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PROGRAMME AND SCIENTIFIC PROCEEDINGS
Orthopedics

FRAgMENtEd MeDIAL CORONOID ProCEss (FMCP)

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The elbow is a hinge joint composed of humero-radial, humero-ulnar, and radio-ulnar articulations. Because the antebrachium is comprised of 2 bones, the radius and the ulna, the elbow joint is subject to variations in their growth rate. These bones lengthen independently, moving back and forth past one another until a maturing of the interosseous ligament begins to constrain their longitudinal movement around 16 - 20 weeks of age, and finally restricts their movement by skeletal maturity. Because the medial coronoid process (MCP) ossifies between 12 and 22 weeks of age, it is particularly vulnerable to mechanical overload during this developmental process. Contrary to belief, the radial head and coronoid processes equally share load transmission through the normal mature elbow joint. Joint surface contact mapping of normal dogs showed continuity of coronoid and radial articular fovea contact areas across the lateral (axial) margin of the MCP. The main radial articulation is horizontal, whereas the ulnar articular surface slopes downward. There is significant anatomic variation between breeds with heavier, stockier breeds tending to have a relatively larger, wider, less steeply sloping MCP. This may suggest an increased weight-bearing function of the MCP in these breeds.

Pathogenesis of FMCP

Common theories for the pathogenesis of FMCP include (1) osteochondrosis, (2) trauma and (3) mechanical overload of the MCP leading to subchondral bone fragmentation and, eventually, cartilage fissure. In elbows with FMCP, the MCP and distal edge of the ulnar trochlear notch frequently lie slightly above the level of the radial head articular surface, creating a "step". The height of the step is variable and may be difficult to accurately assess. This step may be the result of a shortened radius (compared to the ulna) or it may be due to a relative decrease in the diameter of the ulnar trochlear notch (as compared to the trochlea of the humeral condyle) or a combination of the two. Either way, when a step is present, it is likely that load-bearing on the MCP is excessive and leads to subchondral fragmentation and, ultimately, cartilage fissure. If a discrete fragment is present, it may be variable in size and location though it tends to be present on the axial margin of the MCP.

Early detection of FMCP is important in order to avail pet owners of all treatment options and to treat underlying problems prior to the development of secondary osteoarthritis (OA). Early detection of FMCP requires that the veterinarian develop an "index of suspicion" based upon patient signalment and history, then carefully perform a physical examination, and finally closely scrutinize radiographs for subtle supportive findings.

Signalment & History

FMCP is most common in Golden Retrievers, Labrador Retrievers, Rottweilers and Bernese Mountain dogs, but can affect most any large breed of dog including mongrels. Puppies may present for thoracic limb lameness, stiffness, exercise intolerance, or non-specific mobility problems as early as 4 months of age.

Gait

Many puppies with FMCP stand with their paws externally rotated (supination). They severity of lameness preferred by others. Micropicking uses a gentle taps of a mallet onto the handle of a surgical micropick to create vascular channels to the subchondral bone. Flexion of the shoulder and the use of a Hohman retractor eases exploration of the caudal joint pouch. If the excised flap and/or fragments do not match the size of the defect, the bicipital tendon sheath should be explored via a cranial approach performed through the same skin incision. Often the joint mice will form a "string of pearls" within the tendon sheath along the deep and medial surface of the biceps tendon. This exploration is unfamiliar to many and review of regional anatomy via cadaveric dissection is encouraged. Bilateral simultaneous shoulder arthrotomy can be performed in patients with bilateral lameness provided the first arthrotomy is uncomplicated.

Arthroscopic treatment is more technically demanding, but can be rapidly and atraumatically performed once skills in triangulation of the scope and instrumentation have been mastered. Operating cannulas facilitate passage of arthroscopic instruments through the heavy shoulder musculature. Arthroscopic visualization of both shoulders and treatment as necessary can be easily performed during that same anesthetic episode. Postoperative care includes strict activity restriction for 3 weeks followed by slow, methodical increases in activity over the subsequent 3 weeks.

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Reproduction is quite variable. Having the patient descend stairs may be helpful in exacerbating subtle lameness.

**Physical Examination**

Joint effusion is most easily detected in the standing patient as a puffy, fluid pouch between the lateral epicondyle and the olecranon. Normally, during elbow flexion, puppies can place their distal antebrachium against the point of their shoulder with no discomfort. When elbow flexion is painful, dogs resist flexion or pull their shoulder joint dorsally to relieve the elbow flexion. As OA progresses, elbow flexion is physically restricted by osteophytosis and/or periarticular fibrosis. Normal puppies can extend their elbow with no discomfort and display only mild discomfort upon forced, full elbow extension. The elbows should specifically be tested in pronation and in supination as this is not painful in most normal puppies, but puppies with FMCP will usually display some discomfort.

**Radiographic Examination**

Concurrent diagnosis of juvenile orthopedic diseases such as panosteitis is often quite simple, but should not prevent the veterinarian from closely scrutinizing for a more challenging diagnosis of FMCP. Detection of an FMCP is the exception rather than the rule. Clear radiographic delineation of an FMCP is difficult due to the superimposition of the MCP upon the radial head. In addition to standard medio-lateral, flexed medio-lateral, and cranio-caudal views, various special views have been described (Cd75M-CrLO, Cr15-CdMO, MEDLAP) to increase radiographic diagnostic sensitivity for FMCP. Even with special views, however, radiography lacks sensitivity. While scintigraphy and computed tomography (CT) are of additional diagnostic value, the economy and availability of radiography make it the primary screening tool for FMCP. Accurate radiographic positioning and scrutiny of specific areas maximizes its diagnostic value:

- Periarticular osteophytes along the dorsal margin of anconeal process (flexed medio-lateral view)
- Mild sclerosis below the trochlear notch of the ulna in the region of the MCP (medio-lateral view)
- Periarticular osteophytes ("lipping", "spurring") associated with the MCP (cranio-caudal view)
- Abnormal contour or lack of detail of the normal contour of the MCP (medio-lateral view)

**Treatment**

Surgical treatment is not curative. At best, early surgical treatment delays and minimizes OA progression. Therefore, comprehensive nonsurgical therapy including maintenance of lean body conformation through caloric restriction, a lifestyle of regular, moderated activity, an OA-therapeutic diet, disease-modifying osteoarthritic agents, physical therapy and non-steroidal anti-inflammatory drugs should be always incorporated into the management of FMCP. Recent emphasis upon minimally invasive joint surgery has brought arthroscopic elbow surgery to the forefront. Illuminated and magnified arthroscopic visualization and photodocumentation of the elbow provides great insight into the severity of the disease. Considerable debate exists as to the relative merits of FMCP fragment removal versus medial coronoidectomy whether performed through a mini-arthrotomy or arthroscopically. Recent evidence suggests that the origins of the disease are in the subchondral bone of the MCP. As such, there is speculation that FMCP removal combined with regional subtotal coronoidectomy may be indicated. Load-shifting osteotomies including ulnar ostectomy (high versus low), radial lengthening osteotomy, and humeral osteotomy are indicated when incongruity leading to MCP overloading is documented. CT is a more sensitive imaging modality for assessment of radio-ulnar incongruity.