How to Interpret Borderline Hip and Elbow radiographs.

Hips:

Reasons for xray include
- Trauma,
- breeding schemes,
- lameness,
- pain on examination of hip joint,
- Positive ortolani sign.

To Begin with...
Normal anatomy of hip joint: acetabulum, a cup-shaped lunate cavity, formed by fusion of 4 bones: (ilium, ischium, pubis and acetabulum). Femoral head sits into acetabulum and together they form the hip joint.

Views:
- Ventrodorsal View: symmetrical positioning very important. Animal in dorsal recumbency with the femurs fully extended and parallel, stifles rotated slightly inwards. Xray beam centred in middle of hips and includes entire pelvis and femurs. (Chemical restraint recommended for patient positioning and radiation safety).
- Ventrodorsal flexed (frog-leg ) view: Good for femoral head fractures Animal in dorsal recumbency and limbs adducted, must be symmetrical
- Lateral View: place animal in lateral recumbency with affected side on cassette and other limb abducted out of the way.
- Penn HIP®: 3 radiographic views, VD extended hip, distraction and compression views. Can only be taken by a Penn HIP® certified veterinary surgeon or technician.

Canine Hip Dysplasia

The most common orthopaedic disease of the dog! Symmetry on VD most important
- Obturator foraminae are of equal size
The ilial wings have same diameter
Line drawn thro lumbar vertebrae continues straight through the pelvic symphsis

VD radiograph can be insensitive. Increased incidence of detection as dog gets older!

**Radiological Findings**

**Femoral head subluxation or luxation**
- >50% or more of femoral head (FH) is not within acetabulum or Norberg angle abnormal

**Osteoarthritis/itis**
- Remodelling of FH and neck
- Remodelling of acetabulum
- Periarticular osteophytes
- Morgans line
- Osteophyte formation on FH parallel to physeal scar (FH rimming)
- Subchondral sclerosis of the acetabular margin.

Measurement of the Norberg angle: Draw a line between the centres of the femoral heads, and a line extending cranially from the centre of the femoral head to the craniolateral acetabular margin. The norberg angle is the angle of intersection between the two. Normal dogs have an angle of 105 degrees or more (95 in the cat). Values less than this indicate subluxation, the lower the angle the more severe the subluxation. The Norberg angle does not correlate as well as the distraction index (DI) with regard to the subsequent development of osteoarthrosis.

**Hip Control Schemes:**
BVA, OFA, PennHIP®

**Elbow Joints**
Humero-radial-ulnar joint.

**Mediolateral Extended**
Lateral recumbency on affected limb. Upper limb retracted caudally and head and neck extended. Angle of 120 degrees between the humerus and the radius and ulna. Beam centred on medial epicondyle.
- Evaluates incongruity
- Osteophytes (O/ps) on cranial aspect of joint
Medial Coronoid Process (MCP) is superimposed on radial head.

**Mediolateral Flexed (maximally)**
Lateral recumbency on affected limb. Upper limb retracted caudally and head and neck extended. Distal limb pulled towards head and neck so that angle between humerus and radius/ulna is <45 degrees. Don’t elevate carpus, as elbow must stay in lateral position. Beam centred on medial epicondyle.
- Evaluation of O/ps on AP
- Diagnosis of ununited anconeal process (UAP)

**Craniocaudal**
Patient in sternal recumbency with humerus, radius and ulna in a straight line. Head elevated and retracted away from affected limb. Beam centred just distal to medial epicondyle.
- OC defects medial humeral condyle
- O/Ps medial humeral epicondyle
- Humeral condylar fractures

**Extended Supinated mediolateral**
- Cranial border of MCP

**Craniolateral-caudomedial oblique**
Patient in sternal recumbency with humerus, radius and ulna in a straight line. Limb pronated 15 degree. Beam centred on joint.
- MCP visualised
- OC defects of medial humeral condyle

**Craniomedial-caudolateral oblique**
Patient in sternal recumbency with humerus, radius and ulna in a straight line. Limb supinated 15-50 degree. Beam centred on joint.
- Lateral humeral condyle
- Incomplete ossification of the humeral condyle (best seen on 15 degree supination).

**Abnormal Radiological Findings**

**Fractures**
- Condylar Fractures
- Olecranon Avulsion Fracture
- Medial Epicondyle Avulsion Fracture
- Physeal Fractures

**Luxations/ Subluxations**
- Elbow trauma
- Secondary to Distal Antebrachium pathology
- Congenital radial and/or ulnar luxation

**Congenital and Developmental**
- **Elbow Dysplasia**
  - Fragmented Medial Coronoid Process (FMCP)
- UAP
- Osteochondritis Dissecans (OCD) of the medial humeral condyle
- Elbow incongruity
  - Ununited Medial Humeral Epicondyle
  - Medial Epicondylar Spur
  - Incomplete Ossification of the Humeral Condyle
  - Patella Cubiti

Metabolic Disorders

Hypervitaminosis A in cats

Osteoarthrosis
  - Usually as a result of elbow dysplasia in predisposed breeds
  - Secondary to trauma, do joint tap if suddenly very lame

Infection
  - Bacterial, viral, protozoal or fungal
  - STS, subchondral erosion, later changes of periosteal proliferation

Neoplasia
  - Synovial cell carcinoma most common joint neoplasm