



Phone: 1800 442 648

## Cranial Cruciate Ligament Disease



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# Cranial Cruciate Ligament Disease

## ANATOMY:

The cranial cruciate ligament is one of the ligaments that provide essential support to the stifle (knee), which is referred to as the stifle joint in animals. It is the same ligament as the anterior cruciate ligament (ACL) in humans. The cranial cruciate ligament connects the femur and tibia and is critical to prevent excessive rotation and over-extension of the stifle joint, as well as to stopping the tibia sliding forward when walking.

The meniscus cartilage is another important structure within the joint, which sits between the femur and tibia. The meniscus provides shock absorption, load-bearing and stability to the stifle joint. The meniscus may be concurrently damaged when the cruciate ligament is ruptured and meniscal injury worsens the prognosis by hastening the progression of osteoarthritis. Meniscal injury is more likely when the cranial cruciate ligament is completely ruptured.

## CAUSES:

The cranial cruciate ligament can rupture suddenly as the result of a traumatic event or gradually as the result of degeneration. Causes of degeneration include high body weight, aging, genetics, obesity, immune-mediated disease and leg conformation. The ligament can degenerate slowly over time, becoming weaker and culminating in either sudden, complete rupture or chronic gradual rupture. This process can affect both stifles and therefore the other leg is frequently affected. Around 20% of dogs have problems with both stifles when they are initially assessed, and the lifetime risk of the other side rupturing is at least 50%. Some medical conditions, such as hyperadrenocorticism (Cushing's disease), can also weaken the ligament. When the ligament ruptures, either partially or completely, the dynamics of the stifle joint are altered, and the joint becomes painful and unstable. The most common result is joint pain and lameness with subsequent development of arthritis, degeneration of cartilage in the joint, and associated stiffness.

Cranial cruciate ligament injury is the most common cause of hind limb lameness in medium and large-breed dogs but also occurs frequently in small breed dogs and rarely in cats. Although any dog can suffer a ruptured cranial cruciate ligament, some breeds are predisposed to this condition including Rottweilers, German Shepherd Dogs, Labrador Retrievers, Staffordshire terriers and Mastiffs.

## CLINICAL SIGNS:

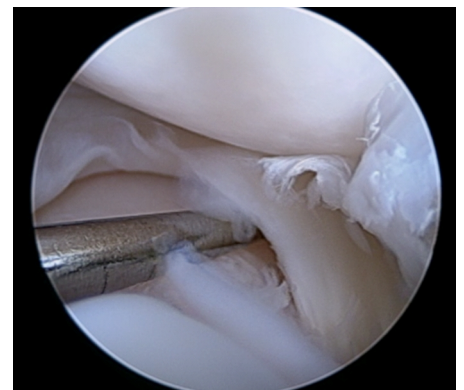
Sudden or intermittent lameness in the hind limb is the primary symptom. Intermittent lameness may typically appear worse after extended walks or running. Affected dogs may also have reduced activity levels, trouble jumping or rising from rest. Joint swelling, pain or stiffness may be noted in the affected stifle joint. Often dogs with partial tears will have these signs and may improve with rest, but this will usually progress to a complete tear or worsening osteoarthritis over time. Dogs with concurrent injury to the meniscus are often severely lame and may have 'clicking' sound on movement of the stifle joint.

## DIAGNOSIS:

Joint infections, injuries to other joints such as the hip, development of osteoarthritis, lumbosacral or other lower spinal problems, other bone disorders such as panosteitis or even certain bone tumours may also produce similar symptoms to a ruptured cruciate ligament. Since the symptoms alone do not differentiate between these disorders, assessment of your pet's history and a physical examination will be required to diagnose the cause of the lameness.

Several tests can be performed to confirm or eliminate the possibility of cranial cruciate ligament rupture.

1. **The cranial drawer test and tibial compression test:** This will be performed by the surgeon during examination. However, absence of this sign does not rule out the diagnosis especially if your pet's muscles are too tense or there is a small partial tear of the ligament where the majority of ligament tissue is not damaged. This test is often performed or repeated when your pet is under sedation or anaesthesia which helps to relax these muscles around the stifle joint.
2. **Radiographs (X-rays):** Both stifle joints will be radiographed for evaluation and comparison. Joint effusion (fluid accumulation in the joint) will often be noticed in the affected limb on X-rays. This will also allow us to evaluate for the presence or absence of osteoarthritis and assess for other disorders that might mimic cranial cruciate rupture. Radiographs will be performed under general anaesthesia to allow proper positioning as these films will often be used to aid surgical planning.
3. **Arthroscopy (keyhole joint inspection):** The interior structures of the joint can be examined arthroscopically either routinely if it is the preference of the surgeon or if the diagnosis is still uncertain following palpation and xrays. A camera and instruments are introduced through small wounds to allow the joint to be evaluated. This can confirm an early partial tear of the ligament by visualizing and palpating the ligament tissue, but does not require open surgery and allows the most complete assessment of the joint. A video presentation on stifle arthroscopy is available on our website [www.vss.net.au](http://www.vss.net.au)
4. **Joint fluid examination:** Occasionally the fluid from within the joint is examined under a microscope or submitted to a laboratory before surgery. This test is usually to eliminate alternative causes of limping such as joint infections.



*Image – Arthroscopic probing of medial meniscal cartilage.*

## TREATMENT

Affected animals often have ongoing pain and lameness due to the important functions the cranial cruciate ligament has. This can lead to joint instability, cartilage damage, chronic inflammation and the development of degenerative joint disease (arthritis).

Furthermore, to compensate for this, more stress is placed on the other hind limb, which may lead to a ruptured ligament in that stifle. In most cases we recommend surgery to stabilise the stifle - this provides the best prognosis for long-term function. Arthritis can eventually develop or continue to progress in the joint even with surgery, but the rate and severity of this irreversible complication is significantly lower once surgery is performed.

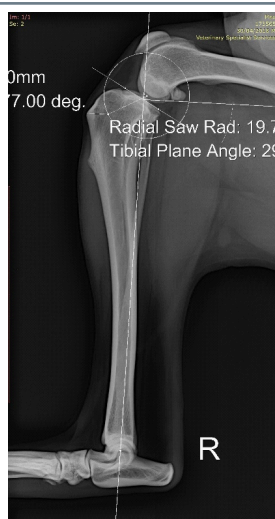
**Surgery:** All patients undergoing surgical stabilisation will have an exploratory surgery into the stifle joint. Depending on your pet's requirements this may be done arthroscopically or via arthrotomy (surgical incision into the joint). This is performed for two reasons. Firstly, this will allow visualisation of the ligament and will confirm the diagnosis of a ruptured cruciate ligament. The damaged ligament will then be removed as it can be a focus of ongoing inflammation within the joint. Secondly, the meniscus will also be assessed for concurrent injury and the damaged portion may be repaired or removed. Meniscal assessment is most accurate when assessed by arthroscopy.

There are several surgical techniques that we provide at Veterinary Specialist Services to stabilise the stifle.

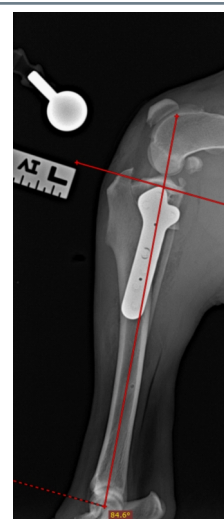
- Osteotomy-based techniques:** Stability of the stifle joint is achieved without replacing the cruciate ligament but rather by changing the biomechanics of the stifle joint. The aim of these techniques is not to replace the ligament, rather change the joint to function well without it. The techniques we employ in our practice are the Tibial Plateau Leveling Osteotomy (TPLO) and Triple Tibial Osteotomy (TTO) procedures. The procedures involve making bone cuts (osteotomy) in the tibia to adjust the contact surface (tibial plateau) until it attains a near level orientation (approximately 90 degrees) relative to the attachment of the quadriceps muscles. This biomechanical alteration renders the stifle more stable in the absence of the cranial cruciate ligament. The cut in the bone needs to be stabilised with a bone plate and screws. Once the bone has healed, the bone plate and screws are no longer needed. In some patients, irritation or infection may necessitate removal of the implants.

The decision on which procedure is best suited to your pet is made following individual assessment of each case. Both techniques have advantages in different situations. These techniques are our preferred choice because of better outcomes especially in larger dogs with good return to previous normal limb function, athletic mobility and with less progression of arthritis. There are only a very small number of dogs that are not candidates for these procedures.

Left – preoperative planning radiograph of a case with cranial cruciate ligament rupture  
Right – post operative radiograph following a TPLO procedure

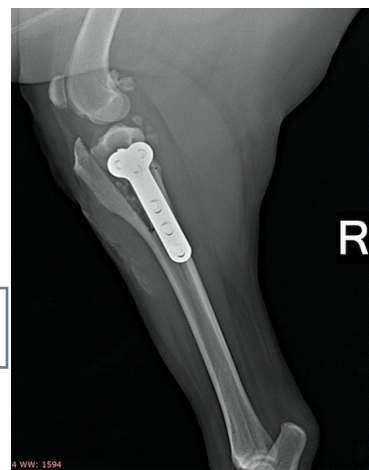


Pre operative radiographs showing tibial plateau angle of 30 degrees on left radiographs, with right radiographs showing the same dog post operatively with a tibial plateau angle of 5.4 degrees



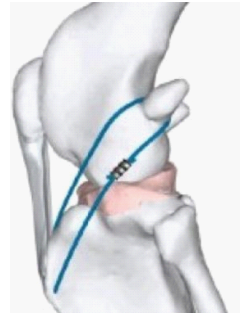
TPLO Radiograph from a mastiff (left - 60kg) and miniature poodle (right - 5kg) demonstrating the wide range of patients that can be treated with this procedure

Post operative radiograph of TTO



- *Extra-capsular suture stabilisation techniques* (also called De Angelis suture): The technique acts to mimic the function of the ruptured ligament with a prosthesis placed in similar orientation to the original ligament. The long-term goal is to facilitate the formation of organised scar tissue around the joint to provide stability as the prosthesis weakens over time. Some small breed dogs and cats, with normal stifle anatomy, respond well to this technique, but larger patients do not do as well.

*Right - Modified De Angelis Procedure Prosthesis placed in the same anatomical plane as the ruptured cranial cruciate ligament.*



#### **COMPLICATIONS:**

With any surgical procedure complications are possible. There is a small risk with any anaesthetic, as there is in people. The chance of a major anaesthetic complication is presently very low – only 0.01%.

90% of patients are expected to return to normal function following an uncomplicated tibial plateau levelling procedure.

There is a 5% risk of infection that will necessitate additional antibiotic therapy and the likelihood of implant removal following healing of the osteotomies.

There is also a small risk of a meniscal injury even if the meniscus was intact at the point of surgery. This generally occurs within 12 months of surgery and typically requires trimming of the meniscus to resolve the lameness which may be able to be done arthroscopically.

In about 50% of dogs or cats with cranial cruciate ligament rupture the ligament in the opposite stifle (knee) may have problems. Vigilance for the onset of lameness in the opposite hind limb is important.

#### **POST-OPERATIVE CARE:**

Appropriate post-surgical care is extremely important for optimal long-term return of function, including physiotherapy, which has been shown to improve the outcome after TPLO surgery. We will arrange an appointment with our physiotherapist soon after the procedure. Eight (8) weeks of strict confinement is recommended following surgery to allow uncomplicated healing to occur. A slow introduction of short leash walks on flat surfaces are encouraged to allow tissue healing and convalescence. The length of walking time is gradually increased this will be discussed with you after surgery. In most cases, normal activities are resumed postoperatively by 12 weeks. It takes 12 months for maximum return to function. An osteoarthritis management plan may need to be established for some dogs - this can be discussed in the post-operative period.

Reassessment is recommended at 2 and 8 weeks post-operatively to assess function and recovery. A follow-up radiograph may be performed at the 6 to 8 week recheck to assess bone healing. This is a day procedure and your pet may require sedation. This may need to be repeated 12-14 weeks after surgery. Once healing is complete free exercise should be allowed.



#### **COST:**

The cost of surgery and work-up ranges from \$3,500 - \$5,500 depending on the surgical procedures required.

Hospitalisation and physiotherapy following surgery range from \$150-350 per day again depending on individual requirements.

The 6 to 8-week follow-up radiographs may need sedation or general anaesthesia for us to adequately assess the bone healing and evidence of any complications. The cost of this is approximately \$540.

**If you have any questions, please feel free to contact of the Specialist Surgeons at Veterinary Specialist Services.**



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