History

A 9-month-old sexually intact female Bernese Mountain Dog weighing 30 kg (66 lb) was referred for neurologic consultation because of a progressive stumbling gait starting during the second month after birth. No signs of previous illness or trauma were recorded by the owner. On physical examination, general body condition was good. On neurologic examination, the mental status was bright and responsive; a marked general proprioceptive ataxia with hypermetric gait in all 4 limbs was detected. Moreover, lack of conscious proprioception was evident in all limbs, the thoracic limbs being more severely affected. Signs of neck pain were not obvious; however, pain was suspected, given that the dog refused passive extension and flexion of the cranial portion of the cervical region. On the basis of neurologic findings, a C1 through C5 lesion was localized.

No abnormalities were detected on CBC. Serum biochemical abnormalities included a high alkaline phosphatase activity (124 U/L; reference range, 16 to 118 U/L) and high calcium (11.4 mg/dL; reference range, 9.2 to 11.1 mg/dL) and C-reactive protein (0.63 mg/dL; reference range, 0.01 to 0.22 mg/dL) concentrations. Serum protein electrophoresis indicated a decrease in γ-globulin fraction (5%; reference range, 6.4% to 14.5%), whereas the coagulation panel revealed a high fibrinogen content (295 mg/dL; reference range, 152 to 284 mg/dL).Urinalysis results were unremarkable. The dog underwent radiographic examination of the cervical vertebral column (Figure 1).

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

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On lateral and ventrodorsal radiographic views of the cranial portion of the cervical vertebral column, an irregularly shaped mass extends from the caudal third of the dorsal arch of the atlas, involving ventrally both the caudal articular foveae of the atlas and the corresponding cranial articular surfaces of the axis, to the cranial third of the spinous process of the axis (Figure 2).

The mass consists of multiple mineral opaque foci with a granular appearance. Both the caudoventral portion of the dorsal lamina of the atlas and the cranioventral aspect of the spinous process of the axis appear misshapen with signs of bone remodeling; this latter feature can also be detected at the atlantoaxial articular surfaces. Given the radiographic findings, differential diagnoses included calcinosis circumscripta, cartilaginous exostosis, granuloma (foreign body or parasites), abscess, or neoplasia (eg, osteochondroma and chondrosarcoma).

The dog underwent CT examination of the neck to further evaluate the actual extension of the mass and possible involvement of the vertebral canal.

On CT examination (Figure 3), a mass (4.2 X 3.6 X 2.2 cm) and the mineral nature of the hyperattenuating multiple granular foci (610 to 650 Hounsfield units independent of contrast medium injection) were confirmed. The soft tissue portion of the mass was characterized by marked contrast enhancement (50 Hounsfield units before and 150 Hounsfield units after IV administration of contrast medium). Bone remodeling of the dorsal...
lamina of the atlas and of the cranial articular surfaces of the axis was evident. Likewise, vertebral canal stenosis and consequent compression of the spinal cord within the canal at C1-2 were present; the CT features of the remaining cervical vertebral column were normal. Differential diagnosis included calcinosis circumscripta, cartilaginous exostosis, granuloma, and neoplasia.

**Treatment and Outcome**

Acquisition of a percutaneous CT-guided biopsy specimen was attempted twice with a biopsy needle, but both attempts were unsuccessful because of the excessive shear strength of the mass. Surgical excision of the mass was not planned. The dog was euthanized at the owner's request because of a sudden worsening of clinical conditions; however, some cadaveric core biopsy specimens of the mass were obtained.

On histologic examination of biopsy specimens following H&E and Masson trichromic staining, the mass consisted of well-differentiated fibrous tissue infiltrating paravertebral muscles with multiple foci of calcification, surrounded by a fibroblastic reaction with rare macrophages. Foci of osteochondrotic tissue were also observed in the specimens. The microscopic findings were consistent with calcinosis circumscripta.

**Comments**

Calcinosis circumscripta, also called tumoral calcinosis, is defined as an ectopic deposition of calcium salts in soft tissues. It commonly affects young large-breed dogs, particularly those < 2 years of age, with no sex predilection. German Shepherd Dogs are reported to be predisposed. On the basis of pathogenesis, calcinosis circumscripta has been classified as metastatic, dystrophic, iatrogenic, or idiopathic types. In dogs, focal trauma is probably responsible for most dystrophic cases of calcinosis circumscripta; however, in the absence of any tissue injury or metabolic disorder, the idiopathic form is reported as the most common in small animals. A recent retrospective pathological analysis of 77 cases of canine calcinosis circumscripta revealed that the most common location of the lesions was the subcutaneous tissues of the hind limbs (50% of dogs) followed by the tongue (23% of dogs); in 2 of 77 (2.6%) cases, the lesions were located at the right side of the transverse process of C2 and C3. Furthermore, the scientific literature included imaging descriptions of 2 dogs with paravertebral calcinosis circumscripta affecting the atlantoaxial articulation and 2 dogs with pathological localization at the dorsal laminae of T2 and T3. In both reports, neurologic signs were described and cord compression was detected through myelography. Surgery was curative in 3 of the 4 dogs; 1 subject died of meningitis 18 hours after myelography.

To our knowledge, this is the first report on the CT features of idiopathic atlantoaxial calcinosis circumscripta causing spinal cord compression in a dog. Computed tomography rather than radiography enabled a more detailed definition of the extension of the mass, its vascularization, and adjacent bone remodeling as well as provided information about the presence of spinal cord compression. However, a CT myelogram (with subarachnoid deposition of contrast material) would have been more useful for a better evaluation of the compression.

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