

# Diagnosing Forelimb Lameness in Canine Patients

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Diagnosing and treating forelimb lameness in dogs can often be challenging. Our patients rarely demonstrate overt pain on forelimb palpation and standard diagnostics may not show a clear lesion. As with most diagnostic workups in veterinary medicine, a systematic approach is recommended. However I find that the patient's signalment and history are the most important factors in narrowing down the most likely causes of lameness.

## Signalment

The most relevant factors in the dog's signalment include the age, breed and size. The age, more specifically, refers to the age of onset of clinical signs, not the age at which the patient presents to you. Dogs that start limping under a year of age are more likely to have a congenital and/or developmental condition. Dogs over a year of age are more likely to present with lameness due to an injury, either chronic or acute. In geriatric dogs, neoplasia should unfortunately be high on the list of differentials. Osteoarthritis may be present in any age of dog, though will more likely be of significance in older dogs. It is important to note that in dogs, osteoarthritis exists secondary to a specific underlying condition, not from wear and tear to normal joints. Breed and size go together to some degree, but there are some breeds that are more prone to certain conditions. For example, German Shepherds are more likely to have an ununited anconeal process compared to other large breed dogs, while Spaniels are more likely to have incomplete ossification of the humeral condyle causing an increase risk of intercondylar fractures. Most conditions that cause forelimb lameness occur more often in large breed dogs, but there are a few that are more specific to small breeds, such as glenoid dysplasia and congenital medial shoulder instability.

## History

Obtaining a detailed history is paramount to discerning the cause of forelimb lameness. Again, the age of onset of clinical signs is very important. In addition, did the lameness start

acutely or was it a gradual onset? Was there a specific injury that occurred, such as jumping down from a height or being hit by a car? Has the lameness improved, worsened or stayed consistent over time? Is the lameness worse at any time of day or after any specific events, such as rising from laying down or after running around outside. If an acute injury occurred, then the workup is often simpler, as we are typically looking for a fracture, joint luxation or ligamentous damage. The more challenging cases are those with a gradual onset and a mild consistent or intermittent lameness. Dogs that suffer a lameness that steadily worsens over time are more likely to have a nerve related condition and/or neoplasia.

## Physical exam

Orthopedic exams in canine patients range from simple and diagnostic, to challenging and in some cases, impossible. After performing a general physical exam, including heart and lung auscultation, and abdominal palpation, I prefer to perform a gait analysis before palpating any limbs. This can be done down a long hallway, but outside with the owner can be helpful as well. I find it interesting that with forelimb lameness, owners often report the opposite side as being affected, because they see the dog's head dip down and assume that the limb hitting the ground at that moment is the affected limb, when in fact the dog is "down on the sound" limb. After gait analysis, when evaluating for forelimb lameness, I recommend starting with the unaffected limb. This will allow for a basis for comparison, especially if the patient resents palpation of its digits or other areas. Keep in mind that with many dogs that exhibit a unilateral forelimb lameness, the condition is actually bilateral, but clinically worse on one side.

However you perform an orthopedic exam, be consistent in your method. I start with digits and work my way through joints and long bones from distal to proximal. Each long bone should be directly palpated. Each joint should be put through full range of motion and if possible, stressed in additional directions. The carpus can be easily stressed mediolaterally, while the elbow is more difficult. Internal and external rotation of the elbow while in hyperflexion will often yield discomfort in patients with elbow disease. The shoulder joint can be extended, flexed (while palpating the cranial aspect) and abducted to evaluate for pain and/or laxity. There are additional tests that involve grasping and moving the biceps tendon, but they are not always reliable. Ultimately, you are looking for a pain response. Finally, cervical range of motion should be evaluated (be careful when ventroflexing small breed dogs) and the axilla palpated for potential masses or pain.

## Imaging

While cranial cruciate ligament injury is typically diagnosed on palpation, we often rely more heavily on imaging to diagnose the cause of forelimb lameness. Radiographs are the first step and are conclusive for many conditions. If radiographs are normal, and a bone or joint

lesion is suspected, then CT imaging will likely be valuable. If a soft tissue injury or lesion is suspected, then ultrasound and/or MRI would likely be more appropriate. If radiographs show evidence of joint disease but do not confirm a specific condition (such as subtrochlear sclerosis suggesting elbow dysplasia), then arthroscopy can be performed instead of advanced imaging to further evaluate the joint.

## **Young adult and older juvenile dogs**

Young adult dogs with a chronic history of unilateral forelimb lameness pose a common diagnostic and treatment challenge. If palpation is equivocal, the workup is focused on ruling out elbow versus shoulder disease. Elbow dysplasia is a developmental disorder that most commonly causes clinical lameness before a year of age, but can affect dogs of any age due to secondary osteoarthritis. The specific abnormalities that are included in the term elbow dysplasia include a fragmented medial coronoid process (most common), ununited anconeal process and humeral condylar OCD. Ununited medial epicondyle is considered by some to be a component of elbow dysplasia, but there is no general consensus and the pathophysiology is unclear. Dogs with elbow dysplasia will most likely have radiographic abnormalities, including subtrochlear sclerosis and osteoarthritis. If more information is desired regarding the severity of the condition, CT evaluation can be performed. If not, proceeding with arthroscopic evaluation and treatment is recommended. Dogs with more severe changes may have medial compartment disease. This involves complete cartilage loss on the ulna and medial humeral condyle. Medial compartment disease is difficult to treat, and may involve more advanced procedures that transfer load sharing from the medial compartment of the joint to the lateral compartment, such as a sliding humeral osteotomy (SHO) or proximal abducting ulnar osteotomy (PAUL). The canine unicompartiment elbow arthroplasty (CUE) is a procedure that uses focal prosthetic implants to resurface the medial compartment only, as opposed to a total elbow replacement, which at this time has not shown as promising of clinical results.

In young adult dogs with normal radiographs, shoulder injury is suspected. The two most common types of shoulder injury include supraspinatus tendinopathy with or without biceps involvement, and medial instability. The former is a chronic repetitive injury that often affects both shoulders. The supraspinatus tendon becomes chronically inflamed and can cause secondary impingement and tearing of the biceps tendon. Dogs can also have primary biceps injury without supraspinatus involvement. While radiographs may show mineralization in the area of the supraspinatus and biceps tendons, the absence of mineralization does not rule out the condition and the presence of mineralization does not confirm that the cause of the lameness is due to tendinopathy. Ultrasound or MRI are performed to evaluate the tendons and confirm a diagnosis. Treatment options range from medical management to surgical. Shockwave therapy has shown promising results in dog with supraspinatus tendinopathy when there is minimal damage to the biceps tendon. When there is core damage to the biceps

tendon, arthroscopic transection may be needed as physical therapy is often not enough to allow resolution of signs. Steroid injections can be used in dogs with primary bicipital tendonitis with variable results.

Shoulder instability in large breed dogs is a traumatic injury (chronic or acute), compared to small breed dogs where it is more commonly a congenital laxity. Unilateral is more common than bilateral, and 80% of traumatic instability is medial. Shoulder abduction angles are measured during a sedated exam. While 30 degrees is considered normal and 50 degrees abnormal, comparison between the affected and unaffected limbs is more helpful than the numeric value due to individual variation. Radiographs again do not show any changes and ultrasound cannot adequately reach the medial structures of the shoulder joint. MRI is the best imaging modality for evaluating the medial collateral ligament and subscapularis tendon. Arthroscopy allows direct visualization of the medial collateral ligament and also often shows cartilage erosion and synovitis. Dogs with mild lameness due to medial shoulder instability may improve with physical therapy alone, including a shoulder stabilization system which is a custom Hobbles construction. Dogs with more severe lameness are treated surgically with prosthetic reconstruction of the medial collateral ligament. Previously employed treatments have fallen out of favor, including biceps transposition (which alters joint biomechanics) and radiofrequency induced thermal modification (which causes collateral tissue damage and has a high rate of recurrence). In severe cases, arthrodesis can be considered. Arthrodesis is also a viable option for small breed dogs with congenital shoulder instability or traumatic luxation, as small dogs do very well clinically with shoulder arthrodesis.

## **Juvenile dogs**

Most common causes of forelimb lameness in juvenile dogs can be diagnosed with palpation alone and/or with radiographs. Advanced imaging is pursued if still unclear or if signs don't resolve as expected. Carpal laxity syndrome in young puppies does not require imaging to diagnose as long as age and history fit with the condition. Panosteitis and hypertrophic osteodystrophy should be evident on radiographs, though CT will confirm if radiographs are unremarkable. These three conditions are self-limiting in most cases, so treatment is aimed at treating discomfort if needed. Elbow incongruity can be trickier, as radiographs are not performed in a weight-bearing position. If a step defect cannot be visualized on radiographs, CT can be performed but arthroscopy is considered the gold standard due to its direct visualization and dynamic movement (compared to static images). Elbow incongruity requires more aggressive treatment in the form of an ulnar osteotomy or ostectomy to realign the radius and ulna with the humerus, or corrective osteotomies to correct resulting angular limb deformities.

## Older adult and geriatric dogs

Older dogs with forelimb lameness have a shorter list of possible underlying conditions, especially if the onset of clinical signs occurs later in life. Dogs with a several year history of gradually worsening lameness are more likely to have chronic joint disease with progressive osteoarthritis. Dogs with rapidly progressive lameness and obvious pain on palpation are unfortunately more likely to have neoplasia. Primary bone tumors are found more often in the proximal humerus and distal radius. If no pain is found on direct palpation of the long bones, but the patient is profoundly lame, deep palpation of the axilla may reveal pain or even a palpable mass from a brachial plexus tumor. CT with contrast or MRI are indicated when looking for a brachial plexus tumor, though very small lesions may be missed in which case repeat imaging after a period of time may be needed.

## Cervical disease

Lastly, forelimb lameness may not be due to an appendicular lesion at all, but related to cervical myelopathy. Lateralized cervical lesions, most commonly disc protrusions, can cause a nerve root signature from compression of the nerve root. Not all dogs with cervical myelopathy will show pain on cervical range of motion because if the disc is caudal enough, the area is more protected by surrounding musculature. Whenever performing MRI evaluation of the shoulder and/or brachial plexus looking for a soft tissue lesion, planning a possible second scan of the neck should be considered.

## Conclusion

Forelimb lameness in dogs can be challenging to diagnose, but signalment and history should help to narrow down the potential causes. Radiographs will be diagnostic for most bony lesions, and CT is the next step if a bony lesion is suspected but radiographs are normal. If a soft tissue lesion is suspected, ultrasound or MRI (or CT with contrast for neoplasia) of the limb is appropriate. If joint disease is suspected, arthroscopy is an ideal diagnostic tool, which also facilitates treatment. In young adult dogs with lameness, the most common causes are elbow dysplasia (< 1 year) and shoulder injury (> 1 year). Juvenile dogs are more likely to limp from a congenital or developmental abnormality, most of which can be diagnosed with radiographs. Geriatric dogs are more likely to suffer from chronic osteoarthritis or neoplasia. Most conditions of juvenile and adult dogs have a better prognosis with early treatment, so prompt imaging and diagnosis is ideal.