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Proximal Ulnar Osteotomy as Primary Treatment for Canine Elbow Dysplasia (Ununited Anconeal Process, Fragmented Medial Coronoid Process, Osteochondroses, Incongruities)

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Treatments for ununited anconeal process (UAP), fragmented medial coronoid process (FCP), and osteochondroses, such as osteochondritis dissecans (OCD) and "kissing lesions" of cartilaginous surfaces have focused primarily upon removal of loose fragments of bone and/or cartilage or attempts at reattachment of loose bone fragments. Unfortunately, none of these procedures has been completely successful in preventing the progression of degenerative joint disease (DJD) in the canine elbow. They have provided short-term clinical improvement and have likely decreased or slowed the progression of DJD, but they have not stopped the progression of DJD or prevented the restrictions in elbow flexion and extension.

The likely reason bone and/or cartilage fragment removal or reattachment techniques have failed to provide long-term improvement is because the currently accepted primary etiology of elbow dysplasia is not addressed by these techniques. The loose bone/cartilage fragments are results rather than causes of elbow dysplasia. Wind^{1,2} concluded that elbow

incongruity is the common denominator in the development of UAP, FCP, and OCD and that these conditions likely occur by 4 – 6 months of age. By the time these conditions are diagnosed radiographically, DJD has already begun. It is interesting to note that very seldom do UAP and FCP occur concomitantly, while FCP and OCD are more often found in the same elbow^{2,3}. This suggests there may be more than one type of elbow incongruity or developmental abnormality that results in lesions of the elbow dysplasia complex.

Ununited Anconeal Process

UAP is seen most often when the radial head lies higher than the distal ulnar trochlear notch, resulting in joint incongruity, as reported by⁴. This is likely due to asynchronous growth of the radius relative to the ulna in the first 6 months of age. The anconeal process should be fully united in most dogs by 5 months of age.

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It has long been thought that the "loose" anconeal process was the cause of the DJD, but both removal and reattachment of the fragment with lag screws has not prevented or significantly minimized progression of DJD or prevented significant joint flexion and extension limitation. The anconeal process is important in elbow joint stability and function, so removal can cause joint instability and progression of degenerative changes. Removal of the ununited anconeal process has uniformly resulted in some degree of progressive DJD and restriction of joint ranges of motion⁵. Reattachment of an ununited anconeal process has not been successful in preventing DJD most likely because the DJD is caused by the joint surface incongruity.

Proximal ulnar osteotomy/ostectomy was first described by in 1990⁶ and additional studies have been reported by Sjostrom, *et al.*⁴ and by Vezzoni, *et al.*⁷ to treat UAP. An ulnar osteotomy or ostectomy (with removal of a 3-4 mm segment of bone) is performed 3-4 cm distal to the plane of the radial joint surface. Transverse cuts are preferred over oblique cuts because the oblique cuts tend to unite too quickly. The theory is to "relieve" the undue pressure on the anconeal process and other area of joint surface. A noticeable increased distance between the bone edges is seen during the first 4-8 weeks post-osteotomy before the osteotomy unites. No metallic stabilization implant is used after the osteotomy, just postoperative bandaging. If the osteotomy/ostectomy is done before the dog is 6 months old, there is a high likelihood that the UAP will unite.

Even if it does not unite, but remains attached to the proximal ulna by stout fibrocartilaginous attachment, the relief of abnormal shear stresses on the joint surfaces greatly reduces the progression of DJD. Sjostrom, *et al.*⁴ re-

ported excellent long-term results in 20 elbows operated, with no or only minimal progression of periarticular osteophytosis and only minimal reduction of joint ranges of motion (mean follow-up was 21 months).

These findings strongly suggest that it is not the ununited anconeal process that causes the progression of DJD, but rather the abnormal joint shear stresses and contact irregularities created by the elbow incongruity. It is only if the anconeal process is completely unattached to the proximal ulna by even fibrous tissue and is floating as a free body that it should be removed. Results are best when the osteotomy/ostectomy is done relatively early, before significant DJD has developed. This technique has not proven to significantly improve lameness in cases where the DJD is already advanced.

Fragmented Coronoid Process

The distal surface of the elbow joint is formed by the radial head, which bears approximately 80% of the bodyweight, and the medial and lateral coronoid processes, which bear the other 20% of body weight during loading. The medial coronoid process begins to ossify at 12-14 weeks of age and is usually complete by 20-22 weeks of age. FCP is likely a result of either elbow incongruity or asynchronous growth of the radius and ulna (or possibly both), whereby the medial coronoid process usually lies higher than the radial head. The humero-ulnar joint space is narrower than the humero-radial joint space. There is abnormal pressure on the medial coronoid process which may result in cracks or fragmentation of the coronoid process or "kissing lesions" of the articular joint cartilage surfaces. OCD may also fit into this scenario.

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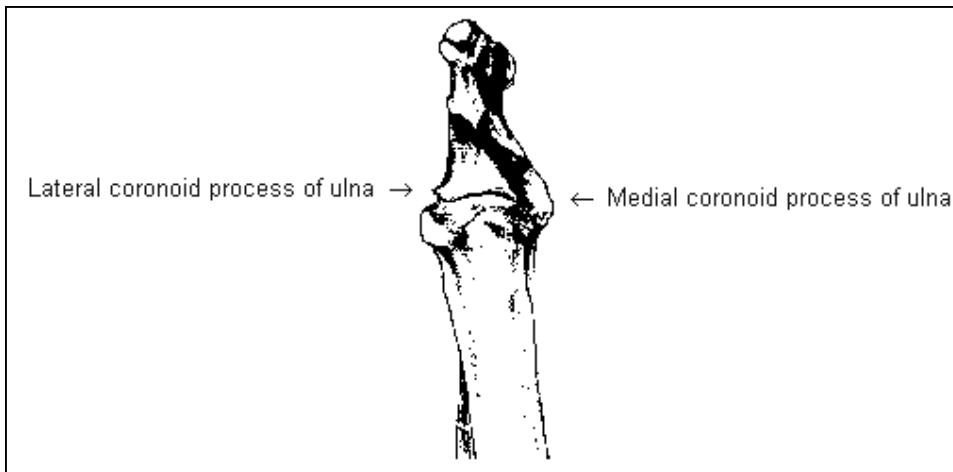


Figure 1: The coronoid processes illustrated

The distal surface of the elbow joint is formed by the radial head, which bears approximately 80% of the bodyweight, and the medial and lateral coronoid processes, which bear the other 20% of body weight during loading.

Grondalen⁸ found in an examination of 236 elbow joints of 120 dogs with elbow arthrosis that fragmentation of the medial coronoid process occurred in 85% of the joints. Apical fragmentation occurred in about 40% of the damaged coronoid processes while a curved fragment that paralleled the radial notch was found in the other 60% of fragmented coronoid processes.

In these cases, I do recommend that the medial elbow joint be explored for any loose fragments of bone or cartilage, and that these loose fragments be removed before the ulnar osteotomy is performed. Medial arthrotomy also gives me a chance to examine for OCD lesions and debride and curette them if present. I then do an osteotomy, similar to the one described above, whereby a 3-4 cm wafer of ulnar bone is removed so that the ulna may settle distally if it so desires. In some cases, the proximal ulna "tilts" slightly craniad. This suggests that the ulnar notch is under undue stress but the curvature is such that it cannot settle distally, so it seeks its "level of comfort" by shifting slightly caudally to relieve the abnormal stresses on the joint surfaces. No form of metallic implant stabilization is used after

the osteotomy is performed, just coaptation bandages. Two other investigators have successfully utilized proximal ulnar osteotomy for the treatment of FCP. One used osteotomy/osteotomy only⁹, with no stabilizing implants on the ulnar osteotomy while the other rotated the proximal ulna a predetermined amount, then held the osteotomy with a bone plate¹⁰. In both cases, the surgeons were attempting to reduce the abnormal stresses that were being applied to the joint surfaces.

Prognosis is dependent upon a number of factors. These factors include: the age at which elbow dysplasia develops, the rate of progression of the disease, the age of the patient when the problem is diagnosed and treated, the severity of incongruity, and the degree of DJD present at the time of treatment. As in the cases of UAP, proximal ulnar osteotomy is far more successful in reducing progressive DJD when done in cases where the degenerative changes are minimal at the time of surgery. When done after significant DJD is already apparent, ulnar osteotomy will have minimal benefit in improving lameness or DJD.

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