ESPANOLA ANIMAL HOSPITAL
SETTING THE STANDARD OF CARE

Dr. PJ Rocheleau, DVM and Associates
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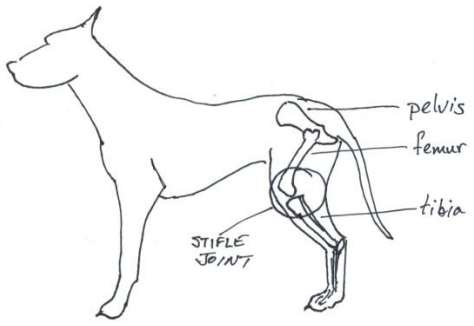
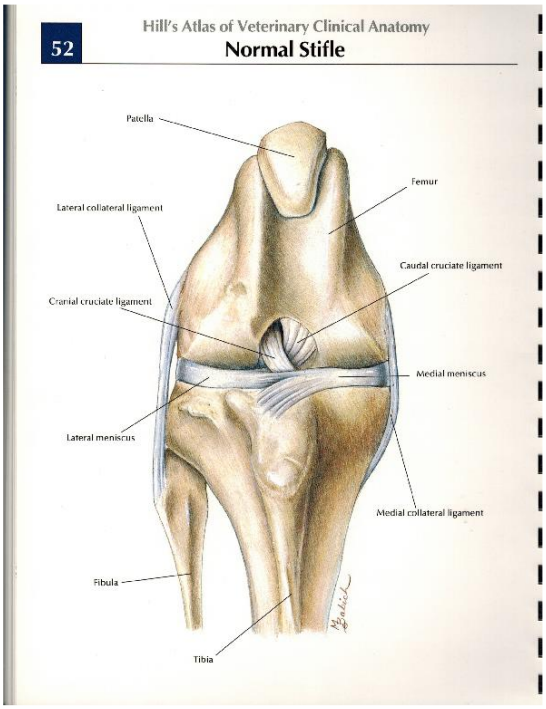
Cruciate Ligament Disease

The Cranial Cruciate Ligament

The cranial cruciate ligament (CrCL), which in humans is called the anterior cruciate ligament or ACL, is one of several structures in the knee that provide joint stability and allow normal function. The knee is the joint formed by the femur, tibia and patella ("knee-cap") and is a basic pulley system that allows the lower leg to swing in a backward and forward direction like a pendulum. Four ligaments prevent motion in other planes; two collateral ligaments that prevent side-to-side motion and provide some rotational stability. There are two cruciate ligaments (cranial and caudal) that prevent the tibia moving backward and forward independently of the femur. These ligaments also help limit the internal and external rotation of the joint. Two other structures that help form the surface of the joint which are also very important are called the meniscus (lateral and medial).

The cruciate ligaments together provide rotational stability to the joint; i.e., they limit the internal and external rotation that is possible. They do this by locking against each other when excessive rotational force is applied to the joint. If the cranial cruciate ligament is completely torn, this locking mechanism is destroyed and internal rotation may occur during loading of the limb. This finding is variable between dogs; some dogs have significant problems with rotational instability while others seem to have far less issues.





The primary purpose of the CrCL is to prevent cranial tibial thrust – motion of the tibia in a forward and upward direction**. Rupture of the CrCL allows this motion to occur, which precipitates most of the problems that happen with cruciate disease.** The CrCL also prevents

forward translation of the tibia relative to the femur.

How Do I Know If My Dog Has Cruciate Ligament Disease?

Only a veterinarian can diagnose cruciate disease by performing a proper orthopedic examination and obtaining x-rays. A number of signs can occur that suggest cruciate disease and any hind limb lameness that occurs in your dog should be evaluated. **The vast majority of dogs presented for hind limb lameness will have cruciate ligament disease as the cause**.

Cruciate ligament disease can occur in a dog of any breed and any age. Unfortunately, this is often a bilateral disease; approximately 40% of dogs that have cruciate disease eventually have it in both legs. Some breeds of dogs are predisposed to bilateral disease: Labrador retrievers, Mastiffs, Rottweilers and Bernese Mountain dogs are some examples. Concurrent orthopedic disease such as hip dysplasia and patellar luxation (dislocation of the "knee cap") can occur and may contribute to cruciate disease. It is important that these problems also be recognized and addressed.

When you present your dog to our hospital for a lameness problem, a complete orthopedic examination is required to obtain a proper diagnosis. The lameness exam should include a gait evaluation and a complete physical examination including a proper detailed orthopedic examination. In our hospital the gait examination also includes objective gait analysis by using a pressure sensitive walkway called a TekScan. Part of the orthopedic examination must be performed under sedation and includes a number of manipulations and physical tests to determine the full extent of any existing orthopedic problems. Good quality, properly positioned radiographs of any affected limbs and joints are then obtained to assist diagnosis and plan appropriate treatment. For surgical purposes, specific radiographs must be obtained that can be used by our orthopedic planning software to take measurements of your pet's knee.

Cruciate Disease, Progression and Arthritis

In dogs, cruciate disease is a chronic, degenerative disease; traumatic injury is uncommon even though to the owner it often appears as an acute event. **It is not an injury**, as happens in humans. It follows a typical, predictable and inevitable progression, from partial tear to complete tear to torn meniscus to severe degenerative joint disease. When chronic disease is present or a torn ligament goes unrepaired, arthritis begins to develop and other structures in the stifle can become damaged. All patients with cruciate ligament disease will follow this progression if this disease goes untreated.

The meniscus can be torn resulting in significant pain and worsening of the lameness with an escalation in the rate at which arthritis develops. Approximately 50-60% of dogs with complete cruciate rupture have a damaged or torn meniscus at the time of surgery. Meniscal injuries are dealt with at the time of surgery; the damaged tissue is removed and any functional tissue is preserved whenever possible. In dogs that have an intact meniscus at the time of surgery, approximately 2% will tear it at some later point.

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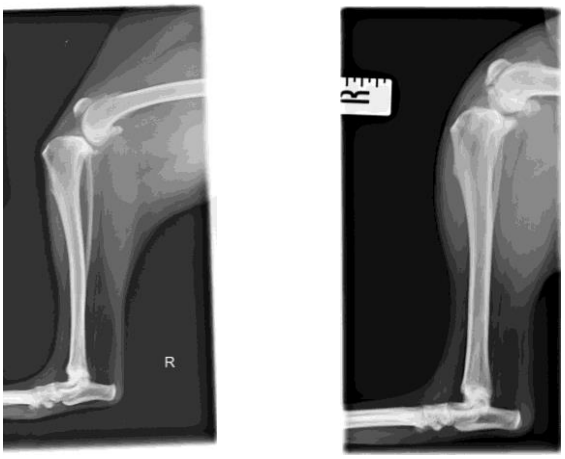
This dog has a partially torn CrCL. The tear is the disorganized tissue to the lower left. The caudal cruciate is visible in the background.

The severity of disease and the rate at which it progresses is directly related to the weight of the dog – the heavier the dog typically the more severe and rapid the development of disease. **Regardless of size, this is a surgical disease.** There is no way around this reality and failure to address this disease surgically will result in severe and rapid progression of disease. Dogs treated early, such as those with a partial tear, have a much better long-term outcome than those that present with more damage.

Cruciate ligament tears do not and cannot heal and will always get worse if left untreated. We now understand that it is the exposure of the torn internal structure of the ligament to the immune system that brings about its ultimate destruction. It is at the point that a partial tear develops that the patient has a surgical disease; failing to act at this point will simply allow further damage to occur to the joint and puts the cruciate ligament in the opposite leg at risk due to over-loading. **Dogs that do not have timely treatment are at very high risk of tearing the cruciate ligament in the other leg.**

The goal of surgery is to restore normal function and mitigate the development of further damage and arthritis. With timely management the dog can be expected to have a normal life expectancy with good function and normal quality of life afterwards, especially with some of the newer surgical techniques in current use. Patients are expected to return to all of their normal pre-injury activities after treatment is complete.



1. The radiograph on the left shows a dog that has a recently ruptured cruciate. The joint shows no evidence of arthritis. 2. The radiograph on the left shows a dog that had a ruptured cruciate that went untreated for 12 months. The joint is severely arthritic. This dog was non-weight-bearing on this leg at presentation.

Medical Management

As mentioned previously, patients with cruciate disease require surgical repair. However, medical management is necessary to protect the joint and keep it healthy pending surgery, in the perioperative period, and for the rest of the patient's life thereafter. It is important to understand that surgery is a very important event, but affected joints need long-

term care to keep them healthy and prevent further damage. No matter how good a job the surgeon does, some arthritis will develop over time.

Surgery is the beginning of treatment, not the end! The goal of all therapy, including surgery, is to minimize the development of arthritis so that the dog can live a normal, healthy and pain-free life. Simply investing in surgery and failing or refusing to follow instructions regarding long-term management, especially dietary, will lead to poor results and poor long-term outcome, often within months following surgery.

It is also important to understand that arthritis is not a disease. Hip dysplasia, cruciate ligament disease, elbow dysplasia, etc, are diseases. These diseases affect the joints and cause chronic inflammation; arthritis is simply the chronic, bony, permanent, degenerative change resulting from unaddressed chronic inflammation. As such, the goal of **all** of our therapies is to prevent or suppress inflammation, thereby preventing the development of arthritis. Attempting to treat arthritis is generally unproductive – at that point it is too late, permanent irreversible damage has occurred.

Weight, Diet and Cruciate Disease

In any patient with any orthopedic disease, the most important factor impacting the development of disease, prognosis and treatment is the weight of the patient. This is true with respect to the relative weight of the dog (St. Bernard v. Chihuahua) but especially with respect to obesity. **Regardless of the orthopedic condition, failure to recognize and address issues of diet and obesity will result in treatment failure, no matter how much is invested in treatment and surgery.** Some surgeons have a policy of declining to perform surgery until obesity issues are resolved due to the higher complication rates, increased difficulty in performing procedures and sometimes demonstrated failure of compliance on behalf of the client. We will provide specific dietary recommendations including a specific diet(s), strict feeding guidelines that include specific measuring instructions and complete diet counselling during the orthopedic consult.

Joint Diets - Therapeutic diets are very commonly employed in the treatment of many diseases in veterinary medicine. These diets are intended to produce a clinically measurable impact just like any other treatment that we prescribe to treat disease. In the case of the diet we prescribe for joint disease, multiple outcome measures have been described in the veterinary literature.

These diets are designed not only to deal with inflammation associated with joint disease but are excellent at addressing weight issues that will have the most impact on patient outcomes. The product that we use in our hospital is j/D®,

produced by Hills. There is a companion diet, Metabolic plus Mobility® that we use to manage dogs with significant weight problems. We use these diets for specific reasons that are discussed in detail during our orthopedic consults. This is an essential component of the long-term care for these patients and will determine their outcome.

Other Medical Treatments

Chondroprotectants – Recent large-scale studies have shown that glucosamine and chondroitin have no therapeutic value unfortunately. However, since it is important that patients be on an effective long-term joint supplement, most surgeons have shifted their recommendations to a product called Flexadin, which has good evidence to support its use. This usually prescribed and supplied in our hospital at the initial visit.

NSAID's - All dogs presented for cruciate disease initially start on NSAID's as this is our primary means of immediately addressing pain and inflammation. While our other therapies can also address these issues, they all take a significant amount of time to start having an effect – drug therapy is immediate. A number of options are available, including some newer products that have a reduced incidence of adverse effects.

Surgical Management of Cruciate Ligament Disease

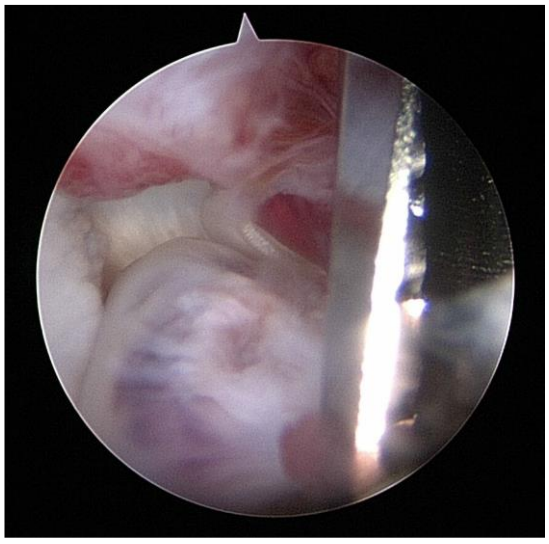
Surgery for this condition is a multistep procedure. The joint is first examined and treated arthroscopically and then the joint must be stabilized to eliminate tibial thrust and rotational instability. There are a number of surgical techniques currently available which are divided into 2 major groups: extra-capsular repair and geometry modifying techniques

Arthroscopy – Treating the Joint

The joint itself must be treated and tissues inspected for damage and debrided or repaired if necessary. Addressing the joint is a major part of proper surgical management and should be performed in every single case. The best approach for performing this procedure is arthroscopically.

An arthroscope is both a camera and a magnifying glass – up to 20X magnification – in a small metal tube that is inserted into the joint. Arthroscopy is performed through 3 or 4 very small holes through which both the scope and miniaturized surgical instruments are passed into the joint. The entire joint is visually inspected

for tears or damage to the ligaments, meniscus and cartilage. We are able to perform these procedures far more accurately and precisely than by open joint exploration. Many lesions not visible to the naked eye are very easily visualized and treated with this minimally invasive approach. This is currently considered the gold standard of care for treatment of the joint. Arthroscopic surgery is a technique in which we have a great deal of specific expertise and for which our hospital and staff have received international recognition.



Ruptured cruciate being arthroscopically debrided with a motorized shaver.

When performing arthroscopic treatment of the knee, the cranial cruciate ligament is first inspected and then all damaged tissue carefully removed. If a partial tear is present the remaining functioning tissue is left in place. The meniscus' are then inspected for tears. Most commonly the medial meniscus is affected by pathology, which may include a variety of tears or simply instability. Any meniscal tears or instability are addressed either by removal of the damaged tissue or repair by suturing. Meniscal suturing is a common treatment in humans but is in early development in veterinary surgery. Our hospital is involved in the development of this technique and the results thus far have been excellent. The success rate of this procedure in our hospital has been holding at 96% for the past several years, which is considerably higher than what is seen in humans (approximately 83%). We have published the first ever clinical outcome report in the veterinary literature on meniscal suturing.

Once the arthroscopic portion of the procedure is completed the joint must then be stabilized as described below.

Extracapsular Repair

Extracapsular techniques rely on using very heavy suture materials to construct a restraint on the external surface of the joint to provide stability. These repairs inevitably rely on formation of scar tissue and fibrosis of the joint capsule as the repair is expected to break down over time. The two currently most common are the Lateral Fabellar Suture and Tight-rope®. A number of studies have now demonstrated that extracapsular techniques do not perform well in the long term and do not provide adequate stability to the joint. We no longer provide extracapsular repairs as a primary stabilization in our hospital, regardless of patient size.

However, the current primary advantage of extracapsular repairs are their ability to provide rotational stability. In patients with significant rotational stability, we will implant a lateral suture as an anti-rotational device ("Internal Brace®") in addition to a TPLO. Patients receiving a meniscal repair will also receive an internal brace to protect the repair.

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We have performed a very large number of these augmented repairs (about 400) and our experience with patient outcomes is excellent. It is important to note that increasing the level of complexity of any surgery may increase the potential for complications. This is discussed in more detail with clients on a case-by-case basis during the orthopaedic consult.

Geometry Modifying Techniques

TPLO is the most commonly performed repair in North America and is the current gold standard against which other similar treatments are compared. A TPLO is performed by making a circular cut through the back of the tibia and rotating the resulting segment by a predetermined amount to result in a tibial plateau angle of about 2-3 degrees. The bone segment is held in that position by a special plate where it then heals permanently. The incisions are closed and the leg is bandaged overnight. All of our patients receive this procedure, with or without an internal brace. This alters the mechanical forces acting on the joint to eliminate tibial thrust, eliminating the primary cause of most patients' mobility problems.

These are highly successful surgeries with some of the highest client satisfaction rates in veterinary surgery. We also know that TPLO can be protective of partial cruciate tears, in some cases preventing further breakdown of the ligament. Newer implant designs in recent years such as locking screws and pre-stressed/pre-contoured plates have eliminated a lot of potential complications. We use only the latest generation, highest quality available implants for our procedures.

Post-Operative Care

Client compliance with post-operative care is extremely important – **failure to meticulously follow instructions can, and usually does result in severe complications and treatment failure.** It is our preference whenever possible to provide complete and comprehensive case management for the entire post-op period. Patients are taken in for surgery at 8:15am the morning of and are discharged the following day at 9am. Post-operative pain management such as NSAIDs, opioids (codeine), etc., are provided as is a short course of antibiotics.

Rehabilitation is a crucial component of post-op management and is initiated immediately except in the case of an internal brace. Rehabilitation instructions are given at discharge and include massage, passive range-of-motion exercises and controlled leash walks.

Other than prescribed rehabilitation, absolute exercise restriction is necessary and off-leash activity is strictly forbidden. Unrestricted access to flights of stairs in the house is to be avoided, however going up and down exterior stairs to get in or out of the house is permissible (on-leash only!). Construction of ramps or other devices is generally not necessary.

Sutures are removed after 14 days and a comprehensive recheck is performed at 8 weeks post-op. During this recheck a gait exam will be performed and objective gait analysis data obtained using a TekScan to determine how the patient's mobility is progressing. A physical exam will be performed to evaluate for any abnormalities and x-rays obtained to assess bone healing, implant stability and the presence of any complications. At this point we will be able to

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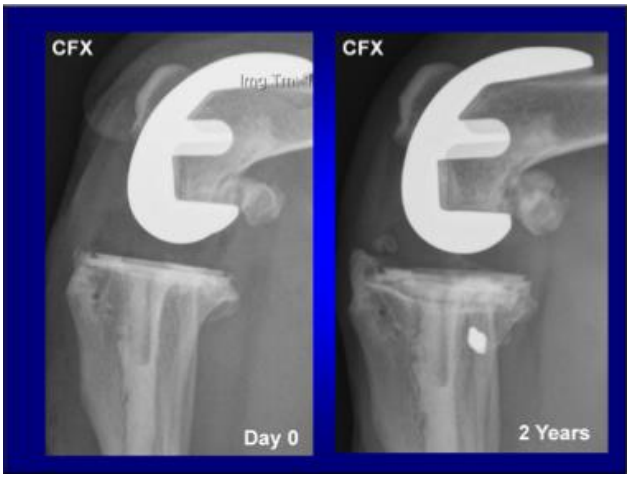
give final instructions about the patient's return to normal activity in terms of how and when.

Total Knee Replacement

A small percentage of patients come to us with chronic, severe end-stage degenerative joint disease. These dogs have full-thickness cartilage loss and other severe damage to the joint. In these cases we will offer Total Knee Replacement (TKR) as a treatment option. It is believed that these patients will have a much better long-term outcome with joint replacement as opposed to conventional surgery.

TKR in dogs is very similar to the same procedure that is very commonly performed in humans. All of the joint surfaces of the femur and tibia are removed and replaced with prosthetic implants. A total joint replacement is intended to be a permanent surgical solution to treat these end-stage cases. The expected outcome of a TKR is to restore completely normal function and activity to the patient. This is a complex surgery that will be discussed with owners of dogs who are candidates on a case-by-case basis.



Complications

As with any surgical procedure, complications can and do occur. Unfortunately, a high percentage of complications that we see are induced by the owner wilfully not following the discharge instructions, so it is vitally important to follow the instructions as given. The discharge instructions are not difficult to perform but do require some regimentation and self-discipline to complete over the 8-to-10-week healing period. Occasionally, patient compliance can be challenging but can usually be managed with some extra assistance from our hospital staff. Discharge instructions are provided the morning after surgery, which typically takes approximately 20-30 minutes and are provided in writing and are highly detailed.

Some of the more common post-operative complications of these procedures include infection, post-operative meniscal tear, patellar tendonitis, implant loosening or breakage, and fibular fracture. Of these, infection and post-operative meniscal tear are the most common. Implant infections are always treated seriously and usually require removal of the implants after healing is complete at approximately 12 weeks. Post-operative meniscal tears can be neither prevented or caused and may occur at anytime during the dog's life after surgery. They are treated arthroscopically by removal of the damaged segment or through a meniscal release.

Clients should be aware that the costs associated with the treatment of complications are the responsibility of the client and are not included in the cost of surgery. These costs may be substantial. While complications will usually produce lameness and certainly have nuisance value, they

rarely affect the long-term outcome of the surgery.

Cost

The cost of these procedures is as follows:

Orthopedic exam: $750 + HST
(includes consult, sedation and whatever X-rays are necessary)

Cruciate Surgeries:

Up to 40kg:
TPLO $3500 + HST
TPLO with Internal Brace $4150 + HST

Over 40kg
TPLO $4000 + HST
TPLO with Internal Brace $4650 + HST

Over 50kg
TPLO $4500 + HST
TPLO with Internal Brace $5150 + HST

Note that 8-week post-op X-rays are **not** included in the cost of surgery: $125 for the recheck and 1 X-ray + HST, each additional X-ray is $75 + HST (sedation not included if necessary, usually X-rays can be obtained without). If sedation is necessary, add $150 + HST

Note that prices are subject to change and should be confirmed at booking.
****A non-refundable deposit of $750.00 is due at the time of booking any orthopedic work-up and/or surgery.****

NOTE: Surgical discharge with Dr. Rocheleau is scheduled for 8:30am the morning following surgery (unless otherwise stated). It is imperative that a patient's owner(s) be present at the hospital at this time. Failure to do so will result in a missed surgical discharge and may lead to post-operative complications which will be at the expense of the owner(s).