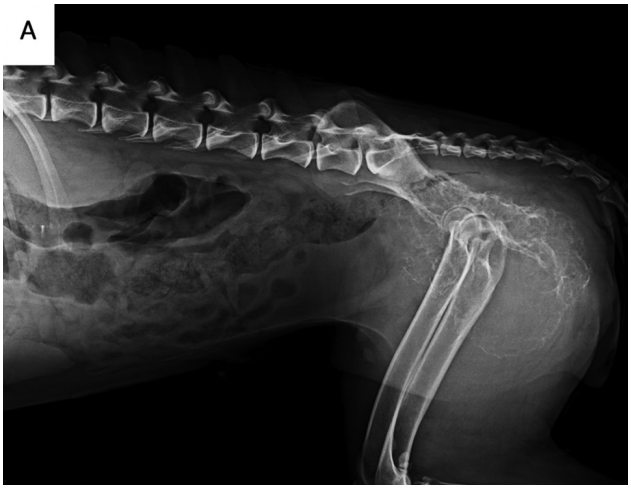
What Is Your Diagnosis?



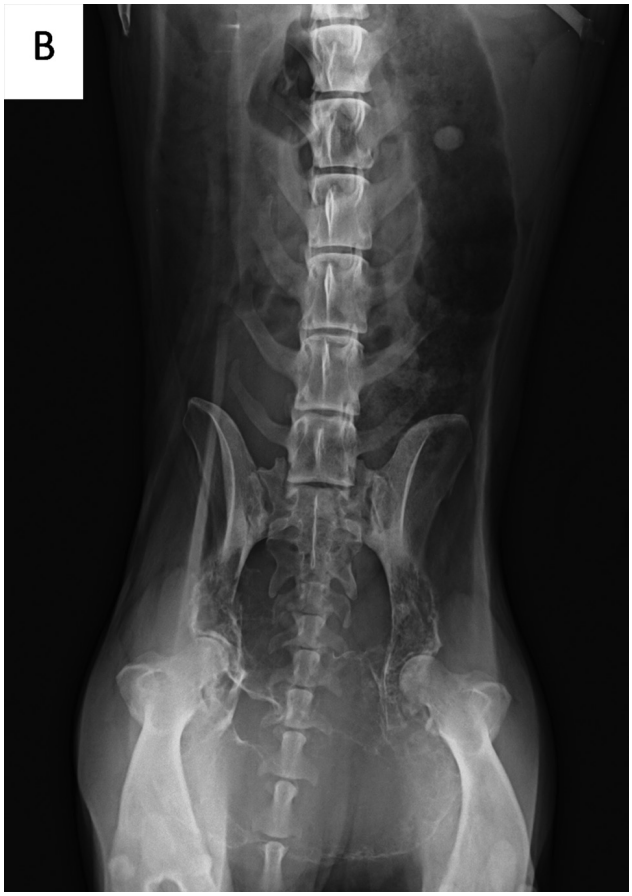


Figure 1—Lateral (A) and ventrodorsal (B) radiographic views of the pelvis of a 4-year-old female mixed-breed dog evaluated for progressive pelvic limb weakness and lameness of 10 weeks' duration.

History

A 4-year-old 19-kg (42-lb) spayed female mixed-breed dog was evaluated for progressive pelvic limb weakness, lameness of 10 weeks' duration, and urine retention. The dog was housed indoors and outdoors. Its vaccination status was not current, and the dog had not received parasitic prophylaxis.

Physical examination revealed pelvic limb muscle atrophy and a firm, 6 × 7 × 3-cm swelling on the medial aspect of the right thigh, close to the inguinal region; the mass was consistent with an inguinofemoral lymph node. The perineal region was symmetrically swollen. Pain was elicited on extension of each pelvic limb. No abnormalities were detected on neurologic examination.

Findings on CBC included normocytic and normochromic anemia (RBC count, 4.80 × 10^{12} RBCs/L [reference range, 5.5 × 10^{12} RBCs/L to 8.5 × 10^{12} RBCs/L]; hemoglobin, 21 g/dL [reference range, 12 to 18 g/dL]; Hct, 33% [reference range, 37% to 55%]). Plasma biochemical analysis revealed hypoalbuminemia (albumin, 1.84 g/dL; reference range, 2.6 to 3.3 g/dL), hyperglobulinemia (globulins, 9.8 g/dL; reference range, 2.7 to 4.4 g/dL), and hypercalcemia (total calcium, 11.9 mg/dL; reference range, 9 to 11.3 mg/dL). Serum creatinine and BUN concentrations were 0.57 mg/dL (reference range, 0.50 to 1.5 mg/dL) and 28.4 mg/dL (reference range, 21.4 to 60 mg/dL), respectively. Urinalysis revealed proteinuria and a high urine specific gravity (1.055). Serum electrophoresis revealed high serum protein concentrations (γ-globulin, 48.4 g/dL [reference range, 8.0 to 18.0 g/dL]; α_2 globulin, 13.9 g/dL [reference range, 5.0 to 12.0 g/dL]).

No abnormalities were detected on radiographic views of the thorax. Radiographs of the pelvis and pelvic limbs were obtained **(Figure 1)**.

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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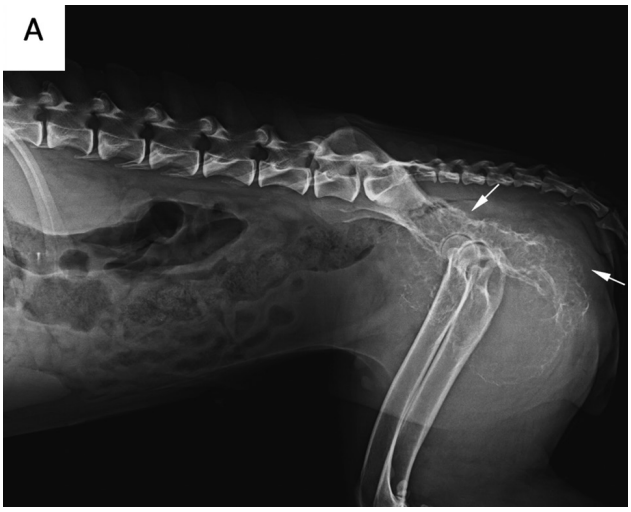

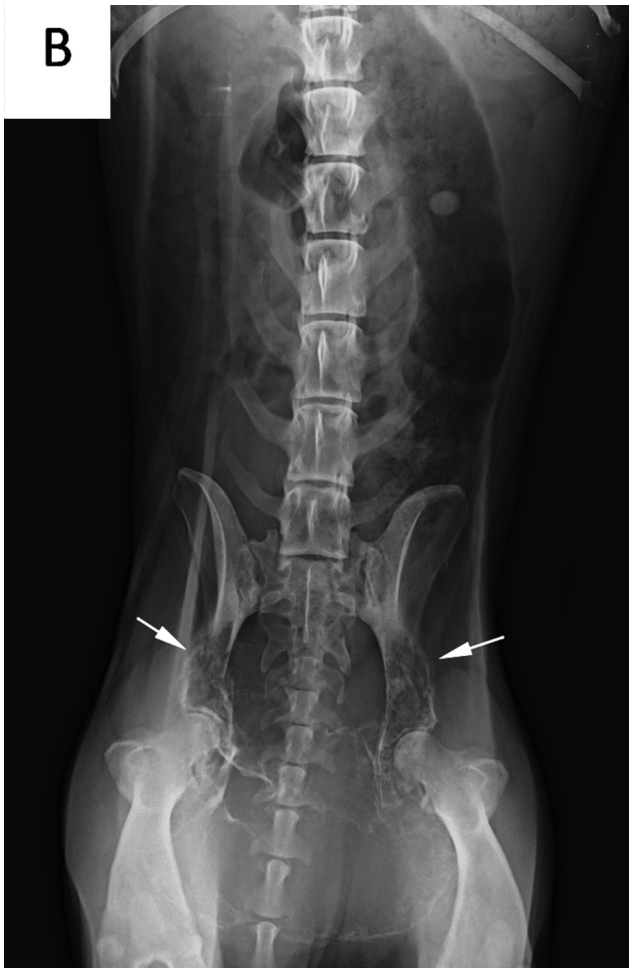

Figure 2—Same radiographic images as in Figure 1. Notice the bilateral severe bony lysis of the ilia, ischia, and pubes. The bony lesion has an atypical appearance, which symmetrically involves the entire pelvic region; the iliac wings, sacral and lumbar vertebral bodies, caudal vertebrae, and femoral heads and diaphyses appear lesion free. Moderate to severe soft tissue swelling is apparent along the pelvic limbs. A—Notice the lack of normal cortical contours in the caudal aspects of the ilia, ischia, and pubic bones (arrows). B—Notice that bone loss begins at approximately the level of the middle portion of the ilia (arrows).

Diagnostic Imaging Findings and Interpretation

Severe bilateral polyostotic permeative to moth-eaten bony lysis of the ilia, ischia, and pubes is evident, with severe cortical thinning of these bones. Mild to moderate columnar to amorphous periosteal proliferation is seen, particularly along the ischiatic arch. The lesion symmetrically involves the entire pelvis, with almost complete lysis of the cortical contours of the affected pelvic bones. The iliac wings, sacral and lumbar vertebral bodies, caudal vertebrae, and femoral heads and diaphyses appear unaffected. Moderate to severe soft tissue swelling is apparent along the pelvic limbs **(Figure 2)**.

Radiographic findings were consistent with severely aggressive and destructive, mildly proliferative, polyostotic processes with moderate soft tissue infiltration and inflammation, cellulitis, or edema. On the basis of radiographic findings, differential diagnoses included metastatic tumors (carcinomas) or primary bone tumors of vascular or hemolymphatic origin (eg, lymphoma, hemangiosarcoma, and plasma cell myeloma or multiple myeloma). Other primary bone neoplasms, including intrapelvic sarcoma, osteosarcoma, chondrosarcoma, and fibrosarcoma, were also considered. Granulomatous osteomyelitis was not completely ruled out.

Non–contrast-enhanced CT of the thorax, abdomen, and pelvis was performed for metastatic screening and to confirm the radiographic findings of the pelvis. Computed tomography was repeated following IV administration of iodine contrast medium **(Figure 3)**. Multiplanar reconstructed CT images in the sagittal and dorsal planes were also made. Computed tomography revealed permeative lysis in the distal portions of the ilia, ischia, and pubes, with an amorphous periosteal reaction along the ischiatic arch and ill-defined,

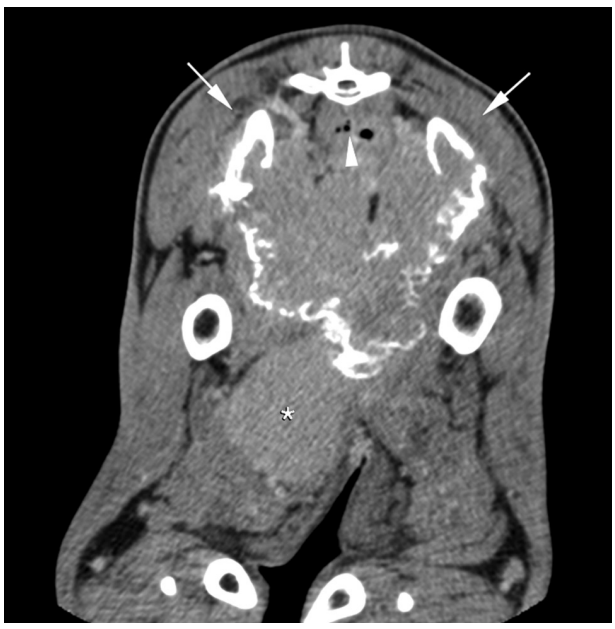

Figure 3—Transverse, contrast-enhanced CT image of the pelvic region at the level of the sacrum (right is to the reader's left). There is expansile destruction and deformity of the ilia and the pubic arch (arrows) associated with a large, moderately contrast-enhancing intrapelvic soft tissue mass, which appears to be a markedly enlarged inguinofemoral lymph node (asterisk). The mass displaces the rectum dorsally (arrowhead).

severe, bony destruction in the ischia and pubes. The gluteal and semimembranosus muscles were severely compressed caudally. Abdominal CT revealed severe enlargement of an inguinofemoral lymph node on the right side (6 × 4 × 4 cm) and splenomegaly. Differential diagnoses for the widespread lymphadenopathy included a metastatic or immunoreactive cause, whereas those for the splenomegaly included vascular pooling and engorgement secondary to sedation, extramedullary hematopoiesis, neoplasia, and lymphoid hyperplasia.

Treatment and Outcome

Histologic examination of biopsy specimens of the body of the right ilium revealed complete effacement of osteoid that was replaced by a densely cellular neoplastic tissue composed of round cells arranged in sheets separated by minimal fibrous stroma. The neoplastic cells had variably distinct cell borders; a moderately eosinophilic cytoplasm; large, round to oval nuclei with densely stained or coarsely clumped chromatin; and 1 or more variably distinct nucleoli. The nucleus-to-cytoplasm ratio was moderately increased, with mild anisocytosis and anisokaryosis. The mitotic figures ranged from 0 to 3/hpf. Within the neoplasm, dystrophic mineralization and cell necrosis were present.

Histologic examination of biopsy specimens of the swollen tissue in the inner right thigh revealed lymphoid tissue that was consistent with an inguinofemoral lymph node; the lymphoid tissue was infiltrated with numerous malignant, round cells that had morphological features similar to those of cells observed in the pelvic bone biopsy specimens. Numerous mitotic figures were present within the neoplastic population. These findings were consistent with regional metastasis from a round cell neoplasm.

Cytologic examination of bone marrow aspirates obtained from the greater tubercle of the humerus revealed cytopenia and a mixed population of cells, including poorly to moderately differentiated plasma cells, few myeloblasts, rare megakaryocytes, and rare adipocytes. Myelophthisis was not present. On the basis of the histologic and cytologic findings, a final histopathologic diagnosis of plasma cell myeloma was made.

Treatment included 7 cycles of chemotherapy. Each cycle was composed of melphalan (7 mg/m^2, PO, q 24 h) for 5 consecutive days every 21 days. In addition, prednisolone (0.5 mg/kg [0.23 mg/lb], PO) was administered once a day for 10 days and then every other day for 182 days.[1] After the second cycle of chemotherapy, clinical improvement was observed, and serum protein electrophoresis revealed a decrease in the globulin concentrations to within reference range. On completion of 7 chemotherapy cycles (189 days following initial hospital admission), the dog remained in good physical condition, with a weight gain of 3 kg (6.6 lb) and no pelvic limb weakness or lameness. Results of a CBC revealed normocytic normochromic anemia. No abnormalities, however, were detected on plasma biochemical analysis.

Seven months after the initiation of chemotherapy, pelvic radiography revealed a mild decrease in the dimensions of the enlarged inguinofemoral lymph node. Furthermore, the periosteal reaction had decreased, with almost complete restoration of the normal cortical contours of the ischia. Bone healing was evident, with mild remineralization particularly along the ischiatic arch.

Comments

Plasma cell myeloma is a slowly progressive, highly malignant, generally multifocal (ie, multiple myeloma) tumor of plasma cells. It mostly affects mature and aged dogs and is rare in cats.[1,2] Typically, multiple myeloma is characterized by multiple, focal, osteolytic lesions throughout the involved bones, which include the vertebrae, ribs, pelvis, skull, and proximal or distal aspects of the long bones, where hematopoiesis is maximal. This tumor often metastasizes to the spleen, liver, lymph nodes, and kidneys.[1]

Multiple myeloma in dogs is generally diagnosed on the basis of findings on cytologic examination of bone marrow specimens, which is typically prompted by the presence of osteolytic bone lesions, and the presence of myeloma proteins in the serum or urine.[1–4] Bone marrow cytologic findings in affected dogs reveal plasmacytosis.

The typical radiographic appearance of bone lesions in dogs with multiple myeloma includes several areas of permeative or moth-eaten lysis, characterized by coalescing regions of ill-defined bony destruction, which typically spares the cortices.[4] Solitary plasma cell myeloma lesions involving a single bone are rare in dogs. Some authors classify this condition as solitary osseous plasmacytoma and suggest that it represents an early manifestation of multiple myeloma.[5] In the case described in the present report, we used the term plasma cell myeloma because of extensive involvement limited to the pelvic bones with severe osteolysis and prolonged duration of clinical signs before diagnosis.

Radiography and CT of the thorax, abdomen, and pelvis revealed the exact location and extension of the lesion in the dog of the present report; CT also quantified the involvement of soft tissues, detected metastases in a right inguinofemoral lymph node, and excluded metastases elsewhere in the body. The findings in the dog of the present report, particularly the presence of bony invasion that was restricted to the pelvis, were unusual, considering the dog's age. Despite the extensive involvement of the pelvis, metastases were found only in a right inguinofemoral lymph node.

The dog of the present report had an unusual clinical manifestation of plasma cell myeloma that responded to treatment. On radiographic and CT evaluation, extensive aggressive, polyostotic, mixed destructive and proliferative pelvic bone lesions were observed. Plasma cell myeloma should be included on the differential diagnosis list for such lesions. Despite the extent of the patient's lesions, a good quality of life was seen during the described interim.

References

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