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Benign Bone Tumors in the Dog (1-Jan-1985)

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- Osteoma
- Chondroma
- Multilobular Osteoma and Chondroma of the Canine Skull
- Osteochondroma
- Enchondromas

Benign tumors of bone are uncommon in the dog and usually of little clinical significance. (14) The fact that they are poorly documented precludes formation of any definitive statements on the actions of these tumors. Benign tumors arising from the oral cavity, such as ossifying fibromas, will not be included in this discussion.

Osteoma

Osteomas are protruding tumor masses composed of abnormally dense, but otherwise normal bone formed in the periosteum. (16) They may resemble exostoses in structure and frequently cannot be differentiated from them on histopathologic examination.

Osteomas are rare. Their incidence by age, breed, and sex is unknown. They most frequently involve the skull and facial bones and protrude from the underlying bony surface (Fig. 75-1). The excised tumor is extremely hard, with a smooth surface that is covered by a zone of connective tissue. On histologic examination one finds wide trabeculae of mature bone in an irregular pattern; these trabeculae may be lined by mature osteoblasts (Fig. 75-2). The intratrabecular tissue, which contains vascular, fibrous, adipose, and hematopoietic elements, (3,9,14) varies in amount.

These slowly growing tumors will cause clinical signs only when they impinge on adjacent structures.



FIG. 75-1 Cranial osteoma: gross section. (Courtesy of Dr. Wayne Riser)

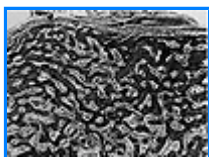


FIG. 75-2 Osteoma showing proliferation of trabeculae of mature bone.

Chondroma

A chondroma is a benign tumor of cartilaginous origin. Pool(14) states that the term has been used inappropriately to describe neoplastic lesions that may in fact be other entities but that have been diagnosed as chondromas owing to inadequate clinical and pathologic evaluation.

Primary chondromas of bone are rare and affect flat bones more often than long bones. These slowly growing tumors are seen as expansile masses, which vary in size depending on the length of time they have been present (6,9,14,17)

The excised tumor is firm, covered by a connective tissue capsule, and on cut section has a bluish white, multilobulated appearance. Histologic examination shows the chondrocytes to have a uniform shape and size and to lie in a chondroid stroma (Fig. 75-3). Differentiation from low-grade chondrosarcomas is difficult.

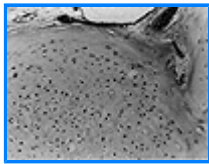


FIG. 75-3 Chondroma. There is little cellular or nuclear pleomorphism.

Multilobular Osteoma and Chondroma of the Canine Skull

Multilobular osteoma and chondroma of the canine skull has been referred to by several other names. Jacobson(7) proposed the name "chondromatodens." Zaki(18) and Liu(10) proposed the name "calcifying or juvenile aponeurotic fibroma." Pool, (14) who proposed the term currently in use, believes that this is a primary tumor of the canine skull arising from a focal area of perturbed periosteal activity. He could find no evidence that the tumor originated in extraskeletal connective tissue with secondary involvement of the bones of the skull.

This tumor is the most common benign tumor of bone that we have seen in the dog. Pool(14) rates it second in frequency to osteochondromas. The age of affected dogs ranges from 15 months to 12 years, with an average age of 7 years. Medium and large breed dogs are affected most commonly, but no breed or sex predisposition has been noted.

Clinical signs associated with the tumor vary considerably. The dog may present with a firm protuberant mass arising from the bones of the skull and causing a variable degree of deformity to the area. The size of the tumor ranges from 1 cm to 10 cm. Those tumors arising from the frontal sinus may produce a unilateral purulent rhinitis; if they invade the underlying brain, neurologic signs will be observed. Invasive tumors may produce clinical signs referable to involvement of cranial nerves, exophthalmia due to invasion of the retrobulbar tissue, or difficulty in opening the jaw in animals in whom the temporal bone or zygomatic bone is involved.(8,10,18)

The tumor is a hard nodular mass. When it projects into soft tissue, it is covered by a fibrous membrane (Figs. 75-4 and 75-5). However, when the tumor invades the cranial vault, it is covered by the dura mater, which remains intact. The nasal epithelium covers the surface of those tumors arising from the frontal sinus. On cut section the tumor has a characteristic multilobulated appearance with tiny gritty nodules separated by connective tissue trabeculae.

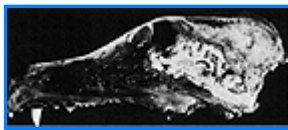


FIG. 75-4 Multilobular osteoma and chondroma of the canine skull. The tumor has arisen from parietal bone.

On microscopic examination, the periphery of the lobule is shown to consist of well-vascularized fibrous connective tissue. In the center of the lobule hyaline cartilage or immature bone may be found (Fig. 75-6). This central area is surrounded by a zone of plump ovoid to fusiform cells that merge with the septal cells. Mitoses are rare. All these tumors have the multilobulated pattern but differ in the amount of cartilage and bone present.



FIG. 75-5 Multilobular osteoma and chondroma of the canine skull: gross section. (Courtesy of Dr. Wayne Riser)

These tumors are invasive and slowly growing but will produce clinical signs unless removed. Recurrence at the site of surgical excision is common and usually follows incomplete surgical excision. We have noted malignant transformation with metastasis to lungs, a transformation that has been reported also by Pool (14) and Diamond. (2)

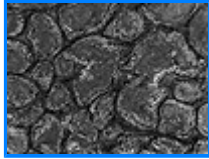


FIG. 75-6 Multilobular osteoma and chondroma of the canine skull: histologic appearance.

Osteochondroma

Osteochondroma is a cartilage-capped bony projection that may arise in any bone that develops from cartilages. The tumor may be either solitary, a monostotic osteochondroma, or multiple, polyostotic osteochondromas, also referred to as osteochondromatosis or multiple cartilaginous exostosis. Polyostotic osteochondromas are a heritable entity in dogs.

Osteochondromas are found in young immature dogs during the period of active bone growth. They respond to the same trophic influence as the growth plate and cease growth at skeletal maturity. (14) No sex predilection has been noted. Great Danes, Saint Bernards, and Hounds may be affected more commonly than other breeds.

The osteochondromas arise from the metaphyseal portions of long bones in the dog, particularly the femur and tibia (Fig. 75-7). (1,4,5,11,13) Vertebral involvement of cervical and thoracic vertebrae has also been found. (5,15) Tracheal involvement has been noted.



FIG. 75-7 Distal femur of a dog with multiple cartilaginous exostoses. There is asymmetric enlargement of the metaphysis immediately proximal to the articular surface.

Clinical signs associated with osteochondroma are due to compression and distortion of adjacent structures. Lesions on the limbs produce lameness and pain. Those tumors arising in the vertebrae show progressive limb weakness or paraparesis. Tracheal osteochondromas present with respiratory distress localized to the upper airway.

On gross examination the tumor appears as a nodular projection from the surface of the bone that blends with the parent bone at the base of the tumor. A cap of hyaline cartilage covers the surface. On cut section the trabecular bone and marrow spaces of the tumor are continuous with those of the underlying bone (Fig. 75-8).

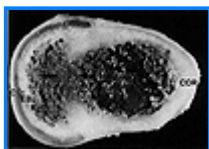


FIG. 75-8 Cross section through the exostosis described in Figure 75-7. There is remodeling of the original cortex (opposing arrows) covered by the exostosis. Enchondral Cancerous bone (EB) is present beneath the cartilage cap (C). (COR, unaffected cortex)

Histologic examination shows the cartilage cells of the cap to be in rows similar to the orientation of cells in a normal epiphysis (Fig. 75-9). The cartilage cap is thickest in young animals and decreases in thickness with maturity. At the

base of the cartilage a zone of chondro-osseustransformation is present. The base of the lesion is trabecular bone with marrow spaces that are continuous with those of the underlying bone.

Following complete surgical excision of the mass, the prognosis may be good. When incompletely excised, osteochondromas may recur. Occasionally osteochondromas may undergo malignant transformation to chondrosarcomas and osteosarcomas. (12)

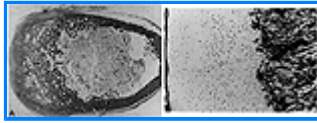


FIG. 75-9 (A,B) Histologic section of a cartilaginous exostosis. Note the cartilage cap (C) and remodeling of the cortex underlying the exostosis (opposing arrows).

Enchondromas

Enchondroma is a benign neoplasm of cartilaginous origin located within the medullary cavity of bone. Many tumors diagnosed as chondromas are probably enchondromas. (14) The lesion is thought to arise from heterotopic cartilaginous cell nests in the metaphyseal area of normal bone. (16) Enchondromas may be solitary or multiple. Multiple tumors of bone are referred to as enchondromatosis. They are rare in the dog; thus no age, breed, sex, or site predilection is known. However, larger breeds are affected more often. Tumors may be diagnosed as incidental findings on radiographic examination of asymptomatic animals, or the expansile lesion may produce swelling and pain or a pathologic fracture at the tumor site. The fracture may be due to thinning of the cortical bone by the expanding intramedullary tumor.

Specimens obtained by biopsy from enchondromas consist of normal appearing, blue white hyaline cartilage. Histologic examination shows the chondrocyte nuclei to be small and uniform in size. No atypia or binucleated cells are found. A positive diagnosis should be made only when radiographic changes associated with an enchondroma are present.

Following surgical removal, which may require radical surgery, the prognosis may be good. Recurrence is seen only in those animals in whom tumors were inadequately excised.

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