

Diagnosing elbow dysplasia and current treatment options

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1 Anatomy of the canine elbow

Five ossification centers contribute to the elbow joint: medial and lateral humeral condyle, anconeal process, olecranon and radial head. The anconeal process is fusing with the olecranon at 5 months, whereas most other growth plates are closing between 6 and 10 months. The medial and lateral coronoid processes are extensions of the ulna and have no separate ossification center.

The medial collateral ligament arises from the medial humerus condyle and inserts at the radius; the lateral collateral ligament inserts on both, radius and ulna.

For approaches from the medial side, normally used for surgical treatment of fragmented coronoid processus and osteochondrosis, the ulnar nerve must be spared. After incision of the medial fascia, the joint is reached by muscle separation between the flexor carpi radialis and superficial digital flexor muscle. Lateral approaches are indicated for the removal of the anconeal process. The anconeal muscle is lifted off the ulna and reattached after joint incision. Many intercondylar fractures of the distal humerus are approached laterally and after partial detachment of the extensor carpi radialis muscle from the humerus. Care is taken not to hurt the radialis or medianus nerve.

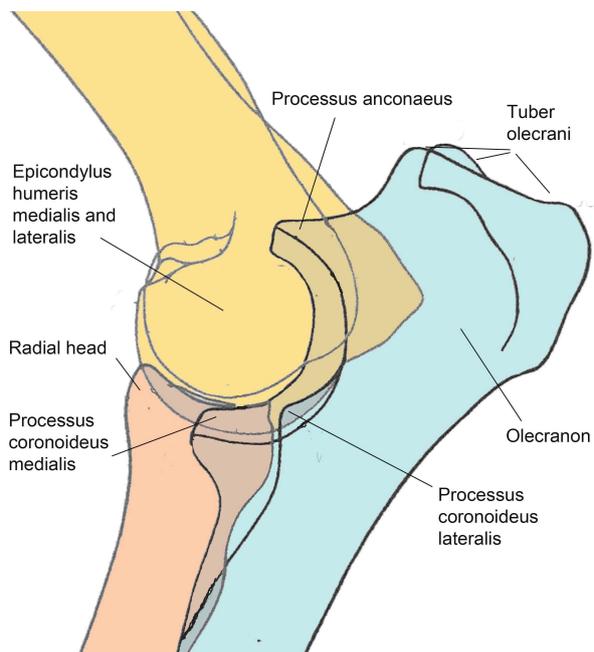


Fig. 1: Schematic laterolateral view of the canine elbow

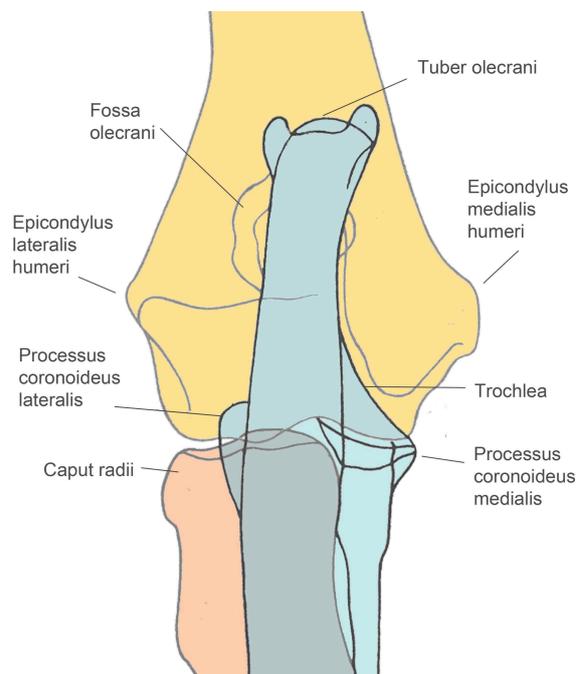


Fig 2: Schematic anteroposterior view of the canine elbow

2 Diagnostic imaging of the canine elbow

Plain radiography has been the standard for diagnosing ED. Four projections are obtained with the dog in sedation. Two latero-lateral projections are made with the carpus supinated and slightly elevated from the table. An extended (135°) and flexed picture (to show the entire anconeal process) are taken. A strict antero-posterior projection and a 15° inward rotated (pronation, anterior-posterior medial oblique) projection complete the examination. The latter allows better visualization of the medial coronoid process.

There are many limitations with radiographic interpretation. Whereas osteochondrosis and ununited anconeal processes can be easily detected, presence and severity of fragmented medial coronoid processes and elbow incongruity can be difficult to diagnose with certainty. Best seen on oblique views, the medial coronoid can be seen as flattened, rounded, with proliferation or even fragmented. However, the absence of these findings does not rule out elbow disease. Incongruity of the elbow joint is strongly dependent on the positioning on the table and is associated with a low sensitivity among radiologists when evaluating different projections together with radio-ulnar incongruence.

Other diagnostic modalities have been evaluated. Only computed tomography and magnetic resonance techniques show the potential to be widely used in the clinical setting. Limitations exist on the measurements of the incongruity and the assessment of the cartilage. Nuclear scintigraphy and ultrasound are less useful.

Arthroscopy, however not belonging to diagnostic imaging techniques, has the highest sensitivity and specificity for diagnosing elbow dysplasia.

An algorithm for the standardized assessment of plain radiographs of the elbow joint with regard to ED was set up by the author, using this mnemonic as a help: "elbow – IS A RICH ORACLE"

On the latero-lateral projections:

	Location	Prim	Sec
I	Incisura semilunaris (trochlea notch): sclerosis		X
A	Anconeal process: separation or osteoarthritis	X	X
R	Radial head: osteoarthritis		X
I	Incongruency	X	
C	Coronoid process: flattening	(X)	X
H	Humeral condyle, caudal aspect: osteoarthritis		X

On the anterior-posterior projections:

	Location	Prim	Sec
O	Osteochondritic lesion on the medial humerus	X	
R	Radial head: osteoarthritis		X
A	Articulation: distance between humerus and radius/ulna, steps	(X)	
C	Coronoid process: proliferation, separation, flattening	(X)	X
L	Lesions: kissing lesion on the medial humerus opposite to medial coronoid process		X
E	Epicondyles (medial and lateral) of the humerus; osteoarthritis		X

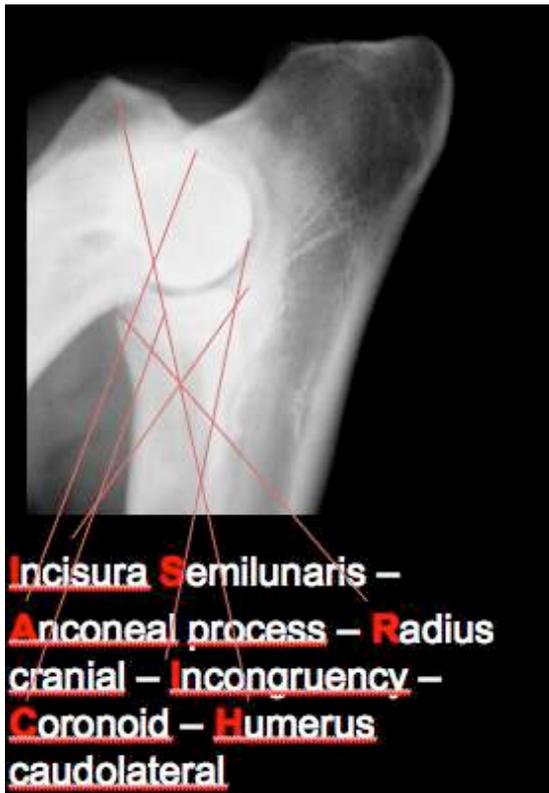


Fig 3: Flexed laterolateral projection of a canine elbow with interpretation aids.

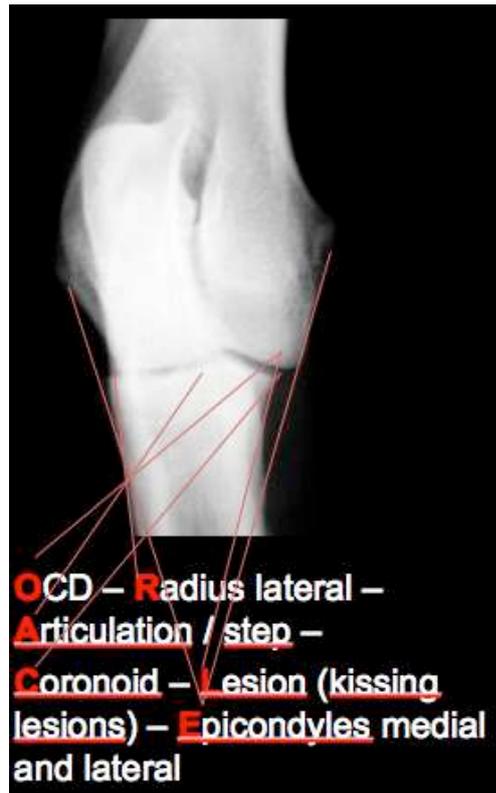


Fig. 4: Anterioposterior oblique projection of a canine elbow with interpretation aids

3 Current treatment options

If not managed by conservative methods, medial coronoid disease was and still is treated with coronoidectomy. There is rising agreement on the removal of large pieces of the coronoid by an ostectomy, summarized under the term of subtotal coronoidectomy (SCO). Less aggressive debridement may leave in parts of the coronoid exerting pressure onto the opposing cartilage of the humerus. Arthroscopic removal of fragmented coronoids carries the risk of unsatisfactory efficiency.

Ulnar osteotomy is proposed to correct radio-ulnar incongruity (short radius), when large steps can be identified. In the author's experience, it is most beneficial when done within the first 8 months of age. The ostectomy can be performed along the entire diaphysis. On the proximal ulna, the cuts should be made oblique in order to prevent shifting of the olecranon along the triceps muscle. Osteosynthesis is not required.

A novel idea is to partly tenotomize the biceps tendon on its attachment to the medial ulna (biceps ulnar release procedure, BURP). This procedure minimizes supination and loading forces onto the medial compartment of the elbow. Good surgical candidates are dogs without overt fragmentation of the medial coronoid. There are no long time experiences with BURP.

Sliding osteotomies of the humerus tend to reduce the load on the medial compartment of the humerus. Follow up reports are needed to assess the benefit of this procedure.



Fig. 5 Subtotal coronoidectomy (from Fitzpatrick, Vet Surg, 2009)



Fig. 6 Bicipital ulnar release procedure (from Fitzpatrick, Vet Surg, 2009)



Fig. 7 Sliding humerus osteotomy (from Fitzpatrick, Vet Surg, 2009)

Osteochondritic lesions are curetted and the margins cut perpendicular to the joint surface to allow the subchondral bone to grow into the defect. This intervention can be performed with an arthroscope or by arthrotomy. The prognosis is quite favorable.

Ununited anconeal processes are mostly removed. Only with very large pieces, osteosynthesis with a lag screw makes sense. This procedure is combined with a proximal ulnar osteotomy in order to allow the olecranon to shift proximally. The prognosis is guarded.

End stage osteoarthritis of the elbow is difficult to control. A combination of short walks, physiotherapy and weight control reduces and rearranges the load onto the elbow joint. Chondroprotectives increase the remainder of the cartilage and help absorbing unphysiological forces. Non-steroidal inflammatory drugs are given on a long term base with very good results and owner satisfaction. Elbow prosthesis are currently developed and should be ready for clinical use within the next two years.



Fig. 8. Medial approach to the elbow and curettage of a large OCD lesion



Fig. 9 Partial elbow arthroplasty (Wendelburg, Kyon Symposium, 2009)

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