Fatal Hemorrhage Secondary to Ulcerated Epiphrenic Pseudodiverticulum

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A 47-year-old man was found unconscious after experiencing severe hematemesis. He had a history of alcohol abuse, hepatic cirrhosis, and previous episodes of gastrointestinal bleeding. Imaging studies indicated that the left gastric artery was the probable source of bleeding. A severe coagulopathy was also noted clinically. Angiographic embolization of the left gastric artery failed to staunch bleeding, and the patient died shortly after admission. Autopsy demonstrated a large, ulcerated epiphrenic esophageal pseudodiverticulum, the base of which was in close proximity to an esophageal branch of the left gastric artery.

Cystic dilatation of adjacent esophageal submucosal glands was also seen. Gelatin embolic material, without associated thrombus formation, was found within the left gastric artery. Esophageal pseudodiverticulosis is an uncommon disorder that may be associated with dysphagia, stricture, and odynophagia. Bleeding and perforation are very rare complications. This case may be the first fatality proven by autopsy to be secondary to esophageal pseudodiverticulosis.

(Arch Pathol Lab Med. 2006;130:867–870)

Esophageal intramural pseudodiverticulosis (EIP) is characterized by saccular or flask-shaped dilatation of the esophageal submucosal gland excretory ducts and is commonly associated with chronic esophagitis and fibrosis. As opposed to true diverticula, lesions of EIP rarely penetrate or even reach the muscularis propria. Large EIP lesions may penetrate the muscle layer; however, muscularis propria does not accompany the lesion in its descent into the deeper portions of the esophageal wall. Asymptomatic EIP, with the presence of small, cystic lesions, may be relatively common; however, symptomatic EIP is an uncommon disease. Dysphagia, reflux-related pain, and regurgitation are the most frequently reported complaints. Strictures are frequently found in association with EIP. Severe bleeding, perforation, and periesophageal abscess are rarely reported complications of epiphrenic diverticulum (or pseudodiverticulum).

To our knowledge, fatal hemorrhage that is directly related to epiphrenic pseudodiverticulosis has not been previously reported.

REPORT OF A CASE

A 47-year-old man was found on the floor of the county jail cell in which he had been incarcerated recently. He was alive but unconscious, and he was surrounded by a large quantity of blood. Cardiopulmonary resuscitation was initiated and he was transported to the emergency department of our institution. Significant past medical history included alcohol and intravenous drug abuse, hepatic cirrhosis, hypertension, asthma, and possibly (by history only) hepatitis C. The patient also had a recent past history of upper gastrointestinal bleeding that had been treated at an outside hospital. Two months prior to death, he had undergone endoscopic evaluation at the outside hospital, which showed the presence of distal esophagitis, grade 1-2 of 4 varices without stigmata of active bleeding, and nonerosive gastritis. There was no additional information regarding treatment or follow-up. No mention of esophageal ulceration or diverticulum was given in the endoscopy report from the outside hospital.

On admission to our emergency service, he was orally intubated; he was hypotensive, with blood pressure of 93/73 mm Hg. He was found to be severely anemic: hemoglobin, 4.2 g/dL; hematocrit, 12.8%; platelet count, 103 × 10^9/µL; and white blood cell count, 20.6 × 10^9/µL with presence of a left shift. His coagulation profile was abnormal, with a prothrombin time of 27.8 seconds (control, 11.7-13.5 seconds) and an activated partial thromboplastin time of 77 seconds (control, 22-34 seconds). He was also profoundly hypoglycemic, with a serum glucose level of 20 mg/dL (reference range, 70-110 mg/dL). Blood gas studies showed the presence of severe metabolic acidosis: pH 6.82; Pco_2_, 577 mm Hg (on 100% FiO_2_); Paco_2_, 22 mm Hg; and HCO_3_ 4 mEq/L. Serum lactic acid level was 200 mg/dL (reference range, 2.7-23.4 mg/dL). He was given sodium bicarbonate and transfused with packed red blood cells and fresh frozen plasma. During his stay in the emergency department, approximately 3000 mL of sanguinous material was reportedly collected from his nasogastric tube.

The patient was later transferred to the medical intensive care unit with a diagnosis of gastrointestinal bleeding that was presumed secondary to esophageal varices. Emergent endoscopic examination identified a large quantity of blood within the gastric lumen. No definite source of bleeding was found and no obvious esophageal varices were seen. Because of the presence of brisk bleeding from the gastroesophageal junction, a gastric ulcer or varix was suspected. Aortography and selective celiac and superior mesenteric arteriography were performed; these studies demonstrated diffuse and severe spasm of the aorta and all of its branches, findings attributed to hypotension and vasospasm. The celiac axis and its branches were likewise very narrow in caliber. There was no bleeding detected from either the celiac artery or the superior mesenteric artery. The portal vein was patent, and no varices were seen on the venous phase of imaging. A selective embolization of the left gastric artery failed to staunch intestinal bleeding. Imaging studies indicated that the left gastric artery was the probable source of bleeding. A severe coagulopathy was also noted clinically. Angiographic embolization of the left gastric artery failed to staunch bleeding, and the patient died shortly after admission. Autopsy demonstrated a large, ulcerated epiphrenic esophageal pseudodiverticulum, the base of which was in close proximity to an esophageal branch of the left gastric artery. Cystic dilatation of adjacent esophageal submucosal glands was also seen. Gelatin embolic material, without associated thrombus formation, was found within the left gastric artery. Esophageal pseudodiverticulosis is an uncommon disorder that may be associated with dysphagia, stricture, and odynophagia. Bleeding and perforation are very rare complications. This case may be the first fatality proven by autopsy to be secondary to esophageal pseudodiverticulosis.

(Arch Pathol Lab Med. 2006;130:867–870)

Accepted for publication January 10, 2006.

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The authors have no relevant financial interest in the products or companies described in this article.

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Figure 1. A, Selective left gastric arteriogram shows hyperemia and contrast extravasation near the gastric cardia (arrow). B, Autopsy section taken through the left gastric artery shows the presence of intraluminal foreign material consistent with gelatin particles. No evidence of thrombus formation is seen (hematoxylin-eosin, original magnification ×26).

Figure 2. Oval defect in the right lateral wall of the esophagus.

Figure 3. Cross section through fixed specimen showing flask-shaped defect filled with grumous material. Arrows indicate left gastric artery, and circles surround sectioned esophageal branch of the left gastric artery.
left gastric arteriography was performed, which showed evidence of hyperemia and possible extravasation from branches of the left gastric artery near the cardia (Figure 1, A); therefore, this artery was embolized completely using pledgets of absorbable gelatin sponge (Gelfoam, Pharmacia & Upjohn Co., Kalamazoo, Mich). The presence of gelatin pledget material within the left gastric artery (Figure 1, B) was later confirmed at autopsy (vide infra). Postembolization, there was continued bleeding through the patient's nasogastric tube. At that time, his prothrombin time was 33.9 seconds and the activated partial thromboplastin time was more than 150 seconds. He remained severely hypotensive and was pronounced dead approximately 21 hours after admission. A complete autopsy was performed a few hours later.

**PATHOLOGIC FINDINGS**

Significant autopsy findings were as follows: evidence of gastrointestinal hemorrhage was found, with approximately 200 mL of fresh blood within the gastric lumen and an estimated 1400 mL of sanguinous material within the intestinal lumina. There was micronodular cirrhosis of the liver; however, gross evidence of significant portal hypertension was not seen. The spleen was of normal weight (180 g), and no esophageal varices were found. Prior to dissection of the esophagus, a firm nodule was palpated and visualized within the wall of the distal esophagus. On opening the esophagus, a defect was noted in the mucosa of the right lateral portion of the esophagus, 2.5 cm proximal to the gastroesophageal junction (Figure 2). Longitudinal sectioning, after formalin fixation, revealed a flask-shaped crater with a narrow neck. The base of the crater undermined the intact esophageal epithelium. The mucosal defect measured 0.8 cm in diameter and the base of the lesion measured approximately 2 cm in length (Figure 3). Friable, brownish red material was seen within the lumen. The remainder of the esophageal mucosa was pale, gray, and glistening. A few tiny areas of mucosal erythema were seen; however, no other diverticula, ulcerations, or varices were found. The celiac axis and its branches were explored, and the left gastric artery was identified and serially sectioned. Some soft, friable, maroon material was found within the artery. An esophageal branch of the left gastric artery was noted to feed the region near the base of the esophageal defect (Figure 3).

Histologic sections of liver confirmed the presence of cirrhosis. Hematoxylin-eosin and Movat pentachrome staining of the esophageal lesion proved the presence of a pseudodiverticulum that was lined by squamous epithelium. Movat stain demonstrated that the defect penetrated through the muscularis propria, and muscle was not seen within the wall of the deeper portions of the pseudodiverticulum (Figure 4). Partially digested meat and vegetable fibers as well as some bacteria could be seen within the lumen of the pseudodiverticulum, and this likely represented residua of the friable, grumous material seen within the crater lumen in Figure 3. Unfortunately, most of the material filling the crater was lost during handling prior to embedding. Below the muscularis propria, in the region of the pseudodiverticulum, there was evidence of chronic inflammation with the presence of a lymphoplasmacytic inflammatory cell reaction, capillary blood vessel proliferation, fibrosis, and focal presence of thrombosed blood vessels. Within the base of the pseudodiverticulum, distally ulceration of the epithelium and an area of acute inflammation and liquefactive necrosis could be seen (Figure 5). Blood vessels were present in the vicinity of this region, but the exact site of the patient's hemorrhage could not be demonstrated conclusively.

Within the esophageal sections (not illustrated), there were cystlike dilatations of some of the esophageal gland ducts. One duct, apart from the diverticulum, was markedly distended, filled with amorphous debris, and penetrated through the circular layer of the muscularis propria. Sections of the left gastric artery showed the presence of gelatin material that was identical to test samples of Gelfoam that were artificially embedded in paraffin for comparison (Figure 1, B). No thrombus formation was seen adherent to the gelatin particles.

**COMMENT**

The esophageal lesion described here is considered to be EIP on the basis of both the absence of muscularis propria within the large esophageal defect and the presence of multiple small, cystlike, dilated esophageal gland ducts. Epiphenic esophageal diverticula arise within the distal portion of the esophagus. There are varying definitions of the requisite distance from the gastroesophageal junction. Both true diverticula and pseudodiverticula have been reported in the epiphenic region. Bruggeman and Seaman found that 11 of 11 epiphenic esophageal
diverticula that were studied histologically proved to be pseudodiverticula, as was the case in the patient presented here. There appears to be an association of EIP with alcohol abuse,\textsuperscript{1,5,6,8} and many of the reported cases have coexisting cirrhosis. Given the noted association between chronic esophagitis and EIP, one may speculate that alcohol-related inflammation, reflux, or vomiting may predispose persons to EIP. The patient reported here had a large pseudodiverticulum that contained partially digested food and some bacteria. Entrapment of food particles within the pseudodiverticulum may have encouraged local ulceration and infection, as was the postulated mechanism of ulceration in the case described by Hoxie et al.\textsuperscript{8}

In the case presented here, bleeding from the region of the left gastric artery was demonstrated by antemortem angiography, and autopsy confirmed that an esophageal branch of the left gastric artery was in the region of the ulcerated pseudodiverticulum. Gelatin particles, without associated thrombus formation, were found within the lumen of the left gastric artery, which suggested that the patient’s coagulopathy prevented thrombosis and hemothasia in a successfully embolized vessel. We believe that acute inflammation and ulceration within a large pseudodiverticulum resulted in erosion of a vessel fed by the left gastric artery and severe hemorrhage. Embolization, although technically successful, failed to achieve hemostasis owing to the presence of severe coagulopathy. Chronic liver disease is the likely explanation of a patient’s altered coagulation parameters. Although EIP is usually a relatively benign disease, the condition may lead to life-threatening or fatal hemorrhage in some patients.

References