APPLICATION OF A VARIABLY PITCHED CANNULATED SCREW AND BIOBLIQUE DYNAMIC PROXIMAL ULNAR OSTEOTOMY FOR TREATMENT OF UNUNITED ANCONEALE PROCESS IN DOGS

Noel Fitzpatrick DUniv MVB CSAO CVR MRCVS
Fitzpatrick Referrals, Halfway Lane, Eashing, Surrey, UK

Ununited anconeal process (UAP) in growing dogs is characterized by failure of the process to fuse with the parent bone by 20 weeks of age. UAP has been documented in large, fast-growing or heavy-set breeds with the German Shepherd Dog having the highest incidence, and in chondrodystrophic breeds such as the Basset Hound. Other susceptible breeds include the Labrador Retriever, Rottweiler, Newfoundland, Golden Retriever and Bernese Mountain Dog, although there appears significant geographic variation between incidences in these breeds. Male dogs are affected approximately twice as often as female dogs. UAP is reportedly bilateral in 20-35% of affected dogs. Putative aetiologies include asynchronous growth of the radius and ulna and incongruence of the ulnar trochlear notch relative to the humerus. Torsional incongruity may also be involved and UAP in the author’s experience frequently occurs concomitant with medial coronoid disease. This phenomenon is difficult to explain in terms of purely sagittal aberrant forces, and the author proposes that both pathologies could conceivably arise from torsional incongruity of the ulnar trochlear notch relative to the distal humerus.

Non-surgical management has been associated with persistence of lameness and progression of arthrosis and is seldom considered as a useful therapeutic option. Instability and presence of a free fragment of bone within the joint lead to irritation, abnormal cartilage wear and secondary degenerative joint disease. Changes include joint effusion, cartilage erosion progressing to subchondral bone eburnation, remodelling of the anconeal process, osteophyte production and joint capsule thickening, and may be recognised early in the disease process. Where applied, medical management is aimed at maintaining comfort and function, as far as possible, and current recommendations emphasize body weight limitation, regular controlled exercise routine, provision of nutraceuticals and judicious use of NSAIDs.

Conventional surgical treatment has included removal of the ununited segment and this is still widely practiced. Fragment removal has been associated with poor or inconsistent outcomes with progression of degenerative joint disease and persistence of lameness and pain. In one study with mean 19.5 month follow-up, 70% of the dogs improved clinically, but only 50% were free of lameness. It has been proposed that poor outcomes may be at least partly attributable to resultant joint instability. In a proportion of dogs, particularly where disease has been present for some months prior to presentation, the anconeal process has already become substantially remodeled, or cartilage pathology of the intercondylar groove of the humerus is so severe, that attempts to achieve union will fail to improve clinical status and some dogs may experience increased discomfort due to the effective incongruency created by fixation of the anconeal process. In these dogs, fragment removal may represent the only viable therapeutic option and the author has experienced positive outcomes for fragment removal in such cases.

Osseous union of the ununited segment may be achieved by ulnar osteotomy alone where the anconeal process is minimally loose or displaced. Published studies have reported varying success and have made various recommendations regarding location, obliquity and application of intramedullary stabilisation of the osteotomy, although these have largely been based on conjecture rather than validated biomechanical or clinical data. It is well recognized from cadaveric studies that load bearing imparts both sagittal forces on the proximal ulna by the pull applied to the olecranon by the triceps brachii, but there is also a transverse force component which may result in a degree of varus deformity at this level. The author currently employs a proximal ulnar osteotomy directed obliquely caudo-proximal to cranio-distal and proximo-lateral to disto-medial which appears to counteract both potentially destabilizing force components (Bi-Oblique Dynamic Proximal Ulnar Osteotomy). It is likely that failure of union following ulnar osteotomy alone is attributable to poor case selection rather than technical inadequacy in the majority of cases, provided that cut trajectory is appropriate.

Primary fixation of UAP by compression screw placement may frequently be required and is indicated where the anconeal segment is significantly loose or displaced but has not yet significantly remodeled and where the cartilage of the humeral condylar isthmus is still functionally intact. Critical features influencing successful outcome include precise screw positioning, neutralization of shear forces by correction of joint incongruity and age at intervention. Accurate placement of a standard screw in compressive function is technically challenging - whether inserted from the articular surface into the ulnar metaphysis with the head countersunk into the anconeal process (due to the substantial risk of splitting the anconeal fragment while countersinking or lagging the screw), or inserted in compression/lag fashion from the caudal cortex with threads at the tip embedded in the anconeal process.

Surgery Chapter
Recent developments allow application of the Acutrak screw (Acutrak™, Acumed, Hillsboro, OR, USA), a headless, cannulated tapered compression screw through the articular surface, gaining excellent bone purchase and compression while avoiding the potential difficulties associated with conventional screw placement. The tapered fully-threaded profile maximizes pull-out strength and application by lag technique is not required. Core size of the screw is small compared to conventional alternatives of similar strength, which is useful for application to small fragments. Reliable compression may yield superior results by comparison with ulnar osteotomy alone, especially where a wide fibrocartilage zone exists between the anconeal process and the proximal ulna, where the fragment is loose or where bilateral surgeries are performed simultaneously. Cannulation of the implant allows use of a k-wire to accurately position the fragment and determine screw trajectory and length. The potential for fluoroscopic and arthroscopic assisted application would maximize biologic advantage.

Failure to address joint incongruity by ulnar osteotomy in conjunction with anconeal process fixation will inevitably result in failure to achieve union or will result in sub-optimal clinical outcome. Reattachment must be accurately aligned to avoid perpetuation of cartilage wear. Prognosis following achievement of union of the anconeal process, healing of the ulnar osteotomy and perceived improvement in elbow congruency is considered favourable, provided secondary degenerative changes are not well established before surgical intervention. In a case series operated by the author, reliable stabilization of the UAP bone segment to the proximal ulna was achieved. Persistence of a thin radiolucent line in some cases was likely attributable to persistence of a layer of unmineralised fibrocartilage and was not clinically significant for any case. Progression of periarticular osteophytosis was inevitable in cases which had already sustained significant cartilage erosion or were concomitantly affected by FMCP, but progression of arthrosis compared favorably with that reported for other fixation techniques and owner perception of long-term outcome was very satisfactory.