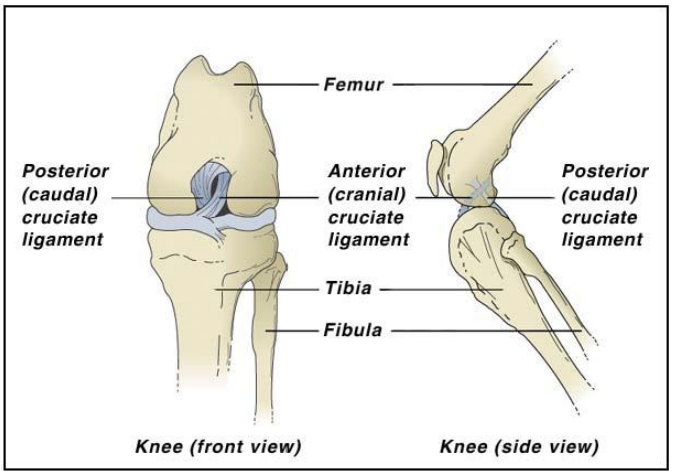
Frey Pet Hospital, PLC
"Treating your pets as if they were our very own"

Tibial Tuberosity Advancement
For the Treatment of Cranial Cruciate Deficiency

Cranial cruciate ligament deficiency in the dog is the most common orthopedic lameness seen in practice today. Many reasons are reported to be at cause, to include; genetic conformational abnormalities, obesity (either genetic or overfeeding), excessive athleticism, and chronic degenerative joint disease. Large breed dogs seem to be over represented when compared with small breed dogs and cats.

There are two cruciate ligaments in the dog knee, termed cranial and caudal. The caudal cruciate ligament rarely tears, but when it does, it is usually concurrently torn with the cranial cruciate ligament. The most common physical reason the cranial cruciate ligament tears is thought to be a result of excessive internal rotation with the knee in slight extension. Your pet will usually "yelp" when this happens, and will limp either slightly or very severely afterwards, though in some cases there is no known "event" that caused the lameness. To some degree, dogs appear to get better in the next few days or so, only to become chronically lame over the next few weeks. During this time, your pet will shift its weight to the good rear leg, increasing the strain on it. In fact, approximately 40-50% of dogs that tear the ligament in one leg will tear the ligament in their other hind leg within 18 months. Tearing of the cranial cruciate ligament results in an instability of the knee termed "cranial tibial thrust". Think of the top part of the knee (the femur) as being a car, and the bottom part of knee (the tibia) as being a hill. The cranial cruciate ligament is the parking brake. When it breaks, the car rolls down hill. This is cranial tibial thrust.



During the examination process, we may take 2-3 radiographs of the affected leg, the opposite leg, and the hips. This is done to look for additional evidence of a torn cranial cruciate ligament, evaluate for bone abnormalities that may have caused the instability in the knee, and the check for osteoarthritis of the hips. These radiographs will also be used to measure the knee for the proper sized implants for a corrective osteotomy to stabilize the knee.

The literature routinely cites over 100 procedures as being available for the "treatment" of cruciate ligament tear in dogs. Most involve replacing the torn ligament with tissue from elsewhere in the body

or with synthetic material. All of these procedures show some success, but it seems apparent that this success to some degree is "operator" and weight dependent. In the last 15 years or so, the list of procedures in use has probably dwindled down to 4-5 procedures. More recent research has shown little differences in the success rates amongst these procedures in long term studies. The exception to this idea becomes apparent with procedures like tibial plateau leveling osteotomy (TPLO) from Oregon, and the more recently developed tibial tuberosity advancement (TTA) from Zurich. Both the TPLO and the TTA modify the geometry of the knee in order to repair it. In other words, rather than trying to replace the ligament, the TPLO and TTA alter the forces on the knee so that it no longer needs the cruciate ligament.

At Frey Pet Hospital, we perform the TTA in the vast majority of dogs over 40 lbs in size. Success rates have been very good, with the majority of dogs regaining near full strength in the leg. National averages place the success rate (defined as dramatic improvement) at 80-85%. We feel our numbers are even higher.

The theory of TTA arose out of a modification of the proposed model by Slocum, in that the net "joint reaction" is approximately parallel to the patellar tendon, and that if the patellar tendon is perpendicular to the tibial plateau (joint surface), the cruciate ligaments are not under any load. If we move the patellar tendon forward to the point that it is perpendicular to the tibial plateau in a standing angle, we relieve the load on the cranial cruciate ligament. The net result being that the patellar tendon takes over the load of the cranial cruciate ligament. Since we know the patellar tendon is capable of loads many times greater than what the cranial cruciate ligament withstood, the joint reaction is not capable of exceeding the force of the patellar tendon. The net result is a stable knee. In simpler terms, the TTA allows us to bypass the torn cruciate ligament, and relocate the strain on the joint to a tendon (the patellar tendon) that will not tear. Additionally, because this is accomplished by moving bone, once that bone heals we have essentially created a "permanent" repair. In fact, after 3-4 months, the bone has completely taken over for the implants.

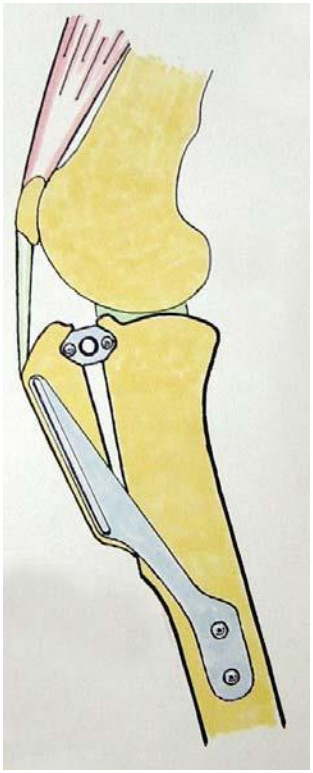
Advantages to the TTA:

1. Quicker recovery – as a result of less invasive surgical technique than the TPLO, less swelling, shorter surgical time, and improved postoperative stability is expected. This difference is particularly evident in the initial weeks following surgery.
2. Ease of procedure – the TTA is less technically demanding than the TPLO. Simpler procedures are less likely to have operator-dependent failures, resulting in better clinical results.
3. Good results with chronically arthritic knees – since TTA does not require a rolling of the tibial plateau (like TPLO), stability is easily achieved even in the most chronic knees. However, it is important to note that pre-existing arthritis or concurrent damage to the meniscus (which occurs approximately 30% of the time with cruciate injury), will limit the outcome of any joint surgery.
5. Complication rates are low. Most studies put the rate around 10-15%, which is remarkably low for an orthopedic surgery. The majority of these are mild, though like all surgeries, occasional serious complications can arise.

Postoperative recovery from knee surgery, regardless of which technique is performed, requires that your pet be kept quiet. Bones have been cut and repositioned to alleviate the cranial cruciate ligament deficit. TTA, more so than TPLO, has resulted in such rapid recovery that many patients begin using the leg too much, too soon. It is imperative to avoid running, jumping, and rough-housing with other pets for a minimum of 8 weeks until the bone has had a chance to adequately heal. Excessive strain placed on the osteotomy in either procedure too early will result in implant failure. This means your pet should not be allowed to be outside off leash, or allowed to jump onto or down from furniture, for at least 8 weeks following surgery. Please see our rehab instructions for further details.

The 8-week postoperative follow up radiograph is important. We are evaluating the leg for proper long-term alignment of the implants, failures, and to assure adequate healing of the osteotomy site. Once healed, a regimen of increased exercise as tolerated by the dog will result in a quick recovery to full use of the limb. Generally, this is about another 2-3 months.

A postoperative x-ray of a tibial tuberosity advancement



Post-Operative Instructions
Tibial Tuberosity Advancement

Historically, rehabilitation on knee surgeries in general has been limited to one common recommendation – cage rest! Veterinarians have been reluctant to allow their patients to perform even the slightest of exercise movements postoperative, for fear that the patient will ruin the work (and expense) already performed. If we have learned one thing from human medicine, the sooner the patient is up and using the leg, the quicker will be the recovery. There is only one modification to this thought that should be stated here, if the leg does not hurt, the dog will use it, and premature overuse of the leg will result in critical damage to the proper healing process. We cannot overemphasize enough, **do not let your dog run loose until the doctor has pronounced the surgery a success.** This will typically be at least 8 weeks. This means your pet cannot go outside unless on a short leash. When indoors, no jumping on or down from furniture should be allowed, nor should access to stairs be allowed.

Week 1: The first few days when your pet comes home, the pain will be the worst. Hang in there! Things will improve rapidly.

(1) Perform physical therapy three times daily as follows:

- Perform range of motion for approximately 3-5 minutes. Do so by gently extending the knee to mimic a walking motion while supporting the leg. This can be done with your pet lying down or standing. The doctor will show you how to perform this exercise at your pet's discharge.

- Then apply ice therapy to the knee for 5-10 minutes

(2) Pain medication – as written by the doctor. If this is not working, do not overdose. Call the office for further recommendations or additional medications.

(3) No other exercise is recommended for the first two weeks (other than walking outside **on a leash** to go to the bathroom).

(4) A small amount of drainage from the incision is common. If necessary, clean the wound periodically with hydrogen peroxide, and do not allow your dog to lick it. **Most dogs should wear an e-collar at all times unless directly supervised.**

(5) The swelling in your dog's knee may begin to descend toward the ankle or foot. This is simply gravity at work and is completely normal.

(6) Your dog may not have a bowel movement for several days. Do not be concerned unless you see him or her straining to go.

Week 2: This should be a continuation of week 1. However, prior to performing the range of motion, please apply heat to the knee for 5-10 minutes. Still, no exercise is to be allowed other than walking outside **on a leash** to go to the bathroom.

Week 3 to 4: At this point, going for leash walks is not only allowed, but encouraged.

(1) Pain medication – in most cases, pain medication will no longer be needed.

(2) Walking **on a leash** is acceptable, but begin with 10 minute walks twice daily. If your dog returns home and is not in pain, you may increase this in 5 minute increments every week as tolerated, provided your dog is not in pain when the walk is over.

Week 5 to 6: By this time, walks should be in the 20 minute range or better, and tolerated well. Do not run yet. Increase the duration of walking as much as you can without causing your dog pain. Do not exceed the 30 minute range, **always on a leash**. If you have access to a pool, some hydrotherapy is ok, but NOT unattended nor allowed to swim in water over your dog's head. Any hydrotherapy over 10 minutes is more likely to exaggerate patellar tendon inflammation and result in lameness.

Week 6 to 7: At the end of this period, it is time to come in for the follow up x-ray. We want to make sure everything has healed prior to increasing the exercise as tolerated. If we release exercise restriction at this time, be forewarned that if you just go home and turn your dog loose, she/he will be in pain. This is the point where you can SLOWLY build back up to full exercise.