Canine Cruciate Ligament Disease

a common orthopedic problem

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Though individual hospital patient demographics vary, the peak prevalence of cruciate injury seems to occur in older (7-10 years), large breed (>22 kg), obese, neutered dogs (Rottweiler, Newfoundland, Staffordshire Terrier, Golden Retriever, Labrador Retriever, Mastiff and others).

The pathophysiology of cruciate ligament disease in dogs remains very complicated and incompletely understood, and the search for the elusive, optimal corrective procedure Continues. We have been unable as yet, to create a normal canine stifle once damage to cranial cruciate ligament has occurred.

Clinical signs of cruciate ligament disease

Most veterinarians are well versed in recognizing the clinical signs of hind limb lameness due to a cranial cruciate injury. This is a common condition. Some dogs will present completely non-weight bearing, especially if the injury is acute and severe with or without involvement of the medial meniscus. Others will
present with just a subtle shifting of weight to the other leg, or sit with the affected leg abducted or mild muscle atrophy. Unfortunately late presentations are all too common with a thickened, chronic knee making the surgical correction less likely to be completely successful. There are certainly some stoic dogs that may present with no clinical signs other than mild joint effusion. Some of these stoic dogs don’t even react to stifle manipulation and palpation. Thankfully these are less common as cruciate injury with arthritis is a painful condition allowing us to recognize most dogs with this condition. Radiographs should be taken of all legs showing the above clinical signs to aid in diagnosing a cranial cruciate injury and rule out other conditions causing lameness such as neoplasia, other forms of arthritis, trauma, fractures, or chronic degenerative joint disease etc.

Radiology and the Injured Cranial Cruciate Ligament

Radiology is an essential diagnostic and surgical planning tool used in the management of canine cruciate disease. Most veterinary facilities have trained registered animal health technicians performing radiographs. It is important to make sure that as a surgeon, you are given the correct views. These views should be free from rotation and artifact and have proper exposure in order to make an accurate diagnosis, elect the most optimal surgical procedure for that specific problem and stifle anatomy, and perform the necessary pre-surgical measuring and planning for the elected corrective procedure. When a dog presents with a suspect cruciate ligament problem, technicians should utilize a standard radiographic technique, with or without sedation (patient dependent) capturing at least three views. The first is a mediolateral standing position (135 degrees of extension – some choose to use a goniometer for this). The second is a mediolateral flexed (90 degrees) with the hock included if possible. The third is a craniocaudal view. Avoidance of rotation and artifact is essential when assessing the stifle for cranial cruciate disease. Avoidance of cranial translation is important when assessing TTA measurements. It is important to take these images using some sort of size calibration technique so that accurate measuring for implants and advancement or rotation may be performed. Digital radiography allows for rapid and accurate assessment of the stifle with automatic calibration and measurement for advancement, rotation and implant selection for procedures such as the TPLO or TTA. Some digital software such as scil IPS make pre-surgical assessment and planning much easier, quicker and perhaps more accurate. They will allow not only for accurate measuring, but they will also allow the surgeon to place digital implants in the correct position in the proposed surgical site.

Because cruciate ligaments and menisci are not normally seen with standard radiographic techniques, we often rely on secondary radiographic changes in the stifle to help diagnose or infer a compromised cranial cruciate ligament. The degree of radiographic changes vary according to chronicity and severity. Young animals with a traumatic injury may present with an easily diagnosed avulsion fracture. Some may have joint effusion only with no degenerative changes. Older animals, again depending on chronicity of the disease, may have degenerative changes of osteophytes and enthesophytes, joint effusion, changes in the infrapatellar fat pad, and a gastrocnemius sign. Sometimes easy recognition of a cranial displacement of the proximal tibia relative to the femur may allow for a definitive diagnosis.

Definitive Diagnosis of a compromised or torn cranial cruciate ligament

Performing manual tests that evaluate stifle stability are most commonly used to definitively diagnose the torn cruciate ligament. Sedation or light anesthesia can aid in performing these procedures but are not always necessary. Cranial drawer and cranial tibial compression will assess for ligament integrity and cranial thrust respectively. Tibial compression assesses for cranial translation during weight bearing more accurately. If done
correctly, it can give the surgeon an idea of the size of the TTA implant that will be required to eliminate shear forces. This does not take the place of accurate radiographic measuring.

Facilities with MRI capabilities may elect to use these advanced imaging techniques to definitively diagnose the torn cruciate and/or meniscus. Surgeons with arthroscopic training and equipment may use arthroscopic techniques to diagnose and treat cranial cruciate disease.

Cranial Cruciate Corrective Procedures

Over the years there have been many corrective surgeries introduced into veterinary surgery dating as far back as the 1960s when a lateral stabilization technique was introduced. Since then, variations of that theme and newer, “outside the box” procedures, have propelled veterinary orthopedic surgery to where it is today.

The goal of these surgeries has always been to neutralize the rotational and cranial shear forces in the stifle joint that result from the loss of a functional cranial cruciate ligament.

Static stabilization procedures such as the lateral suture technique have been perhaps the most common technique performed in the past (and currently by the general practitioner), but they have been plagued with post operative complications of severe osteoarthrosis due to their inability to restore normal forces within the joint. The placement of fishing line or similar material on the lateral (and sometimes medial) aspect of the joint in order to mimic the anatomy of the once existing cruciate ligament is never anatomic and results in a restrictive damaging process in the knee joint. However, newer concepts of isometric points and bone tunneling have greatly improved the static stabilization techniques.

The tightrope surgery is one such static stabilizing surgery which utilizes isometric points and bone tunneling in an attempt to stabilize both rotational and cranial shear forces in the cruciate deficient stifle and has had promising results. One limitation is the inability to accurately predict perfect isometric points in all dogs due to variation in anatomy.

Surgeries aimed at dynamic neutralization of rotational and shear forces in the canine stifle include the tibial plateau leveling osteotomy (TPLO) procedure devised by Slocum in 1993 and the tibial tuberosity advancement (TTA) procedure by Montavon and Tepic in 2002. There are other variations on these two themes. The TPLO procedure is performed by making a radial osteotomy with rotation of the proximal tibial fragment in order to reduce the slope of the tibial plateau, thereby eliminating the relative cranial shear force of the proximal tibia. Necessary instrumentation for this procedure include a radial oscillating saw and drill such as the Aesculap Acculan 3Ti Saw and 3Ti Surgical Drill and a selection of TPLO plates (of which there are several varieties- surgeon preference). Some surgeons use a jig to aid in the osteotomy and accurate rotation of the proximal fragment. The TTA procedure involves making an osteotomy of the tibial tuberosity with advancement in the frontal plane to achieve a patellar ligament to common tangent or tibial plateau slope (PL/CT) of 0 degrees eliminating cranial translation of the proximal tibia and the cranial shear forces within the stifle joint. Some surgeons believe this reduction in the PL/CT is more important than the partial leveling of the plateau in the successful reduction of shear forces in the TPLO surgery. Necessary instrumentation for the TTA procedure include a sagittal saw and drill such as the Aesculap Acculan 3Ti Surgical Drill and some specialized equipment and implants required for advancement of the tibial tuberosity.
When to Refer?

All orthopedic procedures have an acceptable complication rate. Most complications come from inexperience and lack of proper education and training, or not having the proper equipment or inventory forcing implant selection.

Another significant reason for post operative complications is the lack of proper joint inspection and missing a damaged meniscus. Surgeons performing these advanced orthopedic procedures are recommended to compare their complication rates with published rates for the procedures (by specialist facilities) to make sure that they fall within the accepted percentage. In veterinary medicine and surgery today, we have readily available referral centres for these advanced orthopedic procedures in most major centres across Canada. Until surgeons have adequate training and experience, these procedures should be referred whenever possible.

Please contact scil Vet Novations directly for a specialist or referral centre in your area.

Continuing Education

Fortunately for veterinarians that wish to perform these advanced orthopedic techniques and for veterinary facilities that are isolated making referral difficult and rather than performing less than ideal surgical techniques, there are high quality orthopedic continuing education courses available in Canada. It is recommended that veterinarians attend basic orthopedic training courses such as fracture repair first and then continue on to the advanced courses offering training in TPLO and TTA procedures.

For additional information on Cranial Cruciate Ligament Disease, please feel free to contact scil Vet Novations and we can put you in touch with one of the many specialists we work with.

Intermediate Fractures    Calgary, AB    April 20 & 21
Basic Fractures          Charlottetown, PEI  May 4 & 5
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