Aggressive Bone Lesions: Radiographic Interpretation

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Differentiating between benign and aggressive bone lesions (ABL) can, at times, be challenging. The consequences of an incorrect diagnosis can be catastrophic for the patient, client and veterinarian. This lecture will provide some key principles that will guide the practitioner through a systematic approach that will increase confidence and accuracy in radiographic interpretation. It is also important to recognize those situations where more information or expertise is required to make a definitive diagnosis.

Aggressive bone lesions share some basic roentgen signs. These include osteolysis (cortical or medullary or both), periosteal proliferation and an indistinct transition zone between normal and abnormal bone. Usually more than one roentgen sign is present in the same lesion, however if only one is present, the lesion should be considered aggressive until proven otherwise.

Accurate description of an ABL helps define a reasonable list of differential diagnoses

- Descriptors of osteolysis (bone lysis) associated with ABL includes permeative, puncatate, moth-eaten and geographic. These are listed in decreasing order of aggressiveness based on human studies. Of these types of osteolysis, only geographic bone lysis may be associated with a benign process (e.g. bone cysts, osseous cys-like lesions).
- 2. Descriptors of osseous proliferation include irregular, ill-defined, interrupted, spiculated, palisading and "star-burst".
- 3. Descriptors of number of bones affected
 - a. Polyostotic
 - b. Monostotic
- 4. Descriptors of anatomic region
 - a. Appendicular skeleton
 - i. Metaphysis
 - ii. Diaphysis
 - iii. Articular margin
 - Axial skeleton
 - i. Ribs,
 - ii. Skull
 - iii. Vertebral bodies

ABL fall into 2 broad catagories

b.

- 1. Infection (fungal, bacterial, parasitic)
- 2. Neoplasia a. Prima
 - Primary bone neoplasm
 - i. Osteosarcoma
 - ii. Chondrosarcoma
 - iii. Fibrosarcoma
 - iv. Hemangiosarcoma
 - b. Metastatic neoplasia

Monostotic aggressive bone lesions centered on the metaphysis of a long bone are most likely primary bone neoplasms.

Monostotic aggressive bone lesions with large soft tissue components arising from the flat bones of the skull or ribs are most likely chondrosarcoma or fibrosarcoma.

Monostotic or polyostotic aggressive bone lesions in the vertebral bodies are most likely hemangiosarcoma, lymphoma or multiple myeloma, however bacterial or fungal infections should also be considered.

In cases of polyostotic aggressive bone lesions of the appendicular or axial skeleton consideration for fungal osteomyelitis is necessary.

Additional etiologies that may create radiographic signs of aggressive bone lesions include synovial cell sarcoma, histocytic sarcoma, nasal adenocarcinoma, lymphoma, discospondylitis, vertebral physitis, septic physitis, septic arthritis and erosive arthropathies. These are often characterized by a large soft tissue component, with distortion of soft tissue fascial planes (depending on location) and are often polyostitic. In the case of synovial cell sarcoma and histiocytic sarcoma, lesions may involve all osseous structures that articulate at the affected joint.

Fungal osteomyelitis is often polyostotic but can be monostotic, spreads hematogenously and creates lesions with a primarily metaphyseal distribution. Blastomycosis (southeastern USA) and coccidiomycosis (southwestern USA) are the most common.

Bacterial osteomyelitis typically has palisading periosteal proliferation, and usually occurs due to inoculation however hematogenous spread is also possible, particularly in immune-compromised patients.

Protozoal osteomyelitis caused by Hepatozoan (transmitted by the brown dog tick, R. Sanguineus) in the southern USA, is sometimes characterized by smooth periosteal proliferation which can be misleading.

Infections are usually associated with systemic signs, occur in young dogs and may be associated with lymphadenopathy. Travel history is important and a long incubation period (months between travel history and onset of clinical signs) is possible.

Sometimes severe osteoarthrosis may be confused with an aggressive bone lesion due to its extent and differential opacities associated with sclerosis and irregular osteophyte formation that creates areas of relative lucency. These should not be confused with osteolysis. Additionally in some cases of severe osteoarthrosis, subchondral cysts develop that appear as focal lytic areas. To confuse the issue further, some cases of severe osteoarthrosis may develop infections. In those cases additional information must be obtained using ultrasound, MRI, CT and arthrocentesis/fine needle aspirates with culture of any samples obtained.

References

Textbook for Veterinary Diagnostic Radiology 6th edition, Thrall ed. 2013 Manual of Canine and Feline Musculoskeletal Imaging (BSAVA British Small Animal Veterinary Association) 2006.