History

A 7-year-old 26.0-kg (57.2-lb) castrated male Boxer was evaluated because of vomiting, excretion of dark tarry feces, and weight loss of 10 days’ duration. The dog was reported to be intermittently inappetent during the week preceding evaluation. Five months prior, osteosarcoma of the distal portion of the left radius had been diagnosed and the dog was treated with complete forelimb amputation. The dog recovered from this procedure with no postoperative complications. Thoracic radiography at the time of surgery did not reveal any evidence of metastatic disease.

Clinical and Clinicopathologic Findings

Initial physical examination revealed high body temperature (39.39°C [102.9°F]), body condition score of 2 of 9, and pale mucous membranes. Melena was noted on rectal examination.

A CBC revealed mild leukocytosis (15.2 × 10^3 WBCs/µL; reference interval, 5.5 × 10^3 WBCs/µL to 13.9 × 10^3 WBCs/µL) characterized by neutrophilia (13.072 × 10^3 neutrophils/µL; reference range, 2.9 × 10^3 neutrophils/µL to 12.0 × 10^3 neutrophils/µL) as well as moderate, microcytic, hypochromic, nonregenerative anemia (3.65 × 10^6 RBCs/µL; reference range, 4.98 × 10^6 RBCs/µL to 7.92 × 10^6 RBCs/µL). Results of canine fecal PCR assay for Campylobacter jejuni, Campylobacter coli, Salmonella spp, Lawsonia intracellularis, Clostridium difficile, Clostridium perfringens, Giardia spp, and Cryptosporidium spp as well as parvovirus, rotavirus, and coronavirus were negative.

Abdominal ultrasonography was performed and revealed an 8.3 × 6.8-cm heterogenous, cavitory, lobulated eccentric mass involving the jejunum. The mass infiltrated the intestine circumferentially and disrupted normal intestinal wall layering. The surrounding mesentery was heterogenous with hyperchoic and hypchoic striations. Moderate peritoneal effusion was present throughout the abdomen. Ultrasound-guided fine-needle aspiration of the jejunal mass was performed, and the slides were submitted for cytologic evaluation (Figure 1). The specimen was moderately cellular and most cells were individual, ovoid cells (20 to 50 µm in diameter) with a moderate amount of basophilic cytoplasm and an occasional perinuclear clear zone. The nuclei were round to oval, eccentrically located, and had finely stippled chromatin with 1 to 2 large nucleoli. Some large, multinucleated cells were also observed.

The dog received a packed RBC transfusion, was administered gastroprotectant treatment, and underwent exploratory laparotomy. There was a small amount of free peritoneal fluid with substantial omental adhesions. The small intestinal mass was 7 cm in diameter and firm and incorporated the duodenum at the level of the duodenal-colic ligament and extended to the midoral portion of the jejunum. The intestinal mass was removed and submitted for histologic examination.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page →
Additional Cytologic Findings

Among the cells in the fine-needle aspirate specimen, moderate anisocytosis and anisokaryosis were noted. The oval shape of the cells and eccentric location of the nuclei were cytologic features compatible with osteoblasts; the multinucleated cells resembled osteoclasts. The cytoplasm of the cells reacted with alkaline phosphatase stain (nitroblue tetrazolium chloride and 5-bromo-4-chloro-3-indolyl phosphate p-toluidine salt substrate), supporting an osteoblastic origin (Figure 2). Lakes of bright eosinophilic material suspected to be osteoid were evident and were often associated with loose cell aggregates (Figure 3).

Histopathologic Findings

Histopathologic evaluation of sections of the jejunal mass revealed a poorly demarcated, unencapsulated, infiltrative, densely cellular neoplasm that disrupted and replaced all layers of the intestinal wall. The mass extended transmurally through the serosa well into the adjacent mesentery and occluded much of the intestinal lumen (Figure 4). The neoplasm was composed of polygonal to spindle-shaped cells that often surrounded foci of eosinophilic homogenous to fibrillar matrix (osteoid) and were arranged in short interlacing streams and whorls. Neoplastic cells had distinct cell borders and a small to moderate amount of eosinophilic fibrillar cytoplasm surrounding 1 or more oval to elongate nuclei. Chromatin was finely granular with 1 to 3 prominent nucleoli. Moderate to marked anisocytosis and anisokaryosis were noted. Fourteen mitotic figures were counted in 10 hpfs (400X), and rare bizarre mitoses were detected. Neoplastic cells were multifocally located within lumens of large blood vessels. Necrotic bone, a few osteoclasts, and hemorrhage were scattered throughout the neoplasm. Centrally, there was abundant eosinophilic and karyorrhectic cellular debris (necrosis) admixed with fibrin, degenerate neutrophils, and necrotic neoplastic cells. Surrounding the neoplasm was a diffuse, moderate, suppurative peritonitis.

Morphologic Diagnosis and Case Summary

Morphologic diagnosis: metastatic osteosarcoma with vascular invasion and moderate, acute, diffuse, suppurative peritonitis.

Case summary: jejunal metastasis of skeletal osteosarcoma in a dog.

Comments

On the basis of the cytologic and histopathologic findings, a diagnosis of jejunal metastasis of skeletal osteosarcoma was made for the dog of the present report. Osteosarcoma—a tumor that arises from neoplastic osteoblasts—is the most common primary bone tumor of dogs. Most osteosarcomas are primary skeletal tumors, with approximately 75% to 85% originating in the appendicular skeleton.3–8 Primary extraskeletal osteosarcoma is exceedingly rare.4–6 Although the possibility existed that the jejunal osteosarcoma in the dog of this report was a primary extraskeletal osteosarcoma, it was considered highly unlikely given the rare development of this tumor type and this dog’s history of appendicular osteosarcoma. The biological behavior of osteosarcomas is locally aggressive, with a high rate of metastasis (albeit usually subclinical) early in the disease process.1 Metastasis to the lungs via the hematogenous route is a frequent occurrence, although lymphatic extension to regional lymph nodes is rare. Metastasis of primary skeletal osteosarcoma to other bones or soft tissues, such as the intestinal...
tract or cutaneous tissues, is reported much less frequently in both the human and veterinary medical literature.\(^\text{2-12}\) To the authors’ knowledge, there are no case reports of intestinal metastasis of primary appendicular osteosarcoma in dogs.

Given its location, the jejunal mass in the dog of the present report was not initially suspected to be a metastatic lesion derived from the dog’s osteosarcoma of the distal portion of the left radius. Initial differential diagnoses for the intestinal mass based on ultrasonographic findings included neoplasia such as adenocarcinoma and other infiltrative diseases such as pythiosis. Cytologic identification of malignant mesenchymal cells that resembled osteoblasts with a cytoplasmic reaction to an alkaline phosphatase stain led to a presumptive diagnosis of the metastatic jejunal lesion derived from the dog’s skeletal osteosarcoma. Nitroblue tetrazolium chloride and 5-bromo-4-chloro-3-indolyl phosphate p-toluidine salt substrate was used to detect alkaline phosphatase activity in the fine-needle aspirate specimen obtained from the mass.\(^\text{13}\) Alkaline phosphatase is a membrane-bound enzyme that is synthesized by many cells in the body, but primarily by epithelial tissues, including hepatic, renal, and placental tissue.\(^\text{13}\) Among connective tissues, only bone produces alkaline phosphatase,\(^\text{13}\) and nitroblue tetrazolium chloride and 5-bromo-4-chloro-3-indolyl phosphate p-toluidine salt stain is successfully used in unstained\(^\text{13,14}\) or previously stained\(^\text{15}\) cytologic specimens to differentiate osteosarcomas from other mesenchymal tumors. Staining of cytologic specimens for alkaline phosphatase is a rapid, simple, and inexpensive test that does not require any special equipment.\(^\text{13}\) Unstained impression smears from fresh osteosarcoma tissue can be used as a positive control; leukocytes in the blood in the background can be used as an internal negative control.\(^\text{13}\) Once slides are made, they can be stored at room temperature (approx 20° to 25°C) for at least 4 months.

In the case described in the present report, most plump mesenchymal cells resembling osteoblasts were positive for alkaline phosphatase, supporting their presumed osteoblastic origin. The final diagnosis of jejunal metastasis of a skeletal osteosarcoma was confirmed by histologic evaluation of sections of the mass tissue. After surgical removal of the intestinal mass, the dog recovered uneventfully and was reported by the referring veterinarian to be doing well 1 month after surgery.

References