Radiographic diagnosis of elbow dysplasia (ED) in the dog
(Requirements for the internationally standardized screening procedure for ED)

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ED occurs predominantly in medium or larger breeds of dogs. Incidences range from 0% in Border Collies up to 48% in Chow Chows. Male dogs are more likely to be affected by ED than females, and 20-35% of dogs are affected in both elbows. First clinical symptoms may occur as early as 4 months of age. Dogs with ED may or may not be lame, therefore, using lameness to determine the presence of ED or the breed value of an animal is not reliable. The only feasible screening mode is based on radiographs.

Radiographic technique

1. Minimal international requirement is 1 mediolateral view of each elbow joint
2. Both elbows are radiographed
3. No grid is used (for mediolateral views), the limb is placed directly on the cassette
4. Mediolateral projection with elbow in flexed position (45° opening angle)
5. Medial and lateral humeral condyles overlap
6. The beam is collimated, which improves image resolution
7. Additional views such as mediolateral view in neutral position (approx. 110° opening angle) and craniocaudal view with 15° limb pronation (and 15° beam angulation in proximal direction, if possible) are strongly recommended
8. MCP is identified best on a caudomedial - craniolateral 15° oblique view, with the limb placed in lateral position, extended and 15° supinated
9. Minimal age is 12 months for routine screening, but radiographs can be taken at any age in dogs with signs of elbow lameness. Check breed-club specific requirements!
10. Radiographs are fully and permanently identified
11. Radiograph will be archived at appropriate location for 10 years
12. Results of screening procedures are open to researchers and to public
13. A possibility for appeal prior to release of the results is provided

Interpretation

Radiographic findings vary depending on etiology, breed, severity, and age of the dog. The radiographic diagnosis of ED is based on presence of arthrosis and/or a primary lesion such as
- malformed or fragmented medial coronoid process, FCP
- ununited anconeal process, UAP
- osteochondrosis of the medial humeral condyle, OC/OCD
- massive incongruity of the articular surface (step, subluxation), INC

Further findings (of unknown etiology and relevance) may be calcification of periarticular tissue (flexor tendon or bursa of medial epicondyle)
- DJD resulting of unknown origin
- any other abnormality noted
FCP
Mediolateral radiograph
1. increased subchondral bony density in distal part of semilunar notch, with loss of trabecular pattern
2. step between radius and ulna
3. blurred cranial edge of medial coronoid process, but a FCP-fragment is rarely seen!
4. new bone formation dorsal and lateral to anconeal process, on cranial border of radius and of medial humeral condyle
5. uneven joint space width between humerus and radius.

Cranio-caudal radiograph:
6. bony irregularity and/or build up on the medial border of humerus and ulna, but visualisation of bony fragments is uncommon.
7. step between radial and ulnar subchondral bone plate
8. humeroradial joint space wider on medial side than on lateral, particularly in BMD
9. occasionally subchondral bone defect in the medial humeral condyle with/without subchondral sclerosis (OCD or kissing lesion), but a bony flap is rare.

Beware of artifact: The sagittally running radiolucent line within the MCP usually represents the edge of the ulna and not a fracture!

OC/OCD (Osteochondrosis, Osteochondritis dissecans)
DJD similar to FCP, but usually somewhat less pronounced. Typical findings are
1. defect in articular surface of medial humeral condyle, best seen either on the cranio-caudal or mediolateral extended view
2. a bony fragment is rarely visible
3. defect may be missed when suboptimal technique is used!!

UAP (ununited anconeal process)
1. irregular radiolucent vertical line between anconeal process and ulna after 18 weeks of age
2. irregular subchondral sclerosis
3. progressive DJD depending on duration of process

Scoring
The elbow findings are scored according to severity of the arthrosis (DJD) and/or presence of a primary lesion using the IEWG (Int. Elbow Working Group) protocol
Elbow Dysplasia Grading | Radiographic Findings |
---|---|
0 | normal elbow joint | normal elbow joint, no evidence of incongruency, sclerosis or arthrosis |
I | mild arthrosis | sclerosis of ulnar trochlear notch or, step =/> 2 mm between radius and ulna or, osteophyte formation less than 2 mm high |
II | moderate arthrosis | osteophyte formation 2 to 5 mm high |
III | severe arthrosis or 1° ED | osteophyte formation over 5 mm high and / or primary ED such as LPA, FMCP, OCD |

Differential diagnoses (probably incomplete)

Common
Panosteitis (Enostosis)
Less common
premature closure of a growth plate (usually distal ulna, traumatic in origin)
short ulna syndrome or elbow malformation in chondrodysplasic dogs without elbow disease (in Basset, Corgi, and other breed)
avulsion of flexor muscle origin at medial epicondyle
mineralisation of flexor origins
trauma induced elbow arthrosis
Rare
Osteomyelitis
septic arthritis
hypertrophic osteodystrophy
ununited humeral condyles
mineralisation of extensor muscle origin at lateral epicondyle
congenital elbow luxation with lateral displacement of the radial head

Literature