“The 5-Minute Orthopaedic Examination”

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Patient signalment (age, species, breed, sex) and history can influence the examination emphasis a lot and so my ‘ritual’ does vary quite a bit patient-to-patient. Typically I do not spend much time on digits or feet unless the presentation is suggestive of a distal extremity injury. Often if I am not convinced the patient is lame, I will perform a combined orthopaedic and neurological assessment. This presentation will be limited to common features of orthopaedic conditions only. I will show some photos and videos to illustrate key points. Experience and feedback from the results of imaging allow practitioners to refine their skills in the examination process.

The primary goals of a thorough orthopaedic examination are:

1) localize a pain focus or region of pain
2) determine if there is swelling, instability or altered range of motion of a joint
3) narrow your list of differential diagnoses

Step 1 – Standing Conformation

- **Weight shift**: Look for subtle but repeatable change in weight distribution off the affected limb or region of the body. Single limb lameness typically results in leaning onto the unaffected side whereas bilateral hindlimb pain leads to a weight shift onto the forelimbs. Rarely you might see a weight shift onto the hindlimbs due to severe bilateral forelimb pain. The most common weight shift I see is called ‘toe-off’ when a cruciate dog bears less weight on the affected hindlimb.

- **Muscular atrophy**: Short-coated breeds standing on all four limbs allow visual assessment of gross muscle mass. Objective measurement of limb circumference with a tape can also be done. Typically on the forelimb, the spine of the scapula may appear more evident if the supra and infraspinatus muscles are smaller. On the hindlimb you may appreciate reduced width of the hamstrings. If the patient is non-weight bearing, visual appreciation of subtle atrophy is not possible.

- **Joint swelling**: Moderate to severe elbow effusion is easily seen when dogs stand. Medial periarticular fibrosis (buttress) is often visually apparent with chronic cruciate (but not MPL) disease. I have seen a few enlarged carpi and tarsi when ligamentous insufficiency and chronic hock OCD are present respectively.

- **Limb alignment**: Rotation of limbs or segments of limbs can often be apparent. The three most common would be: 1) external rotation of the entire hindlimb due to hip pathology (eg hip luxation), 2) internal rotation of the tibia relative to the femur in large dogs with cruciate disease and small dogs with MPL and 3)
external rotation of the distal antebrachium / pes with radius curvus deformity. External rotation of the forelimb can be seen in pups with elbow dysplasia.

- **Deformity:** Short or angulated long-bones cause overt cosmetic change. Premature growth plate closure can result in lack of elongation at the end of one bone and consequential limb shortening. More commonly, premature or asymmetric physeal closure causes bowing of bones in one of two orthogonal planes. Varus means the distal extremity bends toward midline (genu varus in dogs knees) whereas valgus means the distal extremity deviates away from midline (carpal valgus seen with ulnar physeal injury).

- **Joint Angles:** Quadrupeds sand with the joint in partial flexion rather than extension. The angulation of joint varies with standing, walking, trotting and sitting. The standing angle of joints can be compared to the contralateral side. Knee pain often results in reluctance to extend the knee. Hip pain results in reluctance to extend the hip. Often the tibio-tarsal joint is hyper-flexed with Achilles tendon avulsion. Dorsiflexion of the carpus / tarsus result from hyper-extension injuries to the palmar and plantar fibrocartilage respectively. Hip dysplastic pups can stand with a ‘base-narrow’ stance.

- **Range of Motion:** Development of peri-articular fibrosis and periosteal new bone can reduce extension and flexion range in joints. The most common joints where reduced flexion are seen would include the carpus, elbow, tibiotarsal and stifle whereas reduced extension would primarily relate to the hip.

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**Step 2 – Gait Assessment**

- **Rising:** Delay in rising from a recumbent position can be due to lumbar spine, hip or knee pain. Dogs with elbow dysplasia are often markedly worse after recumbency and improve with activity.

- **Sitting:** Knee pain associated with chronic cruciate disease causes sufficient joint pain that some dogs prefer to stand and are reluctant to flex and sit. The ‘sit test’ is a crude assessment of the ability / willingness of a dog to symmetrically flex the stifle when sitting. A positive means the limb is held in extension when the dog sits and suggested cruciate pain.

- **Walking:** Moderate to severe unilateral forelimb lameness will be evident at slow gaits with the head going down on the sound limb and up when the affected limb contacts the ground. It is always important to confirm that the side the client is concerned about is the pone you feel is problematic. I look for subtle limb rotations (eg. pivot shift in ACL deficient knees) too. Subtle lameness can often be missed at slow gaits. Walking is the only gait in cats that can be assessed and the principles are the same.

- **Trotting:** Voice commands by owners encourage pets to ambulate. My preference is to take the time of going outdoors to allow pets to be less fearful knowing there are often more distractions. ‘Bunny hopping’ is a learned gait
adaptation whereby dogs can reduce bilateral hip pain by moving the hindlimbs in unison and bouncing on the hindlimbs rather than fully extended the hindlimbs. Beware lower lumbar / lumbosacral pain can result in this gait change too.

- **Symmetry:** Single limb conditions and asymmetric bilateral conditions are easy to see when animals are gaited however bilateral symmetric joint disease can be more challenging to see. I have seen many cases of bilateral: elbow dysplasia, early partial cruciate disease and hip dysplasia where gait analysis was unremarkable.

- **Stress testing:** Equine lameness diagnosis utilizes stress testing and articular / region local anaesthesis blocks during gait assessment to assist in lesion localization. Occasionally I will aggressively flex and extend and joint immediately before gait assessment to see if the added stimulus aggravates the lameness. I have not yet used elbow anaesthesia in my clinical practice to assist with lameness diagnosis.

### Step 3 – Limb Manipulation

- **Conscious vs Sedated:** Minimal restraint can limit patient apprehension but veterinarians are at risk of bites. I tend to query owners whilst assessing the animal’s behavior (eyes, ear position, tail wag) and judge each case individually. Few dogs require sedation to assess their limbs. If required we tend to start with acepromazine and an opioids. Detailed hip palpation in juvenile dogs may required general anaesthesia.

- **Standing vs Recumbent:** Typically I perform a general physical examination consisting or oral examination, eyes / ears / peripheral lymph nodes, thoracic auscultation and abdominal palpation, before beginning the orthopaedic examination. The next step is limb palpation with the patient standing on the examination table. I tend to place most dogs in lateral recumbency and use the owner or a nurse to restrain them. For a dog in left lateral recumbency the left hand holds the left antebrachium and the left forearm is used to apply downward pressure on the neck. The right hand holds the left hindlimb and the right forearm applies downward pressure on the lumbar spine.

- **Forelimb:**
  
  - **Shoulder:** The basic manipulation is flexion and extension looking for a consistent reaction. More specific manipulations include; biceps brachii test (concurrent elbow extension / shoulder flexion with digital pressure on the distal tendon insertion above the elbow), craniocaudal instability and abduction assessing the medial passive restraints (subscapularis tendon, MCL).
  
  - **Elbow:** Palpate for effusion caudolaterally between the lateral epicondyle of the humerus and olecranon, assess range or motion, then incrementally stress test the joint in both flexion and extension. You can add pressure on the medial side over the coronoid process of the ulna as well as pronation (internal rotation of the antebrachium). Longbone
shaft pain: directly apply digital pressure to diaphysis of humerus, radius and ulna separately.

- **Carpus**: Palpate for range of extension and flexion, mediolateral instability (checking collateral ligaments) and appreciate any pain during flexion.

- **Hindlimb**

  - **Hip**: There is minimal benefit to assessing hip flexion. Mostly focus your attention on extension pain and range of motion. Crepitus is a sensation of grinding when two interacting joint surfaces without cartilage move relative to one another.
    - Passive mediolateral instability (Ortolani) is detected by having the femur in a neutral standing position relative to the pelvis. One hand is used to brace the pelvis and the other to apply pressure over the end of the stifle and generate a force simulating weight bearing. Concurrently maintain the compression force whilst also abducting the limb (move away from midline). If the patient has dysplasia, the femoral head will be subluxated when the initial compressive force is applied and then relocate back into the acetabulum (reduction of subluxation) as the knee is progressively lifted away from midline.
    - Palpation of the relative positions of the 1) ileal wing, 2) ischiatic tuberosity and 3) greater trochanter using three fingers on one hand and comparing the shape of that triangle to the contralateral side will allow assessment of hips thought to be luxated. The trochanter will be dorsally displaced relative to the pelvic anatomic landmarks if the hip is dorsally luxated.

  - **Knee**: Effusion can be appreciated by palpation of the patellar tendon. This structure will be less palpable in effusive knees. Medial fibrous tissue development can be visually and palpably assessed and compared to the contralateral side. Medial and lateral collateral ligament deficiency can be assessed by applying a valgus and varus stress (respectively) to the knee and assessing to see if there is instability in the frontal plane.
    - The position of the patella relative to the distal femur and tibial crest can be assessed with the knee in a neutral position as well as fully extended and applying a medially directed forced using a finger on the lateral aspect of the patella. Learn the 4 grades of MPL: grade 1 – spontaneously in trochlea, can palpably displace but then returns to anatomic position, asymptomatic. Grade 2 – intermittent patellar displacement with intermittent lameness, grade 3 – displacement / luxation of the patella with ability to relocate the patella manually but immediate relaxation, and grade 4 – permanently luxated and unable to relocate manually.
    - Craniocaudal instability is assessed by using both hands and moving the distal femur and proximal tibia in the sagittal plane. One hand holds the femur with an index finger on patella and the thumb caudal to the lateral fabella. The other hand holds the proximal tibia with one finger on the tibial tuberosity and the other caudal to the fibula head. Complete rupture / deficiency of
the cranial cruciate ligament results in the ability to translate the tibia anteriorly relative to the distal femur (positive drawer).

- Knee extension pain is an indicator of partial cranial cruciate ligament rupture. With the patient recumbent and the hock held, place a cupped hand over the anterior aspect of the stifle and aggressively extend the knee by pulling caudally over the stifle. This is easier if you stand caudal to the patient. This test is reliable if performed under sedation. You are looking for a consistent and repeatable pain response.
- Meniscal years can be tentatively diagnosed in unstable knees when a palpable and sometimes audible clicking is appreciated as the knee is passed through a range of motion.

- **Hock:** Effusion and chronic capsular distension are appreciated by palpation of the caudomedial and caudolateral soft tissues with the tibiotarsal joint flexed. Focal digital pressure can also be applied to the medial and lateral condyles of the talus looking for a pain response which might suggest osteochondrosis. Reduction of range of motion in flexion.

- **Referred spinal pain:** Some patients with a nerve root signature present for ‘lameness’. In these cases, a spinal nerve is irritated by a disc extrusion and the patient has no neurological deficits but will intermittently hold the affected limb off the ground. Asymmetric caudal cervical IVDD typically causes cervical pain and the limb will not have a focus of pain. Advanced imaging (myelography, CT, MRI) may assist in achieving a diagnosis. Hindlimb root signatures in isolation are less common. Additionally it is not easy to differentiate hip extension pain from lumbosacral pain. Patients suffering from lower spinal pain may have a response to firm pressure over the lumbar spine and / or pain with pressure over the sciatic nerve tract between the biceps and semitenindosus immediately distal to the pelvis. Often imaging (radiology) will determine the status of the hips and lumbar spine.

**Key exam features of the 20 most common conditions**

1. **Carpal hyper-extension Injury:** dorsiflexion under stress – take a ‘stressed’ lateral antebrachiocarpal radiograph and compare the degree of extension

2. **Antebrachial limb deformity:** carpal valgus, external rotation of the pes and anterior bowing with or without elbow pain. Assess visually in standing position.

3. **Appendicular osteosarcoma:** severe focal pain / swelling associated with the distal radius, proximal humerus, distal femur and proximal tibia. Adjacent joints normal.

4. **Panosteitis:** severe pain during pressure over diaphysis of longbones in pups

5. **Elbow Dysplasia:** subtle pain response to aggressive flexion and extension
6. **Elbow luxation**: Gross displacement of the medial and lateral humeral condyles relative to the olecranon with varus/valgus instability

7. **Elbow fracture**: pain, swelling and instability associated with the joint. Edema.

8. **Shoulder OCD**: large breed pup with shoulder pain

9. **Biceps tendon disease**: adult dogs, unilateral lameness and positive biceps test

10. **Hock OCD**: effusion or capsular hypertrophy, reduced flexion and flexion pain

11. **Tibiotarsal collateral ligament instabilities**: instability when varus/valgus stresses applied, instability when rotational stress applied to the *pes*

12. **Achilles tendonopathy**: thickening of the distal tendon above the calcaneus

13. **Avulsion of tibial tubercle**: Pain/swelling over the anterior aspect of the tibial crest in juvenile pups

14. **Patellar luxation**: medial patellar instability able to be demonstrated with digital pressure on the lateral side of the patella directly a force medially. Typically extend the knee and even try this with the patient standing. Crepitus may be indicative of full-thickness cartilage loss.

15. **Partial cruciate tear**: Positive sit test, ‘toe-off’ stance if unilateral, development of medial ‘buttress’ if chronic, subtle effusion, no craniocaudal stifle instability, pain during forced extension, variable muscle atrophy.

16. **Complete cruciate tear**: positive drawer test with cranial tibial subluxation relative to the distal femur. This can be performed with the patient standing or recumbent

17. **Meniscal tear**: Palpable or audible ‘clicking’ sensation during range of motion testing of the stifle in a patient with complete craniocaudal stifle instability


19. **Chronic hip arthritis**: reduced extension range of motion and associated discomfort during forced hip extension. Variable degrees of thigh/hamstring muscle mass. Crepitus may be appreciated.

20. **Hip luxation**: Non-weight bearing lameness with external rotation of the limb. Palpation of the three pelvic anatomic landmarks concurrently (greater trochanter of femur, ileal wing, ischial tuberosity) will allow appreciation of any asymmetry. Typically the trochanter will be dorsally displaced following craniodorsal luxation.