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ELBOW DYSPLASIA

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Elbow dysplasia (ED) is a general term which was proposed by the IEWG (International Elbow Working Group) in 1989. It depicts a developmental problem of the elbow joint. ED is an inherited polygenic disease, made up by 4 specific abnormalities, called primary lesions, which may occur independently or in conjunction with one another. They affect the articular surface of the joint, or its congruence – or congruity (i.e. the perfect adaptation of the shape of the three bones constituting the elbow joint. As a consequence, a secondary degenerative joint disease (DJD) will develop.

The 4 primary lesions are :

- Ununited Anconeal Process (UAP)
- Fragmented (medial) Coronoid Process (FCP) of the ulna
- Osteochondritis Dissecans (OCD) of the medial humeral condyle
- Elbow Incongruities (EI)

Dogs with ED are young dogs of large breeds, 50% of which bilaterally affected. An undetermined portion of affected dogs remain clinically silent. Lamé dogs show a non-specific unilateral or bilateral frontleg lameness, which generally appears between 4 and 8 months of age. Due to the secondary development of DJD, more later lameness is also encountered.

I/ UNUNITED ANCONEAL PROCESS

UAP results from a lack of fusion of the anconeal process to the ulna. The condition is seen in large breeds, with a separate center of ossification within the anconeal process. Normal fusion should occur at about 5 months of age. The origin of the problem is due to either an abnormal shape of the trochlear notch, or a dyssymmetric growth of the ulna and the radius with a relatively short ulna. This puts abnormal pressure on the anconeal process (*distractio cubiti*), preventing it from fusing with the ulna. Diagnosis of UAP is easy and relies on radiograph, with lateral projection of the elbow in a flexed position.

II/ FRAGMENTED CORONOID PROCESS

The medial coronoid process (MCP) is the cranio-medial part of the ulno-humeral joint and lies medially to the elbow joint. MCP can be partially or totally fragmented (FCP) or insufficiently ossified (*chondromalacia*). FCP is the most frequent cause of frontleg lameness linked to Elbow Dysplasia. Unhappily, it is also the most difficult of the 4

primary lesions to diagnose accurately. Oblique radiographic views may show the separated piece of bone, or related osteophytes, but in many cases diagnosis is made with arthroscopic examination, CT scan or MRI (when available). Sometimes, the displaced coronoid can cause an erosion on the opposite site (medial humeral condyle), which is referred to as a « kissing lesion » and mimics an OCD of the medial humeral condyle.

The origin of FCP is generally attributed to a slowing of radial growth compared to ulnar growth. This puts abnormal pressure on the medial coronoid process, leading to fragmentation.

III/ OSTEOCHONDRITIS DISSECANS (OCD) OF THE MEDIAL HUMERAL CONDYLE

OCD on this site, as other epiphyseal OCD, results of abnormal thickening of the joint cartilage, which acts as a growing cartilage. This is due to lack of transformation of this cartilage into bone tissue. Then a fissure line develops in the thickened cartilage and leads to a cartilage flap. The release of several debris from the broken cartilage initiates a synovial inflammation, and may induce development of a secondary degenerative joint disease.

Radiographic diagnosis of OCD of the medial humeral condyle is easy. On cranio-caudal projection, or oblique views of the elbow joint in extended position, a defect in the subchondral bone is clearly visible. Sometimes the « flap » is also visible when it is partially mineralised.

Several publications (Guthrie & al, Grondalen & al, Swenson & al, Audell & al, Lavelle and Studert, Studert & al) have emphasised the heritable aspect of OCD of the medial humeral condyle as a multifactorial polygenic threshold trait. Excess food intake, high calcium and phosphorus intake, increase the severity and frequency of OCD in growing puppies.

IV/ ELBOW INCONGRUITIES (EI)

Most of EI are related to malalignment between the radius and ulnar surface, due to dyssymmetric growth of the two bones. Several types of EI may be seen :

- a relatively short radius, which may coincide with FCP
- a relatively short ulna, which may coincide with UAP
- a modified shape of the ulnar notch, which may coincide either with UAP or FCP, or both pathologies.

Even if EI doesn't lead to FCP or UAP, due to abnormal pressure on cartilaginous joint surface, osteoarthritis will develop.

Diagnosis relies on strict medio-lateral radiographs of the extended joint. EI is shown as a « step » between the ulnar and radial proximal surfaces, or a decreased joint space between the ulnar notch and the humeral trochlea. Very small steps may be controversial as it has been shown that radiographic positioning of the elbow plays a role on interpretation of cubital congruity (Murphy & al, Mason & al).

ED THERAPY

Conservative treatment (weight control, adapted exercise, analgesics or long term NSAID treatment) must be considered when severe DJD is already present as in such cases, the benefit of surgical treatment is not always certain.

In early presented cases, surgical treatment is indicated. For UAP (provided that the anconeal process is not too displaced and keeps an anatomic » shape), proximal ulnar osteotomy with or without lag-screw fixation may lead to anconeal fusion. In other cases, excision of UAP is an alternative option. For OCD, conventional or mini invasive approach allows to cut free the cartilage flap and trim the abnormal cartilage around the lesion. A forcefull lavage of the joint helps to flush out any remaining debris. FCP needs excision of the fragmented bone fragment, in conjunction with surgical correction of any elbow incongruity. EI is corrected via ulnar osteotomy (too short ulna) or ulnar ostectomy (too short radius).

ED RADIOGRAPHIC SCREENING PROGRAM

Several studies have proven that ED is an inheritable condition, and that exclusion of affected dogs from the breeding program will decrease the breed prevalence of the condition. As affected dogs may or may not be lame, using lameness to determine the presence of ED or the breed value of an animal is not reliable. Therefore, the only feasible screening is based on radiographs.

Minimal age is 12 months for official screening (check breed-club for specific requirements). Both elbow must be radiographed. Radiographs must be fully and permanently identified. The veterinarian must state that he has personally checked the dog's identity (tattoo number or electronic identification).

The limb is placed directly on the cassette.

In France, we use 3 projections for each elbow joint : medio-lateral projection on hyper flexed (45°) joint, medio-lateral projection on extended elbow, oblique cranio-caudal latero-medial projection.

Radiographic interpretation and scoring (ED 0, Sub-normal elbow joint, ED 1, ED2, ED3) of the dog is based on presence of arthrosis and/or primary lesions.