TSVS SURGERY & REHAB

TEXAS SPECIALTY VETERINARY SERVICES

Stressed Radiographs Views for Joint Ligament Injuries

With an increase in both affordability and ease of use, radiographs have become a necessary (and almost required) diagnostic tool utilized within any modern veterinary practice. This surge in availability of radiographic equipment has created a beneficial environment not only for the practicing veterinarian, who can now diagnose many common musculoskeletal issues in house, but also for veterinary specialists. Instead of the client being required to take their pet offsite for diagnosis, today's veterinarians are able to consult in a matter of minutes without leaving the practice. Common practices for advice, second opinions, and surgical consults include emailing dicom or jpeg formats and texting.

This has led to a mutually beneficial relationship and increased case load for both the clinician and veterinary specialists, but as with any relationship, there are frustrations felt by both sides. With their increased ability to provide radiographs for their clients, clinicians must learn the proper techniques and views utilized which allow a correct diagnosis to be achieved. Today we will discuss a few of the stressed views utilized by orthopedic surgeons to properly diagnose soft tissue damage to tendons and ligaments (collateral ligaments, palmar carpal ligaments, plantar tarsal ligaments, and cruciate ligaments).

****ALL of these views and most radiographic views should be performed under heavy sedation or anesthesia to achieve correct views and allow for appropriate alignment during stressed examination****

CARPAL/TARSAL Joints - Stressed Radiographic View Techniques

Carpal and tarsal joint injuries or luxations, while not as common, tend to be more complicated to diagnose due to the presence of multiple small joints and ligaments, making identification of the pathology difficult. With a standard dorsopalmar or lateral view, the joint itself may appear normal, making stressed views again, VERY important for proper diagnosis and treatment options. To the left are a

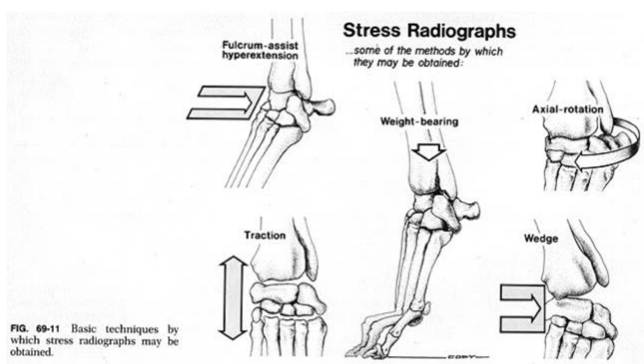


FIG. 69-11 Basic techniques by which stress radiographs may be obtained.

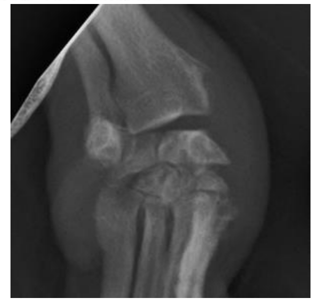
few techniques for stressed views on these distal joints.

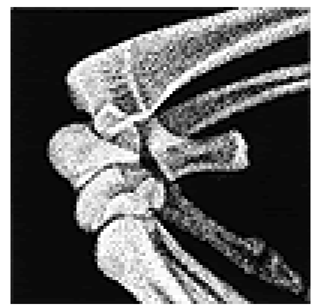
With any suspect carpal or tarsal joint ligament injury, 3-4 views are required to completely evaluate the suspect pathology. In addition, it is a good idea to take similar views of the equal and opposite forelimb or hindlimb for comparative purposes. These necessary views include:

1. **Lateral (weight bearing) standing view** centered over the carpal or tarsal joint with dorsal pressure applied as a fulcrum to actively engage the palmar carpal or plantar tarsal ligament (see diagram above). This view will highlight damage to these ligaments. Dorsal pressure serving as a fulcrum creating a weight bearing momentum, is critical to the successful view in diagnosis of these injuries. The radiograph example to the right reveals a weight bearing view that highlights a damaged palmar carpal ligament as indicated by the increased space located on the caudal aspect of the carpometacarpal joint indicating a carpometacarpal joint subluxation. This injury requires a partial carpal arthrodesis technique or carpometacarpal joint arthrodesis. A complete carpal arthrodesis technique can also alleviate the symptoms associated with this type of injury.

2. **Dorsoplamar view with axial and abaxial pressure** placed at the level of the carpal or tarsal joints. These are two separate views that allow diagnosis of medial or lateral collateral ligament injury. Axial pressure applied to the medial aspect of the carpus or tarsus will allow us to evaluate the lateral collateral ligament by creating a medial to lateral stressed view (as seen in the top carpal image view on the right). Abaxial pressure applied to the lateral aspect of the carpus or tarsus will allow us to evaluate the medial collateral ligament by creating a

lateral to medial stressed view (as seen in the same image of the carpus on the bottom right). Collateral ligament (medial, lateral or both) injuries can be repaired by primary techniques or arthrodesis techniques depending on severity and other ligament damage involving the joint.





3. Two additional views that may provide additional diagnostic information with regards to carpal and tarsal injuries include a **hyperflexed lateral view** of the carpal or tarsal joint (as seen in the carpal image to the left) AND a **traction dorsopalmar view** of the carpal or tarsal joint (see original diagram for example of traction view).

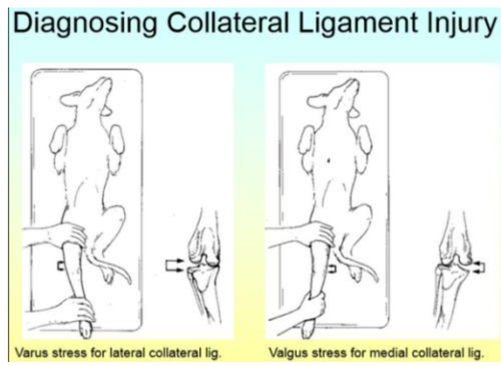
All of these techniques allow for stress to be placed on the individual joints of the carpal or tarsal complex, allowing for the diagnostician (be it the practicing clinician or veterinary specialist) to look for luxation or subluxation of carpal/tarsal bones and injury to various support ligaments and structures.

To the right, we can see the importance of the stressed views in diagnosing an injury within the carpal/tarsal region. In the radiograph labelled B, a normal dorsopalmar shot was taken, revealing a possible widening of the joint between the radiocarpal bone and the second carpal bone. When the wedge technique (focal pressure applied laterally in this joint) from above was performed and the shot was retaken with the carpus pulled laterally, the widening of the previously mentioned joint is exaggerated and more readily apparent on the medial aspect of the joint. This dog has an injured medial collateral ligament. If the medial collateral ligament was completely torn, the paw would be able to be deviated 90 degrees to the radius and ulna.

FIG. 7-2 A dorsopalmar stress radiographic view of a carpus accentuates the abnormal radiocarpal–second carpal joint widening (*A*) compared with the nonstress view (*B*). The dog had a torn medial collateral ligament.

STIFLE Joint - Stressed Radiographic View Techniques

When a pet is involved in a traumatic incident involving the stifle, it is possible for one or many of the support ligaments to be damaged in the event. This includes collateral ligaments (medial and lateral), as well as the cranial and caudal cruciate ligaments. When all 4 major support ligaments are damaged, this is referred to as a deranged stifle.

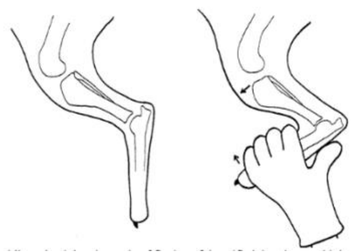


Varus stress for lateral collateral lig. Valgus stress for medial collateral lig.

A possibility with stifle trauma is a tear in the collateral ligaments. While isolated medial or lateral collateral ligament tears are rare in small animals, they can be secondary injuries in conjunction with injury to other restraints of the joint, thus making it important to evaluate them if stifle injury is suspected. Radiographically, the key views used to evaluate collateral ligaments are **stressed views with either a varus** (laterally applied pressure or fulcrum point) **or valgus** (medially applied pressure or fulcrum point) stress applied to the joint using either a wedge or simply applying the proper force to the joint, as seen to the right. If one, or both, of the collateral ligaments are injured, an increased in medial or lateral joint space may be seen. The radiograph to the right is from a cat with a medial collateral ligament injury. You can see an increase in the medial joint space when valgus stress was applied to the joint.

The most common injury of the stifle joint is the rupture of the cranial cruciate ligament, allowing for cranial drawer of the joint and, to a degree, a cranial tibial thrust upon flexion of the tarsus. When radiographing the stifle to assess cruciate damage, it is important to capture a **flexed lateral image** depicting weight bearing biomechanics.

When radiographing a potential cruciate tear, flex the stifle at 90 degrees, making sure that the tibia is parallel with the edge of your plate. With the stifle flexed, maximally flex the hock 90 degrees in order to apply a cranial weight bearing pressure on the tibia. Ensure that the hock (calcanues) is flat against the plate and the tibia is level, allowing for an equal radiographic distance along the length of the tibia. The focal radiographic beam or cross hairs of the radiographic beam should be **centered** directly over the stifle joint (at the level of the tibial tuberosity), but the entire collimated beam or view should include the stifle and hock or tarsal joint.



Interpreting:

With this stressed view, a stifle with a torn CCL will present like the image to the right, with the proximal end of the tibia thrusted or advanced cranially, uninhibited by the ruptured cranial cruciate ligament. Partial tears will often not exhibit this tibial thrust technique, but soft tissue enhancement due to increased effusion from the ligamentous instability in the joint will allow for diagnosis. Additionally, osteoarthritis is another indicator of an unfavorable environment located within a stifle joint that has cruciate injury.

SHOULDER or ELBOW Joints - Stressed Radiographic View Techniques

Collateral ligament, joint capsule or other support ligament damage can occur in any joint including the shoulder or elbow. These injuries similar to other joints can present as non-weight bearing lameness cases particularly if collateral ligament damage is occurred. Collateral ligament injury or joint capsule and support ligament injury can be diagnosed with similar techniques as described for stifle joint ligamentous injury. **Varus AND valgus dorsopalmar projections** of the affected and non-affected limb focused on the affected joint can aide in the diagnosis (refer to diagram “Diagnosing Collateral Ligament Injury” under stifle joint section).