A 27-day-old newborn underwent a left nephrectomy for a renal tumor that was discovered by ultrasound while he was still in utero. The patient was a normally developing, asymptomatic male newborn, but the tumor had increased in size and was therefore subsequently removed. His right kidney was unremarkable.

The excised kidney weighed 34 g and measured 5.5 × 4.2 × 2.3 cm. Bisection of the kidney revealed a 2.8 × 2.5 × 2.2-cm, circumscribed, pale tan tumor in the upper pole (Figure 1). The rest of the kidney, including the surgical margins, was uninvolved with tumor. Histologically, the tumor was composed of spindle-shaped cells with coarse chromatin; the cells were arranged in interlacing fascicles. All sections examined had uniform cell density and did not show hypercellular areas or numerous mitotic figures. The spindle-shaped cells surrounded and entrapped islands of unremarkable renal parenchyma composed of glomeruli and tubules (Figure 2). Rare nodules of cartilage were also seen (Figure 3). Occasional mitotic figures were present, but atypical mitotic figures were not present. Skeletal muscle and blastema elements were also absent.

What is your diagnosis?
Mesoblastic nephroma is the most common renal tumor of infancy and was first described by Bolande et al.1 Most cases are diagnosed within the first few months of life. They may even present in utero, causing nonimmune fetal hydrops and polyhydramnios.2

Grossly, these tumors form a circumscribed, white to yellow, whorled mass with an indistinct tumor-kidney interface. Occasional areas of cyst formation may be present, as well as hemorrhage and necrosis. Because mesoblastic nephromas may extensively involve the renal sinus, careful surgical and pathologic examination of the medial aspect of the nephrectomy and its margins are of paramount importance.3

Based on histology, mesoblastic nephroma is classified into classic and cellular types. The original case described by Bolande et al involved the classic type of mesoblastic nephroma. Microscopically, the classic type has fascicles and whorls of spindled myofibroblasts reminiscent of a leiomyoma. The tumor dissectes through and surrounds groups of tubules and glomeruli. The borders of the tumor are irregular, with bands of tumor extending into renal parenchyma and surrounding soft tissue. A usual finding in many specimens is the presence of metaplastic or dysplastic elements at the tumor-kidney interface or near entrapped renal tubules and glomeruli. Cartilage is the most common finding, but extramedullary hematopoiesis and cuboidal metaplasia may also be present. Occasional mitotic figures are present, but high numbers of mitoses are more characteristic of a cellular mesoblastic nephroma. Cellular mesoblastic nephroma histologically looks like densely packed spindle cells with a high mitotic rate, which appear sarcomatous, but may also show a mixture of cellular and classic mesoblastic nephroma patterns. Data from the National Wilms Tumor Study show that cellular mesoblastic nephroma is more common than classic mesoblastic nephroma by almost 3 to 1, and that cellular mesoblastic nephroma presents a few months later in life than classic mesoblastic nephroma.3 Cellular mesoblastic nephromas may grow to be large and can weigh more than 1 kg, while classic mesoblastic nephromas rarely exceed 100 g.4 Cytologically, 2 cell types are seen. The more common of the 2 types are plump cells composed of spindle cells with ample cytoplasm and vesicular nuclei with nucleoli. The less common are blue cells, which show nucleoli. The less common are blue cells, which show more cytoplasm and resemble infantile fibrosarcoma. Recently, both cellular mesoblastic nephroma and infantile fibrosarcoma were shown to carry the t(12;15)(p13;q25) translocation, resulting in an ETV6-NTRK3 gene fusion.5 Classic mesoblastic nephroma, rhabdoid tumor of kidney, and clear cell sarcoma of kidney did not show the t(12;15)(p13;q25) translocation. Researchers now think that cellular mesoblastic nephroma is actually a renal variant of infantile fibrosarcoma.

The differential diagnosis for mesoblastic nephroma includes Wilms tumor, clear cell sarcoma, rhabdoid tumor, and metanephric stromal tumor.6 The presence of cartilage in mesoblastic nephroma invokes a differential diagnosis of Wilms tumor, but features favoring Wilms tumor over mesoblastic nephroma include the presence of skeletal muscle and blastema, age older than 1 year, bilateral tumors, and nephrogenic rests. In addition, diagnosing mesoblastic nephroma in a patient with previous nephrectomy should be made with caution, because therapy may ablate embryonal elements of Wilms tumor, leaving behind only stromal elements that closely resemble mesoblastic nephroma. While mesoblastic nephroma and clear cell sarcoma overlap in age of presentation, features that favor mesoblastic nephroma over clear cell sarcoma include tumor-surrounding islands of renal parenchyma rather than isolating single nephrons and positive immunostaining for smooth muscle. The plump cells in cellular mesoblastic nephroma may simulate rhabdoid tumor, but mesoblastic nephroma is more circumscribed and has less invasive margins, whereas rhabdoid tumor usually presents with extensive metastatic disease and angioinvasion. Rhabdoid tumor also exhibits cytoplasmic inclusions, which are rarely present in mesoblastic nephroma. The newly described metanephric stromal tumor also closely resembles mesoblastic nephroma.6 Features favoring metanephric stromal tumor over mesoblastic nephroma include subtly scalloped infiltrative borders, nodular low-power pattern, onion-skin cuffing around entrapped renal tubules, heterologous differentiation and vascular changes, positive immunostaining for CD34, and older patient population.

Adult mesoblastic nephromas have also been described, which histologically look like classic mesoblastic nephromas and stain positively for smooth muscle markers. The mean age of these patients is in the 50s. Interesting features include a predilection for females and positivity for estrogen and progesterone receptors in tumor cells. Adsay et al7 proposed that this is a unique neoplasm and gave it the name mixed epithelial and stromal tumor of the kidney.

Most mesoblastic nephromas have a favorable outcome and are treated with nephrectomy alone. About 5% of cases have tumor recurrence or metastasis. The most common site for metastasis is the lungs, followed by the brain and, rarely, bone.8 While histology of mesoblastic nephroma is not related to prognosis, completeness of tumor resection is extremely important. This can be difficult to assess, especially with involvement of the medial side of the kidney.

References