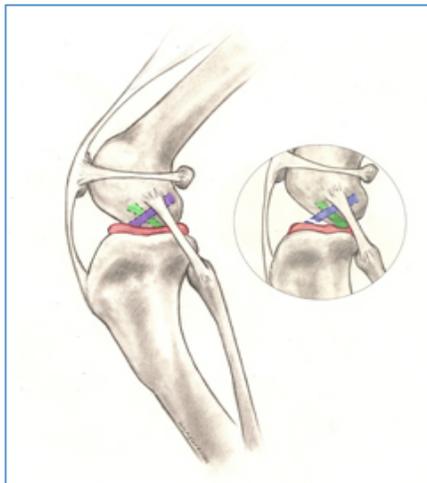


## Cranial Cruciate Ligament Rupture

*Guide to understanding modern ACL repair techniques*

### The Basics:

The knee (stifle) is a fairly complicated joint. It consists of the femur above, the tibia (“shin bone”) below, and the patella (kneecap) in the front. Pieces of cartilage called the menisci are located between the femur and tibia and act as cushions. There are two cruciate ligaments inside the knee joint, and two collateral ligaments outside the knee joint which hold the bones in the correct position. The cranial cruciate ligament (CCL) stabilizes the knee joint by limiting forward motion of the tibia during weight bearing (tibial thrust). Rupture of the CCL is one of the most common orthopedic diseases causing rear leg lameness in dogs.



*In this image, the purple represents the cranial cruciate ligament, the green represents the caudal cruciate ligament (rarely a problem), and the pink is the meniscus. Note in the small inset that when the CCL ruptures, the tibia moves forward - which can lead to the femur crushing/tearing the back part of the meniscus.*

The CCL can acutely rupture due to a sports related injury or it can gradually tear as a result of chronic excessive strain on the ligament. Chronic CCL rupture is most common (75% or more of cases) and is likely due to structural abnormalities of the knee that put the ligament under excessive strain. There are several breeds which are more commonly affected by CCL disease presumably due to conformational changes which put the CCL under stress. Breeds known to have a higher rate of CCL rupture include Mastiffs, Newfoundlands, Akitas, St. Bernards, Rottweilers, Labs, Golden Retrievers and Boxers. These dogs often rupture the opposite CCL as well. Dogs that are overweight are also at greater risk for CCL rupture. Affected dogs typically either become acutely non-weight bearing or will have a history of milder intermittent lameness that progresses to the point that an obvious limp is present.

Once the CCL is injured, a combination of joint inflammation and structural instability within the knee causes arthritis to develop rapidly. If this damage goes unabated it can lead to meniscal tears and irreversible osteoarthritis. Treatment methods for CCL rupture are designed to stabilize the joint and minimize arthritic progression so that the dogs' mobility and quality of life are preserved.

## SURGICAL OPTIONS

Surgical correction of CCL disease can be accomplished by either “replacing” the torn ligament with a prosthetic ligament that mimics the position of the natural CCL, or by changing the forcing on the joint so that the CCL is under less strain.

### ***Lateral Tie:***

Classic or older style CCL repair is performed by placing a lateral suture outside the knee joint which extends from the back of the femur to the front of the tibia. There are many versions of this surgery and they are referred to as Lateral Tie or Lateral Suture techniques. This is an effective method of repair for smaller dogs (less than 30-40 pounds) and can be used for larger animals when other methods are not feasible.



### Advantages of Lateral Tie:

- Simplest technique performed in many hospitals
- Least Expensive
- Least Invasive

### Disadvantages of Lateral Tie:

- Overall performance and owner satisfaction after surgery is not as good as dogs who have had TPLO or TTA, especially larger or very active dogs
- Significantly more osteoarthritis development
- Longer and more involved rehabilitation (4-6 months)
- Unsuitable for dogs with excessive tibial slope because of high implant failure rates

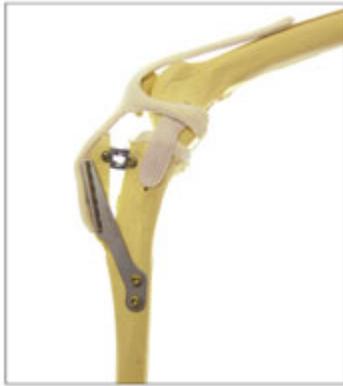
### ***TPLO and TTA***

Modern techniques for CCL repair change the force on the joint, reducing the tibial thrust (the tendency for the tibia to push forward with weight-bearing) and therefore the strain on the CCL. These techniques have been shown to reduce osteoarthritis and maintain joint function more effectively than lateral tie techniques. The two most established and effective surgeries are the Tibial Tuberosity Advancement (TTA) and the Tibial Plateau Leveling Osteotomy (TPLO).

### **TTA:**

This is a newer technique for CCL repair which was developed in Europe. Although this is a relatively new technique, it has quickly gained popularity because of its excellent clinical performance and reduced rate of significant complications. With this technique the tibial tuberosity (the front

section of the tibia) is cut and advanced forward. This is performed using a specialized titanium plate and spacer cage, along with a bone graft, to stabilize the bone until it is healed.



The advantages of TTA include:

- Rapid recovery and return to full function (6-8 weeks)
- Less involved rehabilitation than lateral tie techniques
- Reduced osteoarthritis development long term
- Clinical trials suggest better long term clinical improvement (range of joint motion and weight bearing) and owner satisfaction than lateral tie techniques.
- Easier to perform than TPLO

The disadvantages of TTA include:

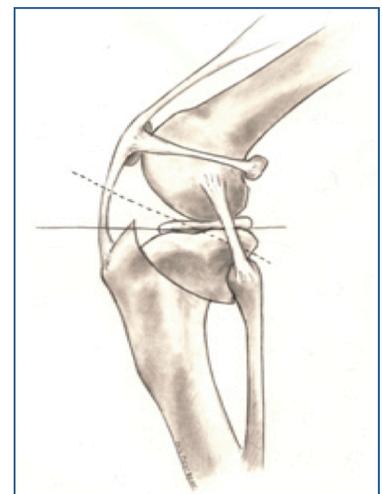
- More involved surgery requiring more technical expertise on the part of the surgeon than lateral tie techniques
- Meniscal damage or patellar luxation can occur post operatively (although infrequent)
- Unsuitable for dogs with excessive tibial slope
- More expensive than lateral tie technique

### TPLO:

This technique was developed in the US and has been in use for many years. With this technique the tibial plateau (top of the bone) is rotated to change the force on the CCL. This is performed by making a circular cut in the bone and using a specialized plate to hold the fragment in place until healed.

Advantages of TPLO:

- Can correct angular limb deformities at the same time
- Best choice for dogs with excessive tibial slope
- Less involved rehabilitation than lateral tie techniques
- Reduced osteoarthritis development long term
- Clinical trials suggest better long term clinical improvement (range of joint motion and weight bearing) than lateral tie techniques.



## Disadvantages of TPLO

- Most technically challenging of the CCL repair techniques
- Highest degree of significant post op complications (fracture or breakdown of the surgical site)
- Involves the weight bearing portion of the tibia so recovery time is longer than TTA (8-12 weeks)
- Most expensive of all techniques (although in the same range as TTA)

## SUMMARY

The choice of surgical techniques is a complicated one. In general, I think that TTA and TPLO are superior techniques because of improved long term joint function and decreased osteoarthritis. My recommendation is to do TTA for younger, large, or active dogs with tibial slopes less than 35 degrees and TPLO for dogs with markedly bowed legs, excessive tibial slope and some giant breed dogs. Smaller dogs can be treated with lateral tie techniques. At Lucerne Veterinary Hospital we do both TTA and lateral tie techniques.

The cost for CCL surgery varies according to individual case. Generally the lateral tie technique will be \$1,800-2,500 and a TTA will be in the \$3,500-4,200. TPLO procedures are referred to the Portland area for surgery and generally are \$4,000-5,000.

Regardless of which technique is chosen, proper post op care is essential to a good outcome. Following all exercise and rehabilitation guidelines is imperative, along with weight reduction for overweight animals.

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*Stifle diagrams courtesy of the American College of Veterinary Surgeons (ACVS).*