISTs rarely spread outside the abdomen. To date, there are only 3 confirmed reports of intracranial GIST metastases, to our knowledge, and none involving the dura. A 27-year-old man with a 9-year history of a primary gastric GIST with previous lung and liver metastases presented with a well-circumscribed, dural-based mass. The mass was composed of packets of spindle to epithelioid cells with a whorled appearance, high mitotic rate, and necrosis. These features combined with the location of the mass were suggestive of an atypical meningioma (Figure 49, A). Immunohistochemical stains were negative for epithelial membrane antigen (Figure 49, B). c-Kit and DOG-1 immunostains were positive (Figure 49, C and D), consistent with a metastatic GIST. We present a unique case of metastatic GIST to the brain, which has rarely been reported and has never, to our knowledge, been reported to be associated with the dura. The patient was 18 years old when he presented with the primary gastric GIST, a tumor that rarely occurs in young adults. Furthermore, primary gastric GISTs tend to be less aggressive than those arising in the small intestine. In this rare case, a uniquely aggressive GIST, mimicking a meningioma, metastasized to the brain; this rare occurrence has not, to our knowledge, been previously reported.

**Spinal Cord Ependymoma and Posterior Fossa Choroid Plexus Papilloma: A Case of 2 Synchronous Primary Tumors**

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We report a case of 2 primary neuroepithelial tumors of different histologic type in the same patient as synchronous tumors. A 54-year-old woman presented with weakness and numbness of extremities. Magnetic resonance imaging of the cervical spine revealed a solidly enhancing, intramedullary mass measuring 2.9 cm. In addition, magnetic resonance imaging of the brain revealed multiple lesions, including abnormal enhancing extra-axial lesions in the posterior fossa, supratentorial region, a lesion above the sphenoid bone, and a separate 1.6 cm lesion in the right, inferior fourth ventricle region. The patient underwent cervical laminectomy for removal of the spinal cord tumor, which histologically was ependymoma, World Health Organization grade II, with Ki-67 index of less than 1%; it was negative for p53. Approximately 2 months later her posterior fossa mass was excised, which was determined to be a choroid plexus papilloma. Multiple neuroepithelial tumors of different histologic types are uncommon, with the most frequently observed combination of glioma and papilloma. Our case is also unique because, apart from the 2 lesions, the patient had multiple extra-axial lesions, thus raising a possibility of some kind of syndromic association, but no past medical or family history goes against it. The most common differential diagnosis in multiple central nervous system lesions would be metastases, and both ependymoma and CPP are known to disseminate by cerebrospinal fluid. We report an unusual case of synchronous cervical cord ependymoma and CPP with multiple extra-axial brain lesions underscoring the importance of tissue diagnosis in multiple central nervous system lesions.

**Solitary Fibrous Tumor of the Fourth Ventricle**

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Intracranial solitary fibrous tumors are typically dural-based, CD34-positive neoplasms that clinically resemble meningiomas. Exceptionally, these tumors can be intraventricular. We describe a rare case of a solitary fibrous tumor located in the fourth ventricle. The patient was a 52-year-old man presenting with progressive weakness and numbness in all his extremities for 2 months. Computed axial tomography scan and brain
magnetic resonance imaging revealed a homogeneous, avidly enhancing, 4.5 × 3.7 × 2.7-cm fourth ventricular mass with compression of the adjacent medulla and cerebellum and extension into the foramen of Luschka. Angiography demonstrated multiple dysplastic-appearing branches from right posterior-inferior cerebellar artery supplying the neoplasm. The patient underwent a suboccipital craniectomy and resection of the tumor. Histologic examination showed a spindle cell neoplasm with prominent collagenized stroma. The neoplastic cells were strongly and diffusely positive for CD34, vimentin, and Bcl2 and were negative for S100, CD99, and epithelial membrane antigen. The MB-1 proliferation index was low (1%). CD31 immunostain highlighted the endothelial cells, but the spindle cells were negative. Reticulin stain demonstrated a moderate reticulin network, but individual cells were not invested by reticulin fibers. The histologic features and immunoprofile were consistent with a solitary fibrous tumor. In the central nervous system, solitary fibrous tumors are usually indolent tumors, with only rare examples showing hypervascularity and increased mitotic activity, features that were absent in the present case. We present an uncommon central nervous system neoplasm in a rare location. Although rare, solitary fibrous tumors should be included in the differential diagnosis of intraventricular tumors in adults.

Neuron Precursor Features of Spindle Cell Oncocytoma of Adenohypophysis
(Poster No. 100)
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Spindle cell oncocytoma of the adenohypophysis is a nonendocrine, benign neoplasm, although recurrent, aggressive forms have been described. Little is known about the pathogenesis of this tumor. It is believed to arise from the folliculostellate cells of the adenohypophysis. We describe the case of a 24-year-old woman diagnosed with this tumor and provide insight into the pathogenic mechanisms of this disease. Hematoxylin-eosin–stained slides, along with immunohistochemical preparations, with adequate controls, for S100, SMI-311, neurofilament, epithelial membrane antigen (EMA), CD68, P53, pankeratin, GFAP, chromogranin, synaptophysin, and Ki-67 were examined by pathologists at the University of Texas Medical School at Houston. Antibodies against CD44, CD36, and CD133, nestin, Gl2-p-Akt, and p-mTOR were applied, and the results were described with respect to each probe’s cellular compartmental distribution and intensity. Hematoxylin-eosin stain showed a proliferation of spindle and polygonal cells arranged in a fascicular pattern, without mitoses, and with a proliferation index of less than 5%. There was patchy reactivity for SMI-311, nestin, CD56, S100, and vimentin, but neurofilament was not present. Both cell types were positive for EMA. CAM 5.2 stained few of the polygonal cells. No reactivity for CD68, chromogranin, synaptophysin, GFAP, and S100 was seen. The Table lists results for stem cells and cell signaling markers. These findings suggest that the cells in spindle cell oncocytoma of adenohypophysis are neuronlike precursor cells with possible aggressive behavior. Sonic hedgehog and mTOR (predominantly mTOR complex 2) pathways were activated; these observations might have therapeutic implications.

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Metastatic Medullary Carcinoma of Thyroid Presenting as Dural-Based Mass With Extra-axial Soft Tissue Invasion and Proptosis: First Case Report
(Poster No. 101)
Arvind Rishi, MBBS, MD1 (arishi@nshs.edu); Karen Black, MD2; Michael Schulder, MD3; Jian Yi Li, MD, PhD.1 1Department of Pathology, North Shore Long Island Jewish Health System, New Hyde Park, New York; Departments of 2Radiology and 3Neurosurgery, North Shore Long Island Jewish Health System, Manhasset, New York.

Dural metastasis from medullary carcinoma thyroid (MTC) has not, to our knowledge, been reported in the English literature. We present the first case report involving a 39-year-old man with headache and right eye proptosis. Magnetic resonance imaging showed extra-axial mass in the right frontal calvarium measuring 7.2 × 6.5 × 6.0-cm with soft tissue extension to the right superior orbit (Figure 50, A). Differential diagnosis included meningioma, hemangiopericytoma, or metastases. Histopathology showed solid nests of metastatic tumor exhibiting several morphologic features, including spindle cells (Figure 50, B), epithelial cells (Figure 50, C), clear cells, and pseudoglandular formation. Immunohistochemistry showed carcinoma cells positive for calcitonin (Figure 50, D), synaptophysin, pancytokeratin AE1/AE3, CAM 5.2, CEA, CK7, and TTF-1 but negative for progesterone receptor, CDX-2, CK20, vimentin, and thyroglobulin. The Ki-67 labeling index was 3% to 4%. Postoperative computed tomography scan of the chest and pelvis showed a 3.6 × 2.7-cm, low-density mass in the right thyroid lobe; innumerable pulmonary nodules; and lytic bone lesions in the ribs, bilateral acetabulum, iliac bone, vertebral bodies, left clavicle, and right humerus. Such clinical presentation of medullary carcinoma has never been reported, to our knowledge. There is single case report of metastasis to an orbit presenting with unilateral proptosis. Intracranial metastasis of MTC has been reported in the sellar region, cerebral hemispheres, and cerebellum. Cases with intracranial metastasis have higher age, poor prognosis, and associated widespread metastasis. The primary management is palliative therapy in the form of metastasectomy and radiotherapy. Data on treatment and survival are debatable and elusive given the rarity of the lesion.

Autopsy Findings From a Recurrent, Atypical Meningioma With Widely Disseminated Metastases
(Poster No. 102)
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Meningiomas represent the most common intracranial tumor with an annual incidence of 13 per 100,000 people per year. A benign clinical course can be expected for most of these lesions; however, a subset of cases will behave aggressively and lead to a poor clinical outcome (World Health Organization [WHO] grade II and III). There can be significant morbidity associated with these tumors, secondary to...
location, resection, or recurrence. In rare circumstances, death can result and is usually due to direct brain invasion and/or, in even rarer instances, to extracranial metastases. Extracranial metastases, when present, are typically found in the lungs. Predicting clinical behavior is both difficult and unreliable because even low-grade, histologically benign lesions have been known to metastasize. There is better correlation with anaplastic (WHO grade III) meningiomas and shorter survival times, with most patients having less than a 2-year survival. We present a case of a 57-year-old man with widely disseminated metastases from a recurrent, atypical meningioma (WHO grade II) following multiple resections and radiation therapy. In this case, both the metastatic foci and the original dural-based primary tumor were composed of histologically similar bland spindle cells that were weakly positive for epithelial membrane antigen. We also provide a review of the literature involving metastatic meningioma and possible predictive factors of aggressive behavior.

**Pituitary Adenoma Mimicking Ependymoma** (Poster No. 103)

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Tumors of the sellar region consist largely of pituitary tumors, which comprise 90% of the neoplastic lesions in this area of the brain. Pituitary adenomas are typically easy to recognize; however, several uncommon variants may take more time and effort to diagnose. We report a case of a nonfunctioning pituitary tumor from a 57-year-old woman with chromophobic cells and striking perivascular pseudorosette architecture pathognomonic for ependymoma. However, the tumor demonstrated only focal staining with glial fibrillary acid protein (Dako, Carpinteria, California) and S100 (Dako), whereas it showed diffuse, strong positivity with AE1/AE3 (Dako). Rather than confirming the diagnosis of ependymoma, the staining pattern suggested the tumor might be of epithelial origin. Additional immunohistochemical studies were performed, including glycoprotein α-subunit (Mayo Clinic Medical Laboratory, Rochester, Minnesota), and proved diagnostic of pituitary adenoma, null-cell type. This case is an excellent reminder to exercise prudent restraint and consider the entire case rather than being drawn in by a pathognomonic morphology. When encountering a tumor with an instantly recognizable pattern in an unusual location, the most common entities of that site must be definitively excluded. Clinical history, tumor size, and location are often of great value. Immunohistochemistry or electron microscopy may be critical to confirm the correct diagnosis (Figure 51).

**Glioblastoma With Angiocentric Glioma-Like Growth Pattern: A Potential Diagnostic Pitfall** (Poster No. 104)

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Angiocentric glioma (World Health Organization [WHO] grade 1) is a recently described, low-grade glioma characterized by a prominent, perivascular arrangement of monomorphous bipolar cells with features of ependymal differentiation. Here, we report a case of a glioblastoma (WHO grade 4) with an angiocentric glioma-like growth pattern. A 66-year-old man was incidentally found to have a 4.2-cm, mild T2 signal abnormality in the right frontal lobe on a magnetic resonance imaging study. A diagnosis of diffuse astrocytoma (WHO grade 2) was made on the resection specimen. He did well after surgery. However, 7 months later, a new mass (3.3 cm) with peripheral enhancement in the right temporal lobe was detected on a follow-up magnetic resonance imaging study. Surgical resection was subsequently performed. Microscopically, a significant portion of the tumor (60%) showed an angiocentric, glioma-like growth pattern, in which bipolar spindle cells were oriented around blood vessels and arranged in pseudorosettes in an ependymomatous pattern (Figure 52). The remaining tumor had characteristic features of glioblastoma, including marked nuclear atypia, frequent mitoses, prominent microvascular proliferation, and necrosis. Immunohistochemically, the tumor cells were positive for GFAP, S100, vimentin, and Ki-67 (10%) but were negative for synaptophysin, NeuN, and EMA. To our knowledge, an angiocentric, glioma-like growth pattern in a high-grade glioma has not been previously reported. This case implies a potential pitfall in an intraoperative consultation if only angiocentric growth-pattern areas in a high-grade lesion are sampled. Awareness of the existence of an angiocentric growth pattern within an otherwise characteristic glioblastoma could avoid a potential diagnostic error.

**Intraspinal Psammomatous Meningioma With Extensive Osseous Metaplasia and a History of Breast Carcinoma** (Poster No. 105)

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Meningiomas are neoplasms arising from leptomeninges or dura mater. They are more common in women and are dura-based within the cranium, although some are intraspinal. There is an increased prevalence in patients with breast carcinoma. Metaplastic changes show bone, cartilage, or fat. This is a case of an intraspinal meningioma with osseous metaplasia in a 75-year-old woman with a history of right breast carcinoma, mastectomy, axillary node dissection, and lung nodules. She

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had a history of gradually increasing pain in the mid thoracic area and lower back with radiation down the right leg. Chest computed tomography showed a right upper lobe lung nodule with focal calcification (differential included granuloma, primary lung tumor, or metastatic carcinoma). Magnetic resonance imaging showed a T6 to T7, focally enhancing, intradural extramedullary lesion, measuring 1.1 cm, pressing against the spinal cord. Pathologic examination revealed a grey-tan, gritty tumor with osseous metaplasia and trabecular bone formation (Figure 53). The patient did well following surgery. Cranial irradiation has an increased risk of developing meningiomas. Osseous metaplasia is relatively rare in the spinal cord. Psammomatous meningiomas, however, have an increased predilection for the intraspinal compartment. Meningiomas are EMA+ regardless of histologic subtypes, and are also positive for progesterone. A nearly 7-year follow-up showed high-grade malignant cells, nonspecific, in pleural effusion and bronchial washings. There was immunoreactivity for CK7 and EMA and focal reactivity for CEA and CA 125. No recurrence of meningiomas was noted in the thoracic spinal cord area. The histogenesis of this relatively rare tumor could be the postradiation effect of right breast carcinoma.

An Unexpected Case of Cerebral Histoplasmosoma
(Poster No. 106)

Ganglioneuroma Maturing Subtype Presenting as Skull Mass With Epidural Extension in an Adult: A Unique Case Report
(Poster No. 107)

Arvind Rishi, MBBS, MD1 (arishi@nshs.edu); Francisco Pechera, MD; Kangmin D. Lee, MD; Leonard Kahn, MD; Peter Farmer, MD; Jian Yi Li, MD, PhD. 1Department of Pathology, North Shore Long Island Jewish Health System, New Hyde Park, New York; Departments of 2Pathology and 3Neurosurgery, Southside Hospital, Bayshore, New York.

We report a unique case of a ganglioneuroma maturing subtype in a 40-year-old woman who presented with a painful skull mass in the left temporal region. Preoperative magnetic resonance imaging showed a heterogeneous, enhancing mass lesion, measuring 3.2 × 2.0 cm, in the left squamous temporal bone (Figure 54, A). There was epidural extension with a mild mass effect on the left temporal lobe. There was no intracranial parenchymal edema or adjacent extracranial soft tissue edema. Differential diagnosis included primary osseous tumor and hemangioma. Histopathology showed features consistent with ganglieneuroma, maturing subtype, according to the International Neuroblastoma Pathology Classification. The tumor had plexiform growth pattern and spindle cells with elongated and wavy nuclei in myxoid and collagenous background (Figure 54, B). There were scattered ganglion-like cells, maturing ganglion cells, and small, round cells resembling neuroblasts (Figure 54, C). Involvement of bone, fibroconnective tissue, and skeletal muscle was evident. Immunohistochemistry showed mature ganglion cells, maturing ganglion cells, and neuroblast-like cells positive for vimentin and SI000. Ganglieneuroma is most common in the pediatric population. Our case is unique because of the extremely rare occurrence of ganglieneuroma involving skull bone in an adult patient. To date, there is only one case report, to our knowledge, of ganglioneuroma involving the external auditory canal and zygomatic bone. Our case is further unique because of epidural extension of tumor with mass effect on the left temporal lobe.

A Rare Case of Spinal Cord Compression Secondary to Intradural Extramedullary Thoracic Arachnoid Cyst
(Poster No. 108)

Lauren King, MD (lcooper8@uthsc.edu); Nadeem Zafar, MD. Department of Pathology and Laboratory Medicine, University of Tennessee Health Science Center, Memphis.

Spinal cord compressive symptoms can be alarming and are most often caused by malignancy, trauma, infection, or degenerative disease and are only very rarely secondary to a cyst. We present a case of thoracic arachnoid cyst in a 44-year-old man with long-standing, multiple peripheral neuropathies and a 3-month history of increasing clumsiness in his right lower extremity. At physical examination, loss of sensation below the T8 level and decreased lower-extremity proprioception were also noted. Imaging revealed a poorly defined compressive abnormality..
of the thoracic cord with increased intensity on T2-weighted images. Thoracic laminectomy and cyst fenestration were performed. Intraoperatively, the arachnoid demonstrated scarring at the T7 level, with a pulsating cyst pushing the cord anteriorly. The resected cyst was grossly composed of a 1.0-cm, gray, shiny soft tissue fragment, which at microscopy consisted of flat epithelial cells lining a cystic space with surrounding fibrous stroma; the cells occasionally congregated with psammoma bodies. Intracranial arachnoid cysts with mass symptoms are well-described, only rarely occurring in spinal cord, in the lower thoracic to thoracolumbar junction, posterior to the thecal sac. Arachnoid cysts are either idiopathic or secondary to trauma or bleeding and arise from arachnoid trabeculae or the septum posticum of Schwalbe. Symptoms include pain, sensory deficits, and neuropathic symptoms, all of which can fluctuate with activity. Occurring very infrequently in the spinal cord, arachnoid cyst must be considered in the differential diagnosis of upper motor neuropathy when causes that are more typical have been excluded.

Glioneuronal Tumor With Neuropil-Like Islands Presenting in a 10-Month-Old Infant: First Reported Case
(Poster No. 109)
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Glioneuronal tumors with neuropil-like islands were first reported in 1999 by Teo et al and are relatively rare lesions. This entity has been reported in the setting of chronic epilepsy, typically in adults, with most patients presenting with seizures or headache. Although most cases affect the cerebral hemispheres, a few cases have been reported to involve the spinal cord. This lesion is characterized by a biphasic histologic and immunohistochemical morphology consistent with features of both an astrocytic gliona and neuronal/neurocytic elements. We present the first reported case, to our knowledge, of this entity affecting an infant: a 10-month-old female presented with tonic-clonic movements and a diminished level of consciousness. Magnetic resonance imaging findings demonstrated a large 7.0 × 6.0 × 5.0-cm diameter intra-axial, bulky neoplasm in the right temporal lobe without enhancement involving the right insula and basal ganglia. After the initial resection, the patient had 2 other recurrences, consistent with the reported natural history of this entity in adults. This case illustrates the importance of differentiating this entity from other more benign glioneuronal tumors and adds value in determining the disease’s course in pediatric patients.

Assessment of Clinical, Morphologic, and Novel Immunohistochemical Profiles in High-Grade Gliomas and Correlation With Outcome
(Poster No. 110)
Kanayo Tatsumi, BS1 (kanayo.tatsumi@gmail.com); Vanitha Rajendran, MS1; Mark F. Evans, PhD1; Takamaru Ashikaga, PhD2; Alexandra N. Kalof, MD.1 Department of Pathology and Laboratory Medicine, University of Vermont College of Medicine, Burlington; 2Department of Mathematics and Statistics, University of Vermont, Burlington; 3Department of Pathology and Laboratory Medicine, University of Vermont College of Medicine/Fletcher Allen Health Care, Burlington.

Context: Glioblastoma (GB) is a highly aggressive tumor of the central nervous system with a 5-year survival rate of less than 5%. Despite recent advances in targeted therapies in other malignancies, there is a lack of effective treatment options for GB. The purpose of this study was to investigate a panel of immunostains, including novel putative markers of GB, for their utility in the management of this disease.

Design: Sixty-nine high-grade glioma specimens (World Health Organization grade III, n = 14; GB, n = 55) were identified. Clinical, radiographic, and morphologic data were collected. Immunohistochemistry was performed on formalin-fixed, paraffin-embedded tissue for GADD45α, BRAF, PTEN, p16, FSTL1, pHH3, and EGFR. Each tumor was scored for proportion and intensity of immunoreactivity. Cox proportional-hazard-regression models and log-rank statistics were examined for all clinical and pathogenic items individually.

Results: One clinical item, a family history of cancer, showed a statistically significant association with survival (regression coefficient = 1.5544; P = .009), hazard ratio = 4.53 (95% confidence interval, 1.47–15.20). None of the pathologic features achieved statistical significance; however, 3 items (oligodendrogial component and immunoreactivity for PTEN and FSTL1) were marginally associated with survival. Regression coefficients were as follows: oligodendrogial component, 0.4825 (P = .10); PTEN immunoreactivity, 1.0947 (P = .10); and FSTL1 immunoreactivity, −0.6869 (P = .08), corresponding to hazard ratios of 1.62, 2.99, and 0.50, respectively.

Conclusions: Failure to find morphologic or immunohistochemical profiles that correlate with survival in GB remains a challenge and underscores the aggressive nature of GB.

Potential Use of CD99 in the Identification of Chordoid Glioma and in Proving a Possible Ependymal Origin
(Poster No. 111)
Withdrawn.

Evaluation of Opportunities for Digital Pathology to Improve Surgical Pathology Workflow Efficiency
(Poster No. 112)
Curtis S. Stratman, MBA1 (Curtis.Stratman@omnyx.com); Laura M. Drogowski, BS2; Jonhan Ho, MD.1, 3 Omnyx, LLC, Pittsburgh, Pennsylvania; 2Department of Pathology, University of Pittsburgh Medical Center, Pittsburgh; 3Department of Dermatology, University of Pittsburgh School of Medicine, Pittsburgh.

Context: Contextual inquiry (CI) and time-motion studies reveal significant opportunities for digital pathology to improve surgical pathology workflow. A high-volume, digital workflow solution must integrate into histology laboratory operations, optimize pathologists’ skills, and address inefficiency root causes. The CI studies identified requirements across pathologists and histology laboratories for such a solution, and time-motion studies quantified the timing of workflow steps. Our objective was to identify opportunities for improved efficiency via implementation of digital pathology.

Design: More than 30 pathologists were observed during CI studies to identify root causes of common workflow breakdowns. The CI process interactively guides users through iterative solution-defining steps from rapid, low-cost prototypes to a final product. The time-motion studies involved passive observation of workflow and were conducted with 6 pathologists (12 days) and 4 histology laboratories (7 shifts) to qualify the time spent on tasks that could be affected by digital workflow implementation.

Results: Pathology productivity primarily resulted from eliminating sub-par workflow matching, searching for cases, and organizing workflow. Histologist productivity primarily resulted from automation of case-image matching and distribution of cases to pathologists. Quantitative opportunities included average productivity improvement of 13.6% per pathologist and 19% of one FTE histologist for a large laboratory.

Conclusions: Opportunities were identified for digital pathology to improve productivity across a pathology department. To deliver this value, a solution must communicate information and support tasks previously driven by physical slides, integrate into clinical histology laboratory operations, provide workflow to optimize pathologists’ skills, and solve the root causes of inefficiencies identified in these studies.

Integration of Transfusion Utilization Auditing Into Anatomic Pathology Laboratory Information Systems
(Poster No. 113)
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Context: Transfusion utilization audits are used to reduce unnecessary transfusions and to improve patient safety. Although utilization audits include personal identifiable information, our data are currently stored outside a laboratory information system (LIS). We demonstrate a secure, user-friendly interface that efficiently stores transfusion audit data into a LIS platform to ensure protection of patient privacy and to maximize utilization of audit data.

Design: Using CoPath Live, version 3.2 (Cerner, Kansas City, Missouri), a transfusion utilization data structure was built that resembled one of an anatomic pathology specimen, with audit type (prospective

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versus retrospective) and blood component type entered under “Specimen(s) Received.’’ The audit resolution (inappropriate versus appropriate) was then entered into the “Final Pathologic Diagnosis” field. Reports were built to include patient information, date range, audit component type, turnaround time, and resolution codes.

**Results:** Minimal training was required for accessioning or editing reports, and a centralized data structure ensured consistency among audit reports. Audit data and patient information remained secure within LIS, while reports were easily accessible to all authorized users. The integration of audit data into LIS provides easy tracking of report completion turn around time and audit workload; this process will also provide a convenient platform for future research studies on transfusion utilization.

**Conclusions:** An anatomic pathology LIS provides an excellent platform for recording, transferring, and auditing of data by improving patient information security and restricting accessibility to authorized users. Adapting the structure of current anatomic pathology specimen reports allows the audit results to be easily interpreted by other pathologists and administrators. The workflow is tracked and status information (received, assigned, completed, received) versus retrospective) and blood component type entered under ‘‘Specimen(s) Received.’’ The audit resolution (inappropriate versus appropriate) was then entered into the “Final Pathologic Diagnosis” field. Reports were built to include patient information, date range, audit component type, turnaround time, and resolution codes.

**Results:** Minimal training was required for accessioning or editing reports, and a centralized data structure ensured consistency among audit reports. Audit data and patient information remained secure within LIS, while reports were easily accessible to all authorized users. The integration of audit data into LIS provides easy tracking of report completion turn around time and audit workload; this process will also provide a convenient platform for future research studies on transfusion utilization.

**The Effects of Color Calibration on a Digital Whole Slide Imaging Scanner**

(Poster No. 114)

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**Context:** Digital whole slide imaging is an attempt to capture digitally a realistic representation of the tissue that is present on a slide. Scanner manufacturers frequently cite optical resolution, sensor quality, and focus as key parameters in achieving this goal. Another key parameter, which is not often addressed, is the fidelity of the color representation. We present results demonstrating the effect of color calibration of a digital whole slide imaging scanner.

**Design:** A custom, 24-color transparent target was made and affixed to a glass slide. National Institute of Standards and Technology–traceable spectrophotometric measurement of the color of each patch in the target was performed. Images of this patch taken on the scanner were compared with these reference values and a color correction table generated.

**Results:** Color calibration of a digital whole slide imaging scanner generated images of the color patches that were close to the National Institute of Standards and Technology–traceable reference color measures when assessed by a standard color difference metric (AE 94). Additionally, pathology images color-corrected by this method were viewed on a calibrated display at the same time the slide was being viewed under a microscope. This perceptual assessment deemed the digital images to demonstrate highly accurate color representation.

**Conclusions:** The study demonstrates that a color calibration procedure for a digital slide scanner can generate digital data that are more representative of “true color” as measured by color difference metrics. Additionally, these improvements can be validated by a human observer when viewing images on a calibrated display and comparing directly to images viewed with a microscope.

**Color Standardization and Image Quality Evaluation in Whole Slide Imaging**

(Poster No. 116)

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**Context:** Standardization of image quality and color displayed by digital slides are important aspects of digital pathology implementation. Although the most common reason for the variations of color and image quality is the variance in the protocols and practices in the histology laboratory, the image displayed can also be affected by variation in capture parameters (for example, focus, illumination, and filters), image processing, and display factors in the digital systems themselves. It is difficult to identify exactly which parameter causes the problem. We have developed a methodology to standardize color and evaluate image quality of any whole slide imaging.

**Design:** Two types of calibration slides were developed in our laboratory: color and image quality calibration slides. These slides were scanned using different scanners. The color information from the scanned image of the color calibration slide was used to characterize the color settings of the scanners. The effectiveness of the proposed color standardization and image quality evaluation algorithms was demonstrated using the image quality evaluation slide, which is an ideally stained embryo tissue slide.

**Results:** The scanned images showed varying color appearance on the same monitor. However, after the implementation of the color standardization algorithm, the color variance was minimized. Moreover, there was good correlation between the results of the proposed image quality evaluation method with evaluation results by human eyes.

**Conclusions:** Initial results of the standardization experiments are promising. However, there are still several factors that need to be considered. We have been conducting a series of research toward standardization.

**Laboratory Information System Change Control Process: 5-Year Experience With an Electronic System**

(Poster No. 115)

Gaurav Sharma, MD (pantovanwitz@upmc.edu); Michael E. Sendek, BS; Kevin Nauman, BS; Anil V. Parwani, MD, PhD; Liron Pantanowitz, MD. Department of Pathology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania.

**Context:** Change control (CC) is a formal process to ensure a systematic, controlled, and coordinated manner of implementing changes in a product or system. Complex and dynamic systems like laboratory information systems need to be governed by an effective CC process. Our aim is to present our experience with the transition from a paper-based to an electronic CC system.

**Design:** A Sharepoint (Microsoft Inc, Redmond, Washington)-based CC application was customized to manage workflow by generating electronic forms to handle requests related to our clinical pathology laboratory information system (Sunquest Information Systems, Tucson, Arizona). The electronic forms capture detailed specifications of change requests using metadata. Weekly CC requests are routed to relevant analysts. The workflow is tracked and status information (received, assigned, completed, tested, and implemented) is available to users. This application is hosted on hospital Information Service Division Web servers.

**Results:** In the past 5 years (since 2006), 2132 requests have been received and routed to a group of 12 analysts. Change requests related to laboratory information systems maintenance were the most common (661; 31%), followed by existing test modification (415, 19%). The average turnaround time decreased from 150 days (paper-based system) to 14 days (electronic system). Because of this success, this application was selected as a benchmark CC system by Information Service Division and has been endorsed by external laboratory inspectors.

**Conclusions:** Investment in an electronic and Web-based CC system improves accountability and traceability of workflow, resulting in shorter project turnaround time. It standardizes the CC process and can be implemented across other hospital departments.

**Autopsy and Forensic Pathology, Bone and Soft Tissue Pathology, Breast Pathology, Cytology, Administrative and Regulatory Affairs, Practice Management**

**H1N1-Negative, Panton Valentine Leukocidin–Positive, Community-Acquired, Methicillin-Resistant Staphylococcus aureus as a Cause of Lethal Necrotizing Pneumonia in an Immunocompetent 13-Year-Old Male**

(Poster No. 1)

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The Panton-Valexkein leukocidin (PVL) toxin is a pore-forming toxin secreted by strains of community-acquired, methicillin-resistant *Staphylococcus aureus* (CA-MRSA) often associated with lethal necrotizing pneumonia in immunocompetent patients. It has become a worrisome emerging entity. We report of a case of a deadly PVL-positive, necrotizing pneumonia in a previously healthy 13-year-old adolescent male. The patient presented with a 1-week history of chest pain after exercise progressing to high fever, rhinorrhea, cough, and congestion. He then rapidly developed progressive respiratory failure requiring intubation.
at an outside hospital. The patient was started on ceftriaxone and vancomycin and then transferred to our institution for possible extracorporeal membrane oxygenation support. The patient died shortly after arrival. Tests sent premortem include respiratory culture positive for MRSA; negative rapid influenza test, H1N1 polymerase chain reaction, urine and blood cultures; and neutropenia and anemia. At autopsy, the patient had heavy hemorrhagic lungs with punctate fibrous exudates on the pleural surfaces bilaterally. Microscopic examination showed diffuse, necrotizing pneumonia with florid colonies of intracellular and extracellular gram-positive cocci in all sections of the lung. Although MRSA was cultured from lung tissue, fungal tissue cultures and blood cultures were negative. Viral tissue cultures were also negative, even though most cases of necrotizing pneumonia occur following a viral illness. The MRSA was positive for the PVL toxin. An exhaustive search for the nidus of infection (usually skin or soft tissue) is recommended in these patients; however, a nidus was not identified in this case.

Expanding the Spectrum of Calcifying Pseudoneoplasms of the Neuraxis (Poster No. 2)

Lisa J. Cichon, MD (lisa.cichon@duke.edu); Christine M. Hulette, MD; Thomas J. Cummings, MD. Department of Pathology, Duke University, Durham, North Carolina.

Calcifying pseudoneoplasms of the neuraxis are nonneoplastic, calcified lesions that can occur anywhere in the central nervous system. These lesions demonstrate variable proportions of fibrous stroma, palisading spindled, epithelioid, and multinucleated cells, a chondroid matrix, psammoma, ossification, and occasional psammoma bodies. We report a case of a 58-year-old man with numerous calcifying pseudoneoplasms of the dura as an incidental finding at autopsy. No known prior imaging was done, and there were no indications he was symptomatic from these lesions. On gross examination, there were innumerable coalescing but discrete, firm nodules covering approximately 75% of the supratentorial dural surface. The lesions ranged from 0.1 to 3 cm in diameter and up to 0.3 cm in thickness and were most numerous in the frontal, parietal, temporal, and occipital regions bilaterally. Microscopic examination of the dural nodules showed typical features of calcifying pseudoneoplasms, including zones of granular debris, calcification, osseous metaplasia, and epithelioid cells with radial orientation surrounding the debris. An immunohistochemical stain for epithelial membrane antigen showed diffuse cytoplasmic reactivity within these cells consistent with reactive meningotheilium. Immunostains for CEA and cytokeratin were negative. Representative sections within these cells consistent with reactive meningotheilium. Immunostains for CEA and cytokeratin were negative. Representative sections

Cirrhotic Cardiomyopathy: An Underrecognized Cause of Mortality in Patients After Liver Transplant (Poster No. 3)

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Cirrhotic cardiomyopathy is a recently recognized form of cardiac dysfunction in cirrhotic patients characterized by contractile, electrophysiologic, cardiac chamber structural, and serum marker abnormalities. Contractile dysfunction is often latent and usually unmasked by various stressors including liver transplantation. We report a case of a 54-year-old man who developed dilated cardiomyopathy following liver transplantation for alcoholic/hepatitis C cirrhosis. The patient had no history of cardiac disease or alcohol use for the past 10 years. Pretransplant workup results, including a dobutamine stress echocardiogram, were normal. The patient underwent liver transplantation without complications. Five days after the transplant, he complained of chest pain. Echocardiography showed multichamber dilatation and severe left ventricular systolic dysfunction with 15% ejection fraction. Serum pro-B type natriuretic factor was markedly elevated at 69940 pg/mL. The patient remained hemodynamically unstable despite pharmacologic intervention and dialysis. He expired 24 days after transplantation. Limited autopsy showed cardiomegaly (620 g) with multichamber dilatation (Figure 55, top). Only focal, moderate coronary artery disease was present. Histology revealed cardiomyocyte hypertrophy and cytoplasmic vacuolization (Figure 55, bottom). No myocarditis or fatty changes were seen. The transplanted liver showed centriacinar necrosis consistent with congestive cardiac failure. In a recently transplanted cirrhotic patient with no prior cardiac disease, the combination of acute, nonischemic, dilated cardiomyopathy; systolic dysfunction with remarkably decreased ejection fraction; and markedly elevated serum pro-B type natriuretic factor, is most consistent with cirrhotic cardiomyopathy. Recognition of this entity is important because it may contribute to poor outcome following liver transplantation. Although associated with a high mortality rate, cirrhotic cardiomyopathy may be reversible with early recognition and intervention.

Autopsy of a 25-Year-Old Postpartum Woman With Cerebral Angiopathy (Poster No. 4)

Charles T. Beavers, MD (charles.beavers@louisville.edu); Susan Williams, MD; Joseph C. Parker, Jr., MD. Department of Pathology, University of Louisville Health Science Center, Louisville, Kentucky.
Postpartum cerebral angiopathy is a rare cause of death among childbearing females with 34 cases reported in the English literature, of which, there were 2 brain biopsies and 2 reported fatalities with brain-only autopsies. We present the youngest known fatal case of postpartum cerebral angiopathy with brain autopsy findings. The decedent was a 25-year-old African American woman who presented initially for cesarean section for the delivery of twins after 2 prior cesarean sections. Her medical records indicated predelivery treatment with ceftriaxone for gonorrhea. She was a smoker with an intrauterine growth restriction of twin B but had no other significant past medical history. Her screening urine toxicology study was negative. Her surgery proceeded with no noted complications, and she was accordingly discharged. Two weeks after the delivery, the patient presented with headaches considered to be migraines, which were treated symptomatically. A computed tomography scan of her brain was normal at this time. She subsequently developed acute neurologic deterioration, vomiting, loss of continence of her urine, and began posturing. She was unresponsive and intubated at this time. A repeat brain computed tomography showed a large intraventricular hemorrhage with acute hydrocephalus and associated hemiations. Subsequent autopsy revealed a hemorrhage originating from the left putamen with interventricular hemorrhage and tonsillar herniation of the cerebellum (Figure 56). A microscopic examination of the medium-sized arterioles revealed hypertensive changes and an undulating, internal elastic lamina with changes consistent with vasospasm.

Sudden Death Following Spontaneous Atrial Rupture: Unknown Cause
(Poster No. 5)

Marjorie G. Sy, MD (marjory2008@gmail.com); Essel De Leon, MD; Maria Laureana Santos-Zabala, MD; Louis Zinterhofer, MD. Department of Pathology, Monmouth Medical Center, Long Branch, New Jersey.

Cardiac rupture is an uncommon and dramatic event, which is often fatal. Right atrial rupture is even rarer. We present a case of an 80-year-old, hypertensive man who presented in our facility because of shortness of breath and chest pain. His condition rapidly deteriorated and he expired. Postmortem examination revealed right atrial rupture with massive hemopericardium. Histologic studies of the adjacent atrial wall revealed extreme thinning, with areas of complete and partial atrophy of the atrial myocardium replaced by fibro-adipose tissue. There were no signs and symptoms of myocardial infarction or history of trauma. The presumed underlying etiology of rupture was age-related degenerative change of atrial musculature. Fibro-fatty degeneration of the atrial musculature is a nonatherosclerotic cardiovascular degenerative change usually seen in the elderly. Because of the rarity of this condition, it is poorly documented and, therefore, difficult to recognize. A high index of suspicion is key to diagnosis and emergent intervention. Atrial rupture should always be included in the differential diagnosis of elderly patients who develops sudden deterioration, hemopericardium, and cardiac tamponade, regardless of history of infarction or trauma.

Endomyocardial Fibrosis and Massive Intracardiac Thrombosis: An Unusual Presentation of Budd-Chiari Syndrome
(Poster No. 6)

Gina Elhammady, MD (gelhamma@msmc.com); Morton J. Robinson, MD. Department of Pathology, Mount Sinai Medical Center and the Herbert Wertheim College of Medicine, Florida International University, Miami Beach.

Budd-Chiari syndrome is a rare condition commonly referred to as thrombosis of the hepatic veins and/or inferior vena cava, where the etiology is frequently unknown. We present a case of Budd-Chiari syndrome with associated massive intracardiac thrombosis demonstrated only at autopsy. The patient, a 36-year-old man, presented with hematemesis, 1 week of melena, and a 1.5-month history of increasing abdominal girth. He had a fever of unknown origin for 2 years, the etiology of which was never identified. The patient underwent upper endoscopy and clotted blood was noted in the stomach. After suctioning, a source of active bleeding was not identified. The patient was admitted to the intensive care unit; however, he rapidly deteriorated and expired. Autopsy revealed massive right ventricular intracardiac thrombosis with complete occlusion of the intrahepatic and suprahepatic inferior vena cavae extending to the right atrium (Figure 57). The endocardium underlying the clots showed marked fibrosis. There were diffuse, vascular intrahepatic organizing, fresh clots with congestive hepatomegaly, and extensive centrilobular necrosis. In more than 80% of patients with Budd-Chiari syndrome, an underlying condition can be identified with thrombotic risk factors present in many of the disorders. These include myeloproliferative disorders, mass lesions, infections of the liver, and many others, none of which were identified in our patient. Our case demonstrates endomyocardial fibrosis as a currently rarely recognized cause of Budd-Chiari syndrome. Only one case with this finding has been reported in the literature, to our knowledge.

The Diagnostic Challenge of Intravascular Talcosis
(Poster No. 7)

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Context: Intravascular talcosis is a granulomatous reaction to foreign material in intravenously injected drugs that causes pulmonary hypertension, cor pulmonale, and sudden death. This diagnosis is easily missed if unsuspected, and in a famous case involving a World Trade Center September 11, 2001 worker, it was misinterpreted as inhalational talc pneumoconiosis.

Design: The electronic database of autopsy and surgical pathology diagnoses was searched for the years 2000 through 2010 to identify cases.

Results: Four autopsy and 4 surgical lung biopsy cases met inclusion criteria. All were male with an average age of 44 years. None were suspected of having intravascular talcosis on clinical grounds. Of the
cases for which data were available, 5 of 7 cases (71%) had admitted intravenous drug use. Other clinical features were tobacco smoking (5 of 7; 71%), hepatitis C (5 of 6; 83%), and pulmonary hypertension (4 of 8; 50%). Computed tomography showed severe panlobular emphysema, diffuse centrifilobular and interstitial nodules, or bibasilar atelectasis and pneumonia. All autopsy cases showed pulmonary edema, with average lung weight of 1930 g; 3 of 4 cases (75%) had cardiomegaly, and 2 of 4 (50%) had hepatosplenomegaly. All showed right and left heart dilation. Extrapulmonary talc deposition was present in bone marrow, lymph nodes, kidney, spleen, liver, myocardium, and a portal venous thromboembolus. An interstitial granulomatous reaction to polverable, needlelike foreign material was found in all cases. The intravascular and/or perivascular distribution of the foreign material confirmed pulmonary intravascular talcosis (Figure 58).

Conclusions: In a forensic pathology context or in a hospital with many intravenous drug users, the diagnosis of intravascular talcosis is likely to be familiar, but pathologists and clinicians in other contexts could benefit from greater familiarity with this condition.

A Case of Fatal Mitochondrial Respiratory Chain Deficiency With Hepatic Involvement in an Infant
(Poster No. 8)
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Mitochondrial respiratory chain deficiencies are a group of disorders with a wide range of clinical presentations varying from single organ involvement to severe multisystem disease. Hepatic disease in the neonatal period affects some patients and is often associated with a progressive and fatal course. To our knowledge, there are only rare reports describing autopsy findings in these patients. We present the case of a 7-week-old infant who presented with failure to thrive and elevated liver enzymes. Histologic examination of a liver biopsy revealed microvesicular fatty infiltration and an increased number of swollen and irregular mitochondria as noted by electron microscopy. The findings were consistent with mitochondrial hepatopathy. Enzyme studies revealed mitochondrial complex IV deficiency. At the age of 4 months, she was admitted with new onset seizures and severe metabolic acidosis with respiratory failure. She expired 3 days later. At autopsy, the patient was found to have acute bronchopneumonia. Microscopic examination of the liver showed progressive disease characterized by decreased microvesicular fat, macrovesicular fatty infiltration, increased fibrosis, and nodular formation with no significant inflammation.

Pulmonary Venous Stenosis in a Premature Infant With Bronchopulmonary Dysplasia: First Report of Autopsy Findings of 2 Newly Associated Diseases
(Poster No. 9)
Steven C. Smith, MD, PhD (stevenchristopherssmith@gmail.com); Raja Rabah, MD. Department of Pathology, University of Michigan, Ann Arbor.

Pulmonary venous stenosis is rare disease, most commonly found in association with total anomalous pulmonary venous return and other cardiac malformations. Recent cohort studies have found increased association of pulmonary venous stenosis with prematurity, especially in infants with bronchopulmonary dysplasia, although no such case has been documented at autopsy. We report the case of a neonate with 26-weeks gestation, who required ventilation at birth, and whose perinatal course was complicated by necrotizing enterocolitis and grade 1 intraventricular hemorrhage. She developed chronic lung disease of prematurity. At 3.5 months, she became increasingly dyspneic, requiring intubation and nitrous oxide. Echocardiography demonstrated suprasytemic right ventricular pressure, suggesting pulmonary hypertension, whereas computed tomography angiography showed moderate to severe stenosis of the right superior, left superior, and left inferior pulmonary veins at atrial ostia. She underwent pulmonary vein marsupialization but continued to experience dyspnea and cyanosis with feeds. On placement of laparoscopic gastrostomy, she did not tolerate extubation and had episodes of desaturation, mixed acidosis, acute renal failure, and bradycardia, expiring after 3 weeks. At autopsy, 3 of 4 pulmonary veins showed a fibrous ridge obstructing the ostium of the atrial wall. The lungs showed bronchopulmonary dysplasia, pulmonary hypertensive vascular changes, and venous obstruction. No cardiac malformations or anomalous venous return was present. Pulmonary venous stenosis in premature infants with bronchopulmonary dysplasia is underrecognized by clinicians and pathologists. These complications in premature infants are possibly pathogenetically related, and aberrant cytokine signaling may be implicated. Careful cardiac examination in these patients is warranted.

Intraterine Death in the Second and Third Trimester of Pregnancy Associated With Umbilical Cord Hypercoiling and Hypocoiling
(Poster No. 10)
Opoku Adjapong, MD (opoku.adjapong@bmc.org); Sandra Cerda, MD; Carmen Sarita-Reyes, MD. Department of Pathology, Boston Medical Center, Boston, Massachusetts.

Context: Healthy umbilical cord (UC) coiling index is 0.2 coils/cm. Hypercoiled cords (coiling index > 90th percentile) and hypocoiled cords (coiling index < 10th percentile) have been associated with adverse perinatal outcome, including intrauterine growth restriction, fetal distress, and intraterine fetal demise.

Design: We conducted a retrospective study of 245 fetal autopsies performed at our institution from January 1999 to January 2011. Postmortem and placenta reports were reviewed for gestational age and maternal factors, including history of diabetes mellitus, asthma, hypertension, smoking, drugs, and alcohol use.

Results: Of the 245 fetal autopsies, 217 (89%) had placentas for review. Of these, 142 (65%) had a placental cause of death, with acute chorioamnionitis (35%) and placental vascular disease/placental abruption (23%) as the major findings. Abnormal torsion of the UC occurred in 6 cases (2.8%): 1 in the second trimester with hypocoiled cords and 5 in the third trimester with hypercoiled cords (Table). Three of 6 cases (50%) also had infarcts and placental vascular disease/placental abruption. Maternal history was relevant in 5 of the 6 cases (83%) for diabetes mellitus type II (n = 1), asthma (n = 1), hypertension (n = 1), and severe preeclampsia (n = 2). No history of smoking, alcohol, or drug use was reported.

Study Findings

<table>
<thead>
<tr>
<th>Placentas Available, No. (%)</th>
<th>Placental Cause of Death, No. (%)</th>
<th>UC Cause of Death, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, n = 245</td>
<td>217 (89)</td>
<td>142 (68)</td>
</tr>
<tr>
<td>Second trimester, n = 158</td>
<td>144 (91)</td>
<td>110 (77)</td>
</tr>
<tr>
<td>Third trimester, n = 87</td>
<td>73 (84)</td>
<td>32 (23)</td>
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</table>

Abbreviation: UC, umbilical cord.

Conclusions: Our study highlights that careful examination of the UC with isolated finding of abnormal torsion in the absence of other placental pathologies can contribute to intraterine fetal demise and help reduce the rate of indeterminate/unexplained fetal deaths. In cases with underlying risk factors such as acute chorioamnionitis, infarcts, placental vascular disease, and placental abruption, the associated finding of abnormal UC torsion can contribute to the final diagnostic cause of death.

Calcified Stylohyoid Ligament: A Case Report and Review of the Literature
(Poster No. 11)
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Eagle syndrome is the symptom complex produced by an enlarged and/or calcified stylohyoid ligament. The stylohyoid ligament is the ligament that joins the styloid process of the temporal bone and the hyoid bone. This elongation or calcification leads to pressure symptoms or entrapment of the nearby glossopharyngeal nerve or even the carotid artery. A PubMed search found only 49 cases reported in recent English
Essential Thrombocythemia Rapidly Transforming to Acute Megakaryoblastic Leukemia: Autopsy Findings
(Poster No. 12)

Jeremy Bowers, MD1 (jbowers@health.usf.edu); Catherine Kennedy, MD2; Hernani Cualing, MD3; Ling Zhang, MD, MD.1 Department of Pathology and Cell Biology, University of South Florida, Tampa; 2Department of Pathology, Pathology Associates, St. Petersburg, Florida; 3Department of Hematopathology and Laboratory Medicine, H. Lee Moffitt Cancer Center and Research Institute, Tampa.

The decedent was a 73-year-old woman with a 5-year history of essential thrombocythemia (ET) and a remote history of ovarian cancer. Treatment included anagrelide from the time of ET diagnosis. Two months before death, she experienced fatigue with musculoskeletal pain. A bone marrow biopsy revealed no increased blasts with reticulin and collagen fibrosis consistent with late-stage myeloproliferative disorder. Because of worsening symptoms, a repeat bone marrow was performed 25 days after the previous test showing rapid progression to acute megakaryoblastic leukemia (AMegL, ≥20% blasts, 50% of which must be megakaryoblasts). At that time, the patient also had hyponatremia, elevated lactate dehydrogenase, pleural effusions, and pancytopenia. Three days later severe respiratory distress ensued with fatal cardiac arrhythmia. Autopsy findings included involvement by AMegL of the spleen, bilateral kidneys, hilar lymph nodes, liver, and complete replacement of the bone marrow with associated marked fibrosis. The lungs had pneumonitis, congestion, edema, bilateral pleural effusions, and pancytopenia. Cardiomegaly was present with myocyte dropout, left ventricular dilatation, and interstitial hemorrhage. The AMegL led to severe anemia and pancytopenia precipitating acute myocardial ischemic with histologic findings less than 20 hours old at the time of death. Because of the AMegL story, the patient from ET is not a particularly rare event; however, autopsy findings have rarely been reported. In this case, involvement of numerous extramedullary organs was observed with extensive bone marrow fibrosis and pancytopenia. This patient was treated with a cytoreductive agent that could increase leukemic transformation in ET.

Autopsy Demonstration of Paradoxical Air Embolism Through a Probe-Patent Foramen Ovale
(Poster No. 13)

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Paradoxical air emboli occur when air within the venous system enters the arterial system, usually due to air-shunting across cardiac septal defects. Rare cases have been attributed to shunting across a physiologically closed, but probe-patent foramen ovale. We describe the autopsy findings of a fatal paradoxical coronary air embolism during surgery. A 31-year-old man underwent a thoracotomy for resection of a 12-cm mediastinal mass. During the procedure, the left subclavian vein was lacerated. Although it was repaired, the patient went into asystole. Air bubbles were seen within the coronary veins. Attempts to remove air from the right ventricle were unsuccessful, and the patient expired. Autopsy revealed coronary veins beaded with air bubbles (Figure 59, A). A needle was filled with a water-filled syringe inserted into the right ventricle and atrium failed to reveal the presence of air within chamber. All vessels of the heart were severely clamped. The heart was removed and submerged in water, and the coronary arteries were then individually cut. As the right coronary artery was cut, abundant amounts of air bubbles escaped through the defect, indicating the presence of air within the heart (Figure 59, B). Endocardial hemorrhages were seen in the superior septum (Figure 59, C). The foramen ovale was easily probe-patent (Figure 59, D). Air emboli are uncommon yet potentially fatal. At autopsy, it is crucial to recognize the subtle presence of air within the coronary vessels as a sign of air embolism. This will ensure proper handling of the heart to demonstrate the presence of air emboli.

Fatal HIV-Related Kaposi Sarcoma and Diffuse Alveolar Damage as a Manifestation of Immune Reconstitution Inflammatory Syndrome: An Autopsy Case Study
(Poster No. 14)

Ming Zhang, MD, PhD (ming.zhang@tuhs.temple.edu); Abir Mukherjee, MD. Department of Pathology and Laboratory Medicine, Temple University Hospital, Philadelphia, Pennsylvania.

Immune reconstitution inflammatory syndrome (IRIS) is a paradoxical clinical worsening of ongoing opportunistic infections or known conditions after initiating the highly active antiretroviral therapy (HAART). A 46-year-old male with a history of AIDS and Kaposi sarcoma of the skin presented with shortness of breath and chest pain. He was hospitalized for pneumonia with unknown etiology approximately 1 month earlier and started treatment with HAART. His pretreatment CD4 count was 29/μL. He was admitted to the respiratory intensive care unit and was managed by mechanical ventilation. The patient developed acute respiratory distress syndrome (ARDS) clinically and expired 3 days after admission. Autopsy showed extensive and bilateral, diffuse alveolar damage with reorganization, indicating a late phase of this process (>2 weeks). Multifocal Kaposi sarcoma was noted in both the lungs. Small-intestinal mucosa (jejenum and ileum) was also extensively involved by Kaposi sarcoma. There was no evidence of bacterial, fungal, or other viral infections in the lungs. Recrudescence of Kaposi sarcoma following HAART therapy has been well described in the literature. However, the present case is unique in having the coexistence of diffuse alveolar damage and multifocal pulmonary Kaposi sarcoma, related clinically to recent initiation of HAART therapy. The pathogenesis of IRIS is complex, and risk factors include initial low CD4 count and extent of antigenic burden. Clinical progression of human immunodeficiency virus–related Kaposi sarcoma remains an important complication of HAART therapy in a subset of patients and may be associated with fatal diffuse alveolar damage (clinical ARDS).

Autopsy Demonstration of Intramyocardial Polymer Gel Emboli Associated With a Giant-Cell Reaction Following Cardiac Catheterization
(Poster No. 15)

Vicky El-Najjar, MD (dov5288@msmc.com); Morton Robinson, MD. Department of Pathology and Laboratory Medicine, Mount Sinai Medical Center, Miami Beach, Florida.

Foreign body type granulomatous vasculitis has been reported in blood vessels of the brain, lungs, and skin of the foot following intravascular instrumentation with devices coated with hydrophilic polymer gel. We report a case of a 77-year-old woman who suffered an acute myocardial infarction. Cardiac catheterization revealed occlusive disease involving the right coronary artery and the circumflex artery. Coronary stenting was performed for both arteries using bare metal
Cardiac noncompaction, a rarely diagnosed, congenital disease, does not seem to be the immediate cause of death in our case, it possibly contributed to the patient’s demise.

Complications of Cardiac Left Ventricular Noncompaction/ Hypertrabeculation (Poster No. 16)

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Context: Cardiac noncompaction, a rarely diagnosed, congenital disease, features numerous large ventricular apical trabeculae that project into the lumen. These ventricular apical trabeculae create deep intertrabecular recesses and subtrabecular channels of potentially slowed blood flow, causing a predisposition toward mural thrombus formation. Other complications include heart failure, arrhythmias, and possibly infarction.

Design: We analyzed these complications in 8 cases.

Results: A 5-month-old boy, also with a ventricular septal defect, had heart failure. A 1.5-year-old girl had heart failure. A 1-year-old boy, 1-year-old girl, and 2-year-old girl all had additional cardiac abnormalities with no complications attributable to the noncompaction. An 11-year-old girl had mitral regurgitation and suffered a sudden cardiac arrest in the outpatient department, presumably due to an arrhythmia. A 45-year-old man with heart failure and a large apical thrombus was started on an anticoagulant but took cocaine and not the anticoagulant. This patient had recurrent heart failure, followed by an embolic stroke and severe cerebral edema. Autopsy revealed extensive, primarily subacute myocardial infarction of both ventricular apices, only moderate coronary atherosclerosis, mural thrombi in both ventricular apices, and biventricular noncompaction (Figure 61). A 55-year-old man died 10 days after a 3-vessel coronary bypass grafting, and autopsy revealed noncompaction along with multiple microinfarcts.

Conclusions: Myocardial infarction may represent a complication of left ventricular noncompaction and add to the risk of mural thrombus formation. Increasing recognition of cardiac noncompaction suggests that it may not be as rare as previously thought. Fully understanding this disease and its complications is important because it may be familial, and its recognition should prompt screening of family members for the disease.

Recurrent Massive Perivillous Fibrin Deposition Associated With Fetal Abdominal Wall Defects (Poster No. 17)

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A 36-year-old woman presented with stillbirth at 21 weeks’ gestation. Autopsy revealed a macerated, small-for-gestation, female fetus with a large right upper abdominal wall defect, with herniation of the intestinal loops and liver (Figure 62, A and B). The placenta was small, with massive perivillous fibrin deposition (Figure 62, C). The obstetric history included 2 term deliveries followed by 4 prior pregnancy losses. The first 2 stillborn fetuses (24 and 30 weeks, respectively) were grossly normal, and the placentas showed variably increased perivillous fibrin (slides were unavailable for review). The third fetus (14 weeks) had an abdominal wall defect with herniation of contents, very similar to that seen in our case, and a microscopic appearance identical to the current placenta (Figure 62, D). The fourth loss occurred in the first trimester with no recognizable fetus and only hemorrhagic decidua on microscopy. Thrombophilia workup results were normal. Massive perivillous fibrin deposition is a lesion of unknown pathogenesis that is associated with recurrent fetal growth restriction and death. Some reports suggest an association with fetal deficiency of long-chain-3-hydroxyacyl-CoA-dehydrogenase. There is no previously reported association with fetal abdominal-wall defects of any type. This defect mimics that of gastrochisis but is distinguishable by a more suprolateral location and an absence of amnio vacuolation typically observed in gastrochisis. One explanation for the defect could be an unusual form of...
Disseminated Zygomycosis in a Patient With Wegener Granulomatosis
(Poster No. 18)

William D. Kotchkoski, MD (wkotchkoski@metrohealth.org); Stanley C. Pace, MD; Timothy D. Beddow, MD. Department of Pathology, MetroHealth Medical Center, Cleveland, Ohio.

We present a 64-year-old woman with a complicated medical history, including diabetes and congestive heart failure, who was hospitalized for Wegener granulomatosis (WG). Shortly after dismissal, she was readmitted and hospitalized for several weeks. Near the end of her illness, she was referred to hospice and expired shortly thereafter. At autopsy, multiple organ systems were involved by disseminated zygomycosis, including the right lung (Figure 63), right kidney, and brain. Stigma of shock included multiple therapies are forthcoming, currently, the best ways to prevent negative outcomes from TTP-HUS are increased awareness of the complications among medical caregivers and close monitoring for those complications. We describe a case of previously healthy, 29-year-old, African-American woman that came to our emergency department after 3 days and 15 to 20 episodes of vomiting and diarrhea. Her symptoms were described with mild epigastric pain as well as a nonquantified fever. The admission laboratory work demonstrated thrombocytopenia, low haptoglobin, high indirect bilirubin, and high lactate dehydrogenase; a constellation of findings indicative of intravascular hemolysis. The ratio of serum urea nitrogen to creatinine suggested the patient had a degree of renal failure. The patient was initially diagnosed with TTP-HUS. Despite adequate treatment with plasmapheresis, she died of the multiple complications of TTP-HUS. Autopsy was performed, which demonstrated multiple hyaline microthrombi in the arterioles and capillaries of the heart, lungs, liver, spleen, kidneys, adrenals, thyroid, and pancreas. Although TTP-HUS is a disease that has recently become less enigmatic, it still possesses many aspects shrouded in mystery. Since the discovery of plasmapheresis as a treatment option, recent insights into the pathogenesis may mean better therapies are forthcoming.

Sudden Infant Death in a Patient With Cystic Fibrosis and Mild Respiratory Syncytial Virus Infection
(Poster No. 20)

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Cystic fibrosis (CF) is a disease characterized by chronic airway obstruction, pancreatic insufficiency, and gastrointestinal dysfunction due to a CFTR mutation. Presentation as sudden infant death syndrome has not been described in the literature, to our knowledge. We report the autopsy findings in a CF patient with mild respiratory syncytial virus (RSV) infection who presented as sudden infant death syndrome. A-3 month-old, male infant diagnosed with CF as a newborn was transferred to our hospital because of acute respiratory distress and positive RSV direct fluorescent antibody. His clinical condition improved to baseline by day 7. He had no respiratory symptoms and required no oxygen or other treatment. The night before his discharge, the infant was found lying prone and unresponsive in his crib. He failed resuscitation and expired. An autopsy was required because of his unexpected death. The autopsy findings were consistent with CF. In addition, there were signs of acute asphyxia and airway obstruction with extensive mucus plugs in the bronchial branches and proximal bronchioles, and focal mild bronchiolitis. Postmortem viral culture and RSV immunohistochemistry of the lung yielded negative results. The cause of death was determined as airway obstruction secondary to undiagnosed CF with mild RSV infection, suggested by the initial positive RSV direct fluorescent antibody assay. We report this case to alert the health care provider to be aware of the devastating complications in patients with CF, even with mild RSV infection and apparent clinical improvement. It is imperative these patients be monitored especially well because of the possibility of sudden death.

Cardiac Angiosarcoma—A Postmortem Diagnosis
(Poster No. 21)

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Cardiac angiosarcoma, a rare malignant tumor, typically presents at an advanced stage with vague, nonspecific symptoms including chest pain, hemopericardium, cardiomegaly, and hepatomegaly. We present a case of cardiac angiosarcoma diagnosed at postmortem examination. A 63-year-old man presented to a referring hospital with angina and dyspnea. A large bloody pericardial effusion and bilateral pleural effusions were noted and sampled. Clinical considerations were given to mesothelioma, metastasis, tuberculosis, and fungal infection. Extensive clinical workup failed to reveal an infection or malignancy. Ultimately, the patient underwent thoracotomy for pleural and pericardial biopsies, which yielded negative results. The patient deteriorated rapidly despite resuscitation efforts. The body was transported to our facility for autopsy. Autopsy at our facility revealed a distended pericardium filled with apparent clotted blood with a somewhat organized appearance as well as lung lesions suspicious for hemangiomata. Microscopic examination of the heart with attached blood clot and liver lesions showed typical spindled, somewhat organized vascular channels with areas of hemorrhage and necrosis. Immunohistochemical staining of the tumor cells revealed positive staining for vimentin, CD31, and CD34, and no staining for calretinin. The
Coronary Artery Ectasia: An Overlooked Pathogenesis
(Poster No. 22)
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Coronary artery ectasia (CAE) is defined as dilatation of an arterial segment to a diameter at least 1.5 times that of the adjacent healthy artery. Its incidence ranges from 1.2% to 5% with a male predominance. Most CAE is attributed to atherosclerosis (50%) and inflammatory or connective tissue diseases (10%–20%) with the remainder being either congenital or idiopathic. Slow or turbulent blood flow is thought to be the cause of ischemia, regardless of the severity of coexisting atherosclerotic artery disease. Thirty-nine percent of patients with pure CAE show significant previous myocardial infarction. We report the case of an 81-year-old male with severe ischemic cardiomyopathy and congestive heart failure (ejection fraction, 15%) with prior myocardial infarction. He was admitted with possible pneumonia versus congestive heart failure exacerbation. His condition continued to deteriorate despite therapy, and he expired 2 weeks after admission. At autopsy, he had marked cardiomegaly (900 g) with marked left ventricular dilatation, a remote left circumferential ventricular infarct, multifocal myocardial fibrosis, and CAE of the right and left main coronary arteries (0.7 and 0.9 cm diameter, respectively) with only mild, uncomplicated coronary atherosclerosis (up to 30% stenosis). The lungs had diffuse alveolar damage with patchy terminal aspiration pneumonia. He succumbed to complications of severe ischemic cardiomyopathy secondary to CAE, despite widely patent coronary arteries. Often, CAE is overlooked at autopsy and attributed to a large-sized heart. If present, CAE should be recognized as a cause of ischemia in patients with ischemic cardiomyopathy.

Fatal Undifferentiated Sarcoma Associated With Polycystic Liver Disease
(Poster No. 23)
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Adult polycystic liver disease is often associated with autosomal dominant polycystic kidney disease (ADPKD). Although 1% to 5% of ADPKD cases can be complicated by development of renal cell carcinoma, to the best of our knowledge, there is no report of malignancy associated with adult polycystic liver disease. We report a unique case of fatal, undifferentiated sarcoma arising in a background of autosomal dominant adult polycystic liver and kidney disease. The patient was a 63-year-old, Hispanic woman with multiple first-degree relatives suffering from ADPKD. She herself had a renal transplant in 2004, for ADPKD. She presented initially with abdominal discomfort and pain. Computed tomography scan showed multiple complex liver cysts with solid areas. The cysts were drained, but within a week, she came back with pleural effusion. Subsequently, she developed anasarca and respiratory distress and died of respiratory failure within a month. Autopsy confirmed ADPKD with numerous cysts in the liver. Extensive necrotic areas were noted in between the hepatic cysts with infiltration of the right hemidiaphragm. There was a pink-tan, friable mass filling the entire right pleural cavity, encasing the right lung, great vessels, and part of the pericardium. Microscopic examination revealed a poorly differentiated sarcoma in the liver and mediastinum strongly immunoreactive to vimentin and focally positive for S100 and SMA. The tumor was not immunoreactive to AE1/AE3, CAM 5.2, CK7, CK20, MSA, desmin, HMB-45, Melan-A, CD34, and c-Kit. Bilateral kidneys were free of tumor. Development of malignancy can complicate the clinical course and management of polycystic liver disease.

Autopsy Findings in a Patient With Sickle Cell Anemia Who Survived Mediastinal Renal Cell Carcinoma for 10 Years
(Poster No. 24)
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Sickle cell disease is a hemoglobinopathy with a significant impact on public health. In the United States, the median survival age was estimated in 1994 to be 42 years for men and 48 years for women. We present the autopsy findings of a 32-year-old, African American man with homozygous sickle cell anemia. He was reported in the literature for presenting renal medullary carcinoma at age 21, a rare neoplasia occurring almost exclusively in patients having a sickle gene. He survived for 10 years and 4 months after having radical nephrectomy and chemotherapy. To our knowledge, this is the longest survival reported for this tumor. The objective of this report is to highlight the spectrum of autopsy findings in this patient, related to sickle cell disease. The clinical course of this patient was relevant for numerous hospitalizations because of vaso-occlusive and thromboembolic complications (bone infarcts, pulmonary embolisms, and acute chest syndrome); numerous transfusions, including full exchanges; and chronic renal insufficiency. The patient presented to the emergency department with acute dyspnea and chest pain. His status worsened, and he expired shortly thereafter. The relevant autopsy findings included the following: evidence of remote and recent pulmonary emboli despite appropriate, long-term anticoagulation; vascular changes of pulmonary hypertension, including plexiform lesions; transfusional liver hemochromatosis; Gama-Gandy bodies in an unexpectedly enlarged spleen (250 g); an incidental pericaval paraganglioma; and no evidence of recurrence of renal medullary carcinoma. The anatomic and histologic findings correlate very well with the clinical presentation seen in this entity (Figure 64).

Fetal Paraneoplastic Necrotizing Myelitis in a 39-Year-Old Obese Man With Non-Hodgkin Lymphoma
(Poster No. 25)
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Paraneoplastic necrotizing myelopathy is a rare disorder associated with malignancies. Fewer than 40 cases have been reported; 13 of these were linked to lymphoma, mostly Hodgkin lymphoma (9 cases). Most affected patients have a spectrum of findings that include ascending sensory and motor deficits, progressive gait disturbances, flaccid or spastic paraplegia with sphincteric involvement, and lower back pain. Cerebrospinal fluid examination reveals elevated protein. We present a case of a 39-year-old man with obstructive sleep apnea, hypertension, and bipolar disorder who initially complained of worsening bilateral lower extremity weakness and sensory loss for 1 month, followed by
Paraplegia and urinary incontinence. Cerebrospinal fluid protein was markedly elevated. Magnetic resonance imaging showed signal enhancement of the spinal cord from the medulla to T10, along with an 8.2-cm, enhancing mass involving the right psoas muscle. Biopsy of the psoas mass showed diffuse large B-cell lymphoma. The day these findings were reported, the patient developed sudden respiratory failure and expired. Autopsy revealed diffuse necrosis of the cervical spinal cord; the upper thoracic spinal cord showed patchy necrosis along with axonal degeneration and focal demyelination of the posterior columns. No lymphoma was present in the leptomeninges or parenchyma of the spinal cord. This patient’s obesity and obstructive sleep apnea likely contributed to his demise, but his death was directly due to neurologic dysfunction from this unusual paraneoplastic syndrome. Figure 6 shows extensive neuronal necrosis in the lower cervical cord and the inset photomicrograph shows neuronophagia.

A Unique Case of Cast Nephropathy Found at Autopsy in a Patient With Concurrent Angioimmunoblastic T-Cell Lymphoma and Epstein-Barr Virus–Positive B-Cell Lymphoproliferative Disorder
(Poster No. 26)
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Although secondary lymphomas occurring in the setting of angioimmunoblastic T-cell lymphoma (AITL) are considered rare, it is a well-described phenomenon seen in association with profound immune dysfunction and Epstein-Barr virus infection. We present a case of concurrent AITL and Epstein-Barr virus–associated B-cell lymphoma, uniquely associated with acute kidney injury, secondary to cast nephropathy. The patient was a 65-year-old woman diagnosed with AITL 7 months before autopsy. One week following the ninth cycle of chemotherapy, she developed acute kidney injury. Serum electrophoresis identified monoclonal immunoglobulin G and free serum light chains; however, urine electrophoresis results were negative. Subsequent flow cytometric analysis revealed a peripheral B-cell lymphoproliferative disorder with lack of light chain expression by the B cells. The patient’s renal function declined, and she expired a week later. Autopsy examination revealed multisystemic involvement by the previously diagnosed AITL (Figure 6, a and b). Additionally, there was extensive nodal involvement by a B-cell lymphoproliferative disorder, morphologically consistent with diffuse large B-cell lymphoma (Figure 6, c and d), and Epstein-Barr virus was positive by in situ hybridization (Figure 6, e) and polymerase chain reaction. Microscopy of the kidney revealed changes of cast nephropathy, including extensive acute tubular injury associated with periodic acid–Schiff-negative cracked casts (Figure 6, f). Of the limited published reports of AITL associated with renal failure, most are secondary to glomerular pathology. Our case demonstrates the unique coexistence of AITL, secondary B-cell lymphoma, and serum monoclonal gammapathy, with subsequent cast nephropathy in the absence of Bence Jones proteinuria.

Abdominal Cocoon and Diffuse Meconium Peritonitis in Fetal Hydrops
(Poster No. 27)
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Abdominal cocoon, sclerosing encapsulated peritonitis, and peritoneal encapsulation are 3 entities describing encapsulation of the small intestine within a membranous sac. Abdominal cocoon and sclerosing encapsulated peritonitis both refer to small-bowel encapsulation secondary to obstruction from chronic inflammation, whereas peritoneal encapsulation refers to developmental malformations found incidentally during laparotomies or autopsies. We report autopsy findings of abdominal cocoon and meconium peritonitis in a fetus with hydrops. The patient was a female infant delivered vaginally at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation. Prenatal history was significant for fetal ascites that progressed to fetal hydrops and oligohydramnios. Ultrasound-guided paracentesis attempted at 27 5/7 weeks gestation.
body weight and measurements were lower than that expected for gestational age. The abdomen was markedly distended and contained 250 ml of ascites fluid. The lungs were hypoplastic as reflected by a decreased lung to body ratio (0.012). Examination of the digestive system was significant for extensive encasement of the duodenum, jejunum, and ileum, by a thin, glistening encapsulating membrane (Figure 67). Microscopically, there were abundant amniotic squamous cells with fibrosis, mononuclear cell infiltrate, and mineralization in the serosa of intestine and other abdominal organs. Other causes of fetal hydrops, such as viral infection or storage disease, were not identified. Cyto- genetics studies revealed a normal female karyotype. This case demonstr- ates that abdominal cocoon or sclerosing encapsulating peritonitis may occur in a fetus or infant as a result of chronic inflammation and not necessarily as a developmental abnormality.

Can the Use of a Virtual Patient Influence Perceptions and Attitudes About the Autopsy? (Poster No. 28)

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Context: Pathologists recognize the role of the autopsy in the practice of medicine. However, other physicians may be reluctant to request an autopsy for a variety of reasons, including misperceptions.

Design: A project using a virtual patient (VP) with an underlying disease that would likely be undiagnosed without an autopsy was developed. The patient has a number of conditions (diabetes, alcoholism, cirrhosis, breast extension) that mask progressive multifocal leukoencephalopathy. We use a pretest/posttest model to determine the participant’s perceptions and attitudes about the autopsy. Participants may interact with the patient (history, physical) and order any diagnostic test before he dies. The VP’s autopsy results are available if requested, including gross organ weights, representative histologic sections of organs, and descriptors of each. The posttest includes a clinical pathologic correlation of the autopsy, an educational overview regarding autopsy use in the United States, and finally, the same questions as in the pretest to evaluate perceptions and attitudes.

Results: To date, we have had an insufficient number of responses to evaluate any trends changes of perceptions and attitudes about the autopsy. Our survey is currently restricted to attending physicians and residents at our institution to vet the questionnaires and the VP; we will solicit national participation within the month. It is anticipated that we will have sufficient participation to compare a variety of considerations.

Conclusions: Our project is unique and intended to explore the use of VPs in continuing medical education. Specifically, it is anticipated that our study will influence attitudes and perception of clinicians about the autopsy.

Smith-Lemli-Opitz Syndrome With Unilateral Renal Agenesis: Another Cause of Oligohydramnios (Poster No. 29)

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The Smith-Lemli-Opitz Syndrome (SLOS) is an autosomal recessive disorder due to deficiency of microsomal 7-dehydrocholesterol reductase resulting in an elevated cholesterol precursor (7-dehydrocholesterol [7-DHCL]) with decreased cholesterol levels in plasma and tissues. The incidence varies from 1:20 000 to 1:70 000 live births. The clinical spectrum extends from intrauterine death with holoprosencephaly to total sterol ratio was 284% (reference range, 0.01%–0.11%), performed by gas chromatography-mass spectrometry on liver tissue at Kennedy Krieger Institute (Baltimore, Maryland). The analysis was consistent with a diagnosis of SLOS. The SLOS with renal agenesis can lead to severe oligohydramnios. Prenatal diagnosis is possible by a 7-DHC to cholesterol ratio analysis of chorionic villi and/or amniotic fluid. The biochemical confirmation is rapid and reliable, thus obviating the need for enzymatic or molecular testing.

Sudden Death in Carcinoid Heart Disease With Significant Left Heart Involvement (Poster No. 30)

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The carcinoid syndrome is a rare cause of acquired valvular heart disease and usually involves the endocardium and valves of the right side of the heart. Bilateral cardiac involvement in carcinoid syndrome is rare. There are few reports of bilateral heart involvement in patients with patent foramen ovale, intracardiac shunting, or carcinoid tumor of lung. We report a case of carcinoid heart disease with significant involvement of left and right sides of the heart including all the valves. The patient, a 74-year-old, black man with no history of congenital heart disease, was brought to the emergency department complaining of respiratory distress and agonal respiration and died of cardiopulmonary arrest. The significant findings at autopsy included a 2.5-cm carcinoid tumor in the ileum with extensive pseudocystic and cavernous foci of liver metastases. The gross evaluation of the heart revealed marked endocardial fibrosis with fibrotic thickening of all 4 heart valves and the pulmonary artery. The valve leaflets were thickened, retracted, and shortened with fibrotic plaques (Figure 68). There was no evidence of patent foramen ovale. Microscopic evaluation of the plaques showed smooth muscle cells and myofibroblasts, surrounded by an extracellular matrix composed of acid mucopolysaccharides, basement membrane, and collagen fibers (Figure 68, Movat pentachrome stain). Our case is unique because it represents a rare manifestation of carcinoid heart disease with gross and microscopic confirmation of bilateral heart involvement in the absence of patent foramen ovale or cardiac shunt, leading to sudden cardiac death.

Fetal Hydrops, Heterotaxy, and Ventricular Noncompaction: A Lethal Combination With Rare and Previously Unreported Findings (Poster No. 31)

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Heterotaxy syndrome is an anomaly of left to right organ partitioning, occurring in 1 per 10,000 births and resulting in abnormal body situs. We present a case remarkable for rare and previously unreported findings in left isomerism heterotaxy (LI-H). A fetus of 31 3/7 weeks’ gestation, with prematurely diagnosed heterotaxy, congenital heart disease, bradyarrhyth-
Colloid Cyst of the Third Ventricle Diagnosed at Autopsy in a Patient With Multiple Sclerosis

(Poster No. 32)

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Colloid cysts of the third ventricle are rare, benign congenital tumors and may be potentially life-threatening because of obstructive hydrocephalus and brain herniation. We present a case of colloid cyst of the third ventricle diagnosed at autopsy. A 42-year-old, white woman had a clinical history of multiple sclerosis, hypertension, recurrent pneumonia, and dysphagia. She was severely disabled and died because of acute bronchopneumonia. A magnetic resonance imaging study was performed for her advanced multiple sclerosis 16 months before she died. It incidentally revealed a large mass in the brain stem, measuring 4.1 cm anteroposteriorly, which involved the upper pons. The tumor was considered a gloma without further workup and treatment. At postmortem examination, a 3.5-cm cyst was identified in the dilated third ventricle, extending to pons and lateral ventricles. The cyst had smooth, tan walls and contained green-yellow, turbid, gelatinous material. Microscopically, the cyst was lined by a single layer of low cuboidal epithelium with surrounding piloid gliosis and Rosenthal fibers. The lining epithelium was positive for pankeratin and negative for glial fibrillary acidic protein. The features of morphology and immunopatterns were consistent with colloid cyst of the third ventricle. The tumor might have caused deterioration in the patient’s neurologic symptom. To our knowledge, this is the first described case of colloid cyst of the third ventricle found in a patient with multiple sclerosis at autopsy. Colloid cyst of the third ventricle should be considered in the differential diagnosis of brain stem tumors.

Fibrous Hamartoma of Index in a 2-Year-Old Boy

(Poster No. 33)

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Fibrous hamartoma of infancy (FHI) is a rare, benign mass of fibrous proliferation. This condition mostly occurs in boys within the first 2 years of life. Up to 25% of cases are present at birth. There is no apparent familial or syndromic association. The FHI is most often solitary, painless, and grows rapidly. The mass is in the subcutis or dermis, freely movable, and frequently located in the axilla, shoulder, and upper arm. Involvement of the hand and wrist is rare. The FHI is a poorly circumscribed, gray-white fibrous tissue intermixed with islands of fat. The histologic appearance is characterized by the presence of 3 distinct components: well-differentiated spindled cells, mature adipose tissue, and areas resembling primitive mesenchyme. It is important to distinguish FHI from other forms of fibrous proliferation of infancy because it is a benign lesion curable by local resection. We describe a case of hypoplastic thumb and associated soft tissue mass in the thenar eminence of the hand of a 2-year-old boy. Magnetic resonance imaging showed an amorphous increase in enhancing soft tissues of the thenar eminence and a suggestion of increased soft tissue between the radial metacarpals. Excision was performed and showed a poorly circumscribed, subcutaneous mass composed of fibroblastic and myofibroblastic spindle cells with bland nuclei separated by dense collagen; islands of immature-appearing, small, primitive mesenchymal cells with scant cytoplasm embedded in a myxoid matrix; and mature fat interspersed among the other 2 components. The tumor cells were positive for vimentin and focally for CD34, and FHI was diagnosed (Figure 70).

Lethal Mucor Necrotizing Fasciitis in a Patient on High-Dose Steroids for Polymyalgia Rheumatica and Idiopathic Thrombocytopenic Purpura

(Poster No. 34)

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An 85-year-old white woman with chronic kidney disease, secondary to chronic nonsteroidal anti-inflammatory drug use, diabetes mellitus, and polymyalgia rheumatica, was admitted for right hand pain. She was hospitalized earlier the same month for idiopathic thrombocytopenic purpura and cellulitis. She was given high-dose steroids for idiopathic thrombocytopenic purpura, even thought she was already receiving steroids for her polymyalgia rheumatica. She was then transferred to the intensive care unit for intermittent mental status changes, worsening right hand wounds, and worry about sepsis. The patient had been on multiple antifungal and antibiotic therapies at that point, including amphotericin B and posaconazole. An excision biopsy from the left dorsal forearm revealed epidermal necrosis with numerous nonseptate hyphae present invading deeply into the subcutaneous tissue. Necrotizing fasciitis was diagnosed, and the patient was sent for below the elbow amputation. The patient continued to deteriorate and developed respiratory failure and atrial fibrillation and was then put on comfort.
care measures only. Although mucormycosis is not uncommon, the most common invasive form is rhinoencephal, followed by pulmonary mucormycosis. Necrotizing fasciitis from Zygomycetes has been reported, but it is exceedingly rare and usually responds to amphotericin B or posaconazole and surgical debridement, which were all unsuccessful in this patient. This highlights the importance of early clinical suspicion and rapid identification from hematoxylin-eosin–stained tissue slides. Awareness of this clinical entity by clinicians and pathologists is very important to help decrease morbidity and mortality from this sometimes lethal disease.

Xanthogranulomatous Inflammation: A Possible Affiliation With IgG4-Associated Sclerosing Disease?
(Poster No. 35)

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Context: Xanthogranulomatous inflammation is a heterogeneous mass-forming lesion occurring in various organs, characterized by diffuse granulomatous infiltrates of foamy histiocytes, multinucleated giant cells, lymphocytes, plasma cells, and neutrophils. Immunoglobulin G4 (IgG4)-related sclerosing disease is associated with lymphoplasmacytic infiltration, sclerosis, and obliterated thrombophlebitis, with atrophy and loss of specialized structures. Although certain morphologic overlaps exist, a relationship between these entities has not, to our knowledge, been described in literature.

Design: Ten cases of xanthogranulomatous inflammation were evaluated, and IgG4 immunohistochemistry was performed. The IgG4-positive plasma cells were quantified based on positive cells per high-power field (HPF), averaging 3 HPFs: 50 cells/HPF.

Results: There were 10 patients, 6 women and 4 men (mean age, 70 years; range, 53–92 years). Sites involved kidney (n=2), orbit (n=1), gallbladder (n=2), uterus (n=1), colon (n=1), breast (n=1), and soft tissue (n=2). All cases were morphologically consistent with xanthogranulomatous inflammation. No patients demonstrated symptoms of systemic IgG4-associated sclerosing disease. Seven cases had increased IgG4 plasma cells (range, 8–110 cells/HPF). Three cases had more than 50 positive cells/HPF (uterus, orbit, 1 gallbladder), 2 cases had 20 to 50 positive cells/HPF (1 soft tissue, 1 kidney), and 2 cases had 20 IgG4 plasma cells with significant lymphoplasmacytic infiltration (>70%) and a minor component of foam cells (10%–30%). Iron and calcium special stains did not confirm malakoplakia.

Conclusions: A subset of xanthogranulomatous inflammation, excluding malakoplakia, may constitute a form of IgG4-associated sclerosing disease. Raised IgG4 serum levels, morphologic features of obstructive phlebitis, and increased IgG4-positive plasma cells may aid in establishing a shared pathogenesis. This may lead to new therapeutic options for xanthogranulomatous inflammation, specifically, conservative steroid treatment.

Low-Grade Neuroendocrine Carcinoma Arising Within a Sacrococcygeal Teratoma
(Poster No. 36)

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Tumors within the presacral space are uncommon with an incidence of 1 in 40,000. Teratomas within the presacral space most commonly occur in infancy and have an incidence of 1 in 30,000 to 1 in 45,000 live births, with a female predominance. Sacrococcygeal teratomas in adults are very rare. Patients most often are asymptomatic. If symptoms are present, they are often reflective of the tumor size with compression of neighboring organs. Macroscopically, teratomas are partially cystic masses filled with gelatinous fluid or keratin. Microscopically, they contain a variety of cell types derived from more than one germ layer. Neuroendocrine tumors within the presacral space are rare and most often represent a direct extension or metastatic spread from adjacent rectal tumors. Dujardin et al found 20 cases of primary neuroendocrine tumors in the presacral space reported in the literature in 2009. Nine of those cases were associated with a tailgut cyst, and 3 originated from a sacrococcygeal teratoma. We describe a fourth case of low-grade neuroendocrine carcinoma arising within a sacrococcygeal teratoma.

The patient is a 31-year-old woman, with a prior history of a myelomeningocele, who was noted to have a large cystic mass within the presacrum during a cesarean section. Microscopic examination of the mass revealed a mature teratoma that contained solid areas of neoplastic cells with moderate nuclear to cytoplasmic ratios and finely clumped “salt and pepper” chromatin arranged in a predominantly trabecular pattern. Immunohistochemical staining revealed these cells to be positive for chromogranin, synaptophysin, and AE1/AE3 (Figure 71).

Liposclerosing Myxofibrous Tumor, Distinctive Histologic Complexity, and the Importance of Distinguishing From Fibrous Dysplasia: Case Report and Literature Review
(Poster No. 37)

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Liposclerosing myxofibrous tumor (LSMFT) is an uncommon, benign, fibro-osseous bone lesion with a strong predilection for the proximal femur, first described by Ragsdale and Sweet in 1986. This lesion is not a universally accepted, pathologic entity and appears in the literature under variants of fibrous dysplasia (FD) or other benign lytic bone lesions. It is assumed to be a nonspecific end result of degenerative change in other benign fibromyxoid or fibro-osseous bone lesions. However, an activating point mutation in the \\n\textit{z} subunit of a G protein has been identified in some LSMFT and in nearly all cases of FD. We report a case of LSMFT in a 72-year-old man with a history of chronic hip pain in the proximal femur. Radiology results revealed a mixed lytic/sclerotic...
Osteofibrous Dysplasia in an Unusual Location
(Poster No. 39)
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Osteofibrous dysplasia is a rare fibro-osseous lesion that occurs in the first 2 decades of life. With rare exceptions, it occurs in the tibia or fibula. Osteofibrous dysplasia has a characteristic course: the lesion grows until skeletal maturity is reached and then becomes stable and may even regress. It often recurs if surgical intervention is performed before puberty. We present a case of osteofibrous dysplasia in the right ulna, an uncommon location, in a 2-year-old boy. The patient presented with a lump over the ulna and no other significant medical history. Radiographs showed a bubbly cystic lesion in the diaphysis of the ulna with cortical thinning and possible cortical breakthrough (Figure 74, A).

Epiphyseal Chondromyxoid Fibroma With Prominent Adipose Tissue: Report of a Case With an Unusual Radiologic and Histologic Presentation
(Poster No. 40)
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The epiphyses of bone have different physiologic development compared with other portions of the skeleton. The incidence of primary tumors in this location is low, with chondroblastoma and giant cell tumor being the most common entities in children and adults, respectively. Chondromyxoid fibroma (CMF) is a rare, benign tumor that typically occurs in the metaphyseal intramedullary portion of long bones and, rarely, in the pelvis and small bones of the hands and feet. The typical zonal architecture with fibrous tissue and early bone formation at the center and abundant boney trabeculae at the periphery was also present. The lesion recurred several months later, and curettage and bone grafting was repeated. Recent radiographs have demonstrated another recurrence. Osteofibrous dysplasia rarely occurs in the ulna. A review of the literature demonstrated 5 case reports of 6 patients with osteofibrous dysplasia in the ulna published between 1992 and 2003. Only 4 of these patients’ diagnoses were confirmed histologically. Our case helps establish the ulna as an uncommon but reported site of osteofibrous dysplasia.
arranged in a zonal distribution, with cellular condensation at the periphery of the lobules, features characteristic of a CMF. In addition, mature adipose tissue was seen streaming throughout the entire lesion. Focal calcifications were also present, a finding rarely seen in intramedullary CMF but more commonly associated with juxtacortical CMF. This case is unique not only for its extraordinarily uncommon location but also for the presence of fat as a lesional component, a feature that, to our knowledge, has not been recorded in CMF of any location to date. Thus, chondromyxoid fibrolipoma may be an appropriate terminology to describe this lesion.

Low-Grade Chondrosarcoma in Childhood With No History of Enchondromatosis: A Diagnostic Rarity
(Poster No. 41)

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A 9-year-old boy presented with a 1-month history of an enlarging mass in his right flank. Computed tomography scan demonstrated an 8 × 10-cm craniocaudal mass with calcification extending from the right ilium to the right flank. A core biopsy of the lesion showed well-differentiated cartilage with bland nuclei surrounding enchondral ossification. No cortical bone destruction, necrosis, or mitotic activity was identified on core biopsy. A complete resection of the mass revealed a hyaline and myxoid cartilage tumor of low to moderate cellularity arranged in nodules and sheets. The tumor permeated the cancellous bone of the marrow, completely surrounding and encasing fragments of cancellous bone (Figure 75). Additionally, the tumor expanded into the adjacent tissues, forming nodules of tumor surrounded by bands of fibrosis. Rare mitotic figures were present. The diagnosis of chondrosarcoma grade 2 was made. Chondrosarcoma is the second most-common primary bone tumor in the general population, surpassed only by osteosarcoma, and is almost exclusively a tumor of adulthood. The peak incidence of chondrosarcoma occurs in the fourth to sixth decades of life. It occurs in children younger than 17 years in only 1.5% of cases. When it does occur in childhood, it is usually a high-grade lesion. Further, the diagnosis of enchondromatosis greatly increases the risk of malignant transformation. We submit a very rare case of grade 2 chondrosarcoma in a 9-year-old boy with no history of enchondromatosis.

Congenital, Undifferentiated, High-Grade Sarcoma Expressing β-hCG
(Poster No. 42)

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Malignant neonatal neoplasms are rare, representing less than 2% of pediatric tumors, and most (78%–80%) are considered to have a favorable prognosis with local excision. Undifferentiated, high-grade sarcoma is even more infrequent in neonatal patients. We report a case of a congenital, undifferentiated, high-grade sarcoma expressing β-human chorionic gonadotropin hormone (β-hCG). A full-term, male infant was born with a 4.5-cm right proximal extremity soft tissue tumor and a knee contracture. Initial biopsy revealed areas of tightly packed, medium-sized, round to angulated cells and areas of loosely arranged ganglion-like cells. Immunohistochemical stains revealed diffuse vimentin positivity, focal CD68 positivity, and the absence of desmin, myoD1, and keratin expression. Initially, a reactive process was favored and suggestive of proliferative fasciitis. Within 3 months, the patient developed rapid tumor growth; above-knee amputation was performed, and permanent histology revealed tumor cells with increased cellularity but unchanged cytology and immunohistochemistry. The tumor was found to be β-hCG positive with normal cytogentic results. Serum β-hCG level peaked at more than 200,000 mIU/mL, but dramatically decreased after resection. However, within 3 weeks of resection, inguinal lymphadenopathy, hypercalcemia, failure-to-thrive, and rise in serum β-hCG developed. Following chemotherapy, repeat biopsy revealed complex cytogentic clonal abnormalities associated with no specific neoplasms. Although there are rare case reports of β-hCG expression in sarcomas, this is the first report in the English literature, to our knowledge, of a congenital undifferentiated sarcoma expressing β-hCG. β-hCG expression may be a marker of a particularly virulent sarcoma phenotype but was also a useful clinical tool to follow tumor relapse and progression (Figure 76).

Extraskeletal Myxoid Chondrosarcoma Presenting as an Abscess
(Poster No. 43)

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Extraskeletal myxoid chondrosarcoma is an uncommon entity, accounting for 3% of all soft tissue sarcomas, which usually presents as a slow-growing, deep-seated, painful mass in the proximal extremities. We report an unusual manifestation of extraskeletal myxoid chondrosarcoma, presenting as an abscess in a 64-year-old woman. The patient complained of a painful right buttock mass for 5 months, as well as fever and chills for 1 week. A computed tomography scan demonstrated a 6-cm right gluteal peripherally enhancing fluid collection concerning for an abscess, with stranding in the superficial soft tissues suggestive of cellulitis. The patient was taken to the operating room for incision and drainage of the lesion. However, the mass unexpectedly expressed soft tissue, and intraoperative assessment of the specimen revealed a small blue cell tumor. Subsequent histologic evaluation of the permanent material supported the surprising diagnosis of extraskeletal myxoid chondrosarcoma. Extraskeletal myxoid chondrosarcoma is currently classified as a tumor of uncertain differentiation by the World Health Organization. Late recurrence and metastasis are common. This case highlights the importance of clinical, radiologic, and pathologic correlation in providing the appropriate management of patients with atypical presentations of rare neoplasms.

Rosal-Dorfman Disease: Another Possible IgG4-Sclerosing Disease?
(Poster No. 44)

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The patients’ ages ranged from 11 to 70 years with a female to male ratio of 5:2. One patient had a history of autoimmune pancreatitis with elevated serum IgG4 levels, a finding linked to IgG4-related sclerosis. Lymph node involvement was documented in 2 cases, but extranodal disease existed in all 7 patients. Involved sites included the nasal cavity, the mediastinum, arm, skin, colon, and the subglottis. Presentations varied from incidental discovery on radiographic imaging to discrete masses. Six of the 7 cases met or exceeded our established 30 IgG4-positive cells. Immunohistochemical stains showed 3-field averages ranging from 30 to 146 IgG4-positive cells.

**Spindle Cell Liposarcoma of the Scalp**

(Difu Wu, MD; Cheryl Rimer, MD; Richard Siderits, MD; Anup Hazra, MD; Vito Gulli, MD; Andre Pagliaro, MD; Peter Marmorata, MD)

We describe 2 cases of extraskeletal osteosarcoma from the thigh and scalp. The first patient was a 59-year-old man with a softball-sized anterior leg mass that had rapidly grown for 9 months. No calcifications were noted on x-ray or magnetic resonance imaging. A core needle biopsy was obtained and a diagnosis of high-grade sarcoma suspicious of osteosarcoma was made. Subsequent excision yielded a 10.5 × 10.0 × 5.5 cm, white, firm tumor with necrosis. No bone involvement was found on magnetic resonance imaging or at the time of resection. The second case was a 79-year-old patient who presented with a solid scalp mass along the left parietal convexity. Extension to the outer table of the calvarium was shown on imaging. Surgery yielded a 3.0 × 2.5 × 1.7 cm mass, with peripheral soft tissue extension. No bone invasion was demonstrated on gross and histopathologic examination; no calcification was identified on imaging. Histologically, both cases shared the common features of mitotically active, high-grade spindle cell proliferation with variable amount of neoplastic osteoid formation. Lymphovascular invasion was demonstrated in the first case. Extraskeletal osteosarcoma is uncommon, and the amount of neoplastic osteoid can be variable and may not be included in small biopsy cores. A high index of suspicion and keen observation is the key to correct diagnosis.

**Cystic Intra-abdominal/Pericardial Monophasic Synovial Sarcoma With Demonstration of X;18 Translocation**

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We report an unusual case of cystic, intra-abdominal/pericardial, monophasic synovial sarcoma. The patient was a 30-year-old man who presented with chest pain. Imaging revealed a large, intra-abdominal, multiculated, cystic mass extending to the inferior pericardium, left hemidiaphragm, and pelvis. Six liters of fluid were drained from the abdominal mass and 85 mL from the pericardium. Biopsies were taken before debulking surgery. Grossly, the resected tumor fragments consisted of multiloculated, thin-walled cysts with scattered solid areas. Microscopically, the thin, cystic capsules/septa contained hypercellular zones of tightly packed spindle cells concentrated near the cystic spaces, and hypocellular zones with prominent fibrovascular stroma. Solid areas of the mass, or areas where the cyst walls were thickened, also showed fibrosarcoma-like, myxoid, microcystic, or hemangiopericytomatous patterns. No glandular or epithelial component was present. There was moderate nuclear pleomorphism and scattered mitotic figures (4/50 high-power fields). Immunohistochemical staining was positive for vimentin, bcl2, PGP9.5, CD56, calretinin, and β-catenin (cytoplasmic). Stains for cytokeratin AE1/AE3, smooth muscle actin, S100, CD117, and CD34 were negative. Fluorescence in situ hybridization revealed the characteristic t(X;18) translocation. The tumor was diagnosed as monophasic synovial sarcoma. In conclusion, synovial sarcoma can present as a predominantly cystic tumor in an unusual location. Without this knowledge, a correct diagnosis for this variant could be difficult to attain. The differential diagnosis for a cystic, spindle cell neoplasm with a complicated pattern of growth should include monophasic synovial sarcoma. Selecting appropriate immunohistochemical stains and a specific t(X;18) translocation test may be necessary.

**Diffuse Glomangiomatosis in a Patient With Cutis Marmorata Telangiectatica Congenita**

(Cheryl Rimmer, MD; (cherylriimmer@gmail.com); Richard Siderits, MD; Anup Hazra, MD; Vito Gulli, MD; Andre Pagliaro, MD; Peter Marmorata, MD)

We present 7 cases of RDD with features of IgG4-related sclerosis, including fibrosis, obliterative thrombophlebitis, lymphoplasmacytic infiltration, and specifically, the number of IgG4-positive plasma cells. Using immunohistochemistry, a threshold of 30 IgG4-positive cells/high-power field (HPF) for an average of 3 HPFs was established before ascribing IgG4-related sclerosis.

**Results:**

The patients’ ages ranged from 11 to 70 years with a female to male ratio of 5:2. One patient had a history of autoimmune pancreatitis with elevated serum IgG4 levels, a finding linked to IgG4-related sclerosis. Lymph node involvement was documented in 2 cases, but extranodal disease existed in all 7 patients. Involved sites included the nasal cavity, the mediastinum, arm, skin, colon, and the subglottis. Presentations varied from incidental discovery on radiographic imaging to discrete masses. Six of the 7 cases met or exceeded our established 30 IgG4-positive cells/HPF. Immunohistochemical stains showed 3-field averages ranging from 30 to 146 IgG4-positive cells.

**Conclusions:** Our data showed a marked increase in IgG4-positive cells in 6 of 7 RDD cases. This suggests a possible relationship between RDD and IgG4-related sclerosing disease. Further investigation and larger sample sizes are necessary to evaluate and define the relationship between RDD and IgG4 sclerosis.

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**Spindle Cell Liposarcoma of the Scalp**

(Difu Wu, MD; Cheryl Rimmer, MD; Richard Siderits, MD; Anup Hazra, MD; Vito Gulli, MD; Andre Pagliaro, MD; Peter Marmorata, MD)
Glomangiomatosis is a rare disorder that is characterized by a diffusely infiltrating perivascular glomus cell proliferation. It is considered a variant of the glomus tumor with an architectural resemblance to diffuse angiomatosis (Figure 78). Glomangiomatosis has been reported to be familial, with an autosomal-dominant pattern with incomplete penetrance and variable expressivity. We describe a case of a 26-year-old, white man with multiple sites of involvement by glomangiomatosis, including skin, peripheral nerve, muscle, and bone. The patient was diagnosed with cutis marmorata telangiectatica congenita at 9 months old. Cuts marmorata telangiectatica congenita is an uncommon vascular anomaly that is localized in distribution and may be associated with a variety of congenital anomalies, such as body asymmetry, syndactyly, and renal hypoplasia. The patient had surgery to correct his leg length discrepancy and subsequently suffered recurrent bouts of painful cellulitis. He suffered progressive lower limb pain with ischemia and ulceration, which resulted in a below the knee amputation. In addition to the pathologic and immunohistochemical features, we report a thorough patient history and reveal an extensive family history with significant findings on the maternal side. To our knowledge, glomangiomatosis has not been reported in association with cutis marmorata telangiectatica congenita. This rare instance of glomangiomatosis may provide clinical and pathologic clues to better our understanding of its pathophysiology and, possibly, a link between it and cutis marmorata telangiectatica congenita.

A Benign Fibro-Osseous Lesion With Rounded, Calcified Spherules: A Rare Case in the Metacarpal Bone of a 7-Year-Old Boy
(Poster No. 49)
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Fibrous-osseous lesions of bone with calcified spherules, a variant of fibrous dysplasia, has been reported to occur mainly in the jaw and rarely in the shafts of long bones, skull, facial skeleton, spine, and pelvis. We report a rare case of this variant of fibrous dysplasia in the metacarpal bone of a 7-year-old boy. The patient first presented with a fracture of his right index metacarpal bone after physical assault with a friend. A year later, the same location was re-fractured, revealing a mass. The mass was nontender and caused stiffness at the metacarpal joint without numbness, tingling, or rotational deformities. Plain radiographs of the right hand demonstrated an expansile lytic lesion with a dense filling involving the metacarpal bone (Figure 79, a). At surgery, the expansile bony lesion had a very thin cortex containing a tumor grossly resembling fibrous dysplasia. Histologic examination showed features of a benign fibro-osseous lesion with rounded and irregularly shaped, calcified structures containing woven bone (Figure 79, b). The differential diagnosis, including osteoblastoma, was ruled out because of the rounded appearance of the bone, poor vascularity, and absence of plump osteoblasts lining the bone. Fibrous-osseous lesions of bone with calcified spherules have been postulated to be part of a morphologic spectrum between fibrous dysplasia and cement-ossifying fibroma. This case report is of clinical significance because of its unusual location, age of patient, and rarity of cases.

A Case Report of Ameloblastic Fibrosarcoma With Cementosarcoma Features in a 13-Year-Old Male
(Poster No. 50)
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Ameloblastic fibrosarcoma is an extremely rare malignant odontogenic tumor that occurs in the mandible and maxilla of young adults. It represents the malignant counterpart of ameloblastic fibroma, in which both epithelial and mesenchymal proliferation of odontogenic epithelium are present. The ameloblastic fibrosarcoma, on the other hand, consists of islands of well-differentiated, ameloblastic epithelium, separated by malignant neoplastic mesenchymal stroma with cytologic atypia and markedly increased cellularity. The stroma is usually reactive with vimentin and actin. Both de novo cases and transformation of ameloblastic fibroma or ameloblastic fibro-odontomas into ameloblastic fibrosarcoma have been reported. We present a case of a de novo, high-grade ameloblastic fibrosarcoma with evidence of an unusual cementosarcoma component in the posterior mandible of a 13-year-old adolescent boy. Immunohistochemically, the stromal component showed a distinctly positive reaction for actin (Figure 80).

Characterization of Bone Marrow Core Biopsy Artifact Due to Aspiration: Implications for Technique and Specimen Quality
(Poster No. 51)
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ry, University of Texas Health Science Center/South Texas Reference Laboratories, San Antonio; 3Department of Science and Clinical, Vidacare Corporation, Shavano Park, Texas.

**Context:** Contemporary evaluation of bone marrow (BM) requires large volumes of aspirate material for special testing. This study aimed to characterize an artifact due to aspiration of large volumes of BM and to determine how far core biopsies should be taken from the aspiration site to avoid artifacts.

**Design:** The BM aspirations were performed on 2 pigs under anesthesia. The BM aspiration and core biopsies from posterior-superior iliac crests were obtained using a powered BM biopsy system. The BM aspiration (0.5 ml, 10 ml, respectively) was performed, followed by BM core biopsies at 0.5 cm intervals from the aspiration site. After routine processing, hematoxylin-eosin–stained sections of core biopsies were evaluated for distribution of the artifact. At the fourth site, 10 ml of aspirate was collected, and then the iliac crest surrounding the aspiration site was excised with a bone saw. The excised iliac crest was fixed in 10% formaldehyde, cut with a diamond saw, embedded in an oversized paraffin block, sectioned, and then stained with hematoxylin-eosin.

**Results:** No aspiration artifact was identified in the core biopsies. The whole mount section revealed a symmetrical defect at the site of the aspiration that measured 0.4 cm wide and 1.6 cm deep, resulting in a calculated 0.2-mL defect. The artifact consisted of fragmented trabecula, hemorrhage, and disrupted marrow elements.

**Conclusions:** Aspirating large volumes of BM created a relatively small defect, which indicates significant hemodilution with peripheral blood. Taking BM core biopsies 0.5 cm from aspiration sites was sufficient to avoid an aspiration artifact.

Vidacare Corporation provided the animals for this study and paid the University of Texas Health Science Center for the processing of the bone marrow specimens.

**Main Intraosseous Myoepithelioma Displaying Prominent Squamous Differentiation, Arising in Iliac Bone and Presenting as a Lytic Lesion: A Rare Case Report**

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Mixed tumors commonly occur in salivary glands but are uncommon in the musculoskeletal system, where, because of their histopathologic spectrum and low index of suspicion, they form a diagnostic challenge. Mixed tumors form a common spectrum with myoepithelioma and parachordoma. Herein, we present a rare case of a mixed tumor/myoepithelioma arising in the iliac bone of a 26-year-old man, who presented with a 2-year history of swelling in the left hip. Radiologic imaging disclosed a large intraosseous, lytic, lobulated, heterogeneous mass (asterisk) with a soft tissue component (Figure 81). Biopsy revealed a tumor comprising polygonal and short spindle cells, arranged in cords and aggregates, embedded in a myxohyaline and osteochondroid stroma. Tumor cells exhibited midnuclear variation, prominent squamous differentiation, focal cytoplasmic clearing, and rare mitotic figures. Coagulative necrosis was absent. Immunohistochemistry, cells exhibited S100P, epithelial membrane antigen, CK5/6, p63, and calponin positivity. The CK/MNF116 showed focal positivity. MIB1 highlighted occasional cells. Diagnosis of myoepithelioma was offered. The patient underwent a surgical tumor resection that further confirmed the diagnosis and revealed a circumscribed, 18 × 17 × 15-cm tumor involving the left iliac crest, left sacroiliac joint, adjoining sacrum, and pubic ramus. It showed free resection margins, except for a microscopically positive sacral cut margin. The patient is on follow-up. The present case forms the sixth documented case, to our knowledge, of myoepithelioma/mixed tumor in appendicular skeletal bones and the first reported case in the iliac bone. In view of its rarity, the case is presented with its differential diagnosis, immunohistochemical profile, and literature review.

**Soft Tissue Myeloid Sarcoma Precedes or Coincides With Acute Myeloid Leukemia at Diagnosis: Differential Diagnoses, Pitfalls, and Practical Approach**

(Poster No. 53)

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**Context:** Myeloid sarcoma (MS) is uncommon and may be misdiagnosed when presenting de novo. This study aims to identify diagnostic pitfalls, differential diagnoses, and practical approach to accurate diagnosis.

**Conclusion:** A retrospective review (1999–2011) of soft tissue tumors to retrieve MS with histologic confirmation was performed. A clinicopathologic correlation and literature review were conducted.

**Results:** Of 1200 soft tissue tumors, only 13 patients (1.1%) were confirmed MS preceding myeloid malignancies (n = 8) or as the primary, sole manifestation with no clinical history or follow-up of hematopoietic disorder (n = 5). The tumor location included breast (n = 2), mediastinum (n = 2), extremities (n = 2), neck (n = 2) and spine, gallbladder, appendix, small bowel, and abdominal wall (1 each). Three of 13 patients (23%) had classic morphologic clues of MS on hematoxylin–eosin stain. The remaining 10 cases including the 5 solitary lesions resembling other neoplasms with differential diagnoses of lymphoma, poorly differentiated carcinoma, melanoma, neuroendocrine carcinoma, Ewing sarcoma, neuroblastoma, and Langerhans cell histiocytosis. The tumors were consistently positive for CD117 (9/9), CD43 (7/7), MPO (8/10), CD68 (4/5), CD34 (5/9), and CD56 (2/3) by flow cytometry and/or immunohistochemistry. Eosinophils were frequently seen. Other positive stain results included CD99 (1/3).

**Conclusions:** There is a need to maintain a high index of suspicion for MS when encountering a soft tissue mass that resembles the aforementioned tumors, even without preceding myeloid disorders. Useful markers for MS include CD117, CD68, CD43, and MPO. Presence of eosinophils is a clue. Blue, round cell morphology and immunoreactivity for CD99 can be a pitfall.

**Fibrous Dysplasia in a Patient With Osteogenesis Imperfecta Type 3: A Case Report and Review of the Literature**

(Poster No. 54)

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Osteogenesis imperfecta is a genetic bone disorder, with 8 different types described, which causes bone fragility in association with other distinctive symptoms. Fibrous dysplasia is an uncommon, genetically based, sporadic disease of bone that causes bone thinning and tumolike lesions in one or more bones. Osteogenesis imperfecta and fibrous dysplasia currently have no known association. We report a case of fibrous dysplasia in a patient with osteogenesis imperfecta type 3. A 25-year-old woman with a history of osteogenesis imperfecta type 3 with numerous fractures in the past presented with jaw pain, impacted teeth, and a fracture of the left mandible. Imaging showed an area of ill-defined radiolucency closely associated with the impacted teeth and fracture. Received in pathology was a 1.5 × 1.0 × 0.4-cm aggregate of pink-red, irregular, fragmented tissue, which was submitted in toto. Hematoxylin–eosin–stained sections showed delicate, curvilinear trabeculae of woven bone surrounded by cellular fibroblastic stroma. Occasional osteoblasts were seen, both surrounding and incorporated into the bone. Fibro-osseous lesions represent a diverse group of mesenchymal processes, including dysplastic, reactive, metabolic, and developmental abnormalities. Fibrous dysplasia is a lesion for which a genetic abnormality is thought to be responsible. Polyostotic fibrous dysplasia is a known
complication of McCune-Albright syndrome, a syndrome that shares the GNAS1 mutation. Fibrous dysplasia in a patient with osteogenesis imperfecta has not been previously reported in the literature, to our knowledge, and whether these 2 entities are seen more commonly together but missed is unclear.

### Atypical Lipomatous Tumor Arising in a Giant Fibrovascular Polyp of the Esophagus

(Poster No. 55)

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Atypical lipomatous tumor (ALT) of the esophagus is a rare neoplasm and shows cytogenetically supernumerary chromosomes and amplification of MDM2 and CDK4 genes similar to its soft tissue counterpart. We report here a case of an ALT of the upper esophagus as demonstrated by morphologic and immunohistochemical studies. An 81-year-old man presented to the hospital with a chief complaint of a mass protruding from his mouth after an episode of emesis. On physical exam, there was a large polyp protruding from his mouth. The polyp appeared viable and could be followed beyond the base of the tongue. A computed tomography scan showed a hypodense, polypoid structure with a fatty component and a narrow, long stalk extending along the pharynx and inserting into the proximal cervical esophagus. The mass was excised. The resected specimen had a shape of a giant, elongated polyp with a smooth surface measuring 14.0 cm × 2.0 cm × 1.9 cm (Figure 82). Cut surface was yellow with fibrous streaks. Microscopic examination revealed inflamed squamous mucosa overlying an adipocytic proliferation with prominent cellular fibrous septa. There was significant variability in adipocyte size, pericellular sclerosis, and atypical stromal cells with nuclear atypia and hyperchromasia scattered throughout the lesion. The lesional cells showed diffuse nuclear immunopositivity for CDK4 confirming the diagnosis of atypical lipomatous tumor. Although ALT may recur locally, it has no metastatic potential. Our case represents a unique finding of heterologous osteosarcomatous differentiation in a dedifferentiated solitary fibrous tumor. Given the degree of differentiation, this tumor is likely to behave aggressively.

### Ossifying Fibromyxoid Tumor Mimicking Fibroadenoma of the Breast

(Poster No. 57)

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Ossifying fibromyxoid tumor of soft parts (OFMT) is a rare soft-tissue tumor thought to be of neural, Schwannian, or chondroid origin. It is well demarcated and slow growing, typically arising in the deep subcutis of the extremities and trunk. Histologic features include myxoid stroma, often with transition to hyaline fibrosis and osteoid formation, with sheets to ill-defined nests of small, round cells. Approximately 75% of cases are accompanied by a marginal shell of mature bone formation. We describe the case of an 81-year-old woman presenting with a palpable right breast mass, thought to be calcified fibroadenoma or low-grade tumor on mammography. After core biopsy, histopathologic examination demonstrated a spindle cell tumor consisting of cords and nests of bland, ovoid to spindle cells within myxoid matrix, with a shell of mature bone. These cords of ovoid cells initially raised suspicion for lobular carcinoma. Immunohistochemical examination showed positive staining for S100 protein, vimentin, and desmin, and negative staining for keratins, smooth muscle actin, and GFAP. Core biopsy diagnosis was OFMT. Excisional specimen revealed no mitoses, necrosis, hypercellularity, or infiltrating pattern, consolidating the diagnosis into typical OFMT. This is a rare case of OFMT arising within breast. Most OFMTs are benign, although there have been reports of tumors with clinicopathologic evidence of malignancy. A 2003 study proposed classifying OFMT into typical, atypical, and malignant variants based on nuclear grade, cellularity, and mitotic rate. Treatment consists of complete local resection, although high rates of local recurrence warrant clinical follow-up.

### Primary Adrenal Leiomyosarcoma: A Case Report and Review of the Literature

(Poster No. 58)

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Primary adrenal leiomyosarcoma has been reported previously in 18 patients. The patient presented herein is the only case, to our knowledge,
where the definitive diagnosis was made with core needle biopsy evaluation. The patient is a 45-year-old man with a history of childhood mediastinal seminoma treated with radiation therapy. He presented with pain in the back and right groin. Radiologic evaluation demonstrated a heterogeneous, 11-cm, right adrenal mass, multiple liver masses measuring up to 3.5 cm, an enlarged aortocaval lymph node, and multiple pulmonary nodules up to 1 cm. No retroperitoneal masses were identified. Positron emission tomography scan demonstrated increased activity in the adrenal mass and lymph node, for which core needle biopsies were obtained. Histologic evaluation revealed a malignant mesenchymal neoplasm composed of atypical spindled cells arranged in intersecting fascicles, with high mitotic activity and focal tumor necrosis (Figure 83, left and top). Immunohistochemical stains confirmed the smooth muscle origin of the tumor, with immunoreactivity for smooth muscle actin and desmin (Figure 83, right-middle and bottom). S100 and c-Kit were negative. The diagnosis of adrenal leiomyosarcoma with extensive metastasis was rendered. The typical survival is less than 2 years. Coexistent liver, bone, and lung metastases and venous thrombosis signify worse prognosis. The differential diagnoses included adrenal cortical carcinoma, pheochromocytoma, metastatic tumors, and other sarcomas. Primary adrenal leiomyosarcoma is an aggressive tumor with clinical presentation at an advanced stage. Definitive diagnosis of this tumor by core needle biopsy can obviate the need for surgical biopsy in patients with advanced disease.

**Gastrohepatic Extra-adrenal Myelolipoma: A Diagnostic Challenge for Frozen Sections**

(Poster No. 59)

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Extra-adrenal myelolipoma (EAML) is a rare, solitary, well-circumscribed, benign tumor composed of adipose and hematopoietic tissue. It may occur in the prescapular space, renal sinus/hilum, perivascular space, spindle, lung, mediastinum, and testis. An EAML is quite uncommon with an estimated incidence of 0.4%. We report a case of EAML found in the gastrohepatic region. A 72-year-old man presented with gradually worsening epigastric pain, nausea, vomiting, abdominal fullness, and mild abdominal distention. A computed tomography scan of the abdomen revealed a large epicolic mass consisting of an admixture of adipose and soft tissue, suspicious for a liposarcoma. The solitary tumor was 14.5 cm at maximum dimension and tan-brown, well-circumscribed, and necrotic foci (Figure 84, A). Increased mitotic figures as well as areas of necrosis were noted. Diffuse positivity with smooth muscle actin, caldesmon, and desmin and strong multifocal nuclear positivity with TFE3 (Figure 84, D) were demonstrated; however, HMB-45 and Melan A were negative. Based on the morphologic features, the smooth muscle immunophenotype, and the positivity with TFE3 this tumor was characterized as a PEComa. The presence of extensive necrosis and increased mitotic count rendered the diagnosis of malignant PEComa. A PubMed search for HMB-45-negative PEComa yielded a single case report. The patient is being followed every 6 months, currently without evidence of recurrence.

**Intraneural Vascular Lesions: Report of 2 Cases**

(Poster No. 61)

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Two cases of previously unreported, intraneural vascular lesions, an intraneural vascular malformation of the median nerve and an intraneural hemangiomia of the spinal root nerve, are described herein. Healthy intraneural microvasculature consists of a perineural plexus and an endoneurial plexus, the latter composed mainly of capillaries. Intraneural vascular lesions are rare. Vascular lesions are classified into malformations (nonneoplastic) and hemangiomas (neoplastic). The first case reported is that of a 48-year-old man with severe pain involving the right buttock and the back of the leg. A 1.6 × 1.4 × 1.0-cm tumor involving the spinal root nerve was resected by means of a L3-L4 laminectomy. Microscopically the tumor showed a proliferation of small vessels occupying the endoneurial compartment of the nerve, representing a capillary hemangiomia (Figure 85, A and insets). The second case presented is that of a 26-year-old man with pain and numbness involving the right wrist and first 3 digits. An intraneural 9.5 × 2.0 × 0.5-cm lesion involving the median nerve was resected. Histologic examination revealed a vascular malformation composed of numerous thick-walled, irregularly shaped, dilated vascular channels populating the nerve trunk.
epithelioid spindle cell hemangiommas of carpal bones

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Epithelioid and spindle cell hemangiommas of bone most commonly occur in the acral bones with recurrent potential. They have been previously reported in metacarpal, metatarsal, tarsal, cuneiform, phalanges, and distal femur. We present a case of recurrent epithelioid and spindle cell hemangiomma of the carpal bones. A 64-year-old woman complained of wrist pain after a fall. The radiograph of the right wrist showed a nondisplaced and nonhealing pathologic fracture through the scaphoid bone and a 9-mm cystic lesion. An open diagnostic and therapeutic surgery was performed. Intraoperatively, a fleshy, red, bony material was found within the fracture. Microscopically, the curretied bone showed closely packed, thin-walled vascular channels with no endothelial atypia or multilayering. In many areas, the lesional endothelial cells were spindled in appearance, whereas other areas showed strikingly epithelioid cells and more-copyious eosinophilic cytoplasm in a lobular growth pattern. Immunohistochemistry showed strong positivity for CD31 and focal positivity for CD 34 and D2-40 in the lesional cells. Actin stained an intact myopericytic layer around the lesional cells. The most common tumors in this family are renal angiomyolipoma and pulmonary lymphangioleiomyomatosis, both of which are more common in patients with the tuberous sclerosis complex. This is a case of a 40-year-old woman with a history of menorrhagia, deep venous thrombosis, pulmonary embolism, and endometrial ablation that presented with heavy vaginal bleeding. A hysterectomy was performed, and pathology received a uterus with attached fallopian tubes and ovaries. Examination of the uterine cavity revealed an ill-defined, submucosal nodule surrounded by a uniform-appearing myometrium. Microscopic examination identified a 6-mm tumor in addition to cervicitis and a left ovarian, follicular cyst. The tumor appeared as an irregular, ill-defined, infiltrative lesion consisting of oval- to spindle-shaped cells with a centrally located nucleus and abundant eosinophilic cytoplasm. Immunohistochemical staining demonstrated the tumor was strongly positive for MART-1. The histologic and immunohistochemical findings were consistent with the diagnosis of a uterine PEComa. Knowledge of this uncommon tumor can enrich the medical literature and increase the awareness of gynecologic surgeons to this rare uterine tumor (Figure 86).

Nuchal-Type Fibroma: Rare Tumor With an Unusual Presentation

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Nuchal-type fibroma (NTF) is a rare benign hyalinized fibroblastic tumor involving the dermis and subcutis. It is a paucicellular, poorly circumscribed lesion that affects the nuchal (cervicodorsal) region predominantly in men during the third to fifth decade of life. Microscopic features of NTF are involvement of the nuchal region, lobulation of collagen fibers, and the presence of entrapped adipocytes and nerve bundles with infiltration into underlying skeletal muscle. We report a case of NTF with an unusual presentation in a 37-year-old woman with a painful mass on her superior right side of her chest wall, which had been steadily increasing in size for the previous 3 months. Chest x-ray and computed tomography scan of the chest revealed no abnormalities. Magnetic resonance imaging of the chest showed only subtle fullness around the pectoralis major and minor muscles. Percutaneous core biopsy of the mass was performed but nondiagnostic. A Tru-Cut needle biopsy was then performed, and the initial histologic impression was a fibroblastic neoplasm. The patient underwent a resection of the right chest wall tumor. Microscopic evaluation revealed the anterior chest wall mass to be a nuchal-type fibroma with an unusual histologic feature of scattered mast cells, highlighted by CD117 immunostain. To our knowledge, this is the first such case reported with such an unusual location and histologic feature. This case also emphasizes the importance of recognizing NTF as a benign tumor, given its potential to clinically mimic malignant tumors, its tendency to recur, and its local infiltration.

Oncotype DX: An Unnecessary Cost?

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Context: Oncotype DX (ODX) is a commercially available multiasay used in tailoring treatment for a subset of patients with breast cancer. We compared the value added to clinical decision making by ODX and conventional histopathologic and immunohistochemical examination.

Design: Ninety-six cases submitted for ODX testing (2004–2010) were characterized based on Nottingham histologic grade, estrogen/progesterone receptor status (ER/PgR), Ki67, and HER2 status, and analyzed for correlation to ODX recurrence scores.

Results: Of the 35 cancers (36%) that were grade 1, 30 (86%) had low-risk recurrence scores. None of the cases that were grade 1 had high-risk recurrence scores. The 7 cancers (7%) that were grade 3 had recurrence scores that spanned the low- to high-risk categories. The single case that was grade 3 had a low-risk recurrence score and was ER+ PgR+, HER2+. Of the PR+ cases, 49 (67%) were low risk, 24 (33%) were intermediate risk, and none were high risk. Of the HER2+ cases, 51 (58%) were low risk, 32 (37%) were intermediate risk, and 4 (5%) were high risk. All 3 cases (100%) that were HER2+ were also high risk. Of the 27 cases that were grade 1, PR+, and HER2+, 24 (89%) were low risk.

Conclusions: The grading of breast carcinomas as histologic grade 1, and the presence of positive prognostic indicators (ER+, PR+, HER2+), significantly predicts the presence of ODX in the low-risk category and...
the absence of ODX in the high-risk category. Better understanding of conventional prognostic markers may ultimately deem ODX testing unnecessary for a subset of breast carcinomas.

**Importance of Neuroendocrine Differentiation in Mucinous Carcinoma of the Breast: Clinicopathologic Features and Outcome**

*(Poster No. 66)*

**Withdrawn.**

**Adenoid Cystic Carcinoma of the Breast**

*(Poster No. 67)*

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Adenoid cystic carcinoma of the breast is a very rare mammary tumor in women. We report a case in a 60-year-old woman who presented with no previous personal history or family history of breast disease. The mammogram and follow-up ultrasound detected a probably benign, small, minimally homogeneous echogenic cystic nodule in the right retroareolar region. Subsequently, magnetic resonance imaging detected a 5-mm enhancing homogeneous nodule with mild irregularity of the margins, suggestive of a suspicious abnormality. The needle core biopsy showed a circumscribed nodule composed of a mixture of proliferating glands, focally expanded ducts, basement membrane components, and adenos structures resembling collagenous spherulosis. Immunohistochemical study for p63 highlighted myoepithelial cells, enclosing areas of spherical eosinophilic stroma. The differential diagnosis included collagenous spherulosis, cutaneous adnexal tumor, and breast carcinoma. The case was sent out to the Mayo Clinic for consultation, which concluded low-grade carcinoma, favored adenoid cystic carcinoma, recommended complete excision. The lumpectomy of the breast showed a 5-mm residual focus of adenoid cystic carcinoma, composed of conspicuous, solid pink cylindromatous nodules, adenomyoepithelial differentiation, and adenoid cystic glandular spaces with basophilic secretion. This adenoid cystic carcinoma was negative for estrogen receptors, progesterone receptors, and HER2/neu by immunohistochemical staining. In conclusion, a small adenoid cystic carcinoma of the breast (5 mm in size) is detectable by advanced imaging systems; p63 positivity for myoepithelial cells cannot rule out adenoid cystic carcinoma of the breast.

**Sarcoidosis of the Breast: A Single Institutional Study With Radiologic and Pathologic Correlation**

*(Poster No. 68)*

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**Context:** Sarcoidosis is a systemic granulomatous disease of unknown etiology. Breast involvement is extremely rare, but could be confused clinically and radiographically with benign or malignant tumors. Here, we report the results of a retrospective analysis of all cases of breast sarcoidosis diagnosed at our institution during a 14-year-period.

**Design:** We identified 26 breast biopsies with granulomatous mastitis between 1996 and 2010. Eight cases were consistent with a diagnosis of sarcoidosis. Data according to gender, clinical presentation, radiologic imaging, diagnostic studies, and follow-up care were analyzed.

**Results:** The mean age at presentation was 55.7 years, and all patients were female. Two patients (25%) had a breast mass as primary presentation of sarcoidosis without any clinical evidence of systemic sarcoidosis. Breast lesions ranged from 0.7 to 6 cm in diameter. One patient presented with more than one lesion in the same affected breast, a single breast mass was found in the rest of the patients. All 8 patients were evaluated by mammmography, which revealed changes suspicious for malignancy. Histopathology in all cases showed multiple noncaseating granulomas. One case was diagnosed 6 years after a diagnosis of breast cancer in the contralateral breast. At a median follow-up of 39 months, all patients remained free of breast malignancy following diagnosis of breast sarcoidosis.

**Conclusions:** Sarcoidosis of the breast, although rare, should be considered when dealing with granulomatous lesions of the breast, especially in patients with a history of sarcoidosis and new breast mass. The most common presentation is a single breast mass.

**Lack of Hepatocyte Growth Factor Receptor (c-Met) Gene Amplification in Breast Carcinomas**

*(Poster No. 69)*

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**Context:** c-Met is a proto-oncogene that encodes hepatocyte growth factor receptor (HGFRI), a transmembrane receptor with tyrosine-kinase activity. Expression of c-Met has been studied in several types of cancers; in general, high expression of c-Met protein is an independent prognostic factor associated with an adverse outcome. Our aim was to evaluate the potential role of c-Met as a marker of treatment resistance and as a therapeutic target in breast cancer.

**Results:** Paraffin-embedded tumor specimens from 910 archival breast tumors in a tissue microarray were characterized for MET gene amplification using silver in situ hybridization (SISH) with MET and chromosome 7 centromere probes. A MET to CEP7 probe ratio greater than 2.0 was interpreted as amplified. Expression of the c-Met protein was evaluated with immunohistochemistry.

**Results:** MET gene copy number was successfully determined in 502 breast carcinomas by SISH with 500 cases having a MET gene amplification and variable numbers of centrally located nuclei. The nuclei in the area of spherical eosinophilic stroma. The differential diagnosis included collagenous spherulosis, cutaneous adnexal tumor, and breast carcinoma. The case was sent out to the Mayo Clinic for consultation, which concluded low-grade carcinoma, favored adenoid cystic carcinoma, recommended complete excision. The lumpectomy of the breast showed a 5-mm residual focus of adenoid cystic carcinoma, composed of conspicuous, solid pink cylindromatous nodules, adenomyoepithelial differentiation, and adenoid cystic glandular spaces with basophilic secretion. This adenoid cystic carcinoma was negative for estrogen receptors, progesterone receptors, and HER2/neu by immunohistochemical staining. In conclusion, a small adenoid cystic carcinoma of the breast (5 mm in size) is detectable by advanced imaging systems; p63 positivity for myoepithelial cells cannot rule out adenoid cystic carcinoma of the breast.

**Conclusions:** In contrast to renal, gastric, and lung carcinomas, amplification of c-MET is unusual in breast cancer. c-Met protein is detected in breast cancers but is not correlated with MET gene copy number or gene amplification (Figure 87).

**Design:** Paraaffin-embedded tumor specimens from 910 archival breast tumors in a tissue microarray were characterized for MET gene amplification using silver in situ hybridization (SISH) with MET and chromosome 7 centromere probes. A MET to CEP7 probe ratio greater than 2.0 was interpreted as amplified. Expression of the c-Met protein was evaluated with immunohistochemistry.

**Results:** MET gene copy number was successfully determined in 502 breast carcinomas by SISH with 500 cases having a MET gene amplification ratio of less than 2, and only 2 cases having a MET SISH ratio greater than 2. Four hundred eight breast carcinomas were not scored by SISH for various reasons. Eight hundred thirty-four breast cancers were successfully analyzed by immunohistochemistry with 202 (24.2%) showing some level of immunostaining for C-Met protein, 164 (19.7%) were 1+, 35 (4.2%) were 2+, and 3 (0.36%) were 3+ while 632 (75.8%) had no immunostaining. Seventy-six cases were not scored by immunohistochemistry because no tumor was present.

**Fine-Needle Aspiration Diagnosis of Mammary Carcinoma With Osteoclast-Like Giant Cells**

*(Poster No. 70)*

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Mammary carcinoma with osteoclast-like giant cells (OGCs) is a rare breast tumor, and most of them are infiltrating ductal carcinoma. Less commonly reported subtypes include invasive cribriform carcinoma and papillary carcinoma. There are about 24 reported cytology cases in the literature. The patient, a 39-year-old woman, presented with a right breast mass, and the mammogram image study reported a 2.4-cm breast Imaging-reporting and data system (BIRADS) 5 lesion. Cytologic examination of the fine-needle aspirate material revealed cellular smears and consisted of mixed atypical ductal cells and multinucleated giant cells (Figure 88). The atypical ductal cells have irregular nuclear contours, high nuclear to cytoplasmic ratio, hyperchromasia, and 3-dimensional clusters. Many single ductal cells were also noted. The multinucleated giant cells were observed in isolation or mixed with the atypical ductal cells, and they have large, round to elongated shapes and variable numbers of centrally located nuclei. The nuclei in the
multinucleated giant cells were round to oval with smooth nuclear membrane and small nucleoli. Mammary carcinoma with OGCs was rendered based on the fine-needle aspirate. The follow-up mastectomy specimen was infiltrating ductal carcinoma with OGCs and one axillary lymph node with metastatic carcinoma. Multinucleated giant cells have been observed in various neoplastic and nonneoplastic lesions of the breast. The different giant cells include reactive giant cells in granulomatous inflammation, stromal giant cells in fibroadenoma and phyllodes tumors, malignant giant cells in pleomorphic carcinoma, and the giant cells in mammary carcinoma with OGCs. Fine-needle aspirate cytology appears to be an accurate diagnostic modality in mammary carcinoma with OGCs.

**Correlation of Radiologic and Pathologic Findings of Breast Needle Core Biopsies: A College of American Pathologists Study of 48 Institutions**

(Poster No. 71)

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**Context:** Practice variation by radiologists and nonradiologists in the performance of image-guided breast needle core biopsies and heterogeneity in each breast imaging reporting and data system (BIRADS) category highlight why correlation of radiologic and pathologic findings is essential for optimal management of patients. The aim of the study was to determine the rate of radiologic-pathologic correlation of breast needle core biopsies and factors associated with better correlation.

**Design:** The study was conducted as part of a College of American Pathologists (CAP) Q-Probes program. Participants retrospectively reviewed 30 consecutive cases of initial diagnostic needle core breast biopsies performed because of abnormal radiologic findings. Detailed information on the radiologic and pathologic findings was provided. The participants determined whether the pathologic findings correlated with the radiologic finding. Cases with no prebiopsy imaging, or that had fine-needle aspiration or surgical excision specimens were excluded.

**Results:** Forty-eight institutions provided information for 1399 cases. There was an overall reported correlation rate of 94.9%. The correlation rate was not significantly different whether radiologists or surgeons performed the biopsy (95% versus 96%; P = .57), whether cores with calcifications were separated in any way (97% versus 98%; P = .44), whether radiologic reports or images were reviewed before pathology report verification (95% versus 96%; P = .40, P = .59), and whether institutions have one or more designated breast pathologists or not (95% versus 95.6; P = .54). Discussing cases at interdepartmental, multidisciplinary breast conferences was significantly associated with higher correlation (P = .008).

**Conclusions:** Better correlation rates were obtained when cases were discussed at interdepartmental, multidisciplinary conferences, highlighting the importance of multidisciplinary communication.

**Risk Factors for Basal-Like Breast Carcinomas Diagnosed by Core Biopsies**

(Poster No. 72)

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**Context:** Our aim was to determine whether risk factors for basal-like breast carcinomas (BLCs) are different from nonbasal breast carcinomas (NBCs).

**Design:** A total of 610 women with breast masses had core biopsies. Factors that were examined included age, parity, lactational history, age at first pregnancy, and obesity. The BLCs had the following immunostaining results: triple negative, positive cytokeratin 5/6, vimentin, and EGFR.

**Results:** Breast carcinoma (BC) was found in 42% of cases (n = 256). The average age of women with BC was 50.1 years, compared with 42.3 years for BLC (P < .01). All of the 174 lactating BC cases, 14% had BLC (P < .001). Average duration of lactation was similar between the benign and BC groups (4.26 versus 4.33 years); however, the duration was 1.2 years in BLC cases versus 4.2 years in NBC cases (P < .01). Parity was similar in the benign and BC groups (3.9 versus 3.9). Parity in BC cases was 5.1, compared with 3.9 for NBC cases (P < .02). No difference was seen regarding age at first pregnancy in benign versus BC groups (22.2 versus 21.5 years). In BLC cases, the average age at first pregnancy was 18 years versus 22 years in NBC cases (P < .01). Body weight of the women with BLC versus NBC versus benign lesions was 95 kg versus 84 kg versus 74 kg, respectively; (P < .02).

**Conclusions:** Lactation is protective against BC, but its duration is only protective in BLC, not NBC. Parity is a risk factor for BLC, but not for NBC. Younger age at first pregnancy is a risk factor for BLC, whereas obesity is a risk factor for all BCS and BLCs.

**Basal-Like Breast Carcinoma Diagnosed by Core Biopsies: Histomorphologic Changes and Immunostaining Pattern**

(Poster No. 73)

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**Context:** Distinguishing different molecular subtypes of breast carcinoma is critical. Basal-like breast carcinomas (BLCs) have chemotherapeutic regimens that are different from nonbasal carcinomas (NBCs). Modes of recurrence, metastatic patterns, risk factors, and prognosis are different as well. The BLCs have some histomorphologic features that distinguish them from NBCs; however, molecular studies, such as immunostains, are essential for determining breast carcinoma subtypes.
A total of 610 women with breast masses had breast core biopsies. Histologic sections of the tumors were reviewed for the following histologic criteria: Black nuclear grade, mitotic count, stromal lymphocytic response, and geographic tumor necrosis. Cases with the following immunohistochemical pattern—ER+, PR+, HER2/neu+, cytookeratin 8/18, vimentin+, and EGFR—were considered BLCs. Figure 89 demonstrates positive immunostaining for cytokeratin 5/6 with geographic tumor necrosis in the background.

**Results:** Breast carcinoma was found in 256 of all cases (42%). The average age of women with NBC was 39.6 years versus 50 years for women with NBC. The BLCs constituted 16% (n = 41) of all invasive carcinoma. The BLCs showed the following histologic patterns, when compared with NBCs: high Black nuclear grade (BLC, 41 of 41 cases [100%]; NBC, 81 of 215 cases [37.7%]; P < .002), markedly elevated mitotic count (more than 20 per 10 high-power field) (BLC, 38 of 41 cases [92.7%]; NBC, 72 of 215 cases [33.5%]; P < .001), geographic tumor necrosis of 21% (BLC, 31 of 151 cases [20.5%]; NBC, 23 of 215 cases [10.7%]; P < .002), and stromal lymphocytic response (BLC, 20 of 41 cases [48.8%]; NBC, 25 of 215 cases [11.6%]; P < .001).

**Conclusions:** Based on immunostaining pattern, BLCs can be diagnosed on core biopsies from breast tumors. The BLCs have the following histomorphologic changes: high Black nuclear grade, markedly elevated mitotic count, geographic tumor necrosis, and stromal lymphocytic response.

**Expression of Cancer Stem Cell Biomarkers in Male Breast Cancer**

(Poster No. 74)

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**Context:** Male breast cancer represents less than 1% of all breast cancer diagnoses. Cancer stem cells have been associated with tumor aggressiveness and drug resistance. The cancer stem cells are characterized by CD44 and/or ALDH1 expression. In this study, we investigated their expression in male breast cancer.

**Design:** Eighteen cases of male breast cancers were studied. Membrane staining of CD44 was scored by the percentage of positivity (1, 1%–5%; 2, 11%–50%; 3, 51%–75%; and 4, 76%–100% positivity). Tumors with scores greater than 3 were considered high expression. Any tumor cell with cytoplasmic expression of ALDH1 was considered positive. The study was approved by the institutional review board of Thomas Jefferson University Hospital.

**Results:** Two cases (11%) were in situ ductal carcinoma (DCIS), and 16 cases (89%) were invasive ductal carcinoma (IDC). Ten of 18 cases (56%) had high CD44 expression, which were all IDCs. Both DCIS and the in situ component of IDC were CD44 low. ALDH1 was positive in 13 of 18 cases (72%), all of which were IDCs. ALDH1+ cells were mostly in the invasive component (12 of 13 cases; 92%). All the DCISs were negative for ALDH1. The 5 IDC cases with only an invasive component had a higher percentage (average 4.4%) of positive cells compared with the other 8 cases with in situ components (average 2.2%). Metastatic cells in sentinel lymph nodes had similar expression patterns of CD44 and ALDH1 compared with the primary tumor.

**Conclusions:** Both CD44 and ALDH1 are overexpressed in IDCs but not in DCISs. Cancer stem cells may be responsible for the metastatic potential and invasion of male cancers.

**Primary Osteosarcoma of the Breast in a 95-Year-Old Woman**

(Poster No. 75)

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Primary mammary sarcomas are rare and constitute less than 1% of breast malignancy. In our institution, 14 primary breast sarcomas, 62 metastatic carcinomas, and 62 phyllodes tumors were retrieved from 40 years of cases. Among these, osteogenic differentiation was reported in 2 metaplastic carcinomas (3%), 2 malignant phyllodes tumors (3%), and 1 primary sarcoma (7%). We report a primary osteosarcoma of the breast in a 95-year-old woman who presented with a 6-cm right breast lump. Initial mammographic impression was of fibroadenoma with calcification. In 7 months, mammography showed a 12-cm radiodense mass, suggestive of malignancy. It was not attached to the chest wall, and there was no axillary lymphadenopathy. Needle biopsy showed malignant neoplasm with osseous differentiation. Modified radical mastectomy was performed. Gross examination revealed a lobulated heterogeneous mass with extensive calcification. Microscopically, the tumor was composed of scattered, atypical epithelioid cells and malignant spindle cells forming osteoid and woven bone trabeculae. The epithelioid cells and spindle cells were immunonegative for AEI/ AE3, CAM 5.2, CK5/6, and SMA. Conventional carcinoma, carcinosarcoma, or coexisting phyllodes tumor was not identified, even after extensive sampling. Hence, the diagnosis of high-grade primary osteosarcoma of the breast was rendered (Figure 90). Axillary lymph nodes were negative. There was no evidence of recurrence at 6-month follow-up. Differentiating metastatic carcinoma/carcinosarcoma and malignant phyllodes tumor from mammary osteosarcoma is important because of different treatments and prognoses. More than one epithelial immunohistochemical marker and extensive sampling to exclude the more common metastatic carcinoma are essential to render this rare entity.

**Reducing Cold Ischemic Times to Optimize Breast Biomarker Assays: An Interdepartmental Solution**

(Poster No. 76)

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**Context:** Recent reports suggest that delays from tissue collection to the initiation of formalin fixation may adversely affect breast biomarker assays and that some tumors with excessive cold ischemic times may be falsely classified as negative. New estrogen and progesterone receptor testing guidelines recommend that excised breast tissue samples be placed in formalin within 1 hour of excision. Monitoring the cold ischemic times for each clinical sample requires recording the collection and fixation start times. To accomplish this, coordination between surgery and the laboratory is necessary. We became interested in whether this guideline could be accomplished at our institution.

**Design:** Since 2008, a rapid tissue acquisition program has been implemented at the University of Rochester Medical Center. This program...
initiative provides the operating room with a dedicated pathology staff member who is immediately notified when a tissue sample has been removed. Specimens are obtained and transported to the laboratory via a pneumatic tube system. The collection, laboratory receipt, and fixation start times are recorded for each specimen. To monitor our compliance with the new guidelines, the collection to fixation start times for 361 breast cancer resection specimens were analyzed from August 2008 through July 2010.

**Results:** Our results indicate that both elapsed time from tissue removal to fixation, and variability in times were reduced because of our initiative (Table).

**Conclusions:** The experience at our institution suggests that standardization of tissue handling is achievable but requires a commitment of resources and personnel with a significant change in practice.

**Myofibroblastoma of the Breast: An Ambiguous Tumor With Myofibroblastic and Smooth Muscle Differentiation**

*(Poster No. 77)*

Thuy Linh T. Nguyen, MD (tngyu96@uab.edu); Xiaojun Wu, MD; Shi Wei, MD. Department of Pathology, University of Alabama, Birmingham.

Myofibroblastoma (MFb) of the breast is a rare, benign mesenchymal neoplasm commonly affecting older adults. The lesional cells have immunophenotypic characteristics of myofibroblasts, as evident by CD34 and smooth muscle actin (SMA) expression, although a clear-cut definition for classifying a cell as myofibroblast has not been generally adopted. In fact, smooth muscle differentiation of MFb by ultrastructural analysis has also been previously suggested. Here, we report 2 cases of MFb. The first case was a 1.0-cm nodule incidentally found in a 72-year-old woman with invasive mammary carcinoma. The second case occurred in a 53-year-old man who presented with a 2.2-cm breast mass. Both tumors were well-demarcated nodules with a tan-white cut surfaces, and histologically consisted of fascicles of bland spindle cells dissecting hyalinized collagen bands. The neoplastic cells were diffusely immunoreactive with CD34, SMA, and h-caldesmon. Given that the latter is exclusively expressed in myofibroblastic and smooth muscle differentiation of MFb at the ultrastructural level in the second case. Features characteristic for smooth muscle differentiation, such as bundles of myofilaments with fusiform dense bodies, were not identified in the lesional tissue by transmission electron microscopy analysis. Thus, MFb represents an ambiguous tumor with both myofibroblastic and smooth muscle differentiation and is likely derived from CD34+ progenitor cells of mammary stroma capable of multidirectional differentiation, including fibroblasts and smooth muscle. Further immunophenotypic and ultrastructural analysis with a larger number of cases is needed to better characterize MFb.

**Glycogen-Rich Clear Cell Carcinoma of Breast: A Report of 2 Cases With Literature Review**

*(Poster No. 78)*

**With Myofibroblastic and Smooth Muscle Differentiation**

*(Poster No. 79)*

Jian T. Yang, MD, PhD; Cheng Z. Liu, MD, PhD; William Dooley, MD; Ronald Squires, MD; Elizabeth Jett, MD; Jeanene Parker, PAC. Departments of *Pathology,* Surgery, and *Radiology,* Oklahoma University Health Sciences Center, Oklahoma City.

**Context:** Triple-negative breast carcinomas (TNBCs) are clinically aggressive tumors without expression of estrogen or progesterone receptors and HER2/new. Anthracycline-based neoadjuvant therapy (ABNT) is used for patients with advanced-stage TNBC. The aim of this study was to assess the extent of pathologic response in patients with TNBC treated with ABNT.

**Design:** The ABNT-treated patients with TNBC were followed with surgical removal of the tumor. Pathologic assessment of ABNT response included size of the residual tumor, nodal metastasis, and therapy-related cellular changes and was compared with the pretreatment biopsy and clinical data. The extent of the pathologic response was semiquantitatively scored from 0 to 4. Score 0 indicated no shrinking in tumor size and little or no therapy-related cellular changes. Scores 1 to 3 referred to a mild, moderate, and marked response to ABNT, respectively. Score 4 was a completely pathologic response.

**Results:** During the past 8 years, 231 patients with TNBC were identified at our institution. Of those, 97 patients (42%) with advanced-stage TNBC were treated with ABNT and followed with surgery. At least 3 responding patterns are identified: resistance (score 0, 37 of 97 patients, 38%), partial response (scores 1–3, 34 of 97 patients, 35%), and complete pathologic response (score 4, 26 of 97 patients, 27%).

**Conclusions:** A subpopulation of patients with TNBC obtained significant benefit from ABNT, with 27% showing complete pathologic response, whereas 38% showed no response. The data represent a relatively large patient pool from one institution. Pathologic assessment is a quick and direct way to evaluate the effectiveness of specific regimens. The tissue bank collected can be further used to study the predictive markers regarding ABNT, which would help in patient selection for this regimen.

**A Rare Presentation of Metastatic Osteosarcoma to the Breast**

*(Poster No. 80)*

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Breast cancer is one of the most common cancers among women. Extra-osseous osteogenic sarcomas encompass a significantly smaller heterogeneous group within the breast cancers. Metastatic osteogenic sarcoma to the breast is an extremely rare and poorly reported entity that appears histologically identical to a primary extra-osseous osteogenic sarcoma. Osteogenic sarcoma is the most common primary malignant bone tumor with a high metastatic potential; however, there are only a few reported cases among the literature of it metastasizing to the breast. We report a case of a 32-year-old woman, with a past surgical history of osteogenic sarcoma of the mandible, presenting with 3 right breast masses, which were diagnosed as metastatic osteogenic sarcoma. Microscopically, osteosarcoma has pleomorphic spindle or polygonal cells with associated neoplastic, osteoid-forming, irregular trabeculae. The tumor cells are immunoreactive for alkaline phosphatase, smooth muscle actin, desmin, S100, CD99, and vimentin. The main differential to this diagnosis is the extra-osseous osteosarcoma; a malignant mesenchymal tumor with tumor cells producing an osteoid matrix that is histologically and immunohistochemically identical to a metastatic osteogenic sarcoma. The rare presentation of metastatic osteogenic sarcoma to the breast and comparing the similarity of metastatic osteosarcoma to extra-osseous osteosarcoma, emphasizes the importance of knowledge of the patient’s medical history in arriving at the accurate diagnosis.

**Thyroid Transcription Factor-1 Positive Primary Breast Cancer**

*(Poster No. 81)*

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**Abstracts** 1187
Clinical Significance of Cancer Stem Cell Marker, ALDH1, in Breast Epithelium

Poster No. 85

Zhicheng Mo, MD, PhD (zmo@conemaugh.org); Wei Hong, MD, PhD; Baoying Weng, MD, PhD; Curtis Goldblatt, MD. Department of Pathology, Conemaugh Memorial Medical Center, Johnstown, Pennsylvania.

Context: Recent studies have shown that the expression of cancer stem cell markers is closely related to tumor grading, metastasis, and prognosis. One of the candidate stem cell markers is aldehyde dehydrogenase 1 (ALDH1), a detoxifying enzyme responsible for the oxidation of intracellular aldehydes. ALDH1 has been shown to be a cancer stem cell marker in normal to hyperplasia to malignant breast cancer tissues.

Design: We selected 112 paraffin-embedded breast tissues. All the invasive ductal carcinomas were followed up for 8 to 120 months. The specimens were immunolabeled with ALDH1. The staining was scored on a percentage basis: 0 = <1%, 1 = 1% to 25%, 2 = 26% to 50%, 3 = 51% to 75%, 4 = 75%.

Results: In normal and hyperplastic breast tissue, ALDH1-positive cells were mainly located in the luminal region of the terminal lobules, and they were a rare population. There is no increased ALDH1 expression seen in the atypical ductal hyperplasia (P > .05). ALDH1 expression was observed in 8.6% of DCISs but not correlated with any clinicopathologic parameters. Significantly more invasive ductal carcinomas showed ALDH1 expression (20.0%, P < .01). The diffuse strong positive staining pattern can be seen in high-grade carcinomas and shorter survival time (P < .01).

Conclusion: The expression of ALDH1 may play a role in the origin of breast cancer and the progression to invasive ductal carcinoma. High ALDH1 expression associates with high-grade breast cancers and poor prognosis.

Clinicopathologic and Biomarker Analysis of Invasive Pleomorphic Lobular Carcinoma

Poster No. 85

Melissa Jacobs, MD (mjacob52@kumc.edu); Maura O’Neill, MD; Osama Tawfik, MD, PhD; Fang Fan, MD, PhD. Department of Pathology and Laboratory Medicine, University of Kansas Medical Center, Kansas City, Kansas.

Context: Pleomorphic lobular carcinoma (PLC) is a distinct morphologic variant of invasive lobular carcinoma (ILC). Although PLC retains the distinctive loosely cohesive and single file growth pattern of classic ILC, it has specific distinguishing characteristics, including enlarged nuclei with greater nuclear irregularity, increased hyperchromasia, prominent nucleioli, and abundant eosinophilic cytoplasm. Attempts to characterize this variant have been limited and data have been conflicting. The goal of this study was to compare the clinicopathologic features and biomarker expression of invasive PLC with classic ILC.

Design: Approximately 1100 invasive breast cancer cases were reviewed from our files. Cases between January 2002 and December 2010. 58 cases of classic ILC (5.3%) and 7 cases of PLC (0.6%) were identified. Histopathologic data and tumor biomarkers were recorded. Clinical follow up information (3–93 months; median, 29 months) for distant metastasis and survival was also gathered. A Fisher exact test was used and results were considered statistically significant if P < .05.

Results: PLC is more frequently higher grade and may exhibit an adverse biomarker profile (negative ER and high Ki-67) as compared to ILC.
We propose a model for an initial lobulocentric inflammatory response that incorporates the role of lobular intraepithelial T-lymphocytes and perilobular-arteriolar lymphatic envelopment that may further enhance the lobulocentric inflammatory response. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes. The demonstration of a perilobular lymphatic interface with associated direct arteriolar envelopment may provide a local positive feedback that facilitates localization of T-lymphocytes and subsequently the growth of invasive ductal carcinoma of breast. These areas often contain a periulesular lymphatic interface and direct arteriolar envelopment, which may be triggered by the actions of lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes. The demonstration of a perilobular lymphatic interface with associated direct arteriolar envelopment may provide a local positive feedback that facilitates localization of T-lymphocytes and subsequently the growth of invasive ductal carcinoma of breast. These areas often contain a periulesular lymphatic interface and direct arteriolar envelopment, which may be triggered by the actions of lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes.

**Proposed Model for a Lobulocentric Inflammatory Response in Breast Cancer Triggered by Lobular Intraepithelial T-Lymphocytes in Association With Perilobular-Arteriolar Lymphatic Envelopment**

(*Poster No. 86*)

Richard H. Siderits, MD; Cheryl Rimmer, MD; Anup Hazra, MD; Peter Mazari, PhD, MSII; David Tacha, PhD; Nagy Mikhail, MD; Janusz Godyn, MD; Department of Experimental Pathology, RWJ University Hospital, Hamilton, New Jersey; Department of Pathology, RWJ University Medical School, Hamilton, New Jersey; Department of Research, Biocare Medical, Concord, California; Department of Experimental Pathology, RWJ Southern Ocean County Hospital, Manahawkin, New Jersey; Department of Pathology, UMDNJ School of Osteopathic Medicine, Stratford, New Jersey.

**Context:** A chronic inflammatory response is often seen in association with invasive ductal carcinoma of breast. These areas contain residual nonneoplastic lobular epithelial components. We propose a lobulocentric model of early inflammatory response that incorporates the role of lobular intraepithelial T-lymphocytes and perilobular-arteriolar lymphatic envelopment. This association may elucidate the evolution of an early lobulocentric inflammatory response.

**Design:** We evaluated 10 multiplex-stained breast cancers for Pan-T, Pan-B, D2-40, p63. This permitted the simultaneous evaluation of lymphatic components, T and B cell lymphocytic populations, and proliferative activity in each section.

**Results:** We identified a pattern of inflammation that is predominantly lobulocentric (confined to the intralobular connective tissue) that may be triggered by the actions of lobular intraepithelial T-lymphocytes. This pattern of inflammation shows temporal evolution with initial accumulation of T-lymphocytes in the intralobular stroma followed by scattered B-lymphocytes. Perilobular lymphatic envelopment and associated direct arteriolar envelopment may provide a local positive feedback that facilitates localization of T-lymphocytes and subsequently the growth of invasive ductal carcinoma of breast. These areas contain a perilobular lymphatic interface and direct arteriolar envelopment, which may be triggered by the actions of lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes. The demonstration of a perilobular lymphatic interface with associated direct arteriolar envelopment may provide a local positive feedback that facilitates localization of T-lymphocytes and subsequently the growth of invasive ductal carcinoma of breast. These areas contain a perilobular lymphatic interface and direct arteriolar envelopment, which may be triggered by the actions of lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes.

**Conclusions:** We propose a model for an initial lobulocentric inflammatory response to ductal carcinoma triggered by lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes. The demonstration of a perilobular lymphatic interface with associated direct arteriolar envelopment may provide a local positive feedback that facilitates localization of T-lymphocytes and subsequently the growth of invasive ductal carcinoma of breast. These areas contain a perilobular lymphatic interface and direct arteriolar envelopment, which may be triggered by the actions of lobular intraepithelial T-lymphocytes. A possible mechanism would involve the localized accumulation of cytokines released by lobular intraepithelial T-lymphocytes.
stain (micrometastasis, 16.1%). The postulated reasons for disparate results are as follows: interpretation error, sampling error, identification of micrometastasis and isolated tumor cells by immunohistochemistry, or type of tumor, particularly lobular carcinomas. Our study further emphasizes the need for additional evaluation of SLNs by deeper levels and immunohistochemical staining.

Use of Second Observer to Improve the Accuracy of Intraoperative Touch Preparation of Sentinel Lymph Node in Breast Cancer Staging
(Poster No. 88)
Sharmeen Mansoor, MD (sharmeen.mansoor@danhosp.org); Ramapiya Vidhun, MD; Steven Sieber, MD. Department of Pathology, Danbury Hospital, Danbury, Connecticut.

Context: Evaluation of sentinel lymph node (SLN) is the standard of care in patients with breast cancer. In most instances, the intraoperative touch preparation (TP) and subsequent permanent sections of SLNs are negative for metastatic carcinoma. False-negative TP can occur because of limited sampling or interpretation error. The purpose of this study is to evaluate the impact of a second observer (pathologist) on the accuracy rate of TP, a process that was implemented in our institution at the beginning of 2010.

Design: Patients (210) with breast carcinoma, evaluated for sentinel lymph node, during 2009 and 2010 were studied. Metastases in SLN were classified according to the current AJCC staging scheme. Only metastatic tumor cells visualized by hematoxylin and eosin staining were included in the study.

Results: Forty-nine of 210 patients (23.3%) had at least one SLN metastasis. Of these, 28 cases (57.2%) showed at least one positive SLN both by TP and permanent sections, and 21 cases (42.8%) had discrepant results (negative by TP and positive in permanent sections, Table). The suggestive of myeloid precursors and islands of darkly staining erythroid precursors. A myeloperoxidase stain was positive in these areas, confirming EMH in the lymph node. The lymph nodes obtained prior to the administration of granulocyte colony-stimulating factor did not show EMH, suggesting a therapy effect. There are only 2 previously reported cases of EMH following neoadjuvant chemotherapy for breast cancer. The presence of EMH in axillary lymph nodes could be problematic especially during intraoperative sentinel node evaluation. EMH should be in the differential diagnosis while evaluating lymph node metastasis, especially in patients with history of neoadjuvant chemotherapy with hematopoietic growth factors.

Adenoid Cystic Carcinoma of the Breast: Importance of Recognition in Guiding Clinical Management
(Poster No. 90)
Mukul Divatia, MD (mkdivatia@tmhs.org); Misu Sanson, MD

Context: Adenoid cystic carcinomas (ACCs) of the breast comprise 0.1% of malignant breast tumors with approximately 200 cases reported in the literature. Interestingly, ACC of the breast does not exhibit the high proclivity for perineural invasion, local aggressiveness, and high recurrence rate that histologically similar salivary gland ACCs demonstrate. Our experience with this unusual breast cancer highlights the importance of understanding the natural history of this tumor in guiding appropriate clinical management.

Design: A search of the electronic database at our institution from 2004 to 2010 yielded 5 cases of ACC of the breast. Slides and medical records were reviewed.

Results: The 5 female patients ranged from 48 to 76 years old. All tumors had morphologic features of classic ACC, histologic grade 1, with cribriform architectural pattern and basement membrane deposition. Development of pulmonary metastasis occurred in 1 case 7 years after initial diagnosis. Two patients had axillary lymph node dissections, without metastatic disease. Perineural invasion was identified in 1 case. Lymphovascular invasion was not seen in any. All of the tumors, including the pulmonary metastasis, were estrogen and progesterone receptor negative and did not overexpress Her-2.

Conclusions: Accurate diagnosis of breast ACC is critical because prognosis and survival rates are overall better than for most other types of infiltrating breast carcinoma, as well as in guiding appropriate clinical management. Axillary node dissection is not generally recommended unless there is clinical suspicion of metastasis or high tumor grade. It is crucial to recognize ACC of the breast so that patients with this tumor are not overtreated.

The Outcome of Diagnosing Flat Epithelial Atypia in Breast Core Biopsies That Underwent Subsequent Excisions: A Retrospective Analysis at Danbury Hospital, January 2009–December 2010
(Poster No. 91)
Amarpreet Bhalla, MD (Amarpreet.Bhalla@danhosp.org); Ramapriya Vidhun, MD. Department of Pathology and Laboratory Medicine, Danbury Hospital, Danbury, Connecticut.

Context: There has been an upsurge in interest in flat epithelial atypia (FEA), because these lesions present clinically as mammographic densities or calcifications. High incidences of low-grade ductal carcinoma in situ (DCIS), tubular carcinoma, and invasive lobular carcinoma (ILC) have been associated with FEA. However, the precise management of these lesions detected in core biopsy is debatable.

Design: We performed a retrospective study of breast core biopsy specimens with the findings of FEA (group A) and FEA with atypical ductal hyperplasia (ADH, group B) that underwent subsequent excision biopsy during a 2-year period.

Results: We received 1281 core needle biopsy specimen, among which 29 (2.3%) biopsies yielded pure FEA lesions and 17 (1.3%) yielded FEA and ADH. The indications of biopsy in group A included microcalcifications in 16 cases (55.7%), calcification and enhancement in 6 cases (20.6%), and enhancement on magnetic resonance imaging in 1 case (3.4%). The median age at diagnosis was 48 years. The indications of biopsies in group B included calcifications in 7 cases (41.2%), mass and microcalcifications in 9 cases (52.9%), and mass in 2 cases (11.7%). The median age at diagnosis was 53.5 years (Table).

Sentinel Lymph Node Cases With Negative TP and Positive Hematoxylin-Eosin–Stained Permanent Sections

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Macrometastasis, No. (%)</th>
<th>Micrometastasis, No. (%)</th>
<th>Isolated Tumor Cells</th>
</tr>
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<tr>
<td>2009</td>
<td>12</td>
<td>10 (83.3)</td>
<td>2 (16.7)</td>
<td>0</td>
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<tr>
<td>2010</td>
<td>9</td>
<td>4 (44.4)</td>
<td>5 (55.6)</td>
<td>0</td>
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Follow-up Excisional Biopsy Diagnoses After a Core Biopsy with FEA (A) or FEA and ADH (B)

<table>
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<tr>
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<th>DCIS/ Invasive Ductal Carcinoma, No. (%)</th>
<th>ADH, No. (%)</th>
<th>LCIS/ ALH, No. (%)</th>
<th>ILC, No. (%)</th>
</tr>
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<tbody>
<tr>
<td>Group A (n = 29)</td>
<td>5 (17.2)</td>
<td>7 (24.1)</td>
<td>2 (6.9)</td>
<td>0</td>
</tr>
<tr>
<td>Group B (n = 17)</td>
<td>3 (17.6)</td>
<td>8 (47.0)</td>
<td>1 (5.8)</td>
<td>1 (5.8)</td>
</tr>
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</table>

Abbreviations: ADH, atypical ductal hyperplasia; DCIS, ductal carcinoma in situ; ILC, invasive lobular carcinoma; FEA, flat epithelial atypia.

Conclusions: Our data revealed that 17.2% of the patients with pure FEA and 17.6% of the patients with FEA and ADH coexisted with a higher lesion, including ductal carcinoma. A similar incidence, 9% to 22%, has been quoted in the medical literature. The above data emphasize that follow-up excision is imperative in the management of patients diagnosed with FEA on core needle biopsy.

Mammootar Concordance Between Core and Needle (Poster No. 92)

Rob Seitz, BS1 (rseitz@clarientinc.com); Rodney A. Beck, BS3; Ainur Kyshoobayeva, MD, PhD2; Kenneth J. Bloom, MD, FACP1; Douglas T. Ross, MD, PhD1; 1Department of R&D, Clarient, Huntsville, Alabama; Departments of 2Pathology and 3R&D, Clarient, Aliso Viejo, California.

Context: InsightDX Mammootar is a 5-antibody immunohistochemistry test that can be used as an aid in the assessment of the aggressiveness of ER+ breast cancer. It has been validated in 4 institutional cohorts and the above data were used in the management of patients diagnosed with ER+ breast cancer.

Results: Seventeen cases had sufficient tissue in both the surgical specimen and core biopsy for all stains to be performed. Concordances between resection and biopsy were CEACAM5, 20 of 20; TRMT2A/HTPCG, 17 of 18; NDRG1, 17 of 18; Angulated 27, Mixed 33; Dense 39, Stippled 12; Cleared 16.

Conclusions: Although individual antibodies varied in concordance, the overall concordance of the Mammootar-based risk assessment was 100%. This suggests that although there is some redundancy in the stains, the algorithm, the Mammootar staining allowed the risk assessment to be reproducible in the presence of some inconsistencies in the sampling or staining of cores compared to resection specimens. The results support the staining and interpretation of Mammootar on needle biopsy specimens.

Metaplastic Carcinoma Arising in Invasive Micropapillary Carcinoma: A Unique Triple Negative Breast Carcinoma Phenotype (Poster No. 93)

Gitika Aggarwal, MD (gaggarwal@mcg.edu); Reena Jain, MD; Suash Sharma, MD; Department of Pathology, Georgia Health Sciences University, Augusta, Georgia.

A 35-year-old woman with history of a left breast mass for a few months was diagnosed with poorly differentiated malignancy on breast biopsy. Gross examination of the subsequent mastectomy specimen revealed 2 tan-white, firm masses, measuring 7.5 × 7.0 × 7.5 cm and 5.0 × 3.5 × 3.5 cm, involving the lower inner quadrant (LIQ) and the upper outer quadrant (UUQ) respectively, interconected by ill-defined induration. Microscopic sections revealed multifocal infiltrating, poorly differentiated ductal carcinoma (grade III) with focal metaplastic carcinoma (LIQ) and invasive micropapillary carcinoma (UQQ). The tumor showed diffuse strong immunopositivity for vimentin and pancytokeratin (carcinoma portion and focal positivity for p63 (myoepithelial differentiation). Immunostaining for estrogen receptors and progesterone receptors and fluorescence in situ hybridization for Her2-neu amplification were negative. The morphologic and immunohistochemical features were consistent with metaplastic carcinoma arising in a background of invasive micropapillary ductal carcinoma. Thirty-five left axillary lymph nodes (35 of 35) were positive for metastatic carcinoma. Postmastectomy magnetic resonance imaging and computed tomography after 1 month showed widespread metastases to lungs, liver, and lytic vertebral bone lesions. The patient was treated with 5FU, daunorubicin, and cytoxan with partial response. To the best of our knowledge, this is the first case report of triple negative metaplastic carcinoma of breast arising in an invasive micropapillary ductal carcinoma.

Cytologic Evaluation of Atypical Urine Cytologies Sent for UroVysion (Poster No. 94)

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Context: Bladder cancer is the fourth most common cancer in men in the United States with an estimated 14680 deaths in both sexes in 2010, according to the American Cancer Society. To date, urine cytology (UC) has been the most common and inexpensive test used to detect patients presenting with hematuria to rule out bladder cancer. Although UC has a high specificity in detecting high-grade and flat lesions, it is less sensitive for low-grade lesions, which are more prevalent. Several urine-based ancillary tests have been developed that are US Food and Drug Administration–approved to overcome the limitations of UC. At our institution, atypical UCs are referred for UroVysion (Abbott Molecular Inc, Des Plaines, Illinois) testing to detect chromosomal abnormalities. In this study, we attempted to correlate the cytologic features with UroVysion results on all atypical UCs for the last 5 years.

Design: We reviewed the records of 558 UCs sent for UroVysion from 2005 to 2010. Of these, cytology slides were available on 111 patients with a diagnosis of cytologic atypia. Two pathologists and 2 senior pathology residents reviewed these cases for number of clusters per case, number of cells per cluster, papillary configuration, nuclear shape, nucleus to cytoplasm ratio, quality of chromatin, and background change. The results were tabulated and evaluated.

Results: The parameters evaluated were not significantly different in each group (Table).

Conclusions: In the setting of urinary atypia, cytology and UroVysion are not reliable differentiators between reactive and neoplastic changes.

<table>
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<th>Comparative Results</th>
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<tr>
<td>UroVysion + (16)</td>
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<tr>
<td>Average no. clusters/case</td>
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<tr>
<td>Average no. cells/cluster</td>
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<td>Nuclear shape, %</td>
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<td>Chromatin quality, %</td>
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<tr>
<td>Nucleus to cytoplasm ratio &gt; 70%, %</td>
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<td>Papillary configuration, %</td>
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<td>Background, %</td>
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<td>Follow-up biopsies, No. cases</td>
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Metatarsal Bone Acremetastasis as an Initial Clinical Presentation of Endometrial Adenocarcinoma (Poster No. 95)

Tatiana N. Buhtoiarova, MD1 (dr.buhtoiarova@gmail.com); Byung K. Kim, MD2; David Dunaway, MD2; Marietta Kintiroglou, MD,1 Departments of 1Pathology and 2Radiology, Saint Barnabas Medical Center, Livingston, New Jersey.

Endometrial adenocarcinoma (EA) is the commonest gynecologic malignancy in developed countries. The most frequent sites of extraterine spread of EA of the endometrioid type are the pelvic and para-aortic lymph nodes and the ovaries, whereas metastesas to the bones are extremely rare. We present a case of metastatic lesion in the left first metatarsal bone and metatarsophalangeal (MTP) joint as initial clinical presentation of EA. An 88-year-old woman presented with primary complaint of pain, erythema, and edema of the left first MTP joint. Foot radiography revealed irregularly dense, oval-shaped lytic destruction in the distal half of the first metatarsal bone with initial impression of osteomyelitis. The joint fluid and the cell block from the affected joint demonstrated metastatic adenocarcinoma. Soon thereafter, the patient developed intractable vaginal bleeding requiring total hysterectomy with right salpingo-oophorectomy. Subsequent pathomorphologic analysis of the uterus revealed EA of endometrioid type, with lymphovascular invasion. Microscopic pattern and immunohistochemical staining of the EA and the metastatic adenocarcinoma of the left first MTP joint fluid were identical, which confirmed the endometrial origin of the metastatic lesion in the absence of any other malignancies. Two possible mechanisms of metastatic tumor dissemination to the lower distal extremities exist in the literature. One is a vertebral metastasis through the Batson paravertebral valveless venous plexus; the other one is via local lymphovascular invasion. In our case, the microscopically proven lymphovascular invasion suggests a possibility of the second theory.

Follow-up and Management of Patients With Atypical Squamous Cells: Cannot Exclude High-Grade Changes in Our Institution (Poster No. 96)

Mana Moghadamfalahi, MD (manaziba@yahoo.com); Houda Alatassi, MD, Department of Pathology, University of Louisville Hospital, Louisville, Kentucky.

Context: Diagnoses of atypical squamous cells: cannot exclude high-grade changes (ASC-H) on cervical Papanicolaou (Pap) tests warrant a differential diagnosis of high-grade squamous intraepithelial lesion (HSIIL), immature squamous metaplasia, cervicitis with reactive changes, and lower uterine segment endometrium. Follow-up recommendations for ASC-H are colposcopy and biopsy. If the result of the biopsy and cytology do not correlate, review of the pathology is warranted.

Design: We found 38 cases of ASC-H (ThinPrep method) from our institutional database since 2009. High-risk human papillomavirus (HPV) testing was conducted on all of these cases using hybrid capture II DNA polymerase chain reaction. Results of available corresponding biopsies were retrospectively studied. All of these findings were correlated with the patient’s age. We divided our patients into 2 age groups, with 17 patients <30 years and 21 patients ≥30 years.

Results: Of the 38 cases, 28 cases (73%) were positive for high-risk HPV. Of those HPV positive cases, 17 (60%) were ≥30 years and 11 (40%) were <30 years. Corresponding biopsies were available for 19 of the HPV positive cases. Fourteen out of 19 biopsies (74%) showed dysplasia, with 7 of those being high-grade cervical intraepithelial neoplasia (CIN, CIN II/CIN III) and 7 low-grade (CIN I usually associated with cervicitis or metaplasia). Of the remaining 5 cases, 3 showed cervicitis and 2 were insufficient.

Conclusions: Because the adequacy of colposcopy and directed biopsy is dependent on the skill of the clinician, we propose that adding reflex HPV testing to ASC-H diagnosis will increase the detection rate of dysplasia. This also will increase sensitivity of Pap tests as a screening tool in finding dysplasia.

Utility of Fine-Needle Aspiration in the Diagnosis of Plasmablastic Lymphoma (Poster No. 97)

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Plasmablastic lymphoma (PBL) is a rare aggressive variant of diffuse large B-cell lymphoma initially described in the oral cavity of human immunodeficiency virus (HIV)-infected individuals. Few cases of PBL have been diagnosed by fine-needle aspiration (FNA) and cytology. We describe a case of PBL that presented as a mandibular mass in a 69-year-old man who was positive for HIV. Fine-needle aspiration was performed from which smears, cell block, and immunohistochemistry were prepared. The smears showed clusters of discohesive, plasmacytoid, large atypical cells with eccentric nuclei, coarse chromatin, prominent nucleoli, basophilic cytoplasm, and focal perinuclear halos. Based on the morphologic features of these cells, the differential diagnosis included lymphoma, melanoma, and poorly differentiated carcinoma. Immunohistochemistry revealed that the neoplastic cells were positive for CD38, MUM1, and CD56, but negative for cytokeratin, S100, CD45, CD3, and CD20. A preliminary diagnosis of PBL was rendered. The diagnosis was further confirmed by subsequent excisional biopsy of the lesion with complete flow cytometry and cytogenetic studies. Interestingly, the lesion was also found to be positive for MYC/ IgH rearrangement, a finding characteristic of Burkitt lymphoma, but also can be seen infrequently in other high-grade B-cell neoplasms, including PBL in HIV-positive patients. This case illustrates the value of FNA in the diagnosis of PBL, as well as the importance of obtaining material for morphologic and molecular-cytogenetic studies for the final diagnosis.

Endoscopic Ultrasound-Guided Fine-Needle Aspiration in the Diagnosis of Pancreatic Lymphomas: A Clinicopathologic Study of 11 Cases (Poster No. 98)

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Context: Endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) is an important tool to diagnose solid pancreatic lesions. We evaluated the demographics, histopathologic characteristics, and clinical course of pancreatic lymphomas.

Design: A review of our database between 2000 and 2010 identified 11 pancreatic lymphomas out of 2360 EUS-FNAs. Data collected included site, tumor size, histological subtype, stage, and outcome. Follow-up ranged from 3 to 78 months (mean 26 months).

Results: Of the 11 lymphoma patients, 6 male and 5 female patients were diagnosed as 8 primary pancreatic lymphomas (PPLs) and 3 secondary pancreatic lymphomas (SPLs). Tumors were predominantly located in the head and body of the pancreas and were revealed by jaundice. Primary pancreatic lymphoma patients were younger with a mean age of 60 years (range, 43–79 years) for PPL and a mean age of 67 years (range 59–77 years) for SPL, with significantly larger tumors in PPL (mean size 54.9 mm; range, 15.4–85 mm) than SPL (mean size, 18 mm; range, 16–20 mm) and a female predominance (female to male ratio, 1.6:1). Histopathologic findings were diffuse large B-cell lymphoma (DLBCL, n = 7), follicular lymphoma (n = 2), marginal zone lymphoma (n = 1), and anaplastic large cell lymphoma (ALCL, n = 1). Patients with SPL seemed much more likely to die of their disease. Interestingly, in the PPL cohort, patients who died had immunoablative variants of DLBCL and ALCL; the 6 remaining patients were alive and disease-free at last follow-up.

Conclusions: This study reports one of the largest series of pancreatic lymphoma diagnosed by EUS-FNA and demonstrates its accuracy in diagnosing. DLBCL was the most frequent encountered histologic subtype. In our series, outcome was better for PPL compared to SPL.

High Rate of Abnormal Cervical Cytology in Uterine Carcinosarcoma: Analysis of 27 Cases (Poster No. 99)

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Context: Carcinosarcoma, formerly known as malignant mixed mesodermal/mullerian tumor, is an uncommon uterine malignancy that occurs almost exclusively in postmenopausal women. The sensitivity of conventional cervical cytology for carcinosarcoma has been reported to be 57% to 70% in a few early studies, and the abnormal cytology was an adverse prognostic sign. The goal of this study was to review our institutional experience.

Design: Uterine carcinosarcoma was searched in surgical pathology data from 1991 to 2010, and the cervical cytology performed within 2 months before the surgical biopsy was retrieved and reviewed. The tumor stage was also recorded.
Results: Twenty-seven uterine carcinosarcomas were included in this study. The patient age ranged from 24 to 84 years, with a mean age of 60 years. Tumor stages were 11 IB, 3 IB3, 3 IB, 3 IVB, 1 V1A, and 3 no stage information. Fourteen cases had cervical cytology, and the cytology diagnoses were 4 adenocarcinoma; 2 suspicious for adenocarcinoma; 1 squamous cell carcinoma; 3 atypical glandular cell; 1 atypical squamous cell, cannot exclude high-grade lesion; and 3 negative. The abnormal cervical cytology rate was 78.6% (11 of 14). The 14 cervical cytologies included 8 conventional and 6 ThinPrep. The ThinPrep had a slightly higher abnormal rate, 83.3% (5 of 6), than the conventional cytology, 75% (6 of 8).

Conclusions: A high rate (78.6%) of abnormal cervical cytology in uterine carcinosarcoma was noted in our study, and there was no significant difference between conventional and ThinPrep cytology. The definitive diagnosis of carcinosarcoma was rendered in none of the 14 cases, and adenocarcinoma was the most common cytology diagnosis (6 of 11).


(Poster No. 100)

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We report the first cytology case of a congenital sialolipoma (CS) of the parotid gland in an infant diagnosed via fine-needle aspiration and core biopsy and confirmed on parotidectomy. CS is a rare benign lesion. Sialolipoma is a new variant of salivary gland lipoma. The youngest age that has been reported so far for CS of the parotid gland is in a 10-week-old female infant. The differential diagnoses include other lipomatous tumors such as a lipoblastoma or a lipoma. A 6-week-old male infant presented with a progressively enlarging left cheek mass since birth. Magnetic resonance imaging and ultrasound demonstrated an enlarged parotid gland measuring 5 x 5 cm with homogeneous echotexture. Fine-needle aspiration and core biopsies were performed. The smears showed scant salivary and adipose tissue. The needle cores showed mature adipose tissue admixed with normal-appearing salivary gland tissue. These cytological and histologic findings were most consistent with a sialolipoma. The child underwent a left parotidectomy. The histology showed a mixture of benign salivary gland tissue and mature adipose tissue (ratio of salivary gland to adipose tissue was 1:1) similar to the fine-needle aspiration biopsies. A final diagnosis of CS was rendered. CS is a rare but benign diagnosis and can be recognized by fine-needle aspiration cytology. These lesions may continue to grow and can recur locally. This case demonstrates the cytologic and histologic features of a CS in an infant.

Cytologic Findings of a Primary Duodenal Gangliocytic Paraganglioma

(Poster No. 101)

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A 35-year-old man presented to our institution with symptoms of diarrhea and dyspepsia. Endoscopy and ultrasound demonstrated a 14-mm submucosal mass in the second portion of the duodenum (Figure 92, A). The clinical differential diagnosis included gastrointestinal stromal tumor and leiomyoma. An ultrasound-guided endoscopic fine-needle aspiration with immediate evaluation was performed. Diff-Quik stain showed clusters of rare large atypical cells with large round nuclei, prominent nucleoli, and abundant finely granular cytoplasm. These cells were associated with a background of more abundant epithelioid-like and spindle cells (Figure 92, B). A hematoxylin-eosin–stained section of the cell block demonstrated a triphasic cell population of ganglion-like cells with abundant eosinophilic cytoplasm, admixed with epithelioid-like and spindle cells, characteristic of a gangliocytic paraganglioma. These cells were arranged in a solid and corded pattern (Figure 92, C). Immunohistochemical stains were diffusely and strongly positive for synaptophysin (Figure 92, D), weakly positive for S-100 protein in the background and paraffin embedded tissues.

Conclusions: The Stellaris FISH method provides a means to accurately detect, localize, and quantify mRNA transcripts. The technique may be useful as an adjunct to immunofluorescence, digital pathology, and companion diagnostics markets.

Stellaris Fluorescence In Situ Hybridization (FISH): A New mRNA Detection Method

(Poster No. 102)

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Context: Most current in situ hybridization techniques are cumbersome and rely on signal amplification for detection, complicating quantification and localization. As a result, there is a need for technologies that can simultaneously detect, localize, and quantify individual molecules of mRNA at the cellular level. An mRNA-directed fluorescence in situ hybridization (FISH) protocol has been developed that can fulfill all 3 needs and is easy to perform. This technique is ideal for applications that analyze transcription activity, protein-RNA interactions, and mRNA translational events, and may be appropriate for future diagnostic applications.

Design: Stellaris FISH probe sets are composed of multiple singly labeled oligonucleotides designed to hybridize specifically to targeted mRNA to give sensitive fluorescence detection. Discrete transcripts are observed as diffraction-limited spots in conventional fluorescence microscopy. The Stellaris method improves and simplifies FISH methods, and provides the direct detection, localization, and quantification of individual molecules of mRNA with linear output and no amplification. A wide variety of fluorophores allows the choice of multiplexing.

Results: Experimental data and images demonstrate the effectiveness of this mRNA detection method in human, mouse, fruit fly, and nematode systems. Stellaris FISH probes can be used in adherent cells, frozen tissue, and paraffin embedded tissues.

Conclusions: The Stellaris RNA-FISH method provides a means to accurately detect, localize, and quantify mRNA transcripts. The technique may be useful as an adjunct to immunofluorescence, digital pathology, and companion diagnostics markets.

Is Whole-Slide Imaging Applicable to Cytology? A Pilot Study

(Poster No. 103)

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The feasibility of digital cytology slide review has not been extensively studied. We compared the diagnostic accuracy of glass versus digital images of pancreatic cytology.

Design: Twenty routinely prescreened pancreatic fine-needle aspiration cases (10 benign and 10 malignant) were relabeled with an anonymous case number and scanned at ×40 with z-stacking at 0.8 μm (Olympus VS110-5S Digital Virtual Slide System). This comprised 59 slides (2 Papanicolaou slides per case and, when available, 1 ThinPrep). Four digital cases per week were reviewed during 5 weeks by 2 cytopathologists, 1 surgical pathologist, and 1 resident. After a 3-week washout period, glass slides were reviewed. For each case, reviewers noted their diagnosis, time required, diagnostic confidence, image quality, whether z-stacking was used, and other comments.

Results: All observers had high accuracy for glass diagnosis with 4 miscalls of 80 observations (4 observers viewing 20 cases). The k values for intraobserver diagnostic correlation (digital to glass) ranged from 0.1 (poor) to 1.0 (perfect). Cytopathologists had highest k scores (0.7 and 1.0), which were associated with experience. On average, whole-slide imaging took 3.6 times longer than glass slide interpretation for all observers (range 1.9–5.3). Z-stacking was used/required in 45 cases (15%).

Conclusions: Accurate diagnosis is possible on digitally scanned pancreatic cytology slides, especially for experienced cytopathologists. Significantly more review time was required for digital cases; further studies are required to determine if this is reduced with increased pathologist experience.

This study was supported by a College of American Pathologists Foundation Research in Whole Slide Imaging Grant and Olympus America.

Cokeromyces recurvatus Originally Misdiagnosed as Paracoccidioides brasiliensis in a Liquid-Based Papanicolaou Test (Poster No. 104)

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Fungal organisms, with the exception of Candida species, are rarely seen in Papanicolaou (Pap) tests. We present a case of Cokeromyces recurvatus in a routine liquid-based Pap test from a healthy, asymptomatic, gravida 0, para 0, 26-year-old white woman with no pertinent past medical history. A prior Pap test was negative. This Pap test showed many fungalike elements as globose yeastlike forms measuring 10 to 30 μm in diameter. Several had multiple narrowly attached apparent daughter buds (2–8 μm in diameter), some of which were rounded and some of which were more elongate (Figure 93). This morphology was characteristic of Paracoccidioides brasiliensis. The background showed benign squamous epithelium with occasional neutrophils and lymphocytes. Direct polymerase chain reaction and DNA sequence analysis in GenBank BLAST showed an exact match for C recurvatus. Cokeromyces recurvatus is a dimorphic zygomycete in the order Mucorales found in soil in the United States and Mexico. This is the ninth reported case of C recurvatus in humans and the fourth reported in the female genital tract.

In 5 cases, the patients were immunosuppressed. The significance of C recurvatus in a Pap test is uncertain. Our patient did not receive any treatment. She has re-presented with recurrent urinary tract infections with negative cultures and low pelvic pressure with itching and burning of the external labia and rectum. A recent transvaginal ultrasound was normal. It is unclear whether her current symptoms are related to C recurvatus. This case highlights the importance of molecular techniques to prevent misdiagnosis of C recurvatus as P brasiliensis based on morphology alone.

Unilateral Knee Joint Effusion as the First Manifestation of Occult Pancreatic Adenocarcinoma: A Case Report and Review of the Literature (Poster No. 105)

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A 77-year-old man with a history of peripheral vascular disease presented with bilateral lower extremity claudication for peripheral angiogram. But on examination, discovery of right lower extremity pitting edema and right knee effusion prompted an x-ray revealing a large suprapatellar joint effusion. Aspiration was performed and 65 mL of straw-colored fluid was obtained. A Papanicolaou-stained ThinPrep and hematoxylin-eosin-stained cell block section demonstrated large pleomorphic malignant cells seen singly and in clusters with prominent nuclei and occasional mitotic figures (Figure 94, A). Immunohistochemical stains were positive for CK20 and CDX-2 and negative for CK20, suggestive of metastasis from a carcinoma of either gastrointestinal or pancreaticobiliary origin. Computed tomography of the abdomen with contrast subsequently revealed a 5.2-cm pancreatic tail mass. Endoscopic ultrasound then demonstrated ascites and lymphadenopathy. Endoscopic ultrasound–guided fine-needle aspiration of the pancreatic lesion revealed pancreatic adenocarcinoma with tumor cells similar to those seen in the knee aspirate (Figure 94, B). Thirty-nine cases of synovial metastases from solid or hematologic malignancies have been reported, with the knee being the most common target and the lung the most common primary. Of these, only 23 presented initially with a joint effusion. In the only previously described case of pancreatic carcinoma metastasizing to a joint space, although the patient first presented with joint effusion and lymphadenopathy, the diagnosis of pancreatic malignancy was established prior to demonstrating positive joint effusion cytology. To our knowledge this is the first case of occult pancreatic adenocarcinoma presenting as a unilateral knee joint effusion and initially diagnosed by joint effusion cytology.

Fine-Needle Aspiration of Lung Lesions: Report of an Institutional Experience (Poster No. 106)

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Context: Fine-needle aspiration (FNA) plays a crucial role in the diagnosis of lung mass lesions. Subclassification of non–small cell
carcinoma has become very important in the recently developed molecular-targeted therapy of lung cancer.

**Design:** Cytopathology reports for lung FNA performed from 2007 to 2011 in our institution were reviewed. Additional immunostains for TTF-1 and p63 were also performed in selected cases.

**Results:** Among 611 cases of lung FNA analyzed, 18.0% were benign, 64.5% were malignant, 15.1% were atypical or suspicious for malignancy, and 2.5% were unsatisfactory for diagnosis. In the 394 malignant cases, 50.5% were subclassified into adenocarcinoma, squamous cell carcinoma, or small cell carcinoma based on cytologic findings, and most of the others were diagnosed as carcinoma or non–small-cell carcinoma. In 134 malignant cases with histology confirmation, all squamous cell carcinoma, all small cell carcinoma and 91.7% of adenocarcinoma diagnosed by FNA matched the histology diagnoses. Additional immunostains for TTF-1 and p63 in cellblocks were able to correctly subclassify 66.7% of previously diagnosed non–small-cell carcinoma into squamous cell carcinoma or adenocarcinoma; the other 33.3% were histologically poorly differentiated carcinoma and could not be subclassified by immunostains in cellblocks.

**Conclusions:** Diagnoses of lung squamous cell carcinoma and adenocarcinoma by FNA were reliable, but only about half of malignant cases in this series were able to be such diagnosed based on cytologic features. Immunostains in cellblock material can help to make the difference between squamous cell carcinoma and adenocarcinoma, but had limited usefulness in poorly differentiated carcinoma.

**Merkel Cell Carcinoma Presenting as Pancreatic Mass: Diagnosed by Endoscopic Ultrasound-Guided Fine-Needle Aspiration**

*Poster No. 107*

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Merkel cell carcinoma (MCC) is an uncommon, rapidly progressive neuroendocrine cutaneous malignancy. The most common site of presentation is the head and neck region. Local recurrence occurs frequently after excision, but distant metastasis to lymph nodes, other skin sites, and visceral organs like lung, liver, and testis is rare. Pancreatic involvement by MCC is extremely unusual, with only 4 such cases reported in the English literature. We present a case of a 65-year-old man with progressively worsening abdominal pain during a period of 3 weeks. Abdominal ultrasound and computed topography scan of the abdomen and pelvis demonstrated a 4.5-cm mass in the head of the pancreas. Endoscopic ultrasound-guided fine-needle aspiration revealed clusters of atypical cells with scant cytoplasm and finely granular, salt-and-pepper-type chromat. These cells stained positively with cytokeratin AE1/AE3, cytokeratin 20, synaptophysin, and chromogranin; they were negative for cytokeratin 7. Given the patient’s previous history of MCC on the skin of the right forearm with metastasis to the ipsilateral axillary lymph nodes, a diagnosis of metastatic Merkel cell carcinoma was rendered. The cytomorphologic features of MCC seen on FNA are similar to those of pancreatic neuroendocrine tumors and metastatic small cell carcinoma. Preoperative diagnosis is critical for these patients, and pathologic distinction of MCC from other neoplasms is essential for appropriate care.

**Improving Quality of Cytology Diagnosis: Splenic Fine-Needle Aspirations and Core Biopsies, Our 16 Years of Experience**

*Poster No. 108*

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**Context:** Splenic fine-needle aspirations and needle core biopsies are challenging during intraoperative consultation because of cytopathologist inexperience and cellular complexity. A 16-year retrospective review of our splenic fine-needle aspirations and core biopsy touch preparations showed 29 specimens from 20 patients collected during 1995–2011.

**Design:** Independent reviews by pathologists blinded to history and diagnosis were performed and results were correlated with histologic examination.

**Results:** In 5 cases, cytologic smears were nondiagnostic because of sampling (hypocellular, blood only, or extensive necrosis). Twenty-one diagnostic samples showed good cyhistologic correlation for interpretation.
Endometrial Aspiration Cytology Findings of Metastatic Lobular Carcinoma to the Endometrium (Poster No. 110)

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Endometrial aspiration cytology has been shown by many authors to be an acceptable method for endometrial assessment. Better sampling of the endometrium and less patient discomfort are its primary advantages relative to endometrial curettage. The literature predominately describes the use of endometrial aspiration cytology in the detection of primary endometrial neoplasms. Little has been written regarding the cytopathologic appearance of metastatic lesions of the endometrium. Metastases to the endometrium from outside the genital tract are rare. The primary tumor is most commonly a breast, gastrointestinal, renal, lung, pancreas, or cutaneous melanoma. A 54-year-old woman underwent a hysterectomy for stage IIa lobular carcinoma treated with chemotherapy and tamoxifen. Two years later, she presented with abnormal uterine bleeding. On exam, the patient was noted to have fluid in the endometrial cavity, which was aspirated and submitted for cytologic examination. A ThinPrep slide was prepared, demonstrating numerous cells with small, oval, bland nuclei arranged singly and more rarely in cohesive groups. A gross cystic disease fluid protein immunostain on an additional ThinPrep slide demonstrated strong staining in these cells, confirming metastatic breast carcinoma. The cytologically benign appearing cells may represent neoplasia.

Pitfalls of Fine-Needle Aspiration Biopsy in Spindle Cell Lesions: Two Case Reports (Poster No. 111)

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We report 2 cases of spindle cell lesions where there was discrepancy between the fine-needle aspiration and biopsy (FNAB) and the final resection because of limited tissue. The first case was a 6-year-old boy with a right-side chest mass measuring 16.2 cm and right lung opacities. FNAB showed a spindle cell neoplasm. Positive stains included BCL2, S-100, desmin, and focal positivity for myogenin and Myo-D1. A diagnosis of embryonal rhabdomyosarcoma spindle cell type was made. After chemotherapy, the subsequent diaphragmatic mass resection and right lower lobe wedge resection showed a spindle cell neoplasm with extensive fibrosis and chondroid nodules. The spindle cell and chondroid areas were positive for desmin, S-100 (weak in spindle areas), and BCL2, but negative for myogenin. A final diagnosis of posttreatment pleuropulmonary blastoma was rendered. The second case was a 40-year-old man with a left-side chest mass measuring 8 cm and lung lesions. FNAB showed small round blue cells with focal rosettelike structures. A diagnosis of atypical Ewing sarcoma/primitive neuroectodermal tumor was made. After chemotherapy, he underwent a pulmonary lobectomy, which showed a spindle cell neoplasm with treatment effect. The spindle cells were positive for EMA, BCL2, and CD99. A final diagnosis of high-grade monophasic synovial sarcoma was made. FNAB, although helpful in evaluating lesions, has a disadvantage in providing limited tissue, which can hamper accurate diagnoses, thus impacting treatment. Insufficient tissue for immunohistochemical and molecular studies can lead to challenges in interpretation.

Giardiasis Associated Pancreatitis Diagnosed by Common Bile and Pancreatic Duct Brushing Cytology (Poster No. 112)

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Although Giardia lamblia is commonly found in the duodenum, it is rarely seen in the pancreas and biliary tract. We report a rare case of chronic pancreatitis caused by Giardia. A 59-year-old man with a history of abdominal pain underwent a laparoscopic cholecystectomy for suspected gallstone pancreatitis. Postoperatively, he continued to have abdominal pain, and also experienced weight loss, decreased appetite, and diarrhea. Laboratory data revealed lipase of 199 u/L and amylase of 70 u/L. Computed tomography of the abdomen and pelvis revealed diffuse thickening of the pancreatic head and multiple punctual calcifications in the pancreatic head. Brushings of the pancreatic duct and common bile duct were taken during an endoscopic retrograde cholangiopancreatography, and brushing cytology revealed many Giardia trophozoites. Pancreatic duct and common bile duct stents were placed. The patient was treated with 500 mg of metronidazole 3 times daily for 10 days. The next month later, cytologic examination of both stents revealed benign ductal cells and no organisms diagnostic of Giardia. The patient’s symptoms resolved following treatment for Giardia, and subsequent stool samples revealed no Giardia cysts or trophozoites. Common bile duct and pancreatic duct brushing cytology has been mostly used for the diagnosis of biliary lesions, and there are few reported cases of this method used to detect Giardia infections. We conclude that common bile duct and pancreatic duct brushing with cytologic examination is useful in detecting Giardia organisms in these locations, and that Giardia should be considered as a possible cause of chronic pancreatitis.

Atypical Follicular Cells Cannot Exclude Papillary Thyroid Carcinoma and Its Significantly Higher Risk of Malignancy Than Other Atypical Follicular Cells (Poster No. 113)

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Context: The Bethesda System for reporting thyroid cytology is intended to standardize reporting terminology and offers specific diagnostic categories to facilitate meaningful reporting. However, the category “atypical follicular cells” may actually encompass subcategories with different risks of malignancy. We therefore sought to determine whether or not significant differences in the risks of malignancy exist between these subcategories.

Design: All thyroid fine-needle aspirations prepared by conventional and liquid-based preparation from 2004 to 2009 were retrieved. The “atypical follicular cells” were subclassified as follows: (1) atypical, not otherwise specified; (2) atypical, rule out Hurthle cell neoplasm; (3) atypical, rule out follicular neoplasm; and (4) atypical, cannot exclude papillary carcinoma. The risks of malignancy were calculated using histologic correlation and comparisons made between these subcategories. Categorical analysis was performed using a 2-tailed Fisher exact test and a P value of .05 was considered significant.

Results: A total of 4971 cases were retrieved with 1368 (28%) cases having a histologic correlation. There were 161 cases (3.2%) originally classified as atypical follicular cells, with 77 (48%) having histologic correlation and a 32% overall risk of malignancy. The risk of malignancy for atypical follicular cells subclassified as “atypical, cannot exclude papillary carcinoma” was significantly higher than the other subcategories combined (46% vs. 20%, P = .03). Cases subclassified as “atypical, not otherwise specified” had a 6% risk of malignancy compared to “atypical, cannot exclude papillary carcinoma” (P = .005).

Conclusions: The subcategory “atypical, cannot exclude papillary carcinoma” has a significantly higher risk of malignancy compared to the other atypical follicular cells.

Differentiation of Lung Adenocarcinoma and Squamous Cell Carcinoma on Fine-Needle Aspiration Biopsies (Poster No. 114)

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Context: A diagnosis of lung squamous cell carcinoma (SCC) or adenocarcinoma (ADC) on limited specimens is challenging. New targeted therapies make it imperative to draw this distinction. We analyze the utility of a panel of immunocytochemical stains on lung fine-needle aspiration biopsies (FNAB). We retrieved 30 LFNAB diagnosed as primary non–small cell carcinoma (NSCC), ADC, or SCC. Diff-Quik/Papanicolaou–stained smears and hematoxylin-eosin–stained cell block sections were reviewed. Cytokeratins (CK) 7, 20, and 5/6, thyroid transcription factor 1 (TTF-1),...
Napsin-A, and p63 were performed. Dual TTF1/Napsin-A and p63 was used in 10 cases.

**Results:** There were 1 ADC, 4 SCC, and 25 NSCC cases. The ADC was CK7+/CK20−/TTF1+/p63−/CK5+/6−. Three SCC cases were CK7+/CK20−/TTF1+/p63+/. One was p63+ and dual TTF1/Napsin-A+. Seven NSCC showed an ADC immunoprofile, of which 1 had a biopsy consistent with large cell neuroendocrine carcinoma. They were consistent with SCC. Two showed adenosquamous features and discordant immunoprofiles. Napsin-A was positive in 4 cases with ADC immunoprofile (including a dual TTF1/Napsin-A+) and negative in 1 SCC and 3 NSCC with SCC profile. Napsin-A was negative in a CK7− SCC and positive in a case showing adenosquamous morphology. Napsin-A results mirrored TTF1. Ten additional cases were stained with p63, dual TTF1/Napsin-A. A SCC was TTF1/Napsin−/A+, p63+. Five NSCC were consistent with ADC (TTF1/Napsin−/A+, p63−) and 3 with SCC (TTF1/Napsin−/A+, p63+). For CK20−/TTF1+/p63−/CK5+/6−, Napsin-A was consistently positive.

**Conclusions:** This panel is consistently useful in separating ADC from SCC. On limited samples, a combination of p63 and dual TTF1/Napsin-A stain is adequate in the categorization of NSCC.

**Utility of Immunocytochemistry in Diagnosing Leptomeningeal Metastases From an Intrahepatic Cholangiocarcinoma**

(Poster No. 115)

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**Applications of Sanctions by the Centers for Medicare and Medicaid Services and by Accrediting Organizations for Proficiency Testing Failure: A 9-Year Study**

(Poster No. 116)

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**Context:** Proficiency testing (PT) is required for all laboratories that hold certificates for nonwaived testing under the Clinical Laboratory Improvement Amendments of 1988 (CLIA) regulations. There has been little published analysis regarding sanctions levied against laboratories because of unsuccessful PT performance. We surveyed the incidence, trends, and types of sanctions imposed by Centers for Medicare and Medicaid Services or accrediting organizations when unsuccessful PT performance occurred, and determined the current certification status of sanctioned laboratories.

**Design:** Data on sanctions for PT failure from the Laboratory Registry were analyzed for the period 2001–2009. Current status of sanctioned laboratories was determined from the CLIA Laboratory database.

**Results:** During the period examined, 336 laboratories were sanctioned for unsuccessful PT performance. There was an increase in the number of principal sanctions during the period studied, which may be a result of increased enforcement by CMS and the accrediting organizations. Fifty-five percent of sanctioned laboratories received a principal sanction with or without an additional alternative sanction. Of laboratories receiving a principal sanction, 26% are no longer operating, whereas 66% of laboratories continue to operate with a certificate of compliance or accreditation. Eight percent of laboratories that received a principal sanction and are still in operation now hold a CLIA certificate of waive or limited certificate. A significant minority of sanctioned laboratories received a principal sanction with or without an additional alternative sanction. Of laboratories receiving a principal sanction, 26% are no longer operating, whereas 66% of laboratories continue to operate with a certificate of compliance or accreditation. Eight percent of laboratories that received a principal sanction and are still in operation now hold a CLIA certificate of waive or limited certificate. A significant minority of sanctioned laboratories received a principal sanction with or without an additional alternative sanction.

**Conclusions:** The number of sanctions imposed by CMS or the accrediting organizations for PT failure has increased in recent years. The ability of laboratories that have had PT sanctions to continue to operate with a lower level of CLIA certificate not requiring participation in PT is of concern.

**An Effective Laboratory Intervention That Decreases Costs and Educates Clinicians Through Optimization Of 1, 25-Dihydroxy Vitamin D Ordering Practices**

(Poster No. 117)

Nichole L. Steidler, MD1 (nsteidler@salud.unm.edu); Matthew Luke, MD2; Lizabeth Rosenbaum, MD,2 Sarah Lathrop, DVM, PhD2; Michael Crossey, MD, PhD,2 1Department of Pathology, University of New Mexico, Albuquerque; 2Department of Clinical Pathology, TriCore Reference Laboratories, Albuquerque, New Mexico.

**Context:** Laboratory measurement of vitamin D is in demand by clinicians and patients because of its suspected association with numerous, varied health problems including chronic diseases, cancers, and auto-immune conditions. Vitamin D status is best assessed by a serum 25-hydroxy vitamin D (calcidiol) measurement. The determination of 1, 25-dihydroxy vitamin D (calcitriol) is rarely clinically useful, except in a few metabolic diseases and chronic renal conditions. This study examines the effectiveness of a laboratory intervention that educated clinicians on ordering practices of calcitriol, a potentially costly test.

**Design:** In March 2010, the laboratory activated an intervention that automatically converted physician test orders for calcitriol to a calcidiol measurement. Clinicians were notified of the order change when they sought the test result in the electronic medical record and were given a brief comment with an educational point.

**Results:** The monthly mean of calcitriol tests ordered decreased, from 81.8 per month prior to the intervention to 3.67 after the intervention (P < .001). In March–May 2010, a monthly average of 74 ordered calcitriol tests were converted to calcidiol orders, whereas in June 2010–February 2011, a monthly average of 33.4 calcidiol tests were converted to calcidiol orders (P = .01).

**Conclusions:** The laboratory saved $2340 per month by preventing excessive referral testing of calcitriol. Clinicians significantly decreased orders of calcitriol after brief education from the laboratory, and available evidence suggested a lack of specific guidance regarding this test order. This laboratory-based intervention effectively partners with clinicians through education, avoids confusing results, and increases patient safety while decreasing health care costs.

**The Hobgood Clinic Revitalization Project**

(Poster No. 118)

Sohale Vu, BS; Denise Brigham, BSN; Romualdo V. Talento, MD, MPH; Karlene Hewan-Lowe, MD (hewanlowe@ecu.edu). Department of Pathology and Laboratory Medicine, Brody School of Medicine at East Carolina University, Greenville, North Carolina.

**Context:** The Hobgood Clinic at the Thomas Shields Community Center in Halifax County, North Carolina, is operated on a volunteer basis by Brody School of Medicine students and clinicians. The clinic was established to provide quality health care for a rural population that is largely uninsured and underrepresented, and for which 38.9% of death certificates list diabetes mellitus as a contributing condition. Services provided include screenings for blood pressure, glucose, cholesterol, and body mass index. A primary goal is to effect lifestyle changes in preventing and managing diabetes mellitus and its sequelae through counseling and education.

**Design:** We received funds from the College of Physicians and Surgeons’ Foundation of Humanitarian Grant Program to acquire Clinical Laboratory Improvement Amendments waived testing devices for hemoglobin A1C, microalbumin, and creatinine, as well as patient education materials. Patients tested at the clinic were given immediate results and consultation, as well as printed materials for home reference. At-risk patients were enrolled in our study and underwent rigorous follow-up screening and counseling.

**Results:** The clinic screened nearly one-tenth of the population of Halifax County. Of those individuals, nearly 25% agreed to enrollment in close follow-up and consultation. Review of records collected from...
September 2009 until December 2010 showed that nearly one-third of subjects improved blood pressure and fasting blood glucose tests over the course of the study.

Conclusions: Multiple medical and public health studies have shown community-based interventions utilizing nonphysician health care workers to have dramatic impact on acute and chronic disease states in underserved areas. Minimal funding for supplies is required, but positive, long-range outcomes can be achieved.

POSTER SESSION 400: MONDAY, SEPTEMBER 12, 2011, 1:00 PM–4:00 PM

Gynecologic and Placental Pathology; Pulmonary and Mediastinal Pathology; Head, Neck, and Oral Pathology; Cardiovascular Pathology; Clinical Chemistry; Clinical Immunology; Endocrine Pathology; Microbiology; Molecular Pathology; Ophthalmic Pathology; Pathology Education; Quality Assurance

Metastasis of Endometrial Carcinoma to the Right Neck
((Poster No. 1)

Dian Feng, MD1; Kent Hoskins, MD; David Laib, MD; Edward Santos, MD. Departments of 1Pathology and 2Center of Cancer Care, Saint Anthony Medical Center, Rockford, Illinois.

We report a case of an uncommon metastasis of endometrial carcinoma to the right neck in a 55-year-old woman. She presented with increased pain at the right lower neck. A 3.5-cm, nonmovable subcutaneous mass was identified. She had a previous significant history of endometrial carcinoma with bilateral salpingo-oophorectomy 17 years previously and metastatic adenocarcinoma of mullerian origin in the lung confirmed by a biopsy 2 years prior. She also had a history of asthma and diabetes. Subsequent positron emission tomography tumor imaging of the whole body found hypermetabolic activity within the mediastinum and bilateral pulmonary nodules and the right neck mass. Ultrasound-guided fine-needle aspiration biopsy of the neck mass was performed. Sections showed a malignant neoplasm composed of papillae with fibrovascular cores lined by malignant cells with pleomorphic and hyperchromatic nuclei, and scant cytoplasm. Scattered psammoma bodies were present. Immunohistochemical staining showed that the tumor was positive for WT-1, CK7, estrogen, and progesterone, and negative for TTF-1 and CK20. A mucicarmine special stain was focally positive. Based on history, histology, and immunohistochemical staining pattern, a diagnosis of metastatic papillary adenocarcinoma most consistent with an endometrial primary was rendered. The patient was treated with 3 cycles of chemotherapy with carboplatin and Taxol, and subsequently received radiotherapy to the neck and mediastinum. She has overall improvement in her condition. In conclusion, stage IV endometrial carcinoma may metastasize to the neck, and responds well to chemoradiation therapy.

Cellular Pseudosarcomatous Fibroepithelial Stromal Polyp
((Poster No. 2)

Michael Gilger, MD (gilger@bcm.edu); Laura Been, MD; Han Seob Kim, MD. Department of Pathology, Baylor College of Medicine, Houston, Texas.

Fibroepithelial stromal polyps are benign polypoid growths identified most commonly within the vulva, vagina, and cervix. Most often these lesions are seen in women of childbearing age, more commonly in pregnant women. Clinically, these lesions present as solitary, polyoid, or pedunculated masses, and are rarely larger than 5 cm. Common symptoms include bleeding, discharge, and mass effect. We present a case of a 36-year-old woman, gravida 6, para 5, at 16 weeks gestation with a rapidly growing, 6-cm exophytic, vulvar mass with symptoms including pain, bleeding, and foul-smelling discharge. Excision of the mass was performed with left partial vulvectomy. On gross examination, the mass showed a tan-pink, lobulated surface with focal hemorrhage and focal areas displaying a gelatinous substance on cut surface. Microscopically, a hypercellular, spindle cell lesion was seen showing both storiform and herringbone architecture. Mild cytologic atypia was observed along with frequent mitoses, abundant vasculature, areas of myxoid change, and a mixed inflammatory infiltrate. Immunohistochemical stains were performed and the lesion was positive for smooth muscle markers, estrogen receptor, progesterone receptor, and vimentin. A diagnosis of cellular pseudosarcomatous fibroepithelial stromal polyp was rendered. Fibroepithelial stromal polyp is a rare benign lesion of the lower female genital tract. Some demonstrate increased cellularity and atypical stromal cells, mimicking a malignant process, and have been referred to as cellular pseudosarcomatous fibroepithelial stromal polyps. Consideration of this entity in the differential diagnosis of vulvovaginal tumors in young women is imperative to avoid unnecessary, aggressive treatment measures (Figure 96).

Fallopian Tube Origination of “Ovarian” Low-Grade Serous Carcinomas
((Poster No. 3)

Jie Li, MD (zhengw@email.arizona.edu); Nisreen Abushahin, MD; Wenxin Zheng, MD. Department of Pathology, University of Arizona, Tucson.

Context: Ovarian low-grade serous carcinomas (LG-SCs) are thought to evolve in a stepwise fashion from ovarian epithelial inclusions (OEIs), serous cystadenomas, and borderline tumors.

Design: The current study was designed to gain insight into the origins of LG-SCs (tubal versus ovarian) by comparatively evaluating morphologic and immunohistochemical attributes of their putative precursor lesions (OEI, serous cystadenoma, borderline tumors), normal fallopian tube, and the overt malignancy. Two hundred twenty-six adnexal tissues from 178 patients were studied, including 98 benign ovaries and fallopian tubes, 48 cystadenomas, 42 borderline tumors, and 38 LG-SCs.

Results: The normal distal tube was comprised of an admixture of Pax8+/tubulin− secretory cells and Pax8−/tubulin+ ciliated cells with an increased proliferative index (PI). The vast majority of ovarian surface epithelia (OSEs) displayed a mesothelial-type phenotype and low PI. In contrast, most (78%) of the OEIs displayed a tubal phenotype and had a significantly higher PI (1.05%) than OSE, indicating that, in most cases, the OSEs and OEIs are of different cellular lineages. There was a progressive decrease in the population of ciliated cells, as evidenced by increasing secretory/ciliated cell ratio, from OEI/cystadenomas to borderline tumors to LG-SC, indicating that the latter is a clonal expansion of secretory cells.

Conclusion: We conclude that OEIs, and therefore the cancers derived therefrom, are of tubal origin. Our findings, in conjunction with the numerous lines of previously reported evidence, are supportive of a tubal origin for a majority of high-grade “ovarian” serous carcinomas, raising the possibility that salpingectomy, rather than salpingo-oophorectomy, may be a feasible approach to the prevention of adnexal serous carcinomas.

Uterine Leiomyosarcoma With Heterologous Elements: A Clinicopathologic Study of 10 Cases
(Poster No. 4)

Natalie Banet, MD1 (nbanet@unch.unc.edu); William Ahrens, MD2; Robert T. Burks, MD2; Marisa R. Nucci, MD. 1Department of Pathology and Laboratory Medicine, University of North Carolina, Chapel Hill; 2Department of Pathology, Carolinas Medical Center, Charlotte, North Carolina; 3Department of Pathology, Brigham and Women’s Hospital, Boston, Massachusetts.

Context: Leiomyosarcomas of the uterine corpus are aggressive tumors with poor prognoses; however, prognostic factors are inconsistent between studies. Features linked to poor outcomes include large tumor size, older patient age at presentation, tumor grade, and stage.
Heterologous differentiation in leiomyosarcoma of the uterus is rare, and has an unclear effect on prognosis.

**Design:** Ten cases of leiomyosarcoma with heterologous areas from our institutions were reviewed, and clinical outcome data were collected when possible.

**Results:** The mean age at presentation was 54; mean tumor size was 11.6 cm. Both parameters are greater than for leiomyosarcomas in general. The stage at presentation was greater for this group than for leiomyosarcomas in general, with 50% of this cohort presenting at either stage III or IV. There was extensive (>50%) necrosis in 70% of the cases. Lymphovascular involvement (LVI) was seen in 6 of 10 cases (Table).

<table>
<thead>
<tr>
<th>Case Series</th>
<th>Leiomyosarcomas, General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y, mean</td>
<td>54</td>
</tr>
<tr>
<td>Extensive necrosis, %</td>
<td>70</td>
</tr>
<tr>
<td>Atypia, %</td>
<td>100</td>
</tr>
<tr>
<td>LVI, %</td>
<td>60</td>
</tr>
<tr>
<td>Stages 1 and 2, %</td>
<td>50</td>
</tr>
<tr>
<td>Stage 3 and 4, %</td>
<td>50</td>
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</table>

**Abbreviation:** LVI, lymphovascular involvement.

Transmural invasion was seen in 2 cases, invasion into the cervix in 3, and subtotal mural invasion in 4. One case had only exophytic tumor. Chondrosarcomatous differentiation was the most common heterologous element (5 cases); rhabdomyosarcoma and osteosarcoma were seen in 2 cases each. Follow-up was available for 6 cases. Mean survival time was 17.5 months among the 4 mortalities. The 2 patients with recent surgery were still alive at 2 and 3 months.

**Conclusions:** Based on this limited case series, uterine leiomyosarcoma with heterologous differentiation may present at a higher stage and be associated with larger tumors, 2 factors that have been shown to affect prognosis.

**The Origin of Endometriosis, Metastatic or Metaplastic**

(Poster No. 5)

Hedyeh Shafi, MD (hedyeh.shafi@cshs.org); Chelsea Hayes, MD; Elvio Silva, MD. Department of Pathology and Laboratory Medicine, Cedars-Sinai Medical Center, Los Angeles, California.

**Context:** Endometriosis is a common disease and the cause of pain, infertility, and several neoplasms. Understanding how endometriosis develops is crucial to its treatment and prevention. Currently, most authors support retrograde menstruation; however, metaplasia of coelomic epithelium has also been suggested.

**Design:** Thirty-five consecutive cases of pelvic and abdominal endometriosis were compared to 18 cases of endosalpingiosis. Eight cases of endometriosis and 6 of endosalpingiosis were stained with anti-human IDH1 R132H antibody for isocitrate dehydrogenase 1 (Dianova, Hamburg, Germany) in conjunction with appropriate positive and negative controls.

**Results:** None of the tumors examined expressed the mutant form of IDH1.

**Conclusion:** Although IDH1 mutations strongly correlate with mutations in p53 in gynecological tumors, we did not observe expression of mutant IDH1 protein in p53 mutation rich gynecological malignancies. Like glioblastoma, invasive endometrial and ovarian papillary serous carcinomas have a rapidly aggressive clinical course with a high rate of mortality. However, we conclude that despite these similarities, different molecular mechanisms are involved in the pathogenesis of these most common gynecologic malignancies.

**An Unusual Cause of Acute Abdomen Following Cesarean Section**

(Poster No. 7)

Stephanie L. Claassen, DO1 (sne90@hotmail.com); Jonathan D. Claassen, DO; Anne L. Champeaux, MD.1 Departments of 1Pathology and 2Family Medicine, Madigan Army Medical Center, Tacoma, Washington.

A 22-year-old woman presented to the emergency department with severe lower abdominal pain 8 days after an uncomplicated cesarean section. Laboratory studies demonstrated leukocytosis (17.8 × 10^9/L). Abdominal computed tomography showed inflammatory changes and free fluid in the right lower quadrant consistent with appendicitis, though the appendix was never visualized. She was taken to surgery with the presumptive diagnosis of acute appendicitis. Grossly, the appendix was normal. Histologically, the serosal surface was involved by a marked inflammatory process consisting of foreign body giant cells and histiocytes centered around amniotic fluid remnants including fetal squamous cells and lanugo hair, without evidence of meconium (Figure 97). Features of acute appendicitis were not identified. These microscopic findings along with the clinical presentation are compatible with vernix caseosa peritonitis (VCP). VCP is a rare pathologic diagnosis caused by spillage during cesarean section of the vernix caseosa, the layer of sebum, shed squamous cells, and lanugo hair coating the neonate. VCP most often presents with severe abdominal pain and fever with leukocytosis 2 to 25 days post–cesarean section. The differential diagnosis of VCP includes granulomatous peritonitis secondary to...
meconium, ruptured dermoid cyst, or carcinoma. The clinical presentation can mimic many other pathologic abdominal processes, which may lead to unnecessary surgical interventions. Treatment consists primarily of supportive care and steroid administration. With the increasing rates of cesarean sections, an increased awareness of VCP is necessary to ensure inclusion into the differential diagnosis of an acute abdomen following cesarean section and possibly prevent unnecessary procedures.

**Primary Carcinosarcoma of Fallopian Tube: Report of a Case and Insight Into Chronic Salpingitis as a Risk Factor**

Poster No. 8

Surya Guha, MBBS, MD (surya418_iowar@yahoo.com); Hui Zhu, MD; Rajiv Pulinthanathbu, MD; Michael Dardik, MD. Department of Pathology, Saint Barnabas Medical Center, Livingston, New Jersey.

Primary carcinosarcomas of the fallopian tube are uncommon neoplasms. We report a 76-year-old woman who presented with vaginal bleeding and a 7-cm left fallopian tube cystic mass. Microscopically, the mass consisted of high-grade papillary serous carcinoma and heterologous chondrosarcoma (Figure 98), with adjacent foci of carcinoma in situ.

Marked chronic salpingitis was noted in the left tube. The right fallopian tube was also involved by chronic salpingitis and carcinoma in situ. The carcinosarcoma was confined to the left fallopian tube and the remainder of the genital tract and sampled portions of the peritoneum and lymph nodes were uninvolved. The tumor was staged pT1a pN0 and the patient was treated with carboplatin, paclitaxel, and doxorubicin without recurrences 7 months after surgery. Characteristically biphasic, carcinosarcomas contain carcinomatous and sarcomatous components. They are thought to arise from Mullerian epithelium within the reproductive tract and peritoneum. Most carcinosarcomas present in advanced stages. Risk factors include pelvic irradiation, prolonged estrogen therapy, endometriosis, endosalpingiosis, and obesity. Given that our patient had chronic salpingitis and carcinoma in situ involving bilateral fallopian tubes, chronic salpingitis may have increased the risk for the development of carcinosarcomas of the fallopian tube, supporting a mutagenic potential for a chronic pelvic inflammatory process. Although carcinosarcomas have a poor prognosis, the early presentation and treatment of this patient might improve her long-term survival. We also present a review of literature with our discussion emphasizing on tumorigenesis and prognosis of these tumors.

**Primary Diffuse Peritoneal Mesothelioma: Diagnostic Challenges of a Rare Neoplasm**

Poster No. 9

Muhammad A. Raza, MD (muhammad.raza@stjohn.org); Hong Qu, MD; Basim M. Al-Khafaji, MD. Department of Pathology & Laboratory Medicine, St John Hospital & Medical Center, Detroit, Michigan.

Primary diffuse peritoneal mesotheliomas are rare tumors with an incidence of approximately 1 per million and account for only 10% to 20% of all mesotheliomas. We report a case of primary peritoneal mesothelioma in a 74-year-old woman with a past history of an unresected stomach gastrointestinal stromal tumor (GIST), who presented with ascites and abdominal pain worsening during a 3-week period. As the initial clinical impression was that of a metastatic GIST, a partial gastrectomy and sigmoidectomy with omentectomy was performed. Grossly, the tumor appeared as numerous nodules with diffuse peritoneal involvement, along with colonic serosal studding. Meanwhile, histologically the tumor consisted of numerous papillae composed of a monolayer of cuboidal, flat mesothelial cells with scattered psammoma bodies. An immunohistochemical panel showed the tumor cells to be positive for calretinin, HBME-1, WT-1, and cytokeratin 7 and 5/6, and to be negative for Ber-Ep4, CK 20, p53, CD 15, caldesmon, and estrogen. Electron microscopy studies revealed the surfaces of tumor cells to have microvilli that appeared clean without glyocalyx coating along with microvilli in the intercellular spaces, thus further aiding in the diagnosis. The rarity of these neoplasms plus their overlapping features with papillary serous carcinomas both primary and metastatic can be a challenging diagnosis. Clinical/pathologic awareness of the entity aided by immunohistochemical and electron microscopy studies is essential for an accurate diagnosis and appropriate clinical care. Cytoreduction surgery with perioperative intraperitoneal chemotherapy results in an improved survival in these patients.

**Expression Profiles of Cytokeratin and Epithelial Membrane Antigen in the Sarcomatous Element of Mullerian Tumors**

Poster No. 10

Hao Wu, MD, PhD (hao.wu@bmc.org); Carmen Sarita- Reyes, MD; Sandra Cerda, MD. Department of Pathology, Boston Medical Center, Boston, Massachusetts.

**Context:** Morphologically, the mesenchymal component of a malignant mixed Mullerian tumor (MMMT) can resemble a high-grade endometrial adenocarcinoma; however, stage IVB patients with MMMT have a worse prognosis than those with adenocarcinoma. Therefore, it is crucial to differentiate MMMT from a pure epithelial malignancy. This is difficult in small biopsy specimens, especially when the mesenchymal component predominates. Cytokeratin negativity has been used to confirm a mesenchymal origin. However, the mesenchymal component can show aberrant cytokeratin positivity and misguide the diagnosis. We studied the expression of individual cytokeratins, pancytokeratins, and epithelial membrane antigen (EMA) in this sarcomatous component of MMMT.

**Results:** Of the 16 cases, 10 had AE1/3 expression and 7 had CAM5.2 expression. EMA was positive in 5 cases, CK7 was positive in 5 cases, CK5/6 was positive in 1 case, and CK903 was positive in 6 cases. CK20 was negative in all cases. The staining intensity and patterns were more prominent in pancytokeratins, with most cases showing a focal to patchy staining pattern.

**Conclusions:** There is discrepancy between pancytokeratin positivity and EMA-negative sarcoma. The high-grade sarcomatous component of MMMT can show EMA and cytokeratin expression, supporting the single clonal nature of this neoplasm. However, it can be misleading when dealing with small biopsy specimens.

**Human Papillomavirus Infection in Amazonas-Peru: Comparative Study of Cytology and Genotype Among Urban and Indigenous Populations**

Poster No. 11

Miguel Martorell, MD, PhD; José Angel García, PhD (garcia_josgar@gva.es); Cristian Ortiz, MD, PhD; Alberto del Aguila, MD; Francisca Camarena, BN; Consuelo Calabuig, MD, PhD; 1Department of Anatomia Patologica, Consorcio Hospital General Universitario, Valencia, Spain; 2Department of Ayuda Al Diagnostico, Hospital III Eissalud, Iquitos, Peru.

**Context:** Cervical carcinoma secondary to human papillomavirus (HPV) infection is the second leading cause of death worldwide, and in developing countries it remains the leading cause of death among women of reproductive age. Peru has an incidence of 48.2%. The purpose of this study is to determine the presence of cervical lesions among the urban and indigenous population by cervical cytology and HPV genotype analysis.

**Design:** The urban population (group 1) consisted of women living in Iquitos (Peru) who underwent gynecologic examination without known
clinical data (n = 202). The indigenous population (group 2) studied were women from the Bora settlement without known clinical data (n = 50). For cytology staining the Papanicolaou (Pap) method was performed. From Pap smears, HPV and genotype detection was performed by real-time polymerase chain reaction and direct sequencing of the partial region L1 in all the samples.

Results: Comparing the results for group 1 and group 2, the results for the cervical lesions were 20.8% and 4%, and were 43.1% and 36% for HPV infection, respectively. The distribution of HPV genotype showed that in group 1 the high-risk HPV was 80.4% compared with 40.4% for group 2. In the first group HPV 16 was the most frequent, with 40.2% of the cervical lesions were 20.8% and 4%, and were 43.1% and 36% for HPV infection, respectively. The distribution of HPV genotype showed that in group 1 the high-risk HPV was 80.4% compared with 40.4% for group 2. In the first group HPV 16 was the most frequent, with 40.2% among all the positive cases. The HPV SIBK3a was the most frequent among group 2 (Table).

Conclusions: There are considerable differences between the 2 groups regarding the lesion, HPV infection, and genotype. The social conditions of the Bora population make the findings considerably unique.

This study is a part of the program AECID from the Health Council of Spain (grant A/017089/08).

Marginal Zone B-Cell Lymphoma Involving the Uterus in Endometrial Endometrioid Adenocarcinoma

(Poster No. 13)

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We present an interesting case of a 58-year-old woman with a history of invasive ductal carcinoma of the breast 4 years prior and newly diagnosed marginal zone B-cell lymphoma (MZL) who underwent an endometrial biopsy for postmenopausal bleeding. That biopsy revealed an endometrial endometrioid adenocarcinoma (EECA) arising in a background of complex atypical hyperplasia and associated with an atypical lymphoid population. Radical hysterectomy and bilateral pelvic lymph node dissection were performed. Grossly, this specimen revealed an exophytic mass in the fundus with invasion limited to the upper half of the myometrium. Lymph node sectioning revealed no gross evidence of tumor involvement. Microscopically, we rendered a diagnosis of well-differentiated (FIGO 1), nuclear grade 2 EECA. In addition, an atypical lymphoid population involving the endometrium, including areas of carcinoma, was identified that was morphologically identical to the prior diagnosis of MZL (Figure 99). Numerous bilateral nodes contained this atypical lymphoid population. An immunohistochemical panel supported the diagnosis of MZL involving the uterus and pelvic lymph nodes, and included CD20(+), BCL-2(−), CD5(−), CD20(−), and CD10(−), k and λ (k restricted). Although we are aware of 1 case report of synchronous EECA with follicular lymphoma, we are not aware of any reported cases of synchronous EECA with MZL.

Serous Borderline Tumor of the Broad Ligament in a Prepubertal 10-Year-Old Girl

(Poster No. 14)

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Serous borderline tumors (SBTs) are rare in children and reports of these tumors in prepubertal girls are even rarer. Furthermore, these tumors are extremely uncommon in the broad ligament at any age. We report a case of an SBT with rare foci of microinvasion arising in the broad ligament of a prepubertal 10-year-old girl. Notably, the patient had a body mass index of 35 and diabetes mellitus. She presented with a 3-week history of worsening abdominal pain and underwent abdominal ultrasound, which revealed a 3.1 × 2.8 × 2.8-cm right pararectal cystic lesion with a solid echogenic nodule. A laparoscopic cyst excision was performed during which the cyst was visualized arising from the broad ligament. Gross examination revealed smooth cyst walls with a granular polyploid mass. Microscopically, the mass exhibited serous epithelium with hierarchical branching papillae characteristic of SBTs (Figure 100). At higher magnification the epithelium showed mild to moderate cytologic atypia, stratification, tufting, and detached cell clusters. Rare foci of microinvasion were also evident as isolated eosinophilic cells within the underlying stroma. Residual cyst wall consisted of simple serous epithelium (serous cystadenoma). To our knowledge, a case of SBT of the broad ligament has never been reported in a prepubertal patient. Our case is also unique in that there was a documented history of obesity and diabetes mellitus. Given the rarity of these tumors in prepubertal girls, these additional factors may have played a role in

<table>
<thead>
<tr>
<th>Group 1 (n = 202)</th>
<th>Group 2 (n = 50)</th>
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<tbody>
<tr>
<td>Cervical lesion, %</td>
<td>20.8</td>
</tr>
<tr>
<td>Lesions, No.</td>
<td>17/15/2/8</td>
</tr>
<tr>
<td>ASCU/LSIL/ASCH/HSIL-CIS</td>
<td>14.3</td>
</tr>
<tr>
<td>HPV infection, %</td>
<td>80.4</td>
</tr>
<tr>
<td>HPV-HP, %</td>
<td>40.4 (n = 8)</td>
</tr>
<tr>
<td>HPV-MP</td>
<td>16 (n = 22)</td>
</tr>
</tbody>
</table>

Abbreviations: HPV-HP, high-risk HPV; HPV-MP; most prevalent HPV; ASCUS, atypical squamous cell of undetermined significance; LSIL, low squamous intraepithelial lesion; ASCH, atypical squamous cells, cannot exclude HSIL; HSIL-CIS, high-grade squamous intraepithelial lesion carcinoma in situ.
Promoting epithelial proliferation or progression of serous cystadenoma to SBT.

Primary Ovarian Carcinoid Tumor: A Case Report and Review of the Literature
(Poster No. 15)

Lynda Gentchev, MD (lynda.gentchev@danhosp.org); Sharmeen Mansoor, MD; Mary S. Chacho, MD. Department of Pathology, Danbury Hospital, Danbury, Connecticut.

Primary ovarian carcinoid tumor, first described by Stewart et al in 1939, is difficult to distinguish from carcinoids secondarily involving the ovary. Primary ovarian carcinoid tumors are rare, accounting for less than 0.1% of all ovarian carcinomas. These tumors are speculated to arise from the neuroendocrine cells of the gastrointestinal and respiratory epithelial components in benign teratomas. We report a case of a 50-year-old woman who presented with irregular bleeding and a palpable pelvic mass. Computed tomography scan revealed a pelvic mass measuring 15.4 cm with areas of necrosis and cystic change. Intraoperatively a multiloculated left ovarian mass was found with no evidence of ascites or gross extra ovarian disease. Gross examination revealed an ovary weighing 980 g with a yellow-orange, firm, solid, and cystic surface. Histologic examination showed a tumor mass arranged in nests, ribbons, and pseudorosettes within a fibrous stroma (Figure 101, top left). In areas, the tumor cells demonstrated single cellIndian filing pattern (Figure 101, lower left). Immunohistochemical stains were negative for inhibin and epithelial membrane antigen, and strongly positive for chromogranin (Figure 101, lower right) and synaptophysin. No evidence of a coexisting teratoma or thyroid differentiation was found. Based on the above findings and absence of any known extraovarian carcinoid tumor, this tumor was diagnosed as a primary carcinoid tumor of the ovary. Primary carcinoid tumor must be considered among tumors that are predominantly solid, yellow, and fibrous. Extensive sampling of the tumor, immunohistochemistry, and clinical correlation are necessary to rule out a carcinoid tumor metastatic to the ovary.

Clinicopathologic Spectrum of Neuroendocrine Carcinomas of Cervix, Including Immunohistochemical Profile and Clinical Outcomes in a Series of 50 Cases
(Poster No. 16)

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Context: Neuroendocrine cervical carcinomas (NECCs) are rare and have a diverse histopathologic spectrum.

Design: Fifty NECCs, diagnosed during 7 years, were retrieved from our pathology database.

Results: Age range was 23 to 69 years (mean = 48.6 years). Tumor (T) stage, known in 28 cases (56%), included 8 cases (28.5%) with stage IV, 5 cases (17.8%) each with stage IIb, IIB and I; 3 cases (10.7%) with stage IIa, and 2 cases (7.1%) with stage IIla disease. T size was 1 to 7.2 cm (mean = 4.7 cm). Histopathologically, there were 26 (52%) small cell carcinomas (SMCAs); 14 (28%) large cell neuroendocrine carcinomas (LCNECs); 4 (8%) SMCA + LCNECs; and 6 mixed carcinomas, including 3 SMCA with squamous carcinoma (SCC) 2 LCNECs with adenocarcinoma (ADCA) and 1 LCNEC with SCC. LCNECs displayed solid, trabecular, insular, nesting, and acinar/rosetting patterns. Immunohistochemistry (IHC) revealed synaptophysin positivity in 22 of 37 cases (59.4%); chromogranin in 27 of 37 (72.9%); CD56 in 8 of 8 (100%); CK in 22 of 30 (73.3%); epithelial membrane antigen in 13 of 17 (76.4%); NSE in 7 of 8 (87.5%); and CK7 in 4 of 5 cases (80%) (Figure 102). Treatment included surgery in 6 of 30 cases; surgery with adjuvant chemotherapy (CT) and/or radiotherapy (RT) (8); CT and RT (10); RT (5); and CT (1 case). Outcomes in 29 cases (2–36 months) included 16 cases (55.1%) with stage IIb, IIB and I; 3 cases (10.7%) with stage IIa, and 2 cases (7.1%) with stage IIla disease. T size was 1 to 7.2 cm (mean = 4.7 cm). Histopathologically, there were 26 (52%) small cell carcinomas (SMCAs); 14 (28%) large cell neuroendocrine carcinomas (LCNECs); 4 (8%) SMCA + LCNECs; and 6 mixed carcinomas, including 3 SMCA with squamous carcinoma (SCC) 2 LCNECs with adenocarcinoma (ADCA) and 1 LCNEC with SCC. LCNECs displayed solid, trabecular, insular, nesting, and acinar/rosetting patterns. Immunohistochemistry (IHC) revealed synaptophysin positivity in 22 of 37 cases (59.4%); chromogranin in 27 of 37 (72.9%); CD56 in 8 of 8 (100%); CK in 22 of 30 (73.3%); epithelial membrane antigen in 13 of 17 (76.4%); NSE in 7 of 8 (87.5%); and CK7 in 4 of 5 cases (80%) (Figure 102). Treatment included surgery in 6 of 30 cases; surgery with adjuvant chemotherapy (CT) and/or radiotherapy (RT) (8); CT and RT (10); RT (5); and CT (1 case). Outcomes in 29 cases (2–36 months) included 16 cases (55.1%) with metastasis, most commonly to liver (7). Four patients succumbed to death. Metastasis and death were higher with SMCAs than LCNECs. Results in 29 cases (2–36 months) included 16 cases (55.1%) with metastasis, most commonly to liver (7). Four patients succumbed to death. Metastasis and death were higher with SMCAs than LCNECs.

Conclusions: NECCs exhibit a wide histopathologic spectrum and are treated with multimodal therapy. Among these, SMCA tumors and tumors with SMCA component are relatively more aggressive. Synaptophysin, chromogranin, NSE, and CD56 are optimal neuroendocrine markers.

Intestinal Metaplasia of the Vagina
(Poster No. 17)

Patrick A. Adegboyega, MD (padegb@lsuhsc.edu). Department of Pathology, Louisiana State University Health Sciences Center–Shreveport.

Intestinal metaplasia in the urogenital system occurs most commonly in the urinary bladder, to a lesser extent in the uterine cervix, and rarely in the vagina. Because of its rarity in the vagina, intestinal metaplasia may be mistaken diagnosed as adenocarcinoma, primary or secondary. This is a case study of a 45-year-old woman who presented with a patch like lesion in her vagina 14 years after surgery and radiation
therapy for cervical squamous cell carcinoma. Biopsy of the lesion showed glandular lesion with stromal desmoplasia and Paneth cells and neuroendocrine cells scattered among the epithelia cells. Immunohistochemical staining with cytokeratin 7, cytokeratin 20, CD56, and chromogranin confirmed the lesion to have features characteristic of benign small intestinal mucosa. Ki67 and p53 immunoreactivity pattern also confirmed the benign nature of the lesion. The glandular cells expressed both cytokeratin 7 and 20 in a manner similar to that reported in esophageal intestinal metaplasia (Barrett esophagus). This case report of a rare metaplastic glandular lesion of the vagina epithelium highlights the characteristic histomorphologic and immunohistochemical features that can be used to distinguish intestinal metaplasia from (non-clear cell type) adenoscarcinoma of the vagina.

Ovarian Mature Cystic Teratoma Presenting as a Rectal Mass
( Poster No. 18)
Sarah Tinsley, MD (Sarah.Tinsley@orlandohd.com); Eric Montgomery, MD; Ray B. Franklin, MD, PhD. Department of Pathology, Orlando Health, Orlando, Florida.

Mature cystic teratomas (dermoid cyst) are the most common tumor of the ovary, accounting for almost 60% of benign ovarian tumors. They are derived from postmeiotic germ cells and are usually composed of 1 or more cysts lined by epidermis and its appendages, as well as other elements. Ovarian teratomas typically present during the reproductive years, with a mean age of 30 years. The majority of cases present as asymptomatic, incidental findings, or with nonspecific signs and symptoms of an ovarian tumor. We present a case of mature cystic teratoma in a 29-year-old woman with a several-month history of chronic constipation and an acute rectal bleed. Colonoscopy revealed a luminal polypoid mass with hair. The patient underwent an en bloc resection of the left ovary and rectosigmoid colon. The specimen showed glandular lesion with stromal desmoplasia and Paneth cells and showed glandular lesion with stromal desmoplasia and Paneth cells and showed glandular lesion with stromal desmoplasia and Paneth cells and showed glandular lesion with stromal desmoplasia and Paneth cells. Immunohistochemical studies demonstrated neuroendocrine differentiation (positive synaptophylin, chromogranin, and neuron-specific enolase). A diagnostic pitfall of this lesion can be aggressive tumor, for example, “adenocarcinoma with neuroendocrine features” and/or “mucinous carcinoma.” However, survival rate is excellent with primary carcinoid confined to 1 ovary. Moreover, there is a possibility of mucinous carcinoid developing into a highly aggressive carcinoma. Thus, it is important to differentiate the carcinomas from carcinoid component because of different responses to chemotherapy and prognosis. To our knowledge, this is the first case of mixed strumal and mucinous carcinoid tumor arising from ovarian mature cystic teratoma.

An Immunohistochemical Study of Embryonic Epithelial Remnants of the Umbilical Cord
( Poster No. 20)
Alicia Hirzel, MD, MPH (achirz97@yahoo.com); John Alexis, MB, ChB. Department of Pathology, Mount Sinai Medical Center, Miami Beach, Florida.

Context: Vestigial epithelial remnants of the umbilical cord usually demonstrate differentiation into intestinal-type epithelium or squamous/transitional-type epithelium. Allantoic remnants typically exhibit cuboidal-to-flattened epithelium, whereas remnants with a vitelline origin are typically lined by columnar epithelium. However, at times, differentiating between the 2 can be difficult. The distinction is not entirely academic, as patent vitelline remnants have been associated with focal atresia of the fetal small intestine as well as the development of umbilical cord cysts. This study was undertaken to determine whether allantoic and vitelline vestigial remnants in the umbilical cord may be distinguished by immunohistochemistry.

Design: Immunohistochemical stains for CDX2 and P63 were performed on 45 cases of umbilical cords with vitelline and allantoic remnants.

Results: All the cases of remnants classified as vitelline stained positively with CDX2 and negatively for p63. Conversely, all cases of allantoic remnants stained positively for p63 and negatively for CDX2. A few cases with ambiguous morphology stained positively for 1 marker only. Three cases demonstrated dual and complementary staining of the remnant whereby a portion of the cells lining the remnant stained positively for p63 and the remaining cells stained positively for CDX2.

Conclusions: Staining of embryonic epithelial remnants of the umbilical cord with CDX2 and P63 allows classification as allantoic or vitelline vestiges in most cases. Vitelline remnants are CDX2 positive and...
Female adnexal tumor of probable wolffian origin is a rare neoplasm believed to originate from wolffian remnants. This tumor with diverse epithelial patterns is usually associated with good prognosis. Given the varied morphology, it can be misdiagnosed intraoperatively and on permanent sections. We report a case of a 57-year-old woman with a left pelvic mass. A diagnosis of high-grade carcinoma of ovary was rendered intraoperatively following left salpingo-oophorectomy. Subsequently, she underwent hysterectomy, right salpingo-ophorectomy, nodal dissection, and omentectomy. The left ovary weighed 486 g and measured 11.0 × 11.0 × 9.0 cm with an intact capsule. The tumor was found in the vulvar soft tissue. It was poorly circumscribed, tan, and firm, and measured 2.6 cm in maximal dimension. The overlying skin was not involved by tumor. Histologically, the tumor demonstrated cystic, ductal, and solid growth patterns, with infiltration into the surrounding skeletal muscle. Different cellular types, including mucous cells, clear cells, intermediate cells, and epidermoid cells, were identified. Mitotic figures were rare; no necrosis or anaplasia was present. The presence of perineural invasion was observed. Mucicarmine stain showed intracellular and extracellular mucin. Based on the histologic features, the tumor was classified as a salivary gland–type mucoepidermoid carcinoma, low grade. Immunohistochemical study showed a mosaic staining pattern for p63 and CK7, with p63 for basal-type cells and CK7 for luminal-type cells. CK5/6 stained basal-type and epidermoid cells. The patient was followed by positron emission tomography scan that showed no systemic disease and was believed to originate from wolffian remnants. This tumor with diverse epithelial patterns is usually associated with good prognosis. Given the varied morphology, it can be misdiagnosed intraoperatively and on permanent sections. We report a case of a 57-year-old woman with a left pelvic mass. A diagnosis of high-grade carcinoma of ovary was rendered intraoperatively following left salpingo-oophorectomy. Subsequently, she underwent hysterectomy, right salpingo-ophorectomy, nodal dissection, and omentectomy. The left ovary weighed 486 g and measured 11.0 × 11.0 × 9.0 cm with an intact capsule. The cut surfaces revealed a well-circumscribed predominantly solid, tan mass with an area of hemorrhage. No residual ovarian parenchyma was identified. Microscopically, the tumor was diffusely cellular with monomorphic polygonal cells in lobules, sheets, and nests with focal tubule formation. The cells had clear cytoplasm and round to oval nuclei with stippled chromatin. The tumor focally displayed 8 mitotic figures per 10 high-power fields. Morphologically, the differential diagnoses considered were sex cord–stromal tumor, carcinoid tumor, adenocarcinoma, and Wilms tumor. The tumor stained positive for epithelial markers (AE1:3, epithelial membrane antigen, cytokeratin-7), progesterone receptors, p53, and WT1 and negative for inhibin, calretinin, chromogranin, synaptophysin, estrogen receptors, and CA-125. Immunohistochemical data were nonspecific. A morphologic diagnosis of female adnexal tumor of probable wolffian origin was rendered. Because of the rarity of this neoplasm and the potential diagnostic pitfall of misinterpreting it for adenocarcinoma, it is important to be aware of this entity to differentiate it from other ovarian neoplasms (Figure 106).

Female Adnexal Tumor of Probable Wolffian Origin: A Case Report and Review of the Literature
(Poster No. 23)
Amal Fadaili, MD (amal.fadaili@bhs.org); Adriana Doldan-Silvero, MD; Carlos Prieto-Granada, MD; Rukmini Modem, MD. Department of Pathology, Baystate Medical Center, Springfield, Massachusetts.
Association of Group B Streptococcus Positivity With Infectious Placental Pathology
(Poster No. 25) (Figure No. 107)

Hui Zhu, MD, PhD (huz2005@live.com); Maria Laureana C. Santos-Zabala, MD; Byung K. Kim, MD; Michael Dardik, MD. Department of Pathology, Saint Barnabas Medical Center, Livingston, New Jersey.

Lymphangioleiomyomatosis (LAM) is a rare lung disease characterized by disorderly proliferation of smooth muscles in lymphovascular channels. We report a case of LAM in a 66-year-old woman with endometrioid adenocarcinoma, invasive breast lobular carcinoma, and mature cystic teratoma of the ovary in the absence of pulmonary disease. We found 2 pelvic lymph nodes with metastatic endometrioid adenocarcinoma that were concurrently involved by LAM. These proliferating smooth muscles in the lymph nodes stained positively with HMB-45, desmin, and smooth muscle actin, and negatively with calretinin or vascular markers, confirming the diagnosis of LAM. The pathogenesis of LAM is not clear yet. Based on the observation that LAM usually affects women of childbearing age, some have suggested that estrogen might play a role. Both the endometrioid adenocarcinoma and invasive breast lobular carcinoma in this case were strongly positive for estrogen receptors (90% and 98%, respectively). Interestingly, these proliferating smooth muscle cells in LAM were also strongly stained with estrogen receptor (82% positive). The association of estrogen with endometrial adenocarcinoma and breast carcinoma has been well established. The findings in this case that LAM involved a 66-year-old patient and that estrogen receptor was strongly positive in the endometrioid adenocarcinoma, invasive lobular carcinoma of the breast, and LAM suggest that estrogen might indeed play a role in the pathogenesis of LAM. The findings in this case also raise the possibility that antiestrogen therapy might have a role in the treatment of LAM.

Metastatic Endometrioid Adenocarcinoma in a Lymph Node With Lymphangioleiomyomatosis
(Poster No. 27)

A Rare Case of Metastatic Thyroid Papillary Carcinoma in the Pleura With Extensive Anaplastic Transformation
(Poster No. 28)

Jun Liu, MD, PhD (liuju@umdnj.edu); Janusz Godyn, MD. Department of Pathology, University of Medicine and Dentistry of New Jersey/School of Osteopathic Medicine, Stratford.

A 58-year-old man presented with recurrent left multiloculated pleural effusion with possible pleural mass, and underwent pleura-decortication and biopsy. Multiple pleural, intrapleural, and chest wall nodules were found and biopsied. Biopsy of the nodules showed that more than 95% of all the nodules consisted of solid high-grade malignant tumor cells with anaplastic features. Rare foci at the periphery of some nodules showed papillary/glandular structure, with cells showing typical nuclear features of thyroid papillary carcinoma. Immunohistochemical stains showed that the papillary area was positive for CK7, Pan-CK, TTF-1, and thyroglobulin, whereas the anaplastic areas were positive only for CK7 and Pan-CK but negative for TTF-1 and thyroglobulin. The positivity of thyroglobulin in the papillary area strongly supported that the tumor represented metastatic thyroid papillary carcinoma with extensive anaplastic transformation. Further clinical history revealed that the patient had a history of papillary carcinoma of the thyroid, and underwent thyroidectomy 8 years prior. Though anaplastic transformation of metastatic thyroid papillary carcinoma is rare, it has been reported in multiple literatures. The most common site is cervical lymph node, with rare cases reported in pancreas and breast. In this particular case, even required excision during pregnancy because of a coexisting elevation of inhibin-A. A 29-year-old woman presented to her obstetrician for a 18-week ultrasound that revealed a 4.8 x 4.3 x 3.8-cm solid left adnexal mass. She also had an elevated inhibin-A of 927 pg/mL with otherwise normal prenatal screening values. She was referred to a high-risk pregnancy clinic, where her workup included a molecular cystic fibrosis screen, which was negative for the 32 mutations analyzed. The adnexal mass and excessively elevated inhibin-A levels were concerning for a granulosa cell tumor. The patient was taken to the operating room at 21 weeks gestation and found to have a normal left tube and ovary and a firm mass within the left round ligament that was laparoscopically excised. Pathology received a specimen composed of a 4.5 x 3.2 x 2.8-cm cyst containing thick caseous material. Histologic review of the cyst revealed a mature dermoid cyst with no ovarian tissue present. The postoperative inhibin-A level remained elevated and the patient delivered a healthy baby at term.

A Rare Case of Metastatic Thyroid Papillary Carcinoma in the Pleura With Extensive Anaplastic Transformation
(Poster No. 28)

Jun Liu, MD, PhD (liuju@umdnj.edu); Janusz Godyn, MD. Department of Pathology, University of Medicine and Dentistry of New Jersey/School of Osteopathic Medicine, Stratford.

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Diffuse Alveolar Septal AA Amyloidosis in the Absence of Chronic Inflammatory Disease
(Poster No. 31)

Brian Brinkerhoff, BS (bbrinker@mcw.edu); Nagarjun Rao, MD. Department of Pathology, Medical College of Wisconsin, Milwaukee.

Diffuse alveolar septal amyloidosis is an uncommon manifestation of pulmonary amyloidosis, typically involving amyloid light chain protein deposits in the lower respiratory tract. Secondary amyloid A (AA) amyloidosis occurs in the setting of chronic systemic inflammatory disease. We report an unusual case of diffuse alveolar septal AA amyloidosis in the absence of underlying inflammatory disease. A 70-year-old man with a history of recurrent pleural effusions presented to the emergency department for shortness of breath. Computed tomography scan revealed increased interstitial markings, bronchial wall thickening, and cardiomegaly. A transthoracic echocardiogram showed a normal ejection fraction, mild left and right ventricular hypertrophy, diastolic dysfunction consistent with restrictive cardiomyopathy.

Screening was negative for C-ANCA, P-ANCA, atypical ANCA, SSA AB, SSB AB, and ANA. A left lung upper lobe wedge excisional biopsy revealed subtle deposition of amorphous eosinophilic hyaline material producing patchy to diffuse thickening along the alveolar septa, bronchial walls, and small- to medium-sized blood vessels. Congo red stain showed typical apple green birefringence within alveolar septa and vascular walls. Amyloid A protein immunostain demonstrated marked linear septal staining along alveolar septa as well as along vessel walls (Figure 108). Both κ and λ light chain stains were diffuse and nonspecific within vessel walls and plasma cells. This case documents the unusual presentation of diffuse alveolar septal amyloidosis with AA deposition. The occurrence of AA amyloidosis, seemingly in the absence of an underlying inflammatory condition, is intriguing and needs further evaluation.

Radiation as a Possible Causative Factor for Pulmonary Epithelioid Hemangioendothelioma
(Poster No. 32)

Deepthi Bhansali, MD (dhbansal@uci.edu); Yi Ouyang, MD, Maria D. Iyer, MD, 2 Department of Pathology, University of California, Irvine, Orange; 2Department of Anatomic Pathology, Long Beach Veterans Affairs Medical Center, Long Beach, California.

Pulmonary epithelioid hemangioendothelioma (EH) is a rare vascular tumor of low to intermediate grade and unknown etiology. Approximately 30 cases have been reported, three-quarters occurring in women, with a mean age of onset of 36 years. We report a 30-year-old man who developed such a tumor after inhalational exposure to radioactive dust 2 years previously. Chest x-ray following the appearance of respiratory symptoms disclosed the presence of numerous rounded nodules in both lung fields. Gross examination of
a wedge resection specimen revealed multiple, well circumscribed, tan-gray, firm masses ranging from 0.2 to 1.0 cm in diameter. Pleural puckering was observed overlying the largest nodule. Histologically the nodules showed central fibrosis and focal necrosis, with atypical epithelioid cell proliferation. The atypical cells were scattered through both the central sclerotic area and, in a microcystoid manner, the periphery, spreading into adjoining alveolar spaces and bronchioles. These polygonal cells contained abundant cytoplasm and large nuclei with many intracellular vacuoles and intranuclear inclusions. The tumor cells were immunoreactive for CD31 and CD34 but not for TTF-1 or AE1/AE3. The morphologic and immunohistochemical features supported a diagnosis of EH. To our knowledge, this is the first known example of EH to be associated with a history of radiation. We suggest that radiation may be a possible causative factor in the development of pulmonary EH (Figure 109).

**Pulmotype Assessment of Non–Small Cell Lung Carcinoma Differentiation Status Is Highly Concordant When Measured on Initial Nonsurgical Specimen Compared to Surgical Resection Specimen**

(Rodney A. Beck, BS; Robert S. Seitz, BS; Marshall Schreeder, MD; Douglas T. Ross, MD, PhD. Department of Research and Development, Clarient Inc, Huntsville, Alabama. 

**Context:** Pulmotype (Clarient, Aliso Viejo, California) is a 5-antibody immunohistochemistry assay used as an aid in determination of adenocarcinoma from squamous cell differentiation in non–small cell lung carcinoma (NSCLC). It has been validated on 600-μM tissue microarray cores on more than 1100 patients in comparison to the gold standard morphologic differentiation performed on surgical resection specimens. We were interested in comparing Pulmotype differentiation determination on small clinical samples compared to subsequent diagnosis on surgical resection samples.

**Design:** Sixty-seven cases were identified in the Clearview Cancer Institute tumor sample archive where both initial small biopsies (needle core, fine-needle aspiration, bronchial brushing, and bronchial washes) and subsequent surgical resection specimens were available. The 5 Pulmotype antibodies (CK5/6,TRIM29, SLC7A5, MUC1, and CEA-CAM5) were applied to the stained biopsies and surgical specimens and differentiation type determined by the Pulmotype algorithm and compared to diagnosis from the clinical record.

**Results:** There was 100% concordance between diagnosis on the initial limited sample and subsequent surgical resection with respect to both Pulmotype and clinical record diagnosis when a definite differentiation assessment was made. Pulmotype differentiation based on the algorithmic combination of staining results was interpretable on 93% of initial small biopsies compared to only 55% in the clinical record.

**Conclusions:** Pulmotype allowed a significant improvement in the fraction of cases for which a definitive determination of differentiation status was possible on initial nonsurgical biopsies. The concordance between diagnosis on initial biopsy and subsequent surgical resection was excellent. These results support the utility of Pulmotype for assessment of differentiation status when clinical material is too sparse to allow a definitive morphologic diagnosis to be made.

**Patient With Laryngeal Basaloid Squamous Cell Carcinoma With Pulmonary Metastases and Pulmonary Blastomycosis: Confounding Diagnostic and Management Issues**

(Jihoon Yoon, MD (jyoon1@hfhs.org); Chad Stone, MD, Frank Torres, MD. Department of Pathology, Henry Ford Health System, Detroit, Michigan.

Blastomycosis is an uncommon but endemic dimorphic fungal infection in parts of the United States caused by *Blastomyces dermatitidis*. Primary infection usually involves the lungs and often mimics malignancy. We report a case of pulmonary blastomycosis in a 60-year-old man who presented with dyspnea and was found to have a laryngeal carcinoma with neck lymph node metastases. Computed tomography scan revealed a 3.2-cm spiculated left upper lobe nodule, suspicious for primary lung cancer (Figure 110, A) and additional bilateral pulmonary nodules. Needle biopsies of large and small nodules showed fungal pneumonia. Because of clinical suspicion of malignancy, a wedge resection of the left upper lobe was performed and revealed extensive necrotizing granulomatous inflammation with numerous round yeasts that had grayish thick double-walled capsules and broad-based budding in keeping with blastomycosis (Figure 110, B and C). In measuring on initial nonsurgical specimen compared to surgical resection specimen...
Grossly, the 4-cm tumor extended into a large bronchus and involved adjacent lung parenchyma. Microscopically, the solitary lesion was heterogeneous with sclerotic, hemorrhagic, and papillary patterns consistent with the diagnosis. Dystrophic calcifications and acute hemorrhage were prominent. Cytologically, immediate smears featured pseudopapillae, abundant blood, discohesive round and spindle cells, and siderophages. By immunohistochemistry, tumor cells were strongly positive for thyroid transcription factor 1 and epithelial membrane antigen markers with no reactivity for standard neuroendocrine markers. Although the karyotype revealed 46,XY,del(9)(q34), add(19)(q13.4), observed in 1 of 5 in situ cultures, fluorescence in situ hybridization using a 19q13 probe indicated the karyotype abnormality was an artifact of long-term in situ culture, and the final karyotype was interpreted as normal male. Lymph nodes were negative for tumor. The patient is doing well 3 years postresection. This case emphasizes the occasional unlikely location of pneumocytoma: central intrabronchial. Cytologic features are distinctive, enabling preresection diagnosis.

**Pleomorphic Carcinoma of Lung With Histologically Distinct Metastasis to Lymph Nodes**

*(Poster No. 36)*

Xiangbai Chen, MD (xchen@conemaugh.org); Zaibo Li, MD, Department of Pathology, Conemaugh Memorial Medical Center, Johnstown, Pennsylvania; Chengqun Zhao, MD, Department of Pathology, The Methodist Hospital, Houston, Texas.

One of the positive lymph nodes showed metastatic adenocarcinoma resembling the adenocarcinoma component from the primary tumor. The second positive lymph node showed foci of subcapsular atypical, spindled cells similar to the areas present in the original tumor. The metastatic spindled area in the lymph node stained positive for cytokeratin and negatively for TTF-1 and CD163. With spindled cells exceeding 10% of the tumor, the diagnosis of pleomorphic carcinoma was rendered. Two of the 3 accompanying lymph nodes were positive for metastatic disease. One of the positive lymph nodes showed metastatic adenocarcinoma component from the primary tumor. The second positive lymph node showed foci of subcapsular atypical, spindled cells similar to the areas present in the original tumor. The metastatic spindled area in the lymph node stained positive for cytokeratin and negatively for TTF-1 and CD163. Lack of TTF-1 staining in the area of metastatic foci confirmed the lack of adenocarcinoma component in the purely spindled area. It appears that adenocarcinoma and spindled components of pleomorphic carcinoma metastasized separately in this case. Whereas the spindled component of pleomorphic carcinoma can be positive for TTF-1, this is a unique case of the TTF-1 negative spindled component of pleomorphic carcinoma metastasizing to the lymph node, separately from the adenocarcinoma portion.

**Diffuse Diopathic Pulmonary Neuroendocrine Hyperplasia (DIPNECH): First Case Successfully Treated With Bilateral Lung Transplant in the United States**

*(Poster No. 37)*

Amanda L. Peterson, MD (draepeterson@yahoo.com); Philip Cagle, MD, Department of Pathology, The Methodist Hospital, Houston, Texas.

Diffuse idiopathic pulmonary neuroendocrine cell hyperplasia is a rare entity and a preinvasive lesion for carcinoid. It is defined as diffuse proliferation of pulmonary neuroendocrine cells (scattered singly, linearly, or in nodules <5 mm) confined to the bronchial/bronchiolar epithelium and superficial to the basement membrane. It usually presents in middle-aged female nonsmokers. Clinical symptoms, mainly persistent dry cough and dyspnea, are typically obstructive in nature. Currently there is no defined standard for management and treatment with little known about prognosis. A 60-year-old woman who was a lifetime nonsmoker was initially diagnosed in 1995 with neuroendocrine hyperplasia. She developed significant morbidity with oxygen-dependent chronic obstructive pulmonary disease. Computed tomography scans of the chest showed scattered diffuse bilateral pulmonary nodules and diffuse bronchial thickening. The clinical diagnosis was idiopathic pulmonary fibrosis. Results of octreotide scan and 24-hour urine collection for 5-hydroxyindoleacetic acid were normal. Serotonin levels were elevated at 353 ng/mL. Pretransplant transbronchial biopsies showed minute nests of neuroendocrine cells with fibroblast proliferations. Because of the patient’s clinical status, bilateral lung transplantation was performed. At resection, typical carcinoid tumors were present along with diffuse idiopathic pulmonary neuroendocrine cell hyperplasia. Diffuse idiopathic pulmonary neuroendocrine cell hyperplasia can be asymptomatic or cause extensive disease. Typically indolent and nonprogressive, most cases are managed with surveillance; few are treated by surgical resection. To our knowledge, this is the first case successfully treated with lung transplant in the United States. We conclude that lung transplant may be a therapeutic option for patients with advanced obstructive disease due to diffuse idiopathic neuroendocrine hyperplasia.

**Thymic Foregut Cyst With Aberrant Pancreatic Tissue in a 9-Year-Old Girl**

*(Poster No. 38)*

Reema Jaffar, MD (RJaffar@childrensmemorial.org); Veena Rajaram, MD, Department of Anatomic and Clinical Pathology, Children’s Memorial Hospital, Chicago, Illinois.

Foregut cysts are rare lesions that arise during development of the primitive foregut. They are characterized by cysts lined with epithelium and surrounded by 2 layers of smooth muscle. They are commonly encountered in the middle and posterior mediastinum and are symptomatic at an early stage. Pancreatic tissue has been described in association with foregut cysts 3 times. We report a case of a symptomatic anterior mediastinal foregut cyst with aberrant pancreas. A 9-year-old previously healthy girl presented with persistent shoulder pain for 7 months that did not respond to Tylenol. Computed tomography scan showed an anterior mediastinal mass. A left-sided thoracotomy showed a mass densely adhered to the pericardium. Grossly, the specimen weighed 100 g and measured 8.0 × 7.0 × 4.3 cm, and cut section showed a predominantly solid mass with a focal cystic area measuring 1.5 cm. Microscopically, most of the section showed thymic tissue with extensive fibrosis, hemosiderin deposition, focal dystrophic calcification, and mild involution changes. The dominant feature in the cystic area was the presence of lobules of disorganized pancreatic tissue consisting of exocrine and endocrine components with ducts. They were associated with cysts lined by squamous, ciliated, columnar, and pseudostratified gastric type and intestinal type epithelium; the majority of them had a well-formed, 2-layered muscularis externa layer. There were 2 foci of cartilaginous nodules associated with cysts having respiratory type epithelium. No ectodermal elements were seen on extensive sampling. These findings were consistent with a foregut cyst with extensive aberrant pancreatic tissue.

**Immunohistochemical Features of Large Cell Neuroendocrine Carcinoma of the Lung**

*(Poster No. 39)*

Xiangbai Chen, MD; Zaibo Li, MD; Chengyun Zhao, MD; Donald S. Berry, DO; Frank Zuehl, MD. Department of Pathology, Walter Reed National Military Medical Center, Bethesda, Maryland.

Diffuse idiopathic pulmonary neuroendocrine carcinoma (LCNEC) is an underdiagnosed entity that is more aggressive than other non–small cell carcinomas. The data on the immunohistochemical features of LCNEC in surgical and cytologic specimens are limited. The aim of this study is to determine the sensitivity of immunohistochemistry (IHC) for various markers in identifying LCNEC on surgical and cytology material.

**Design:** The surgical and cytologic files were searched for pulmonary LCNEC in the past 10 years. Seventy-two LCNEC cases were retrieved. Twenty-seven cases had histologic diagnosis without cytology, and 18 cases were diagnosed by cytology only. In total, there were 54 cases with surgical diagnosis and 45 cases with cytologic diagnosis, including 29 fine-needle aspirations and 16 bronchial brushings. IHC for synaptophysin, chromogranin, and CK20 were performed. At resection, typical carcinoid tumors were present along with diffuse idiopathic pulmonary neuroendocrine cell hyperplasia. Diffuse idiopathic pulmonary neuroendocrine cell hyperplasia can be asymptomatic or cause extensive disease. Typically indolent and nonprogressive, most cases are managed with surveillance; few are treated by surgical resection. To our knowledge, this is the first case successfully treated with lung transplant in the United States. We conclude that lung transplant may be a therapeutic option for patients with advanced obstructive disease due to diffuse idiopathic neuroendocrine hyperplasia.

**Immunohistochemical Results in Cytologic and Surgical Specimens of Large Cell Neuroendocrine Carcinoma of the Lung**

<table>
<thead>
<tr>
<th>Marker</th>
<th>Histology, %</th>
<th>Cytology, %</th>
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<tr>
<td>Synaptophysin</td>
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<td>Chromogranin</td>
<td>42.9</td>
<td>29.4</td>
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</table>
CD56, TTF-1, CK7, and CK20 was performed on archived cytology and surgical pathology material.

Results: CD56 and synaptophysin are expressed more frequently in cytologic (93.3% and 80.8%) and surgical specimens (92.9% and 94.2%), respectively, whereas chromogranin is expressed less frequently in both cytologic (26.4%) and surgical specimens (42.9%) (Table). TTF-1 and CK7 have a relatively high rate of expression in both cytologic (68.2% and 77.8%) and surgical specimens (81.6% and 81.8%), respectively.

Conclusions: Our results indicate the immunohistochemical features of LCNEC in lung are similar in surgical and cytologic specimens. CD56 and synaptophysin are more sensitive markers whereas chromogranin has relatively lower sensitivity. Recognition of the frequency of expression for these markers may facilitate diagnosing LCNEC in lung, especially when diagnostic material is limited.

Primary Pulmonary Angiosarcoma: An Unusual Presentation of a Rare Tumor (Poster No. 40)

Daniel S. Atherton, MD (danatherton@gmail.com); Stephanie D. Simmons, MD; Mariantonieta Tirado, MD; Rance C. Siniard, MD. Department of Pathology, Baptist Health Systems, Birmingham, Alabama.

Pulmonary angiosarcoma usually presents as a metastatic lesion from pulmonary arteries, heart, or other distant sites. However, primary pulmonary angiosarcoma is rare, and only a few cases have been reported to date. Most of these cases present with hemoptysis. We report a case of primary pulmonary angiosarcoma with the unusual presentation of pneumonia. The patient is a 58-year-old woman with a history of chronic obstructive pulmonary disease, coronary artery disease, and hypertension. She presented in June 2010 with a history of recurrent pneumonia for the past 6 months. Computed tomography revealed a left lower lobe intraparenchymal mass. Several attempts at computed tomography–guided biopsy failed to provide a definitive diagnosis. In August of 2010, video-assisted thoracic surgery was performed to obtain a biopsy. Pathology revealed a poorly differentiated malignant neoplasm. The tumor was composed of malignant-appearing spindle cells with numerous vascular spaces. Massive necrosis was present in all sections. Results of immunohistochemical stains to rule out carcinoma, mesothelioma, and melanoma were negative; S100, desmin, and CD34 were also negative. However, CD10 was positive. The diagnosis of angiosarcoma was made based on these findings. No other primary site could be identified despite numerous imaging studies, including computed tomography of the abdomen, pelvis, and chest. A probable metastatic focus that was not present in June was identified within the thalamus. The patient was discharged and scheduled for CyberKnife therapy and palliative chemotherapy. The patient’s condition further declined and she was pronounced dead in September 2010.

Nodular Pulmonary Granuloma Formation by Acanthamoeba in a Patient Receiving Rituximab Therapy (Poster No. 41)

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Acanthamoeba are ubiquitous organisms found worldwide, and 1 of 4 genera of free-living amoeba that have been associated with human disease: Acanthamoeba, Balamuthia, Naegleria, and Sappinia. Acanthamoeba infection in humans has generally been reported to fall into 3 categories: (1) in immunocompromised patients and granulomatous amebic encephalitis. Pulmonary involvement by Acanthamoeba has only thus far been reported in the literature 4 times, and only in the setting of disseminated acanthamebasis, which is, in itself, extremely rare and typically occurs in immunocompromised hosts. Two of these cases involved available pulmonary pathologic descriptions, which included pneumonitis and concomitant necrosis. We present a case of isolated pulmonary granuloma formation due to Acanthamoeba in a 68-year-old man receiving rituximab for rheumatoid arthritis. The lesion presented as a 1.2-cm right lower lobe nodule with mild radiolabeled [18F]-2-fluoro-deoxy-D-glucose uptake on positron emission tomography scan during follow-up cancer surveillance. Video assisted thoracoscopic surgical wedge resection of the right lower lobe was completed for definitive diagnosis of the lung nodule. Microscopic analysis of the nodule revealed necrotizing granulomatous inflammation with multiple trophozoites and cysts suggestive of Acanthamoeba. Polymerase chain reaction and electron microscopy studies performed from the tissue block were also consistent with Acanthamoeba. Upon review of the literature, this case appears to represent the first reported of pulmonary involvement by Acanthamoeba in the absence of systemic infection, as well as the first resulting in lung granuloma formation. Furthermore, the association with the immunomodulator, rituximab, by Acanthamoeba is novel.

Pathology of Pulmonary Oligometastases (Poster No. 42)

Lauren Xu, MD (lxu1@umm.edu); Allen Burke, MD. Department of Pathology, University of Maryland Medical Center, Baltimore.

Context: Pulmonary metastatic disease with limited number of metastatic nodules, or oligometastases, may be surgically resected for diagnostic and therapeutic purposes. There are few reported series of surgically resected pulmonary metastases.

Design: We retrospectively reviewed the clinical and pathologic features of 55 resections of lung metastases.

Results: There were 30 women (age 64 ± 8 years) and 25 men (age 62 ± 10 years). Primary sites included squamous carcinomas of the head and neck (10), gastrointestinal adenocarcinomas (9 colon, 1 pancreas), soft tissue sarcomas (8), renal cell carcinomas (6), breast carcinomas (5), salivary gland tumors (5), hepatocellular carcinomas (3), testicular germ cell tumors (2), gynecologic carcinomas (2), melanomas (2), anaplastic thyroid carcinoma (1), and esophageal adenocarcinoma (1). The mean interval between initial diagnosis and metastastectomy was 37 ± 40 months, with high intervals for salivary gland tumors (78 ± 55 months), melanoma (73 ± 83 months), breast carcinoma (64 ± 47 months), and hepatocellular carcinoma (57 ± 53 months). More than one-half (55%) required immunohistochemical stains or clinical correlation to determine site of origin. Thirteen patients had extrapulmonary metastases at the time of resection, 13 patients developed subsequent extrapulmonary metastases, 12 developed recurrent pulmonary metastases, 6 were disease-free for the median of 17 months, range 6–25 months), and 11 were lost to follow-up.

Conclusions: Pulmonary metastases may occur late in disease, especially for certain tumor subtypes. Differentiation between pulmonary primary and metastatic tumor may be difficult. Short-term follow-up demonstrates that a proportion of patients may remain tumor free for prolonged periods after metastastectomy.

Epstein-Barr Virus–Positive Thymic Lymphoepithelioma-Like Carcinoma (Poster No. 43)

Sung-Eun Yang, MD (sungeunyang@gmail.com); Ersie Pouagare, MD; Monika Pilichowska, MD. Department of Pathology and Laboratory Medicine, Tufts Medical Center, Boston, Massachusetts.

Thymic lymphoepithelioma-like carcinoma is a rare neoplasm with only a few cases reported in the pediatric population. We present a case of a 14-year-old adolescent boy of Chinese descent with Epstein-Barr virus–positive thymic lymphoepithelioma-like carcinoma. The patient presented with right side chest pain for 2 months. Computed tomography scan demonstrated a 1.8 × 7.6 × 8.3-cm lobulated mass in the anterior mediastinum, additional mediastinal masses (up to 4.8 cm), multiple disseminated areas of plaquelike pleural thickening, and diaphragmatic lesions. A fiber-optic examination revealed no lesions in the nasopharyngeal cavity. Biopsy of the right diaphragmatic lesion demonstrated a neoplasm composed of syncytial sheets of epithelial cells associated with a prominent lymphoplasmacytic infiltrate. The epithelial cells were positive for pankeratin AE1/AE3, CD5, CD7, and p63. In situ hybridization for Epstein-Barr virus early RNA was uniformly positive in all neoplastic cell nuclei. Tumor cells were negative for CK7 and CK20 and the associated lymphoid infiltrate was negative for TdT. Molecular analysis for C-kit mutations (exon 9 and exon 11), KRAS, and EGFR amplification were negative. After initiation of chemotherapy the tumor decreased in size (up to 25%); however, it stayed unchanged despite varying treatment protocols. The patient is stable and in a relatively good condition 8 months after initial diagnosis.

Intrapulmonary Giant Bronchogenic Cyst With Dystrophic Calcification (Poster No. 44)

Ali H. Cermik, MD1 (hakancermik@hotmail.com); Murat B. Kaplan, MD2; Timuçin Aksu, MD. Departments of 1Pathology, 2Thoracic Surgery, and 3Cardiovascular Surgery, Etimesgut Military Hospital, Ankara, Turkey.

Bronchogenic cysts (BC) arise from abnormal budding of the tracheal diverticulum of the foregut before the 16th week of gestation. Approximately two-thirds are within the mediastinum and one-third is
intraparenchymal. A 20-year-old man was admitted to our hospital with increasing dyspnea and pain at left and back side of chest for 2 months. Thorax computed tomography (CT) and chest x-ray showed giant bullae with calcific degeneration in the left apicoposterior segment of the lung. The giant bulla was 12 cm in diameter and occupied more than half of the left hemithorax. The patient was a smoker for 5 years. On spirometry a mild obstructive pattern was observed. No mediastinal or hilar adenopathies were present. The patient underwent left posterolateral thoracotomy and bullectomy was performed. Postoperatively the patient had an uneventful recovery and was discharged. Grossly, the bullae surface was smooth with white calcific areas. Sectioning revealed a large cyst (12 × 10 × 9 cm) with a grey-pink appearance. Histologically, the cyst was lined with ciliated epithelium and bronchial cartilages, suggesting a diagnosis of bronchogenic cyst. Some surface areas showed dystrophic calcification, accumulation of histiocytes, and many foreign body–type giant cells. The clinical presentation of giant intrapulmonary BC varies according to size and intrathoracic localization. The treatment of choice is surgical removal. Calcific degeneration may be causing some diagnostic problems in CT. The differential diagnosis includes congenital pulmonary airway malformation, persistent pulmonary interstitial emphysema, pneumatocèle, abscess/necrotizing pneumonia, and lymphatic cyst/malformation.

**Malignant Sarcomatoid Mesothelioma After Liver Transplantation**  
(Poster No. 45)

Yu Liang, MD (liangyu@ucmail.uc.edu); Kevin Turner, DO; Asojo Oluonyi, MD; Jiang Wang, MD. Department of Pathology and Laboratory Medicine, University of Cincinnati College of Medicine, Cincinnati, Ohio.

Immunosuppression is associated with increased risk of malignancies; however, de novo mesothelioma after solid organ transplantation is rare. We report a case of malignant sarcomatoid mesothelioma in a 58-year-old man with a history of nonalcoholic steatohepatitis and status post–liver transplantation. He was brought to the hospital for severe anemia workup. Chest computed tomography scan identified multiple well-delineated nodules scattered throughout the right hemithorax. A biopsy showed a chest wall nodule was composed of atypical spindle cells infiltrating into adipose tissue with prominent fibrosis. Lung wedge biopsies contained multiple subpleural nodules consisting of predominantly bland spindle cells, collagen, with mild chronic inflammation and an infarct area. The spindle cells were infiltrating into the vessels within the lesions and alveolar septa. Immunostains showed the spindle cells in the chest wall mass and the lung nodules were positive for pankeratin, CK7 (patchy, weakly positive, lung nodules only), calretinin, D2-40, and SMA, and negative for HepPar1, HMB 45, and MART-1. The tumor cells were also negative for desmin, S-100, CD34, bcl-2, and p63. Based on the immunophenotype and infiltrating pattern of the lesions, the diagnosis of malignant sarcomatoid mesothelioma was given. To our knowledge this is the first report of malignant sarcomatoid mesothelioma in a liver transplant patient.

**Necrotizing Sialometaplasia: A Rare Presentation and Challenge for Intraoperative Consult**  
(Poster No. 46)

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Necrotizing sialometaplasia is an infarctive, inflammatory, metaplastic process that can occur wherever there are seromucinous glands. It is well known to involve minor salivary glands, most commonly the palatal minor salivary glands, and is often associated with history of prior surgery or trauma. Misinterpretations on frozen section were analyzed during a period of 6 years from the database of the hospital and 2 cases were retrieved. Our first case involves a 68-year-old man who had a right lower and middle lobectomy for poorly differentiated squamous cell carcinoma. The bronchial margins submitted for frozen section were misinterpreted as squamous cell carcinoma. Our second case involves a 71-year-old man who had a tongue biopsy that was misinterpreted as squamous cell carcinoma on the frozen section. Necrotizing sialometaplasia in minor salivary gland is well reported and is well known as a close mimicker of squamous cell carcinoma. Necrotizing sialometaplasia is extremely rare in the tracheobronchial tree. This study emphasizes the existence of this entity in the tracheobronchial tree and its potential misinterpretation as squamous cell carcinoma on frozen sections.

**Distinctly Unusual Desmin Coexpression in a Sarcomatoid Carcinoma of the Lung**  
(Poster No. 47)

Asif S. Shahab, MD (asif23@hotmail.com); M. I. Zulfiqar, MD; U. Sheikh, MD; Paul J. Kowalski, MD. Department of Pathology, St John Hospital Medical Center, Harper Woods, Michigan.

Sarcomatoid carcinomas (SC) are a group of poorly differentiated non–small cell lung carcinomas that contain a component of sarcoma. These are rare and aggressive malignancies of lung. We report an interesting and unusual case of SC with an intense aberrant desmin coexpression. In this case, a 70-year-old woman presented with chest discomfort. Chest x-ray revealed an incidental right lung mass. Computed tomography of the chest showed a 3.6-cm peripheral mass within the right upper lobe of the lung. Positron emission tomography scan revealed an increased uptake to the isolated lesion consistent with a primary lung tumor. The patient then underwent a resection. Grossly, the mass was well circumscribed, tan, fleshy, and homogenous. Microscopic evaluation revealed a combination of haphazardly arranged spindle cells and markedly atypical epithelioid cells including occasional multinucleated forms. Mitotic activity was brisk. The immunostain results were interesting in that the neoplastic cells were not only intensely and diffusely immunoreactive for desmin and vimentin but also focally reactive for cytokeratin Cam 5.2 in a manner typical of SC. However, caldesmon, smooth muscle actin, muscle-specific actin (HHF-35), and myogenin were completely negative. In addition, cytokeratin AE1/AE3, cytokeratin 5/6, cytokeratin 7, cytokeratin 20, and melanoma markers were also negative. The intense desmin positivity is distinctly unusual for a sarcomatoid carcinoma. The clinical or biological significance of a strongly positive desmin expression in this tumor is yet to be determined. To our best knowledge, this is the first such case reported.

**Synovial Sarcoma of the Thyroid**  
(Poster No. 48)

Marnelli A. Bautista-Quach, MD (mmbautista@llu.edu); Kate Grogan, MD, Craig Zuppan, MD. Department of Pathology and Laboratory Medicine, Loma Linda University Medical Center, Loma Linda, California.

Intrathyroidal synovial sarcoma is a rare incidence with only a few documented cases in the current literature. About 85% of synovial sarcomas occur in the lower extremities and approximately 10% in the head and neck region. It usually affects younger patients, with an average age at diagnosis of 30 years. This is the case of a 23-year-old previously healthy man who presented with a nontender, rapidly enlarging neck mass for about a week, with associated worsening dyspnea and dysphagia. There was no history of neck trauma, recent respiratory tract infection, or any neoplasm. Imaging showed a large thyroid mass partially compressing the trachea. The patient underwent total thyroidectomy with bilateral paratracheal dissection. The bilaterally enlarged thyroid gland showed a white, poorly delineated, lobulated mass almost entirely replacing the thyroid tissue (Figure 111), with extension to the posterior surface of the resection cut surface. Microscopy revealed a monotonous, high-grade spindle cell tumor with an increased number of mitotic figures. Tumor cells were positive for pancytokeratin and epithelial membrane antigen. A diagnosis of synovial sarcoma was made, and confirmed by demonstration of the characteristic SYT-SSX1 gene fusion product by fluorescence in situ hybridization (reverse transcription–polymerase chain reaction). The patient received radiotherapy.
following surgery. Positron emission tomography 1 year after surgical resection showed no evidence of local or regional recurrence, or distant metastasis. Our case illustrates the usefulness of molecular analysis in confirming the diagnosis of synovial sarcoma in unusual sites, and in differentiating it from other spindle cell lesions or carcinomas primarily arising from the thyroid gland.

**Solitary Spindle Cell Lipoma of the Tongue: Case Report and Literature Review**

Poster No. 49

Rafat Makary, MD, PhD; Nikhil G. Patel, MD (nikhil.patel@jax.ufl.edu). Department of Pathology, University of Florida COM–Jacksonville.

Spindle cell lipoma (SCL), an uncommon benign variant of lipomatous tumor, was first described by Enzinger and Harvey in 1975. Typically SCL occurs in elderly men as a solitary posterior neck and/or back lesion, but less commonly it involves the oral cavity. Histologically, irrespective of their location, SCLs are characterized by mature adipocytes, bland uniform spindle cells with eosinophilic cytoplasm internixed with dense collagen. A review of the English literature revealed 23 reported cases of oral SCLs (Table) of which only 9 cases occurred in the tongue. We describe a new case of a solitary SCL of the tongue in a 48-year-old African American man referred to our institution for evaluation and management of a nodular lesion along the left lateral border of his tongue. Intraoral examination revealed a 1-cm-diameter, rubbery, soft nodule which had increased in size during the previous 2 weeks. A clinical diagnosis of a “benign lesion” was made. The lesion was completely excised surgically. Histology revealed mature adipocytes and uniform bland spindle cells with distinct cytoplasm internixed with collagen (Figure 112, A). The spindle cells were positive for CD-34 (Figure 112, B) and negative for desmin (Figure 112, D) immunostains. The adipocytes were positive only for S-100 immunostain (Figure 112, C).

<table>
<thead>
<tr>
<th>Location of Spindle Cell Lipoma</th>
<th>No. of Cases</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor of mouth</td>
<td>3</td>
<td>McDaniel et al, Levy et al, Piattelli et al</td>
</tr>
<tr>
<td>Hard palate</td>
<td>1</td>
<td>Tosios et al, Khoo et al, Yamagata et al, Piattelli et al, Nagisa et al, Yamada et al, Kawasaki et al</td>
</tr>
<tr>
<td>Cheek</td>
<td>8</td>
<td>Christopoulous et al</td>
</tr>
<tr>
<td>Gingiva</td>
<td>1</td>
<td>Agoff et al</td>
</tr>
<tr>
<td>Alveolar ridge</td>
<td>1</td>
<td>Darling et al</td>
</tr>
</tbody>
</table>

In conclusion, although SCL is a rare lesion of the tongue, it should be considered in the differential diagnosis to distinguish it from other benign or more aggressive spindle/lipomatous neoplasms, in order to preserve the tongue function as much as possible by avoiding aggressive treatment.

**Sebaceous Epithelial Myoepithelial Carcinoma**

Poster No. 50

Muhammad A. Malik, MD (mmalik1@uthsc.edu); Molly S. Rosebush, DDS; Yeshwant B. Rawal, DDS; Kenneth M. Anderson, DDS, MS. Department of Pathology, University of Tennessee Health Science Center, Memphis.

Epithelial-myoepithelial carcinoma (EMC) of salivary glands is a low-grade malignant tumor. Recent reports have described sebaceous differentiation in EMC. Given the prognostic implications, differentiation between sebaceous differentiation in EMC and sebaceous carcinoma is imperative. A 63-year-old white man presented with right preauricular mass of 6 to 7 months duration. Computed tomography showed a 3.5 × 2.5-cm, circumscribed, heterogeneous mass in superficial lobe of right parotid gland. A right parotidectomy was performed. The sections revealed effacement of parotid tissue by an infiltrative neoplasm of salivary origin. The tumor was composed of conventional EMC (Figure 113, A) showing closely spaced bilayered structures of ductal cells surrounded by myoepithelial cells with clear cytoplasm. These areas were admixed with conspicuous zones of sebaceous differentiation characterized by basaloid, clear, and vacuolated cells (Figure 113, B) showing positivity for epithelial membrane antigen (Figure 113, C) and negativity for S-100 (Figure 113, D). In some fields, the sebaceous component predominated. Sebaceous differentiation in EMC has not been well documented. However, it appears to be a distinct variant of EMC with a similar clinical course to conventional EMC. The myoepithelial component in this case was confirmed by positivity for smooth muscle actin stain. The importance in differentiating this variant from sebaceous carcinoma of salivary gland lies in the latter’s aggressive potential and immunohistochemical stains may be useful in making this distinction. Although it appears to be characterized by a similar prognosis to that of conventional EMC, additional reports may provide more precise information on its biologic potential.

**Ameloblastic Fibrosarcoma of the Mandible: A Rare Malignant Odontogenic Tumor**

Poster No. 51

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Ameloblastic fibrosarcoma (AFS) is a very rare malignant odontogenic tumor with fewer than 60 cases reported in the literature. AFS is considered the malignant counterpart of ameloblastic fibroma; histologically...
it consists of benign islands of well-differentiated ameloblastic epithelium within a malignant fibrous stroma. We report a case of AFS that presented as a rapidly growing mass arising within the mandibular ramus of a 16-year-old adolescent girl with myasthenia gravis and myotic dystrophy. Computed tomography scan revealed a 5.2-cm partially necrotic mass causing destruction of the right mandibular ramus along with destruction of the molar teeth. No prior lesion was identified within the same site. Microscopically the epithelial component consisted of nests and cords of benign odontogenic epithelium, with no pleomorphism. However, the mesenchymal stroma appeared cellular and consisted of spindle and stellate cells that exhibited moderate nuclear pleomorphism with numerous mitotic figures. The majority of AFSs arise de novo; however, one-third may arise from a recurrent ameloblastic fibroma, in which case they appear to present at an older age. AFS is a locally aggressive malignant tumor, with regional and distant metastases being uncommon. The treatment of choice is wide surgical excision, with long-term follow-up; the utility of postoperative chemotherapy and radiotherapy is unclear.

### Carcinoma Ex Pleomorphic Adenoma With Squamous Cell Carcinoma as the Epithelial Component: A Rare and Atypical Presentation

(Poster No. 52)

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Pleomorphic adenoma (PA) is a common neoplasm that arises from the major salivary glands and infrequently undergoes malignant transformation. Malignant changes in PA have been associated with long duration, tumor recurrence, radiation therapy, an advanced age, and tumor size. Malignant PA represents 3 subtypes, which are carcinoma ex PA (CxPA), carcinosarcoma, and metastasizing PA. CxPA represents approximately 5% to 15% of all malignant neoplasms of salivary gland. It mostly originates from major salivary glands and develops in primary or recurrent PA. We report a case of a 55-year-old man with right parotid swelling of 20 years duration and 10 × 8 cm in size. He underwent an operation and subsequent histopathology revealed biphasic tumor consisting of both epithelial and mesenchymal elements with foci showing sheets of malignant squamous cells (Figure 114). For proper diagnosis of CxPA, coexistence of PA and carcinoma is needed. The majority of CxPAs develop from epithelial component of PA, which are usually adenocarcinoma but encompass a wide spectrum of histologic patterns such as salivary duct carcinoma, myoepithelial carcinoma, adenoid cystic carcinoma, epithelial myoepithelial carcinoma, and even carcinosarcoma. CxPA with squamous cell carcinoma as epithelial component is extremely rare. PA has high metaplastic potential and oncocytic, sebaceous, mucinous, squamous, chondroid, osseous, and adipose differentiation is common. This case highlights that squamous cell carcinoma can be a component of epithelial malignancy associated with CxPA and should not be wrongly labeled as squamous metaplasia.

### Evaluation of Laryngeal Papillomas for Morphologic Features and the Expression of p16 and Ki-67 as Predictive Indicators of Recurrence

(Poster No. 53)

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**Context:** Laryngeal papillomas rarely become malignant. p16 immunostaining is used as a surrogate marker for high-risk human papillomavirus (HR-HPV) infection; its presence may indicate viral activity. Ki-67 is a proliferative marker that correlates with the degree of epithelial dysplasia. This study aims to explore the use of a grading system for laryngeal intraepithelial neoplasia (LIN), similar to the cervical intraepithelial neoplasia grading system, and to determine if p16 and Ki-67 immunostains can be used as predictive indicators of recurrence or malignant transformation.

**Design:** A 5-year retrospective review was performed and all laryngeal papilloma cases were retrieved from our archives. Hematoxylin-eosin–stained sections were evaluated, and the corresponding blocks were cut and stained with p16 (CINtech, Westborough, Massachusetts) and Ki-67 (Ventana, Tucson, Arizona) antibodies. These were evaluated for the intensity, proportion, and pattern of staining. LIN grade, p16, Ki-67, demographics, and recurrence were then correlated.

**Results:** Twenty-four of 30 cases showed variable p16 positivity. One outlier, graded as LIN3, revealed diffuse, intense p16 positivity, and follow-up biopsy revealed squamous cell carcinoma. Staining varied from moderate to strong in 18 cases, which included 9 cases classified as LIN2-3. Five of 18 cases have shown no recurrence. p16 staining was predominantly basal. Ki-67 revealed predominantly basal staining in 5 cases, whereas 5 of 9 cases classified as LIN2-3 revealed suprabasal staining.

**Conclusions:** p16 staining patterns in laryngeal papillomas are predominantly basal with moderate to strong positivity in LIN2-3. Though suprabasal Ki-67 intraepithelial staining was identified more in LIN2-3, this pattern was not significantly different from LIN1, limiting its use for the aforementioned implications.

### Porokeratosis of the Tongue

(Poster No. 54)

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Porokeratosis is a common dermatologic condition affecting the skin. However, it is distinctly uncommon in the oral mucosa and only rarely reported to involve the tongue. We report a case of porokeratosis involving the tongue without other cutaneous manifestations. A 65-year-old man presented with a thin 6-mm right ventral tongue lesion clinically believed to be leukoplakia. A biopsy was performed and demonstrated cornoid lamellae characteristic of porokeratosis (Figure 115). The cornoid lamellae were comprised of thin columns of parakeratotic cells with underlying dyskeratosis extending into the lower third of the squamous mucosa. There was minimal submucosal inflammation and no evidence of squamous
epithelial dysplasia or malignancy. Porokeratosis classically presents as an annular plaque with a raised threadlike keratotic border that expands centrifugally. However, there is a myriad of clinical expressions and lesions may be solitary or numerous. Although traditionally regarded as an autosomal-dominant inherited genodermatosis, many nonfamilial cases have been reported. The presence of cornoid lamellae suggests faulty keratinization; however, the exact pathogenesis is unclear. The absence of hair follicles and sweat ducts in the tongue provides further evidence that porokeratosis is not a disorder arising from adnexal structures.

**Morphologic Features and Surgical Impact of Salivary Gland Frozen Section—Deferred Diagnoses: An Interdisciplinary Investigation**

*(Poster No. 55)*

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**Context:** The frozen section (FS) is a modality pathologists frequently use to aid surgeons. We correlated diagnoses with surgical outcomes in salivary gland FS cases in which the diagnoses were deferred.

**Design:** The records of approximately 2000 patients who received surgical treatment for salivary gland lesions (January 1, 2000–June 30, 2010) were reviewed. One hundred eighty cases were identified in which an FS had not been performed. Of these, cases were included in which a conclusive FS diagnosis had not been given. These diagnoses were classified broadly as “deferred.” Aided by our surgical colleagues these select cases were correlated with surgical/clinical outcomes.

**Results:** Analysis of 180 cases revealed 45 cases in which a conclusive FS diagnosis had not been given (deferred). Deferral rates in benign lesions (23%) and malignant lesions (32%) were calculated. Pleomorphic adenoma was the most commonly encountered lesion and because of its wide histologic spectrum was frequently deferred (13 of 52 cases, 25%). Three of 45 deferred cases did not receive the optimal surgery. One case resulted in overtreatment when a malignant differential diagnosis was given for a pleomorphic adenoma. The second case resulted in undertreatment because of a differential diagnosis favoring adenoid cystic that was given for a salivary duct carcinoma. The third case led to a suboptimal treatment when a differential diagnosis favoring metastatic breast carcinoma was given for a primary parotid small cell carcinoma.

**Conclusion:** Deferred diagnoses with broad differentials can lead surgeons to perform suboptimal procedures. (2) Pleomorphic adenomas are commonly deferred lesions on FS because of their wide histologic spectrum.

**Table 1: Deferred FS Diagnoses in 180 Salivary Gland Lesions**

<table>
<thead>
<tr>
<th>Pathologic Entities (No.)</th>
<th>Conclusion FS Diagnosis</th>
<th>Deferred FS Diagnosis, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleomorphic adenoma (52)</td>
<td>39</td>
<td>13 (25)</td>
</tr>
<tr>
<td>Warthin tumor (21)</td>
<td>18</td>
<td>3 (14)</td>
</tr>
<tr>
<td>Benign cysts (6)</td>
<td>5</td>
<td>1 (17)</td>
</tr>
<tr>
<td>Basal cell adenoma (5)</td>
<td>3</td>
<td>2 (40)</td>
</tr>
<tr>
<td>Other benign neoplasms (15)</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Sialadenitis (5)</td>
<td>3</td>
<td>2 (40)</td>
</tr>
<tr>
<td>Benign (35)</td>
<td>31</td>
<td>4 (11)</td>
</tr>
<tr>
<td>Lymphoma (7)</td>
<td>6</td>
<td>1 (14)</td>
</tr>
<tr>
<td>Squamous cell carcinoma (7)</td>
<td>5</td>
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<td>Acinic cell carcinoma (6)</td>
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<tr>
<td>Adenoid cystic carcinoma (3)</td>
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<tr>
<td>Mucoepidermal carcinoma (3)</td>
<td>2</td>
<td>1 (33)</td>
</tr>
<tr>
<td>Other malignant neoplasms (9)</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total (180)</strong></td>
<td><strong>135</strong></td>
<td><strong>45 (25%)</strong></td>
</tr>
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Transformation of a differentiated papillary thyroid carcinoma into high-grade squamous cell carcinoma is extremely rare. We report a case of an 80-year-old woman who presented with an enlarged left lobe of thyroid. Thyroid scintigraphy revealed a cold nodule. Preoperatively fine-needle aspiration suggested a papillary thyroid carcinoma. Computed tomography scan of the neck also revealed a prevertebral soft tissue mass measuring 4.0 × 1.5 × 1.0 cm. Histology of the subsequent thyroidectomy specimen revealed a papillary carcinoma with high-grade squamous cell carcinoma. Prevertebral soft tissue mass was excised and revealed a high-grade squamous cell carcinoma revealing similar morphology as found in the thyroid. Immunohistochemical studies showed that CK7 was positive in all tumor cells. TTF-1 and thyroglobulin were strongly positive in the papillary component of the tumor. Tumor cells progressively lost these stains toward the squamous component and were completely negative in the squamous component. On the other hand, P63 revealed a strong nuclear positivity in the squamous component which progressively decreased toward the papillary component and was completely negative in the papillary component. Based on these characteristic immunohistochemical results, we believe that in our case, the papillary carcinoma of the thyroid transdifferentiated into the high-grade squamous cell carcinoma. Exhaustive clinical and radiologic examinations did not reveal any primary site of squamous cell carcinoma. The papillary carcinoma transdifferentiating into the high-grade squamous cell carcinoma must be known because of its aggressive clinical behavior and high metastatic potential.

**Carcinosarcoma Arising from a Pleomorphic Adenoma in a Parotid Gland**

*(Poster No. 57)*

Irmeen Q. Siddiqui, MD1 (irmeenqamar@gmail.com); Sang Wu, MD2; Qihui Zhai, MD, MD1 Department of Pathology & Laboratory Medicine, University of Cincinnati, Ohio; *Department of Pathology, ProPath Laboratories, Fort Worth, Texas.

In salivary glands, there are 3 types of malignancies that can arise from a pleomorphic adenoma (PA): carcinoma arising in a PA (carcinoma ex PA), metastasizing PA, and carcinosarcoma. Carcinosarcoma ex PA is extremely rare and accounts for less than 0.04% to 0.16% of all salivary gland tumors. We report a case of carcinosarcoma ex PA in a 56-year-old woman who presented with a 10-month history of right parotid mass. This mass was followed for several months up to the point where she developed facial nerve paralysis. She then underwent right total parotidectomy. Microscopically the neoplasm demonstrated 2 distinct morphologic components, one sarcomatous manifesting as chondrosarcoma and the other carcinomatous manifesting as a poorly differentiated high-grade adenocarcinoma. The neoplastic epithelial cells demonstrated marked cytologic atypia with scattered mitoses. The mesenchymal component is predominantly cartilaginous and fibrotic. The cartilage has multiple foci of atypical chondrocytes with enlarged nuclei, prominent nucleoli, and occasional mitoses. Immunostaining with CK-LMW, patchy p63, and S100 provided the evidence of myoepithelial differentiation within the carcinomatous component, which supported a salivary gland primary. In the adjacent areas, foci of mucosxymoid stroma were identified, highly suggestive of pleomorphic adenoma. Carcinosarcoma ex PA is a morphologically high-grade and clinically aggressive tumor. Recurrence, distant metastasis, and angiolymphatic invasion are frequently encountered. Hence, the recognition of malignant transformation of both epithelial and mesenchymal components is of utmost importance. Because of the rarity of the tumor, consensus on the therapeutic approaches is yet to be established.

**Myeloid Sarcoma of the Tongue: A Unique Case Report and Review of the Literature**

*(Poster No. 58)*

Sarah W. Lindley, MD (Sarah-Lindley@ouhsc.edu); Elizabeth M. Gillies, MD. Department of Pathology, University of Oklahoma Health Sciences Center, Oklahoma City.

Myeloid sarcoma (MS) is a rare extramedullary malignant tumor composed of immature myeloid precursor cells. This tumor is strongly associated with acute myeloid leukemia (AML) and seen in 1% to 5% of patients with AML. MS can occur in a variety of body sites, including gastrointestinal tract, skin, and bones, but rarely occurs intraorally. We report a unique case of MS occurring in the anterior one-third of the tongue. A 60-year-old man with newly diagnosed AML (not further classified) was referred for induction chemotherapy. Within 2 weeks, he developed a painful ulcerated lesion on his tongue. Fungal and herpes cultures were negative. The patient failed induction chemotherapy and his tongue lesion increased to 3 cm in size. Clinically, there was concern...
for carcinoma and the lesion was biopsied. Microscopically the lesion demonstrated mucosal epithelial hyperplasia with ulceration. In the submucosa there was a subtle diffuse cellular infiltrate of medium- to large-sized cells with prominent nuclei. These cells were focally positive for CD117 and CD34, and diffusely positive for CD15 and myeloperoxidase, consistent with the immunophenotype of the patient’s AML. The patient died 2 weeks later of multorgan failure secondary to sepsis. To the best of our knowledge this is the first reported case of MS occurring in the tongue. It is important to consider MS in the setting of a mass lesion occurring in a patient with known AML. MS portends a poor prognosis with most patients succumbing to their disease; therefore, this unique presentation is clinically relevant.

**Comparison of Angiogenesis, Proliferative Activity, and DNA Ploidy in Various Histologic Grades of Squamous Cell Carcinoma of Oral Cavity: An Immunohistochemical and Morphometric Study**

((Poster No. 59)

Sauymaranjan Mallick, MD1 (dsmallick.aiim@gmail.com); Monika Breta, MD2; Rischika Gupta, MD3; Siddhartha D. Gupta, MD3; Bidhu K. Mohanti, MD2; Amit K. Dinda, MD, PhD; Manoj K. Singh, MD, FRCPath.1 Departments of 1Pathology and 2Radiation Oncology, All India Institute of Medical Sciences, New Delhi, India; 3Department of Pathology, Chaha Nehur bul chikischalaya, New Delhi, India.

**Context:** Squamous cell carcinoma (SCC) is the most common type of oral cancer. The present study was aimed at evaluation of the angiogenesis, proliferative activity, and DNA ploidy in different grades of oral SCC.

**Design:** This was a retrospective study including 44 cases of oral SCC.

**Results:** The mean age was 52.4 years with sex ratio M:F 5:4.5. The mean age was 52.4 years with sex ratio M:F 5:4.5. Arch Pathol Lab Med—Vol 135, September 2011

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Four cases of recurrent papillomatosis with aggressive behavior were selected from our files. Two were autopsies with extensive tissue sampling, and 2 were from patients with multiple biopsies for recurrent papillomatosis. AP was defined as a squamous and glandular proliferation that appears to extend along preexisting ducts or channels and lacks significant nuclear atypia.

**The Morphologic Features of Aggressive Papillomatosis:**

A Neglected Histopathologic Entity

((Poster No. 61)

Vicki J. Schnadig, MD (vschnadig@utmb.edu); Nahal Boroumand, MD. Department of Pathology, University of Texas Medical Branch, Galveston.

**Context:** Studies have confirmed that human papillomavirus is an oncogenic agent associated with squamous papillomata and carcinoma of the genital and respiratory tracts. Investigators believe that the virus un couples cell DNA synthesis from terminal differentiation so that infected cell proliferation and differentiation occur simultaneously. Molecular studies help explain the dysregulated cell proliferation; however, the peculiar morphologic aspects of so-called “invasive” or aggressive papillomatosis (AP) has been neglected. AP can be misinterpreted as squamous carcinoma, adenocarcinoma, or mucoepidermoid carcinoma. This study reviews the histology of AP, an entity intermediate between simple papilloma and invasive carcinoma.

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**Design:** Four cases of recurrent papillomatosis with aggressive behavior were selected from our files. Two were autopsies with extensive tissue sampling, and 2 were from patients with multiple biopsies for recurrent papillomatosis. AP was defined as a squamous and glandular proliferation that appears to extend along preexisting ducts or channels and lacks significant nuclear atypia.
Results: All AP cases had a mixture of intermediate-type squamous cells resembling immature squamous metaplasia, ciliated columnar cells, and goblet cells lacking malignant-type nuclear atypia. These cell types were seen, in various combinations, extending into submucosal bronchial and sinonasal glands and tonsillar and intrapulmonary lymphoid tissue. In the lungs, there was intra-alveolar extension without destruction of alveolar walls. The mixture of small squamous, ciliated columnar, and goblet cells resulted in an interesting pattern that mimicked mucocutaneous carcinoid.

Conclusions: The morphology of AP, an unregulated proliferation midway between simple papillomatosis and invasive carcinomas, should be recognized as a distinct entity.

Patient Demographics, Pathologic Findings, and HPV Types Associated With Recurrent Respiratory Papillomatosis (Poster No. 62)

Trang L. Ly, MD (tuly@utmb.edu); Jianli Dong, MD, PhD; Vicki Schnadig, MD; Nahal Beroumand, MD, Department of Pathology, University of Texas Medical Branch, Galveston.

Context: Recurrent respiratory papillomatosis (RRP), associated with human papillomavirus (HPV) types 6 and 11, has a variable disease course. This study examined RRP-associated patient demographics, pathologic findings, and HPV types.

Design: A database search identified 14 males and 3 females with ≥1 biopsy diagnosis of respiratory tract or oromaxillary/neck squamous papilloma during 2007–2008. Cases diagnosed at <3 years of age were classified as juvenile onset (JRRP) and the remainder as adult onset (AORRP). HPV typing was performed by polymerase chain reaction (PCR) on several blocks. p16 immunostaining was performed in 16 cases. Clinical records were reviewed.

Results: Three JRRP cases occurred in males (age range, 6 months–2 years). In cases of AORRP (age range, 29–76 years), 3 female patients had an age of onset >50 years. The larynx was primarily involved in JRRP, whereas AORRP involved the oropharynx, sinonasal area, and larynx. Follow-up ranged from 2 to 21 years. JRRP cases were associated with higher procedure numbers (average 31) compared to AORRP (average 6). Two JRRP and 2 AORRP cases demonstrated lung involvement. One case demonstrated high-grade squamous dysplasia, and 2 cases showed invasive squamous cell carcinoma. Five of 9 HPV-11–associated cases showed aggressive behavior. Three cases demonstrated HPV-6, and 1 case showed HPV-16. HPV was undetectable in 3 cases. p16 staining revealed diffusely positive in the HPV-16–associated case but was negative/focally positive in remaining cases.

Conclusions: JRRP and AORRP were distinguished by patient age, site, and number of diagnostic procedures. HPV-11 was identified most commonly. Both adult and juvenile cases demonstrated aggressive behavior.

Histologic Variants of Papillary Thyroid Carcinoma (Poster No. 63)

Muhammad Zulfiqar, MBBS (muhammad.zulfiqar@stjohn.org); Yasin Ahmed, MD; Asif Shahab, MD; Robert D. Danforth, MD. Department of Pathology, St John Hospital and Medical Center, Detroit, Michigan.

Papillary thyroid carcinoma (PTC) is the most common malignant tumor of the thyroid gland. It is a slowly progressing malignancy with early lymph node metastasis. The tall cell variant of PTC is associated with a worse prognosis as compared to conventional PTC and the follicular variant is associated with a better prognosis as compared to follicular carcinoma. It is important to recognize these variants of PTC because of prognostic implications. We report 2 histologic variants of PTC. A 19-year-old man presented with a left thyroid nodule with no symptoms or laboratory abnormalities of thyroid dysfunction. The thyroidectomy specimen showed a 5.7-cm right thyroid mass. The tumor was encapsulated and exhibited a follicular pattern. The tumor cells had pale to clear chromatin, irregular nuclear contours, nucleoli, and intranuclear inclusions. The tumor was diagnosed as encapsulated follicular variant of PTC. The right lobe showed benign thyroid tissue. An 80-year-old woman presented with an enlarging right thyroid mass of 2 months duration. A fine-needle aspiration showed papillary carcinoma. The thyroidectomy specimen showed a 3.5-cm right thyroid mass. The tumor exhibited an extensive papillary architecture with a dense sclerotic stroma, lymphocytic infiltration, and necrosis. The tumor cells were 2 to 3 times tall as they were wide with abundant eosinophilic cytoplasm, nuclear grooves, and intranuclear inclusions. The tumor involved the criocarciyoidenium muscle, recurrent laryngeal nerve, and was present at the margin at multiple foci. The tumor was diagnosed as tall-cell variant of PTC. The left lobe showed benign thyroid tissue.

Alveolar Rhabdomyosarcoma, Solid Variant, of the Maxillary Sinus Invading the Orbit in an Adult (Poster No. 64)

Ashwini K. Enakula, MD, MS; Krishna M. Iririki, MD (dirrirkink@yahoo.co.in); Tammy Naab, MD. Department of Pathology, Howard University Hospital, Washington, DC.

Rhabdomyosarcoma of the head and neck is the common soft tissue sarcoma in childhood, with approximately 80% being diagnosed in children 12 years or younger. It is exceedingly rare in adults. We report a case of alveolar rhabdomyosarcoma in a 36-year-old man who presented with left eye proptosis, rhinorrhea, and a polypoid nasal mass. Computed tomography scan revealed a soft tissue mass in the left maxillary sinus with bony erosion and extension into the anterior cranial fossa and the left orbit. Frozen section revealed infiltrative sheets of mitotically active, medium-sized, pleomorphic malignant cells with cytoplasmic differentiation into a rim of densely eosinophilic cytoplasm. Alternating hypercellular and hypocellular areas, fibrous bands, patchy foci of neoplastic cells with cytoplasmic clearing, and variable crush artifact were appreciated in the permanent sections. The differential diagnosis included sinonasal undifferentiated carcinoma, poorly differentiated squamous cell carcinoma, high-grade olfactory neuroblastoma, malignant melanoma, and rhabdomyosarcoma. A limited immunohistochemical stain panel was ordered. The neoplastic cells strongly and diffusely expressed vimentin and desmin and failed to express pancytokeratin and S100 protein. Skeletal muscle origin was later confirmed by strong and diffuse nuclear expression of myogenin and myo-D1. Fluorescence in situ hybridization revealed chromosomal rearrangements involving the FOXO1 (FKHR) gene on chromosome 13q14 in 59% of the interphase cells, a finding characteristically associated with alveolar rhabdomyosarcoma. Rhabdomyosarcoma should be suspected in high-grade nasal malignancies in adults and can be confirmed using a limited, cost-effective battery of immunostains.

Intraoral Sebaceous Carcinoma: Is DNA Mismatch Repair Associated? (Poster No. 65)

Xiu Yang, MD (xiu.yang@downstate.edu); Hangjun Wang, MD; Jinjiao Yao, MD; Marshall Solomon, DDS; Constantine A. Axiotis, MD, Department of Pathology, SUNY, Brooklyn, New York; Department of Pathology, Kings County Medical Center, Brooklyn, New York.

Sebaceous carcinoma predominantly occurs in eyelids, skin of head and neck, or salivary glands, whereas it rarely occurs primarily in the oral cavity, where it is thought to arise from Fordyce granules or salivary gland elements. A minority of individuals with this carcinoma have Muir-Torre syndrome, which is due to germline mutation of DNA mismatch repair (MMR) genes. We report the first case of primary intraoral sebaceous carcinoma, and studied the immunoprofiles of this case. A 50-year-old man presented with oral pain for 3 months and an intraoral fungating mass on the left posterior buccal mucosa. The tumor was composed of sebaceous nest, keratinized squamous component, and poorly differentiated malignant cell with many mitotic figures. Fordyce granules and minor salivary gland with chronic inflammation and sebaceous differentiation were noted adjacent to the tumor. The neoplastic cells were positive for epithelial membrane antigen and androgen receptor, and negative for mucicarmine and periodic acid–Schiff. This immunohistochemical profile helps to differentiate from poorly differentiated squamous carcinoma or mucoepidermoid carcinoma. Recent evidence suggests that immunohistochemistry is very sensitive in detecting MMR defects. No observations have been reported in the expression of MMR defects in intraoral sebaceous carcinomas. Our current case showed strong MSH6 expression by immunohistochemistry. Thorough clinical examination showed no malignancy in this patient’s internal organs. An MMR defect examination is recommended for the workup of a patient presenting for the first time with a sebaceous neoplasm and no prior personal or family history of internal malignancies.

Cystic Medial Degeneration and Medial Smooth Muscle Degeneration Are Distinct Clinopathologic Entities in the Pathogenesis of Dissecting Aneurysms of the Aorta (Poster No. 66)

Philip Grieshaber, MD (phil.grieshaber@gmail.com); Amrita Patel, MBBS; John L. Farber, MD. Department of Pathology, Thomas Jefferson University Hospital, Philadelphia, Pennsylvania.

Context: In the 1950s, Gore and Seiwert distinguished 2 processes whereby aortic dissecting aneurysms arise: cystic medial degeneration

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Primary Cardiac Neoplasms: A Clinopathologic Analysis of 42 Cases
(Poster No. 67)

Andrea Barbieri, MD (andrea.barbieri@yale.edu); Adebowale J. Adeniran, MD. Department of Pathology, Yale University School of Medicine, New Haven, Connecticut.

Context: Primary cardiac tumors are a heterogeneous collection of malignant lesions that vary widely in appearance, location, size, number, and age at presentation. The aim of this study was to review a single center experience, and evaluate the clinopathologic characteristics of these rare neoplasms.

Design: A retrospective search of our files was performed to identify primary cardiac tumors during a 10-year period. Clinical, radiologic, and pathologic findings were reviewed. Follow-up information was obtained from clinical charts and tumor registry data.

Results: Forty-two cases were identified (37 benign and 5 malignant). The benign cases were predominantly myxoma (81%). The malignant neoplasms consisted of 2 cases of angiosarcoma and 1 each of lymphoma, melanoma, and undifferentiated small round blue cell malignant neoplasm. Females were more commonly affected than males (2:1). For the benign neoplasms, the mean age at presentation was 55.3 years, compared to 45.8 years for malignant neoplasms. Average tumor size was 4.2 cm. Tumors more commonly arose from the left atrium. Papillary fibroelastoma was typically seen in the elderly, whereas both cases of angiosarcoma suggested a predilection for young females in the third decade of life. In symptomatic patients, clinical and hemodynamic findings were related to the number, position, and size of tumors.

Conclusions: Myxoma was the most common benign neoplasm in all age groups. There was no correlation between clinical presentation or tumor size and the diagnosis of malignancy. The prognosis of patients with cardiac myxoma was excellent. The prognosis was very poor for patients with primary malignant cardiac tumors.

Spectral Imaging of Myocardial Cores in Left Ventricular Assist Device Recipients: Nuclear Size Correlates With Clinical Outcome
(Poster No. 68)

Valentina Robila, MD, PhD1 (vrobila@mcvh-vcu.edu); Lauren N. Huddle, MD2; Areej AlhareerI, BS2; Colleen Jackson-Cook, PhD2; Michael Idowu, MD1; Margaret Grimes, MD, Departments of 1Pathology and 2Cytogenetics, Virginia Commonwealth University, Richmond.

Context: Myocyte hypertrophy has been proposed as a predictive factor for cardiac function improvement of left ventricular assist device (LVAD) recipients, as well as outcome of cardiac transplantation. The primary aim of this study was to determine if myocyte quantifications, using spectral imaging, could allow for improvement in stratifying patient outcomes after LVAD implantation.

Design: Hematoxylin-eosin–stained slides of cardiac apical biopsies obtained at the time of LVAD placement (2000–2008) were analyzed using spectral imaging for quantification of myocyte nuclear area and staining intensity in 20 high-powered fields. Myocyte size was correlated with a poor (death within 2 months of LVAD implantation) or good (survival on LVAD for at least 2 months prior to heart transplantation) patient outcome. Patient cases were excluded from the study if they received a heart transplant within 2 months of LVAD placement, or if they died of noncardiogenic causes.

Results: Fourteen of 19 cases identified in the study met the study criteria. These patients (5 women, 14 men) ranged in age from 25 to 66 years. Myocytes were categorized as small/normal (<2500 µm²), intermediate (2500–5500 µm²), or large (>5500 µm²), with nuclear areas ranging from normal to 6-fold increased values. Patients having poor clinical outcome had significantly higher mean myocyte nuclear areas (Table, P < .05) regardless of sex or age. Nuclear staining intensities did not correlate with nuclear size or outcome.

Conclusions: Large mean nuclear areas (>5500 µm²) correlated with an unfavorable clinical outcome following LVAD implantation. Spectral imaging is useful for the quantification of myocyte nuclear area.

Cardiac Inflammatory Myofibroblastic Tumor With Pulmonary Embolic Metastases: An Autopsy Case Report
(Poster No. 69)

Xiaoyin Jiang, MD (jiang009@mc.duke.edu); Elizabeth Pavlisko, MD; Christine M. Hulette, MD; Louis R. DiBernardo, MD. Department of Pathology, Duke University, Durham, North Carolina.

A 17-year-old African-American adolescent boy was brought in by EMS in asystole after hemoptysis at home. He had a history of cardiac inflammatory myofibroblastic tumor in the right ventricle, resected twice, with tricuspid valve replacement because of involvement by tumor. Autopsy demonstrated cardiomegaly and a right atrium involved by ex crescences with overlying thrombus, approaching the SVC opening and covering the bioprosthetic valve almost entirely. The right ventricle demonstrated fibrosis of the wall with pale discoloration. In addition to the cardiac findings, there were several masses in the bilateral lungs, the largest of which was a 2.5-cm fungating mass arising from the wall of the left main pulmonary artery (Figure 117). Histologic sections of the cardiac tumor and pulmonary masses were similar and demonstrated fibrous tissue with an extensive mixed inflammatory infiltrate. Some areas demonstrated hyalinized fibrous tissue with small staghorn vessels, whereas others displayed greater cellularity with prominent vascularity, whorled fibrous tissue, and proliferation of fibroblasts and myofibroblasts. The myofibroblasts exhibited enlarged nuclei with occasional prominent nucleoli. Mitoses were inconspicuous. The histology was identical to previous resection specimens. Cardiac inflammatory myofibroblastic tumor is a rare entity, with fewer than 40 cases reported. No cases with documented metastasis have been identified, though one
Myxomas are the most common primary tumor of the heart. Most occur in the atria and on the left side, and when multiple, are usually in association with Carney syndrome. Myxomas are thought to possibly arise from multipotent primitive mesenchymal cells, and some suggest this may be evidenced by the extramedullary hematopoiesis (EMH) and ossification seen in some cases. We report a patient with multiple cardiac myxomas with extensive ossification and EMH. A 27-year-old man with a history of skin lesions presented with stroke. Magnetic resonance imaging scans showed 4 masses in the heart involving the left and right ventricles and right atrium. The masses were mobile with features of embolic potential. The patient underwent surgery for excision of these masses, which were submitted to pathology. Received were multiple masses sectioned to reveal a solid-cystic, gelatinous, calcified cut surface. Hematoxylin-eosin–stained sections showed spindled to stellate myxoma cells with indistinct borders surrounding vascular channels in myxoid stroma. Large areas of ossification and EMH were present, and thrombi were noted. The origin of myxomas is still uncertain. EMH and ossification occurs in 7% and 8% of myxomas, respectively, and these findings may support a primitive mesenchymal cell origin. Immunohistochemical and ultrastructural studies have shown endothelial and neural/neuroendocrine differentiation. Genetic studies have shown mutations on chromosome 2 and 17, but inconsistencies exist between the genetic abnormalities seen in hereditary and sporadic myxomas. More comparative studies are necessary to elucidate the true origin of both hereditary and sporadic myxomas.

An Unusual Cause of Culture-Negative Endocarditis in a 63-Year-Old Woman: Tropheryma whipplei

(Poster No. 72)

Tobi Quinto, MD, MPH1 (tobiquito@gmail.com); Erin J. Morris, MD2; Robert N. Salomon, MD1; Golrokh Javid, MD1; Brett A. Leav, MD2; Basem Alraddadi, MD2; Borzoo Nikpour, MD, PhD2; Erica Brooks, MD2; Duc T. Pham, MD3; Departments of 1Pathology & Laboratory Medicine, 2Geographic Medicine, 3Division of Cardiology and 4Division of Cardiothoracic Surgery, Tufts Medical Center, Boston, Massachusetts.

Tropheryma whipplei endocarditis is a rare finding associated with a male predominance, and absence of usual symptoms of Whipple disease, such as arthralgias, weight loss, diarrhea, and abdominal pain. Tricuspid involvement is even rarer. We report a case of a symptomatic, blood culture–negative T whipplei endocarditis involving the aortic and tricuspid valves in a 63-year-old woman. The patient presented with a myocardial infarction complicated by cardiogenic shock and complete heart block, followed by successful stenting of the left anterior descending coronary artery. Transesophageal echocardiography revealed severe aortic and tricuspid regurgitation, a mobile mass on the aortic valve, and a vegetation on the tricuspid leaflet. Subsequent valve replacement surgery demonstrated large vegetations on the left and right aortic valve cusps, and the septal and anterior leaflets of the tricuspid valves. Steiner, silver, and periodic acid–Schiff stains showed slender bacilli within thrombi associated with both valves (Figure 118). Polymerase chain reaction–based study of aortic valve tissue was positive for T whipplei. The patient’s postoperative course was uncomplicated. Of about 10 reports of T whipplei endocarditis involving either the tricuspid valve alone or with other valves, only 1 reports tricuspid and aortic valve involvement in a symptomatic 51-year-old man. To our knowledge, this
T whipplei

Fecal hemoglobin (Hb) or occult blood test is often a manual

For a rack of 10 samples, all results were obtained within

We evaluated the performance of the new automated

(324 consecutive samples. OC-Diana is able to detect as little as 20 ng Hb/

Chemical, Japan), with a loading capacity of 100 test samples, against our

immunoturbidimetric assay against human Hb, OC-Sensor Diana (Eiken

colorectal cancer.

and medications. Although fecal immunochemical testing for Hb has

Qualitative procedure, subject to observer variation and affected by diet

and symptoms, this distinguishes adenomatoid tumor from mesothelioma.

Awareness of this entity can prevent misdiagnosing the lesion as a

vascular lesion, a metastatic adenocarcinoma, or most importantly

malignant mesothelioma invading the myocardium.

Primary Rhabdomyosarcoma of the Heart as a Cause of

Recurrent Syncope in Adults

(Washed).

Automated Quantitation of Fecal Hemoglobin

(Poster No. 77)

TarChoon Aw, MD (tarchoon@gmail.com); Victor Ng, MD; Rosie Ng, BS; Soon-Kieng Phua, BS; Show-Pin Tan, MS; Wee-Teng Poh, MD. Department of Laboratory Medicine, Changi General Hospital, Singapore.

Context: Fecal hemoglobin (Hb) or occult blood test is often a manual

qualitative procedure, subject to observer variation and affected by diet

and medications. Although fecal immunochronometric testing for Hb has

improved specificity, lack of automation limits large-scale screening for

colorectal cancer.

Design: We evaluated the performance of the new automated

immunoturbidimetric assay against human Hb, OC-Sensor Diana (Eiken

Chemical, Japan), with a loading capacity of 100 test samples, against our

current manual visual immunochronometric test, OC-Light (Eiken), or

324 consecutive samples. OC-Diana is able to detect as little as 20 ng Hb/ mL of buffer; OC-Light reports any value >50 ng Hb/mL of buffer as positive.

Results: For a rack of 10 samples, all results were obtained within

12 minutes with the first result available after 9 minutes. The day-day

assay precision (CV) was 2.1% to 3.6% at concentrations from 44 to

636 ng/mL and 6.4% at 22 ng/mL. This method fared well in the College of

American Pathologists external quality assurance survey for 2010. Of

the 261 samples reported as negative by OC-Light, 5 had fecal Hb values

is the first report in a woman of infection of both tricuspid and aortic

valves by T whipplei. Our case is the second report of infection limited to

the tricuspid and aortic valves.

Takayasu Aortitis Causing Fatal Hemopericardium

(Poster No. 73)

Vishnu Ganta, MD1 (vganta@forumhealth.org); Kevin Schetz, MD2; Richard N. Mitchell, MD, PhD. 1Department of Pathology, Western Reserve Care System, Youngstown, Ohio; 2Department of Pathology, Brigham and Women’s Hospital, Boston, Massachusetts.

Takayasu disease is one of the main causes of noninfectious aortitis.

Aortic dissection leading to death as the initial and only manifestation is exceedingly rare, and in the absence of overt perforation, it would be exceptional. The decedent was a 20-year-old white woman with an

unremarkable medical history whose complaints included abdominal pain, fever, and headaches within 1 week of death. She suddenly collapsed at work as witnessed by colleagues and was taken to the
dospital. Distal pulses could not be auscultated or palpated and she went into cardiac arrest before a complete diagnostic evaluation could be done. She died barely 1 hour after arrival. Autopsy revealed an intimal

“tree-barking” (ie, wrinkled) appearance of the proximal aorta (Figure 119). No overt perforation or dilation of the lumen was grossly

discernable. The pericardial sac contained approximately 450 mL of blood. Microscopically, a focal, near total necrosis of the medial layer with mixed inflammatory cell infiltrates, severe destruction of the elastic laminae, dystrophic calcifications, and thinning of the aortic wall with

focal giant cell formation was present. Although no complete tear was identified, rare exceptions have been described in aortic dissection in which no entry or exit has been found. Given the histologic findings, the
diagnosis of a medial dissection of the aorta that ultimately ruptured into the pericardial sac is supported. Only 2 cases of Takayasu aortitis where the initial manifestation was aortic dissection causing immediate death
have been reported. Neither example had an undetectable macroscopic dissection as in this case.

Early Histopathologic Changes in an Aortic Homograft

(Poster No. 74)

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Cadaveric homografts are increasingly used as an alternative to

synthetic or xenograft prosthetics in the repair of congenital or acquired

aortic valvular defects. Over the course of years, homografts are known
to dilate, form pseudoaneurysms, and calcify, oftentimes necessitating

aortic valvular defects. Over the course of years, homografts are known
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aortic valvular defects. Over the course of years, homografts are known
to dilate, form pseudoaneurysms, and calcify, oftentimes necessitating
> 50 ng/mL on the OC-Diana whereas 12 of 63 OC-Light positive samples had fecal Hb < 50 ng/mL on the OC-Diana.

Conclusions: The higher sensitivity and specificity of the OC-Sensor Diana along with automation makes it an ideal tool for large-scale screening for colorectal cancer.

Change of Serum High Mobility Group Box 1 Level After Surgery and Its Significance
(Poster No. 78)
Guoqian Chen, MD, PhD (guoqian@yahoo.com). Medical Laboratory, Wuxi People’s Hospital, Wuxi, China.

Context: Extracellular high mobility group box 1 (HMGB1) was recently known as an important late proinflammatory mediator, which plays a very important role in the pathogenesis of sepsis, arthritis, pneumonia, and acute pancreatitis. This study was conducted to investigate the change of serum HMGB1 level after surgery and its clinical significance.

Design: Serum HMGB1 levels were determined in 28 healthy individuals and 43 patients with surgery by enzyme-linked immunosorbent assay. The correlation between serum HMGB1 level and serum C-reactive protein level or white blood cell count was analyzed.

Results: Serum HMGB1 level was significantly elevated in patients within 48 hours after surgery and then decreased in the patients with good prognosis. But the level was further increased in the patients with complications of sepsis or acute pneumonia. The level was positively correlated with serum C-reactive protein level or white blood cell count (P < .01).

Conclusions: Serum HMGB1 level was elevated in patients after surgery. The determination of serum HMGB1 is significant to judge the prognosis after surgery.

Detection of Hepatitis B Virus PreS1 Antigen Using a Time-Resolved Fluoroimmunoassay
(Poster No. 79)
Zhigang Hu, MD; Guoqian Chen, MD, PhD (guoqian@yahoo.com). Medical Laboratory, Wuxi People’s Hospital, Wuxi, China.

Context: The hepatitis B virus (HBV) PreS1 antigen is expressed at the distal-most region of the envelope protein and contains the hepatocyte receptor-binding site. The presence of HBV PreS1 antigen in serum and liver of HBsAg-positive patients is a new marker used for diagnosing HBV infection, and is indicative of viral replication. Our objective is to establish a method of time-resolved fluoroimmunoassay (TRFIA) with higher sensitivity and broader detection range for detecting serum HBV PreS1 antigen.

Design: Eu+ labeling of antibodies was performed with respective labeling kits, and Eu+ fluorescence intensity was measured with auto DELFIA1235 TRFIA analyzer. The established method was evaluated for its performance. Five hundred seventy-four serum specimens from Wuxi People’s Hospital were analyzed for PreS1 antigen using the TRFIA and enzyme-linked immunosorbent assay (ELISA).

Results: The precision, specificity, and sensitivity of the TRFIA were clearly better than ELISA. The detection limit was 0.01 ng/mL. The average recovery rate for PreS1 antigen results obtained by TRFIA and ELISA in 374 serum samples with HBV > 10^5 IU/mL (y = 25.04, P < .01) and 183 HBsAg-positive serum samples (y = 12.07, P < .01). Normal reference ranges were established at 0 to 0.32 ng/mL based on the values obtained from 100 healthy controls.

Conclusions: TRFIA is a significantly effective method for clinical detection of serum HBV PreS1 antigen.

Determination of HMGB1 in Ascitic Fluids and Its Clinical Significance
(Poster No. 80)
Guoqian Chen, MD, PhD (guoqian@yahoo.com); Tingting Wang, MD. Medical Laboratory, Wuxi People’s Hospital, Wuxi, China.

Context: Extracellular high mobility group box 1 (HMGB1) was recently known as an important late proinflammatory mediator, which plays a very important role in the pathogenesis of sepsis, arthritis, pneumonia, and acute pancreatitis. This study was conducted to investigate HMGB1 level in ascitic fluids and its clinical significance.

Design: HMGB1 level in 74 ascitic fluids (22 transudates, 23 infectious exudates, and 29 malignant exudates) was determined by enzyme-linked immunosorbent assay (ELISA), and was statistically analyzed for its correlativity with white cell count.

Results: Compared to transudates, the average level of HMGB1 was significantly higher in exudates (P < .01). The rate of HMGB1/total protein in infectious exudates was higher than in malignant exudates (P < .01). The sensitivity and specificity of HMGB1 level in ascitic fluids were about 90% and 80% for exudate differentiation, respectively. There was a significant positive correlation between HMGB1 level and white cell count in exudates (R = 0.522, P < .01).

Conclusions: Determination of HMGB1 in ascitic fluids has potential clinical significance to the differentiation of ascitic fluid types.

Tumor-Associated Macrophages Suffocate NKT Cells: A Novel Tumor Escape Mechanism and a Target for Therapy
(Poster No. 81)
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Context: Natural killer T cells (NKTs) are important for immunotherapy. Tumor progression requires an escape from NKTs via an unknown mechanism. We observed that NKTs colocalize with tumor-associated macrophages (TAMs) in hypoxic primary neuroblastoma (NB) tissues, leading us to hypothesize that TAMs actively chemotactic NKTs inside the tumor.

Design: We used a multiplex quantitative reverse transcription-polymerase chain reaction (qRT-PCR) to analyze expression of proinflammatory genes in primary human monocytes upon coculture with human NB cells in normoxic and hypoxic conditions and immunophenotyping analysis of cell population in tumor microenvironment in vivo.

Results: Coculture of monocytes with NB cells in normoxia resulted in a cell contact-dependent upregulation of chemokine (C-C motif) ligand 20 (CCL20) in monocytes and the effect was amplified up to 70-fold in hypoxia. The ability of NB cells to induce CCL20 in monocytes correlated with the expression of membrane-bound TNFα on NB cell surface, whereas pretreatment of NB cells with an anti-mbTNFα blocking antibody inhibited CCL20 induction in monocytes in both normoxic and hypoxic conditions. An anti-CCL20 neutralizing antibody in turn strongly inhibited NKT cell in vitro migration toward tumor-conditioned hypoxic monocytes. The immunofluorescent staining of primary NB specimens revealed selective CCL20 accumulation in TAMs. We also found that hypoxia impairs NKT-cell proliferation and cytokine production in response to TCR stimulation, suggesting that NKT-cell trafficking toward CCL20-producing TAMs may serve as a hypoxic trap for tumor-infiltrating NKTs and other T cells.

Conclusions: CCL20 production in hypoxic TAMs and consequent inhibition of NKT-cell function reveals a novel mechanism of tumor immune escape and a target for therapy.

Flow Cytometric Analysis of Bronchoalveolar Lavage Fluid for Evaluation of CD103: A Promising Tool for the Diagnosis of Nonfibrotic Pulmonary Sarcoidosis
(Poster No. 82)
Sonia Brar, MD, MPH1 (drsoniabrar@gmail.com); Christopher Rema- kus, MD1; Julia Miller, MD2; Edward Santelli, MD3; Jagmohan Sidhu, MD3. Departments of 1Internal Medicine, 2Radiology and 3Pathology and Laboratory Medicine, United Health Services Hospitals, Johnson City, New York.

Context: Bronchoalveolar lavage fluid (BALF, CD103+CD4+ to CD4+ ratio < [0.2]), alveolar absolute CD4+ lymphocytosis in BALF (CD4+ to CD8+ ratio > [3]), and alveolar relative CD4+ lymphocytosis in BALF (ratio of BALF CD4+ to CD8+ peripheral blood CD4+ to CD8+) > [2]) are used as a tool for discriminating pulmonary sarcoidosis from other interstitial lung diseases. Elevated CD103+CD4+ to CD8+ count in BALF is seen in nonfibrotic sarcoidosis. We investigated the role of these flow cytometric analysis (FCA) ratios in the diagnosis of pulmonary sarcoidosis at various radiologic stages.

Design: FCA ratios in 11 cases of suspected pulmonary sarcoidosis were correlated with clinicopathological and histologic diagnosis. FCA of BALF along with peripheral blood (when available) used CD45/CD3/ CD19/CD4/CD8/CD103 antibody panel in all cases.

Results: Two of 5 confirmed cases met all FCA criteria with the lowest CD103 ratio (0.05% and 0.06%). Four of 5 confirmed cases had CD103 ratio of < 0.2. No FCA criteria were met in 1 confirmed fibrotic (stage IV) case and in 3 unconfirmed cases. One unconfirmed case with only 1% BALF lymphocytes met only CD103 criterion. One unconfirmed case had both absolute and relative alveolar CD4+ lymphocytosis, but did not have < 0.2 BALF CD103 ratio (Table).
Conclusions: BALF CD103+CD4+ to CD4+ ratio of <0.2 is a reliable criterion for the diagnosis of sarcoidosis only in nonfibrotic (non-stage IV) sarcoidosis and only if there is significant alveolar lymphocytosis. Alveolar absolute and relative CD4+ lymphocytosis can be seen in other interstitial lung diseases. As our study includes only a small number of cases, a larger study is needed to confirm our conclusions.

Discrepancy Between Double-Stranded DNA Measurements in Patients With Systemic Lupus Erythematosus

Hashem Ayyad, MD (Hayyad1@hfhs.org); John Carey, MD; John Zajechowski, BS, MT(ASCP); Carolyn Feldkamp, PhD; Veronica Luzzi, PhD. Department of Pathology and Laboratory Medicine, Henry Ford Hospital, Detroit, Michigan.

Context: The prognosis and diagnosis of systemic lupus erythematosus depends on clinical findings and the presence and levels of various antinuclear antibodies, including anti-double-stranded DNA. We compared 2 different methods to anti-double-stranded DNA antibodies.

Design: Twenty consecutive patient samples (19 women, 1 man, age range 21–68) were tested by the *Crithidia luciliae* immunofluorescence (Bio-Rad, Hercules, California), and by fluoroenzyme immunoassay (Phadia Elisa, GmbH, Freidburg, Germany). Results of the *C. luciliae* assay interpretation method are reported as a titer with 1:10 dilution as a cut off for positive, whereas results for fluoroenzyme immunoassay are reported as negative (<10 IU/mL), positive (>15 IU/mL), or equivocal (10–15 IU/mL). Clinical history and anti-nuclear antibody for each patient were reviewed for signs and symptoms of systemic lupus erythematosus, paying particular attention to the occurrence of flares and the presence or absence of progressive renal disease. Results were tabulated and analyzed using Microsoft Excel (Microsoft Corporation, Seattle, Washington).

Results: Eighteen out of 20 patients had clinical signs and symptoms of systemic lupus erythematosus. All patients tested positive for anti-dsDNA using *C. luciliae* immunofluorescence with titers ranging from 1:20 to >1:640; however, only 7 samples were positive by the fluoro-enzyme-immunoassay method. No differences in clinical correlation with C3 complement levels were seen between the 2 assays.

Conclusions: *C. luciliae* immunofluorescence assay had better correlation with SLE diagnosis than the fluoro-enzyme immunoassay method. The latter would not appear to be applicable for diagnostic screening for systemic lupus erythematosus.

Metastatic Carcinoma Ex Pleomorphic Adenoma of the Parotid Gland to the Thyroid

(Moster No. 84)

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Carcinoma ex pleomorphic adenoma (CXPA) is rare. The age range at presentation is 6 to 92 years, with median age being in the sixth decade of life. CXPA is clinically difficult to distinguish from a pleomorphic adenoma (PA). Most patients with CXPA present with a slow-growing lump in the parotid region. Facial nerve weakness or paralysis, cheek numbness, or pain usually occurs when the tumor has progressed. Diagnosis of CXPA is achieved by fine-needle aspiration (FNA). This case is presented to show the potential utility of FNA precedent to radiologic examination. A 57-year-old man had a slow-growing left parotid mass for 1 year, without any other associated symptom. FNA of the mass showed cells suspicious for cancer. The patient underwent left total parotidectomy, facial nerve dissection, and radiotherapy. The tumor was shown to be a CXPA. One year and 5 months later, after complaints of dysphagia and left-sided odynophagia, a positron emission tomography showed increased fluorodeoxyglucose uptake in the thyroid gland and in the left axilla, both of which had palpable masses. Thyroid FNA revealed carcinoma. Total thyroidectomy and auxiliary lymphadenectomy was performed. This first reported metastasis to the thyroid lends support to the notion that the first diagnostic test that should be performed upon palpation of a mass after resection of a salivary gland cancer is fine-needle aspiration (Figure 120).

Follicular Thyroid Carcinoma Presenting Initially as Pelvic Soft Tissue Metastasis Involving the Bone: Case Report and Literature Review

(Noster No. 85)

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Follicular thyroid carcinoma (FTC) is the second most common cancer of the thyroid after papillary carcinoma. Distant metastases have been reported to occur in 11% to 25% of cases, and usually involve bone, lung, brain, or liver through hematogenous spread. Initial presentation with distant metastasis is an uncommon event. A limited literature search on PubMed with terms “follicular thyroid carcinoma,” “initial presentation,” “metastasis,” and “soft tissue” was performed, which revealed only 2 cases with initial presentation as soft tissue and bone involvement. We report a rare and interesting case of an otherwise asymptomatic 51-year-old woman with initial presentation of a left pelvic soft tissue mass with ischiium and acetabulum involvement (Figure 121, A). A computed tomography–guided core needle biopsy and imprint cytology of the pelvic mass revealed metastatic FTC (Figure 121, B & D). The patient had clinical history of total thyroidectomy 4 years prior at an outside institution, which was interpreted at the time as “benign nodules.” Ultrasound of the thyroid area revealed multiple nodules within the right thyroid bed, which on resection revealed FTC with lymphovascular invasion. Subsequent left hemipelvectomy for metastatic FTC (Figure 121, C) revealed a 13-cm mass involving soft tissue, ischiium, and acetabulum with 1 positive pelvic lymph node. Patient is currently receiving ablative treatment with radiiodine I-131. Herein, we describe...
A Rare Case of Anaplastic Thyroid Carcinoma Metastasis With a Well-Differentiated Papillary Carcinoma: Case Report and Literature Review

(Poster No. 86)

Jingyang Feng, MD (jingyang_feng@yahoo.com); Gloria K. Hutchinson, MD. Department of Pathology, Baptist Health System, Birmingham, Alabama.

Anaplastic thyroid carcinoma (ATC), which represents less than 2% of all thyroid cancers, is one of the most lethal human malignant tumors. Papillary thyroid carcinoma is a differentiated form of thyroid carcinoma. Metastasis of papillary thyroid carcinoma is mainly to regional lymph nodes and, less frequently, to the lung. We report a rare case of ATC containing a papillary component with metastases to the lung containing only the papillary component. The patient was a 59-year-old woman who was found on physical examination to have multiple thyroid nodules. Computed tomography revealed mediastinal lymph node enlargement and numerous pulmonary masses. During surgery, the thyroid gland was noted to be densely adherent to surrounding structures and extended to the substernal area. Microscopically, the tumor was composed predominantly of spindle and multinucleated giant cells, which showed a sarcoma-like appearance. Among these cells, there were scattered papillary carcinoma components. A biopsy from the pulmonary mass demonstrated a metastatic papillary carcinoma without the anaplastic component. The neoplastic cells expressed thyroglobulin and TTF-1, consistent with a pancreatic intraepithelial neoplasia grade 2A. Nesidioblastosis is an uncommon cause of hyperinsulinemic hypoglycemia in adults and has been described in the literature in only a small series of patients. Nevertheless, no articles have been found in the literature describing nesidioblastosis in association with pancreatic intraepithelial neoplasia.

Characterization of Dysplastic Foci in Chronic Lymphocytic Thyroiditis

(Poster No. 88)

Michael Herman Chui, MD (michaelherman.chui@utoronto.ca); Ozgur Mete, MD; Clarissa Cassol, MD; Sylvia L. Asa, MD, PhD. Department of Pathology, University Health Network, Toronto, Ontario, Canada.

Context: The follicular epithelium in chronic lymphocytic thyroiditis (CLT) is often atypical, with nuclear features resembling papillary thyroid carcinoma (PTC). There is considerable debate as to whether these cells are premalignant, and previous studies have been equivocal. In this study, we performed immunophenotypic and molecular studies on lesions in CLT classified as normal, hyperplastic, reactive, dysplastic, and malignant based on a redefined morphologic criteria.

Design: A tissue microarray was constructed from 70 cases diagnosed as PTC with background CLT. For each case, representative cores were taken in triplicate, where applicable, from areas of normal epithelium with bland nuclei, nodular hyperplasia, reactive atypia in follicular cells maintaining normal architecture, PTC, and dysplasia. The term dysplasia was reserved for foci of atypical cells with complex architecture distinct from the surrounding parenchyma. Immunostains for HBME-1, galectin-3, cyclin-D1, p63, thyroglobulin, and TFF-1 were analyzed using automated image analysis software (Spectrum Plus, Aperio, Vista, California). Representative samples of dysplasia were microdissected using laser-capture microdissection and sequenced for mutations in BRAF.

<table>
<thead>
<tr>
<th>Immunoprofile of CLT Lesions</th>
<th>HBME-1 Positive, Cases/Total Cases (%)</th>
<th>Galectin-3 Positive, Cases/Total Cases (%)</th>
<th>Cyclin-D1 Positive, Cases/Total Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0/36 (0)</td>
<td>0/36 (0)</td>
<td>7/36 (19)</td>
</tr>
<tr>
<td>Nodular hyperplasia</td>
<td>9/67 (13)</td>
<td>9/67 (0)</td>
<td>45/67 (67)</td>
</tr>
<tr>
<td>Reactive atypia</td>
<td>3/70 (4)</td>
<td>0/70 (0)</td>
<td>28/70 (40)</td>
</tr>
<tr>
<td>PTC</td>
<td>43/103 (81)</td>
<td>45/103 (44)</td>
<td>95/103 (92)</td>
</tr>
<tr>
<td>Dysplasia</td>
<td>43/53 (81)</td>
<td>20/53 (38)</td>
<td>38/50 (76)</td>
</tr>
</tbody>
</table>

Abbreviations: CLT, chronic lymphocytic thyroiditis; PTC, papillary thyroid carcinoma.

Results: Ten of 63 lesions initially classified as dysplasia were found to be solid cell nests, based on diffuse p63 positivity and negative staining for thyroglobulin and TFF-1, and thus excluded from further analyses. Similar to PTC, a significant subset of dysplastic lesions were positive for HBME-1, galectin-3, and cyclin-D1 (Table). The BRAFV600E mutation was detected in 2 of 7 dysplastic areas.

Conclusions: Our data identify proteomic and genetic changes reflecting a spectrum of morphologic alterations in CLT and define a novel category of “dysplasia” intermediate between reactive atypia and PTC in thyroid.

Postmenopausal Hypertestosteronemia Secondary to Struma Ovarii With Leydig Cell Hyperplasia

(Poster No. 89)

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was an insulinoma. A distal partial pancreatectomy was then performed. The pathologic macroscopic examination revealed a homogeneously lobulated pancreatic tissue without evidence of a mass. The microscopic examination revealed irregular islets of Langerhans with variation in shape and size, ductuloinvasive complexes, sepal islets, and an increase in endocrine cell aggregates randomly distributed throughout the pancreatic tissue (nesidioblastasia). These findings confirmed the diagnosis of nesidioblastosis. Furthermore, atypical proliferative changes were present within the ductal epithelium, including mucinous metaplasia with slight nuclear stratification at the basal aspect of the epithelium, consistent with a pancreatic intraepithelial neoplasia grade 1B. Nesidioblastosis is an uncommon cause of hyperinsulinemic hypoglycemia in adults and has been described in the literature in only a small series of patients. Nevertheless, no articles have been found in the literature describing nesidioblastosis in association with pancreatic intraepithelial neoplasia.
Benign teratomas occur in patients of all ages. Most are found in women between 20 and 50 years of age; only about 20% are detected in postmenopausal women. Struma ovarii (SO) is a teratoma in which the thyroid tissue predominates and comprises 1% to 3% of benign ovarian teratoma. More than 50% of the tumor should consist of thyroid tissue before it is designated as SO. Symptoms of hyperthyroidism occur in less than 10% of patients with SO. However, SO is rarely associated with androgen production or clinical symptoms of virilization. We present a case of postmenopausal virilization with markedly increased serum testosterone level caused by SO with Leydig cell hyperplasia. A 74-year-old postmenopausal woman presented with a long history of hair loss. Serum testosterone level was markedly elevated; serum level of dehydroepiandrosterone (DHEA) was within normal range. Pelvic and abdominal computerized tomography scan demonstrated a 3.5-cm locally calcified right adrenal mass as well as a 1.4-cm left adrenal mass. The patient underwent total hysterectomy with bilateral salpingo-oophorectomy. The right ovarian complex mass was diagnosed histologically as SO with Leydig cell hyperplasia. Notably, serum testosterone level rapidly returned to the normal range shortly after the surgery. Three major sources of androgen production in postmenopausal women are described in the literature: the ovaries, adrenal glands, and the peripheral tissue. In our case, normal preoperative DHEA level and postoperative normalization of testosterone level confirmed the ovarian origin of hyperandrogenism.

Hemosiderin Deposition in Parathyroid Hyperplasia and Neoplasia

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Context: We have observed hemosiderin deposition episodically in abnormal parathyroid tissue but virtually never in normal parathyroid tissue. Therefore, this study was undertaken to determine the consistency or otherwise of this finding, and whether it could be of value in the microscopic distinction between parathyroid hyperplasia and parathyroid adenoma.

Design: Seventy-nine random parathyroid specimens were collected retrospectively for analysis. Hematoxylin-eosin and Prussian blue-stained sections were done on each case to detect iron deposits in the form of hemosiderin. Four-micrometer-thick formalin-fixed, paraffin-embedded tissue sections were used for analysis.

Results: Parathyroid adenomas were found to have the highest incidence of hemosiderin deposits (Figure 122), followed by parathyroid hyperplasias. Only 1 normal parathyroid tissue specimen demonstrated hemosiderin deposition (Table).

<table>
<thead>
<tr>
<th>Incidence of Hemosiderin Deposits</th>
<th>Total</th>
<th>With Hemosiderin</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parathyroid adenoma</td>
<td>14</td>
<td>8</td>
<td>57.1</td>
</tr>
<tr>
<td>Parathyroid hyperplasia</td>
<td>42</td>
<td>12</td>
<td>28.6</td>
</tr>
<tr>
<td>Normal parathyroid</td>
<td>23</td>
<td>1</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Conclusions: The histologic criteria for abnormal parathyroid glands include an increase in the ratio of parenchymal cells to stromal fat as well as a decrease in intracellular fat. A diffuse growth pattern and the presence of a rim of normal parathyroid tissue favor the diagnosis of an adenoma over hyperplasia. However, parathyroid hyperplasia and adenomas are frequently histologically indistinguishable. In the series of cases examined, we have shown that hemosiderin may be helpful in distinguishing between normal and abnormal parathyroid tissue, but is less useful in distinguishing adenoma from hyperplasia.

Blood Culture Turnaround Times With On-Site Incubation Versus Central Laboratory Incubation

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Context: Two medium-size community hospitals in an integrated health care system have similar scopes of clinical services and are equidistant from a central laboratory. Both use the central laboratory for organism identification and susceptibility testing, but hospital A follows an “on-site incubation” protocol, incubating inoculated vials to the central laboratory for incubation, whereas hospital B follows an “on-site incubation” protocol, incubating inoculated vials in hospital B and sending only those with growth detected to the central laboratory for identification and susceptibility testing.

Results: Blood culture records from 2010 were extracted from the data warehouse. Turnaround times from specimen collection to detection of growth and to finalization of susceptibility testing were calculated. Mean turnaround times were compared using the 2-tailed t test, and cumulative frequency distributions were compared using the 2-tailed Mann-Whitney-Wilcoxon test.

Candida glabrata Endophthalmitis Following Corneal Transplant

(Jason D. Pimentel, MD (jpiment1@hfhs.org); Linoj P. Samuel, PhD; Robert J. Tibbetts, PhD. Department of Pathology and Laboratory Medicine, Henry Ford Hospital, Detroit, Michigan.)


<table>
<thead>
<tr>
<th><strong>Candida glabrata Susceptibilities</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agent (Sensititre YeastOne, TREK Diagnostic Systems, Cleveland, Ohio)</strong></td>
</tr>
<tr>
<td>Voriconazole</td>
</tr>
<tr>
<td>Itraconazole</td>
</tr>
<tr>
<td>Fluconazole</td>
</tr>
<tr>
<td>Amphotericin B</td>
</tr>
<tr>
<td>Anidulafungin</td>
</tr>
<tr>
<td>Micafungin</td>
</tr>
<tr>
<td>Caspofungin</td>
</tr>
<tr>
<td>5-Fluorocytosine</td>
</tr>
<tr>
<td>Posaconazole</td>
</tr>
</tbody>
</table>

When an 86-year-old man received a third corneal transplant, the donor corneal rim was culture positive for Group B streptococcus and Candida glabrata (Table). Two hundred nine days postprocedure the patient presented with deteriorating vision. At pars plana vitrectomy, plaquelike lesions removed from the lens were culture positive for C glabrata. During the next 6 months the patient had continued poor vision despite intravitreous amphotericin B. Corneal tissue removed during a fourth corneal transplant was also positive for C glabrata. Visual acuity at latest follow-up was only light perception. C glabrata is an uncommon cause of endophthalmitis after corneal transplant, with 14 cases reported during the past 32 years. In 10 of 11 cases, cultures of the donor rim or culture media grew C glabrata. Two patients received prophylactic antifungal therapy after positive rim cultures, but fungal endophthalmitis developed in both. Outcomes were generally favorable in 8 of 10 cases where visual acuity was reported. The longest previous time to presentation was 146 days. There has been controversy over the practice of routine donor rim culture after transplant. However, a meta-analysis of more than 17 000 cases showed the incidence of infection following positive rim cultures was low, but significant. Moreover, the incidence of fungal infection has risen, whereas the incidence of bacterial infection has fallen. This case of post–corneal transplant fungal endophthalmitis is unique because of the pathogen, the prolonged onset, and the poor visual acuity outcome. However, even with positive donor rim cultures, it remains uncertain whether prophylactic antifungals would have altered the outcome.

**Insidious, Largely Undetected, Fatal Clostridium perfringens Sepsis Resulting in Unbridled Vascular Hemolysis and Concepts Regarding Pathogenesis** (Poster No. 93)

**Steve Xie, MD, PhD**<sup>1</sup> (suq.xie@gmail.com); Alex Braun, MD<sup>1</sup>; Edward Bottone, PhD<sup>2</sup>; Department of Pathology, Westchester Medical Center, Valhalla, New York; Department of Medicine, Division of Infectious Disease, Mount Sinai School of Medicine, New York, New York.

Clostridium perfringens, a nonmotile, encapsulated, anaerobic, spore-forming bacillus, is notorious for its involvement in severe human infections such as myonecrosis and its role in α-toxin–induced massive intravascular hemolysis resulting in most cases in a fatal outcome. Herein we document a case of C perfringens intravascular hemolysis in a 66-year-old diabetic woman who succumbed within 7 hours after admission. She presented to the emergency department with intense severe pain all over her body, particularly over the chest and abdomen. Attempts to collect blood for laboratory studies failed because of massive hemolysis. The postmortem findings include remarkable widespread coagulation of soft tissue and muscles, and intraperitoneal gas. The myocardium was soft and flabby and speckled with numerous small gas-filled cysts (Figure 124, A). The gastrointestinal tract was distended. The contents of the small and subcapsular gas-filled cysts were visible. Microscopic review of Gram-stained histologic sections showed the presence of numerous gram-positive encapsulated bacilli within blood and parenchyma of various organs, and bone marrow. Review of her peripheral blood smear showed occasionally intragranulocyte bacilli morphologically compatible with C perfringens (Figure 124, B). Thrombocytopenic blood cultures grew C perfringens. We consider that in our patient the numerous air-filled cysts abounding in multiple organs may not be entirely attributed to postmortem invasion but served as focal points for C perfringens multiplication and passage of the in situ–synthesized toxins inclusive of α toxin into the vascular system with ensuing massive hemolysis.

**Evaluation of Real-Time Polymerase Chain Reaction Assay for the Qualitative Measurement of Clostridium Difficile Toxin B** (Poster No. 94)

**Rita H. Khoury, MD** (ekhoury@aculabs.com); B. P. Salmon, MS; Asha Gandhi, B5; Priyal K. Patel, BA; Peter Gudaitis, BA; Dauna Gudaitis, PhD, Laboratory, Aculabs, Inc., East Brunswick, New Jersey.

**Context:** Clostridium difficile (C. Diff) is a gram-positive anaerobe producing enterotoxin and cytotoxin (toxin A and B, respectively), toxin B, seemingly, essential for the virulence of C. Diff. It is responsible for 15% to 25% of antibiotic-associated diarrhea and 95% to 100% of antibiotic-associated pseudomembranous colitis, and it is one of the most widespread infections acquired in long-term care facilities. The test available for C. Diff confirmation include enzyme immunoassays, tissue culture cytotoxicity, anaerobic culture, glutamate dehydrogenase antigen, and nucleic acid amplification.

**Design:** Eighty-nine stool specimens were collected from residents in long-term care facilities with symptoms of C. Diff colitis. All samples were tested simultaneously by the same technician with Premier Toxins A and B (enzyme immunoassay) and the GeneOhm assay, real-time polymerase chain reaction that detects toxin B (TcdB) gene. Discordant samples were sent for confirmation by toxigenic culture.

**Results:** Of the patients, 57.3% were female, 26 patients were positive, and 63 negative in the Premier assay, whereas 32 were positive and 56 negative in the GeneOhm assay (Table). Ten discordant samples were sent for toxigenic culture and the results confirmed GeneOhm assay results.

**Conclusion:** The GeneOhm assay offers better sensitivity and specificity over the enzyme assay to diagnose C. Diff. In addition, it allows for early treatment and appropriate infection control. Although the initial cost is higher, if we take into consideration the cost of unnecessary repeat testing due to a lack of physician confidence in the results, and the cost of unnecessary isolation due to false positive results, the final cost will be much lower for the facilities/hospitals than enzyme immunoassay.

<table>
<thead>
<tr>
<th><strong>Premier Toxin A&amp;B</strong></th>
<th><strong>GeneOhm</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>26</td>
</tr>
<tr>
<td>Negative</td>
<td>63</td>
</tr>
<tr>
<td>True positive</td>
<td>24</td>
</tr>
<tr>
<td>True negative</td>
<td>54</td>
</tr>
<tr>
<td>Sensitivity, %</td>
<td>75</td>
</tr>
<tr>
<td>Specificity, %</td>
<td>96</td>
</tr>
<tr>
<td>Predictive value, %</td>
<td>87.1</td>
</tr>
<tr>
<td>Positive predictive value, %</td>
<td>92.3</td>
</tr>
</tbody>
</table>
Prototheca wickerhamii constitutes a category of rare infections in humans. These organisms are considered to be achlorophyllic algae and are ubiquitous in the environment. Infections are associated with both immunocompetent and immunocompromised patients. We describe a case of a 73-year-old man with a 4-month duration of progressive right leg swelling and tender nodules arising in this area. Patient had a history of right leg fracture adjacent to lesions 9 months prior to presentation and wood splinter injury while chopping firewood, but no other history of severe trauma. His past medical history was remarkable for treated non-Hodgkin lymphoma. Physical examination of the right leg showed significant soft tissue swelling. Fine-needle aspiration, needle biopsy, and culture of this area were performed. Histologically, the specimen contained numerous spherical organisms containing multiple thick-walled endospores with no evidence of budding (Figure 125). Gomori-methanamine silver and periodic acid–Schiff special stains highlighted the cell walls. The organism was cultured on blood, chocolate, and Sabouraud dextrose agar (Remel, Lenexa, Kansas). After 2 days, the organism appeared as yeastlike colonies on all media. Microscopic examination of the culture plates showed multiple spherical organisms in clusters with thick walls. The organism cultured on the agar plates was inoculated onto an API 20 C AUX strip (bioMerieux Inc, Durham, North Carolina) used to identify the most frequently encountered yeasts. Based on the results of the carbohydrate assimilation tests on this panel, the organism was identified as Prototheca wickerhamii. Treatment is expected to consist of debridement and antifungal therapy.

Detection of Cytomegalovirus in Bronchial Specimens Using Rapid Shell Vials Is Less Optimal Than Standard Tube Cultures (Poster No. 96)

Hashem Ayyad, MD (Hayyad1@fhs.org); Gerald Russell, MT(ASCP); Linoj Samuel, PhD. Department of Pathology and Laboratory Medicine, Henry Ford Hospital, Detroit, Michigan.

Context: Cytomegalovirus (CMV) respiratory infection is a common problem in practice. We compare 2 different methods for isolation of CMV from bronchial specimens, the rapid shell vial method and the standard tube culture.

Design: Two hundred nine bronchial specimens were positive for CMV in the period January 2001–February 2011. Bronchial specimens were tested using 2 methods: shell vials containing MRC5 (human fibroblast) cell line (Viromed, Menotnoka, Minnesota), stained using mouse monoclonal antibodies against CMV immediate early antigen (Diagnostic Hybrids, San Diego, California), followed by fluorescent labeled anti mouse goat antibodies, and standard tube cultures containing MRC5 human fibroblast cell line (Viromed). For samples positive in shell vials, the corresponding tube was discarded, and the specimen was reported as positive for CMV without further testing. Tube cultures corresponding to shell vials negative for CMV were kept for 21 days and observed for cytopathic effect followed by direct fluorescent antigen staining.

Results: Out of 209 samples positive for CMV, 93 samples (44.5%) were negative in shell vials with the virus isolated in a standard tube culture. Comparing polymerase chain reaction to standard tube cultures in 30 clinical specimens showed concordant results in 28 specimens.

Conclusions: In our experience, shell vials are less reliable for CMV isolation from bronchial specimens compared to standard tube cultures. We recommend that for all bronchial specimens received for CMV testing both shell vials and standard tube cultures should be conducted. Polymerase chain reaction might be a rapid and reliable alternative method to both CMV shell vials and standard tube cultures.

Aeromonas hydrophila Infection: An 11-Year Retrospective Review (Poster No. 97)

Blythe E. Bowman, MD1 (bbowman@usouthal.edu); Kalli K. Faulkner, DO2; Andrew Gracza, MD3; Elliott Carter, MD.1 Department of Pathology and College of Medicine, University of South Alabama, Mobile, Alabama.

Context: Aeromonas hydrophila is an unusual cause of human disease. Infection commonly presents as gastroenteritis but extraintestinal infections also occur. Aeromonas hydrophila wound infections are seen in injuries in aquatic environments and medical instrumentation. Risk factors for infection are immunosuppression, extremes of age, hepatobiliary disease, diabetes, and malignancy. During an 11-year period at our institution, 83 cases of infection caused by A hydrophila were identified and studied at our institution.

Design: A retrospective review of cultures yielding A hydrophila from 1996 to 2007 was conducted using an information search system. The identification of A hydrophila was confirmed using the Microscan neg urine combo panel. The age, sex, site of infection, season, and antimicrobial susceptibility patterns of the isolates were obtained from medical records.

Results: The patient population consisted of 66 males and 17 females with a median age of 38 and ranging from 3 to 86 years. The infections manifested as soft tissue infections of the extremities, blood, stool, urine, abdomen, peritoneum, and from mechanical devices. The seasonal distribution was greatest across the warmer months. The majority of antibiotic resistance seen in the isolates was against beta lactams.

Conclusions: During our institution period, 83 cases of infection caused by A hydrophila were identified. Affected patients ranged in age from childhood to adulthood with a median age of 38 years. Several of the patients had documented factors predisposing them to infection. Treatment in the majority of these cases was successful. We review these cases and the current medical literature on A hydrophila infections.

Approximately 1 in 4 Individuals Carries a Detrimental Mendelian Recessive Allele: Results from Universal Carrier Screening of Several Thousand Individuals (Poster No. 98)

Jessica L. Jacobson, MD (jessica@counsyl.com); Gabriel A. Lazarin, MS; Eric A. Evans, PhD; Balaji S. Srinivasan, PhD. Department of Laboratory Medicine, Counsyl, Redwood City, California.

Context: Many individuals unknowingly carry recessive mutations for single-gene disorders. Testing for these mutations is often based on ethnicity, despite widespread recommendations to limit the use of “racial” categories in medicine. We sought to determine the true impact of Mendelian disease by aggregating statistics on a subset of individuals who were prescribed universal carrier screening, many of whom marked “other” for their self-reported ethnicity.

Design: We analyzed data from a representative subsample of 6000 patients ordered universal carrier screening by their physicians.

Abstracts
Approximately 26% (n = 1225) of KRAS mutations may be more common in esophageal adenocarcinoma. Mutations of the KRAS gene, located in the middle to distal esophagus, and tended to be more poorly invasive adenocarcinomas. Mutation status was not associated with tumor grade or patient age. The tumors positive for mutations were located in the middle to distal esophagus, and tended to be more poorly invasive adenocarcinomas (26.3%). No mutations were identified in the 3 intramucosal adenocarcinomas. KRAS mutations were identified using a tet-inducible siRNA system. Knockdown of IRP2 significantly decreases cellular iron level and slows down breast cancer growth, in both in vitro cell culture system and in vivo mouse xenograft model. Next we studied IRP2 expression in human breast cancer. Gene expression profiles study (251 breast cancer patients) demonstrates that IRP2 is associated with tumor grades and molecular subtypes: IRP2 mRNA level is increased in high-grade cancers and molecular subtypes with poor prognosis. Furthermore, KRAS mutations may be more common in tumors with high-grade cytologic features. Such findings will be increasingly important to recognize as optimal chemotherapy, including targeted therapy, is refined for use in clinical treatment protocols for esophageal adenocarcinoma.

**The Role of Iron Regulatory Protein 2 in Breast Cancer**

**Results:** IRP2, as a central player in iron regulation, is overexpressed in breast cancer. Further, overexpression of IRP2 increases cellular iron level by regulating the expression of its target genes—ferritin H and transferrin receptor. Based on these results, we proposed that increased cellular iron by IRP2 overexpression plays a critical role in breast cancer. To test this, we knocked down IRP2 in MDA-MB-231 breast cancer cells using a tet-inducible siRNA system. Knockdown of IRP2 significantly decreases cellular iron level and slows down breast cancer growth, in both in vitro cell culture system and in vivo mouse xenograft model. Next we studied IRP2 expression in human breast cancer. Gene expression profiles study (251 breast cancer patients) demonstrates that IRP2 is associated with tumor grades and molecular subtypes: IRP2 mRNA level is increased in high-grade cancers and molecular subtypes with poor prognosis.

**Conclusions:** This study demonstrates that IRP2 plays a critical role in breast cancer progression via regulating iron.

### KRAS Mutational Status in a Series of Esophageal Adenocarcinoma Cases

**Poster No. 99**

Lauren C. Scott, MD; Joel A. Lefferts, PhD; Gregory J. Tsongalis, PhD; Ariel A. Suriaiwinita, MD. Department of Pathology, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire.

**Context:** Mutations of the KRAS oncogene have been found in a large number of human cancers, appear to play an important role in tumorigenesis, and have helped guide the clinical use of targeted chemotherapy. Thus far few studies have documented the frequency of such mutations in adenocarcinomas of the esophagus.

**Design:** We examined 22 consecutive esophageal biopsy and esophagogastrectomy specimens diagnosed as intramuscular adenocarcinoma (3) or invasive adenocarcinoma (19). KRAS mutations were identified using DNA extracted from formalin-fixed, paraffin-embedded tissue and real-time polymerase chain reaction with probes targeting 7 clinically significant mutations within codon 12 and 13 of the KRAS gene.

**Results:** KRAS mutations within codon 12 were found in 5 of 19 invasive adenocarcinomas (26.3%). No mutations were identified in the 3 intramuscular adenocarcinomas. Mutation status was not associated with tumor grade or patient age. The tumors positive for mutations were located in the middle to distal esophagus, and tended to be more poorly differentiated. One positive tumor had signet ring cell features.

**Conclusions:** KRAS mutations may be more common in esophageal adenocarcinomas than previously reported (5% in most studies).
Primary Mantle Cell Lymphoma in the Bilateral Eyes

(Poster No. 102)

Dian Feng, MD (dian.feng@osfhealthcare.org); David Laib, MD; Edward Santos, MD. Department of Pathology, Saint Anthony Medical Center, Rockford, Illinois.

We report a case of a very rare primary mantle cell lymphoma involving both eyes in an 88-year-old man. He had no previous history of malignancy or radiation therapy. He presented with bilateral blurred vision, ptosis, and ectropion for weeks. Physical examination revealed a bilateral orbital palpable mass, which enlarged rapidly, resulting in increased ptosis of both eyelids. On the date of bilateral orbitotomy with excisional biopsy of the orbital mass, his left eyelid could not be opened and the right upper eyelid opened only 4 mm. The specimens were residents in formalin. Cross examination of the specimens revealed grayish, solid, and rubbery tumor. Microscopic examination showed a diffuse monomorphic lymphoid proliferation. Small- to medium-sized lymphoid neoplastic cells had slightly irregular nuclear contours with moderately dispersed chromatin, inconspicuous nuclei, and a sparse cytoplasm. Rare mitotic figures were present. No plasma cells, eosinophils, neutrophils, or necrosis were seen. By immunohistochemical study, the tumor was strongly positive for CD20, CD5, CD43, and cyclin D1 whereas it was negative for CD3, CD10, CD30, and CD23. Ki-67 highlighted approximately 30% of the neoplastic cells. Based on the histology and immunohistochemical staining pattern, a diagnosis of mantle cell lymphoma was rendered.

Law School Techniques to Teach Pathology Residents
About the Law

(Poster No. 104)

Ken Gatter, MD, JD (gatterk@ohsu.edu). Department of Pathology, Oregon Health and Science University, Portland.

Context: Legal matters pervade pathology practice, ranging from tort and contract law, employment law, fraud and abuse law, and administrative law (Clinical Laboratory Improvement Amendments [CLIA], Medicaid, Medicare). Most pathology residency programs spend little time training residents about legal issues, in part because of residents’ lack of interest, which may stem from feeling legal issues are irrelevant or too complex.

Design: As part of the resident didactic series, 2 one-hour sessions were devoted to legal issues. Residents (12 participants) received a series of law school–style hypotheticals as an effective tool to help pathology residents begin to recognize and manage legal issues. The technique requires someone well versed in the issues to lead the discussion and maintain flexibility.

Results: A postsession quiz assessed and reinforced learning. Residents seemed interested. There was significant variability in skill about how to approach and understand legal issues.

Conclusions: Use of law school–style hypotheticals is an effective tool to help pathology residents begin to recognize and manage legal issues. It effectively communicates the importance of compliance, laboratory management, and the need to ask for help from those more experienced in management and legal matters. The technique requires someone well versed in the issues to lead the discussion and maintain flexibility.

A Paradigm Shift for the Unknown Slide Conference: Switching from Glass to Nonnetwork Digital

(Poster No. 105)

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Context: We previously described a serverless system for managing whole-slide imaging (WSI) files, creating a hard drive–based, digital version of a personal slide collection set using common, off-the-shelf hardware and software, thereby eliminating many advanced WSI barriers such as file/database servers, technical expertise, and delays in slide navigation due to network latency. Here, we explore this system in a well-known residency setting: the unknown slide conference.

Design: Eight unidentified slides were scanned using the NanoZoomer 2.0-HT (Hamamatsu Photonics K.K., Hamamatsu City, Japan). Preconference, a 4-GB USB flash drive containing these slides was given to residents to be copied onto their own computers. Intraconference, the attending physician created digital annotations during each case discussion. Postconference, answers and annotation files were distributed to the residents, followed by a Likert survey.

Results: Eight out of 8 residents took the survey. Results (Table) suggest that the digital format was comparable to the standard glass format regarding enjoyment, convenience, and education. Image quality, navigational speed, and slide distribution were not significant concerns.

<table>
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<th>Agree</th>
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<td>5</td>
<td>3</td>
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<tr>
<td>The digital format was more convenient compared to glass</td>
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<td>1</td>
<td>4</td>
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<tr>
<td>The digital format was more educational compared to glass</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Image quality was adequate for educational usage</td>
<td>None</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Navigation of the digital slide was fast enough</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Obtaining my copy of the conference slide set was not a problem</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

The 5-point Likert scale is shown here as 3 categories: Disagree, Neither, Agree (n = 8).

Conclusions: This study suggests that the residents felt image quality, navigation speed, and downloading images—issues commonly identified as problems with server-based WSI implementations—were not major problems with this implementation. Additionally, the digital format as implemented here appeared comparable to traditional glass slides in this particular conference setting. Further studies examining user experience, such as the creative use of digital annotations, optimization of slide distribution, and use of high-definition projectors, will contribute toward successful, lasting implementation for a digital unknown slide conference.

Misrepresentation of Publication Record by Pathology Residency Applicants

(Poster No. 106)

Jennifer Kaley, MD1 (jkaley@uams.edu); Michael Wiggins, MD2; Joshua Bornhorst, PhD2; Marwan Yared, MD3. Departments of 1Pathology and 2Medical Education, University of Arkansas for Medical Sciences, Little Rock, Arkansas.

Context: Pathology residency programs are required to track publication records of their current and former residents. The methods of tracking, however, are inconsistent. The purpose of this study was to identify the proportion of residents who had misrepresented their publication record.

Methods: A survey was created to identify residents’ previous and current publication records. The survey was distributed to 82 residents. Of those who responded, 59 (72%) residents had previously published or coauthored at least 1 publication. Out of those, 25 (19%) residents had previously misrepresented their previous publication record.

Results: Of the residents who misrepresented their publication record, 11 (44%) of them also misrepresented their current publication record. The most common method of misrepresentation was overstating or claiming to have published a publication that they did not.

Conclusions: Misrepresentation of publication record by pathology residency applicants is common. Multiple methods are available for identifying this behavior, including review of the literature, online database searches, and cross-referencing with residency program records. Further work is needed to determine the impact of this behavior on residency programs and the field of pathology.
Traditional training methods in dermatopathology rely on

Automated whole-slide image capture was performed using

Deidentified glass slide study sets were scanned using a

Four hundred eighty-six applications were reviewed. Eighty-

Clinical data are typically listed in a pathology reference book

Publication misrepresentation among residency applicants

Overall the Pathology Resident Wiki, although new,

Prospective fellows use the Internet as a main source of

The differential map is a potentially useful technique

Arch Pathol Lab Med—Vol 135, September 2011

Context: Publication misrepresentation among residency applicants has been demonstrated in various specialties. This study examines the prevalence of publication misrepresentations among US-trained and non–US-trained pathology residency applicants. Design: All peer-reviewed journal articles reported on residency applications to the University of Arkansas for Medical Sciences pathology fellowship programs in 2010 and 2011 were examined for veracity. Applications from current or past trainees and applications with unverifiable manuscripts were excluded. The type of misrepresentation and the country in which the applicant trained were recorded. The results from US-trained and non–US-trained applicants were compared. Results: Four hundred eighty-six applications were reviewed. Eighty-one applications (17%) were US-trained and 405 (83%) were non-US trained. Nineteen of 81 (23%) US graduates and 191 of 405 (47%) non-US graduates claimed manuscript authorship. Sixty applications were excluded. Publication misrepresentations were found in 36 (17%) of the remaining applications. The most common misrepresentations were omission of other authors (83%), nonauthorship (11%), self-promotion on the author list (5%), and listing a non-peer-reviewed source (5%). A significantly higher percentage of foreign medical graduates listed publications (P < .001). The misrepresentation rate by foreign graduates (24%) did not differ significantly from that of US-trained graduates (21%) (P = .90).

Conclusion: Publication misrepresentation was present in the pathology applicant pool. Similar rates of misrepresentation were seen among US and non-US applicants, although the rate of overall incidence of publication was higher among non-US graduates. Evidence of intentional publication misrepresentation might be considered a criterion for applicant disqualification. We recommend requesting copies of published articles from applicants being interviewed.

Development of a Dermatopathology Digital Slide Set for Trainee Education

(107)

Gaurav Sharma, MD (singhgs@upmc.edu); Oana Radu, MD; John R. Vu, MD;Jonathan Ho, MD; Liron Pantanowitz, MD; Anil V. Parwani, MD, PhD; Rajendra Singh, PhD; Department of Pathology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania.

Context: Traditional training methods in dermatopathology rely on text atlases and review of glass slide-based study sets by pathology and dermatology trainees. Limitations include restricted access, deterioration of stain quality, and loss of valuable slides. To overcome these limitations, a Web-based teaching module was successfully implemented by utilizing whole-slide imaging (WSI).

Design: Deidentified glass slide study sets were scanned using a ScarScope C (Aperio, Vista, California) WSI scanner and organized into virtual study sets utilizing an Oracle 11g (Oracle, Redwood Shores, California) database programmed with ColdFusion (Adobe Systems, San Jose, California). Each set included digitized slides of hematoxylin-eosin (H&E) stains, relevant case information, and ancillary studies (if performed). Once verified, the study sets were published online (https://secure opi.upmc.edu/dermpath_slides/index.cfm) and were viewable through an Aperio Imagescope 10.2 WSI viewer.

Results: In the initial phase, 200 glass slides (195 H&E and 5 special stains) constituting 195 cases were scanned with only 5 repeat scanning events needed (because of coverslip issues). The user group included 31 pathology residents, 17 pathology fellows, 15 dermatology residents, and 2 dermatology fellows. The WSI study set represented a large spectrum of neoplastic and nonneoplastic entities and provided users with an interactive microscope-like learning experience.

Conclusions: The creation of a Web-based digital slide study set has compelling educational benefits. Users can remotely access standardized, good-quality WSI slides from common and rare entities. Planned enhancements include adding annotation capability, significantly expanding the number of cases, and enabling tutoring, self-testing, and auditing through built-in prerotation and postrotation examinations and a standardized virtual rotation.

The Differential Map: A New Method to Visualize a Histologic Differential Diagnosis

(108)

Brett Baskovich, MD (brettb@ufl.edu). Department of Pathology, University of Florida, Gainesville.

Context: Diagnoses are typically listed in a pathology reference book in encyclopedic form, with entities organized by site or cell of origin and then simply described. If the reader is lucky, a differential will be mentioned, but these other lesions might be in another chapter or even volume. Few other approaches have been attempted. In his book on inflammatory skin diseases, Ackerman provides a useful approach to an otherwise complicated dilemma, wherein an entire diagnostic algorithm and differential is visible on one page.

Design: Using Microsoft Publisher, a 2D “map” was constructed of the major (and some lesser) myxoid tumors, with entries arranged by histologic similarity (differential). Pictures from Enzinger and Weiss are used directly in the map, and statements on how to differentiate adjacent tumors are provided.

Results: The differential map was exported as a Web page and is viewable online (http://www.pathology.ufl.edu/~brettb/Myxoid/).

Conclusions: The differential map is a potentially useful technique for grouping and visualizing tumors by histologic similarity. Pictures of similar tumors are seen at the same time with diagnostic information, and because they are electronic the size is not limited by paper size.

Pathology Resident Wiki: A New Comprehensive Fellowship Source

(109)

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Context: Prospective fellows use the Internet as a main source of program information. Currently there is no organized match for the specialty fellowship application process in pathology. As a result, applicants must search extensively to find a complete list of available program information, applications, and interviews. This study surveyed the potential adequacy of pathology fellowship program Web sites in aiding a fellowship applicant.

Design: Current fellowship listing Web sites were compared to see overall adequacy. Three fellowship specialties (dermatopathology, hematopathology, and transfusion medicine) were searched using the following fellowship Web sites: FREIDA, ICPI, and the Pathology Resident Wiki Fellowship listing. The Web sites were compared for completeness, links, and overall ease of use. Fellowships outside of the United States were excluded. Given the ages of the various Web sites, the Resident Wiki was predicted to be the worst resource.

Results: A total of 151 programs were evaluated. Overall, FREIDA had the highest percentage of complete information on all subspecialties. The Resident Wiki had the most links to various department Web sites in all fields. The Wiki lacked information in dermatopathology compared to FREIDA, and lacked information in hematopathology and transfusion medicine compared to the ICPI. However, it had a more complete list of programs.

Conclusions: Overall the Pathology Resident Wiki, although new, performed better than other well-established sources for direct links. Because it can be rapidly edited and updated by anyone, as it becomes more well known, the amount of information it provides will definitely become greater than that of any information source currently available.

Implementation of Whole-Slide Imaging for Multisite Review of Performance Improvement Program Slides

(110)

Gaurav Sharma, MD (sharmag@upmc.edu); Susan M. Kelly, Med, BS; Luke T. Wiehagen, BS; Alka Palekar, MD; Liron Pantanowitz, MD; Anil V. Parwani, MD, PhD. Department of Pathology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania.

Context: The College of American Pathologists Performance Improvement Program (PIP) distributes case sets (10 glass slides and related clinical information) for review by pathologists. Limitations at our geographically dispersed health system included limited access, glass slides being lost in transit, and loss of stain quality. The goal of our project was to facilitate evaluation of PIP slides by utilizing whole-slide imaging (WSI).

Design: Automated whole-slide image capture was performed using a Zeiss Mirax MIDI (Carl Zeiss, Oberkochen, Germany) slide scanner with an apochromatic objective lens and a Hitachi HV-F22 camera. Captured images were evaluated for quality and then transferred to a Web server equipped with the vendor-specific image server software. Hyperlinks to WSI were integrated with an Oracle 11g database (Adobe
Context: Lymph node count has prognostic implications in bladder cancer patients who are treated with radical cystectomy. Lymph nodes that are too small to identify grossly can easily be missed, potentially leading to missed nodal metastasis and inaccurate nodal counts, resulting in inaccurate prognostic utility. We investigated whether there is a benefit to submitting the entire lymph node packet for histologic examination in order to identify additional lymph nodes.

Design: We prospectively assessed 61 pelvic lymphadenectomy specimens in 14 consecutive patients undergoing radical cystectomy. The specimens were placed in Carnoy solution overnight, then analyzed for lymph nodes. The residual fibroadipose tissue was entirely submitted to assess for additional lymph nodes.

Results: In 61 specimens we identified 391 lymph nodes, ranging from 4 to 44 nodes per patient. We identified 238 (61%) lymph nodes with standard techniques and 153 (39%) lymph nodes in submitted residual tissue. The number of lymph nodes found in the residual tissue ranged from 0 to 75% per patient and up to 26 nodes per patient. These lymph nodes ranged in size from 0.05 to 1 cm (median = 0.1 cm) (Figure 126). The number of additional nodes relative to the total number of nodes increased with increasing specimen size. All additional lymph nodes were negative for metastatic disease.

Conclusions: Submitting the entire specimen for histologic examination allowed for identification of more lymph nodes in radical cystectomy pelvic lymphadenectomy specimens. However, it is unclear if there is a clinical benefit of evaluating lymph nodes that are neither visible nor palpable in lymphadenectomy specimens.

Immunohistochemical Analysis of PTEN Antibody: A Survey of 6 Commercially Available Clones

(Aaron J. Leifer, MD; Radhראשee Maitra, PhD; Jaya L. Sunkara, PhD; Sanjay Goel, MD; Kathryn E. Tanaka, MD,1 Departments of 1Pathology and 2Medical Oncology, Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, New York.

Context: Phosphate and tensin homolog (PTEN), a tumor suppressor gene, when mutated, is implicated in various tumors. Studies have reported that loss of PTEN expression by immunohistochemistry in these tumors is associated with poorer survival and may be helpful in predicting response to treatment. This study seeks to determine the immunohistochemical characteristics of 6 commercially available anti-PTEN antibodies.

Design: PTEN antibodies used in previous studies were selected: monoclonal antibodies 6H2.1, D4.3, 217702, 28H6, and 17.A and a polyclonal antibody (R&D Systems, Minneapolis, Minnesota). Cell blocks were made from formalin-fixed wild-type and mutant cell lines with Western blot-determined PTEN expression status [Lim2405 (−) and RKO (+)]. Four methods of epitope retrieval were used: pH 6.1 citrate buffer, pH 9.0 ethylenediaminetetraacetic acid, Trilogy (Cell Marque), and proteinase K. Optimal antibody concentrations were consistent with manufacturer recommendations. The staining was interpreted as 0, blush = 0, 1+, 2+ and 3+.

<table>
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<th>Negative Cell Line</th>
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Staining Results for Each Antibody and Retrieval Method

Abbreviation: EDTA, ethylenediaminetetraacetic acid.

Results: The results are summarized in the Table. Antibodies D4.3 and 6H2.1, using Ethylenediaminetetraacetic acid and pH 6.1, respectively, showed an appropriate staining pattern. Additionally, D4.3 and 6H2.1, when correlated in tissue sections, showed appropriate staining in 1 case of PTEN (+) and (−) colonic adenocarcinoma.

Conclusions: Only 2 of 6 commercially available antibodies stained PTEN cell lines as expected. Similar results were found using PTEN positive and negative tissue sections from a previous study. Our results indicate that monoclonal antibodies 6H2.1 and D4.3 were the most reliable for cell lines and possibly for tissue as well. Investigation on more tissue samples is required and currently underway.

Implementation of a Voluntary Interlaboratory External Proficiency Testing Program in an Emerging Economy Setting

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Abstracts

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Context: Interlaboratory external proficiency testing programs improve laboratory performance and enhance patient safety. In the developed world several programs are available and participation is mandated. Among emerging economies program access is often limited and participation is voluntary. Our organization successfully implemented India’s first ISO Guide 43 and ISO 9001–certified interlaboratory external proficiency testing program.

Design: The program was conceptualized by and offered to pathologists of north India. An ISO 15189–accredited laboratory and its medical director were selected to lead the program’s administration. The technical and management components are based on ISO Guide 43 and ISO 9001 standards, respectively. Covered specialties include hematolology, chemistry, immunohistology, and microbiology. Each month specimen kits are sourced, processed, and shipped, and results reported within 6 days. The program administrator oversees statistical analyses and establishes consensus mean and standard deviation and releases results to participants.

Results: Number of participating laboratories has increased from 24 (in 2002) to 127 (in 2010). One hundred eight monthly cycles have been completed with 100% compliance to stipulated 7-day period. In the last cycle of 2010 (November–December), acceptable interlaboratory agreements within each subspecialty with SD <2 and <3 were achieved: 88.7% and 95.6% for biochemistry; 93.3% and 96.6% for hematology; and 73.3% and 86.2%; along with 91% agreement in microbiology.

Conclusions: This pathologist-led program is an ideal model for implementation in an emerging economy setting. It drives corrective actions and continual improvement and has increased performance level among participating pathologists and laboratories. Positive impact of this program is reflected in millions of laboratory results generated for patients from north India.

Staining for Acid-Fast Bacilli in Surgical Pathology: Practice Patterns and Variations
(Poster No. 114)

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Context: Analysis of acid-fast bacilli (AFB) stains in smears for the diagnosis of tuberculosis has a long history, but quality control for AFB in histologic sections is not as well established. In tissues, necrotizing granulomas are closely linked to positive cultures for mycobacteria. However, the practices of pathologists examining AFB in surgical specimens are not well described in the literature. This study characterizes practice patterns related to the histologic interpretation of AFB stains.

Design: A survey invitation was sent to 1299 pathologists, including members of the Pulmonary Pathology Society and randomly selected fellows of the College of American Pathologists. Twenty-one questions inquired about demographics, ordering, and interpreting AFB stains, reporting, and correlation.

Results: Of the 392 responses (30.2% response rate), 363 respondents review AFB stains on histologic sections. Approximately half of respondents practice in an academic setting with the other half in community practice. Most respondents examine the entire AFB slide with the ×40 objective; approximately half confirm the organisms under oil immersion. There was considerable variation in responses to the following: scenarios in which an AFB stain is ordered, additional workup for negative cases, reporting of results, correlation with clinical and culture findings, and training. Most respondents reported never having been taught a general approach to AFB interpretation.

Conclusions: There is considerable variation in practice patterns involving all aspects of ordering, histologic examination, and reporting of AFB stains. Future efforts to standardize interpretation of AFB stains can potentially improve diagnosis of mycobacterial disease.

Large Bore Tissue Arrays in HER2 Testing: A New Method of Quality Assurance
(Poster No. 115)

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Context: Accurate interpretation of HER2 status in breast tumors is confounded by initial assessment of core biopsy specimens, as well as variability in test performance and interpretation. The purpose of this study was to evaluate the utility of large bore core tissue arrays (TAs) as a quality assurance (QA) device for HER2 testing.

Design: Large-bore cores (4 mm) were made into 10-core TAs. Tissues were obtained from breast cancer resection specimens with presence of tumor on 2 or more slides. An initial set of 6 TAs was produced to establish concordance with initial biopsy results. A seventh TA was made from similar specimens selected to increase the number of specimens with 2+ and 3+ immunohistochemistry (IHC) staining. Reagents used were PATHWAY anti-HER-2/neu (4B5), Ventana (IHC), and INFORM HER-2 silver in situ hybridization (SISH), Ventana.

Results: A total of 65 paired specimens (original cores and TA) were assessed. No specimens with IHC scores of 0 or 1+ (whether original core or TA) were found to be amplified by SISH ratio on TA. Four specimens with original IHC scores of 3+ were found to be nonamplified by SISH ratio on TA.

Conclusions: Large-bore core TAs can be utilized as part of a departmental HER2 QA program. The TA-based QA program identified several discrepancies in HER2 testing. Greater variability was observed with IHC than with SISH. The size of tissues in our TAs is comparable to that of most breast biopsies. Therefore, TAs can be used as an effective tool in teaching HER2 SISH interpretation, as well as ascertaining interobserver variability.

Simultaneous Monitoring of 236 Categories of Quality in Anatomic Pathology Through Use of Structured Vocabulary
(Poster No. 116)

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Context: Quality concerns effecting patient safety, diagnostic accuracy, and process inefficiency can occur throughout the testing process. Quality controls exist in each laboratory section, but departmental quality improvement plans frequently are constrained to monitor too few issues across the workflow with targeted audits. We identified a need to continuously monitor, detect, and resolve numerous potential quality issues not specifically targeted by annual audits.

Design: We developed software incorporating a structured vocabulary of 236 categories of potential quality issues. Issue recording is encouraged by also serving as means of issue resolution. Large monitors in each laboratory section display issues requiring attention for real-time resolution alongside trends of other issues for that section. Graphical interfaces push drillable interactive data summaries to staff.

Results: In the first 2 years, 9640 quality issues were collected in 199 of the 236 categories (Table). Thirty-seven categories recorded no issues. A total of 1974 issues indicated as requiring immediate attention resulted in resolutions within the same shift, and 7666 other issues were also collected for weekly review by supervisory staff. The graphical

| Most Frequent Quality Issues by Location |
|-----------------------------|-----------------|-----------------|
| **Location**                | **Issue Type**  | **Issue Category** |
| Clinician                   | Client services- | HPV testing not |
|                             | callback errors  | provided        |
| Clinician                   | Specimen ID      | Requisition-    |
|                             | errors           | specimen mismatch |
| Clinician                   | Client services- | No/incomplete   |
|                             | callback errors  | ordering physician |
| Accession                   | Incorrect/missing| Requisition not  |
|                             | information      | scanned          |
| Accession                   | Incorrect/missing| Ordering/submitting |
|                             | information      | physician        |
| Gross                       | Gross description| Part of dictation |
|                             |                  | missing/unclear  |
| Gross                       | Gross description| 2 patient identifiers |
|                             |                  | not dictated     |
| Gross                       | Gross description| Fixation status |
|                             |                  | missing          |
|                             |                  | sections         |
| Histology                   | Cutting issues   | Shallow/incomplete |
|                             |                  | sections         |
| Histology                   | Embedding issues | Orientation      |
|                             |                  |                 |
| Histology                   | Slide labeling   | Wrong label      |
|                             | issues           |                 |
| Reporting                   | Reporting issues | Delay in final report |
|                             |                  |                 |
| Reporting                   | EPIC interface   | EPIC 8651       |
|                             |                  |                 |
| Reporting                   | Reporting issues | Misdirected/    |
|                             |                  | unreceived report |

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frequency, severity, and trend analysis of the structured data easily identified quality issues that either require or could benefit from attention. Performance improvement plans were prioritized for targeted intervention. Trending of the subsequent occurrences of targeted quality issues showed improvement.

Conclusions: Tracking quality issues as structured data has enabled us to link real time problem resolution with relevant quality data collection. This has improved intralaboratory communication, quality and quantity of data, system-wide oversight, and timely allocation of resources toward process improvement.
ERRATUM

An abstract published in the September 2011 issue of the Archives (Murugan P et al. Tumor-to-Tumor Metastasis: A Rare Case of Cutaneous Melanoma Metastatic to a Parathyroid Adenoma [CAP abstract 109, session 100]. Arch Pathol Lab Med. 2011;135[9]:1132) contains incorrect data in line 10 when referring to the right inferior parathyroid gland that was removed. The weight of the gland should have been shown as “…1200-mg (normal, 30–70 mg)…”