



Tibial Plateau Leveling Osteotomy

Introduction

The stifle joint of the dog is very similar to a human's knee. The cranial cruciate ligament (CrCL) is located inside the joint and is responsible for maintaining a stable joint during running and play. This ligament is the same as an anterior cruciate ligament (ACL) in humans. One of the important functions of the ligament is to prevent forward and backward sliding of the femur on the tibia bone (drawer motion). Cranial cruciate ligament rupture is the most common orthopedic problem that we treat. This problem affects all ages and breeds of dog. Frequently, cruciate ligament rupture is a gradual process and not simply due to a single traumatic injury (so called: partial tear). Most dogs have a predisposing factor such as age-related ligament degeneration, pre-existing inflammation, anatomical abnormalities and excessive slope of the top of the tibial bone that may cause the ligament to rupture.

Clinical signs of early cruciate disease include stiffness or very mild lameness. As the tear advances and the ligament progressively weakens, the lameness becomes more pronounced. Complete tears initially result in nonweight bearing on the limb, but as time goes on the pet will generally begin to gradually use the limb. It is unusual that the lameness will resolve to an acceptable level in a large breed dog without surgery.

Background

Cranial cruciate ligament (CrCL) tear is considered the most common orthopedic problem in dogs. This results in degenerative changes (osteoarthritis) in the stifle (knee) joint, including cartilage damage, osteophyte (bone spur) production, and meniscal injury. A considerable number of techniques to stabilize the CrCL insufficient stifle have been described, all of which have produced variable and inconsistent results. All of these techniques long-term have been associated with advanced degenerative joint disease. Several surgical techniques have been developed to physically tether the tibia (shin bone) to the femur (thigh bone). These attempt to prevent drawer motion (the passive movement of the tibia forward relative to the femur). Long term, these methods of fixation stretch or fail and ultimately the joint is held together by fibrous (scar) tissue. We term this a "biologic" fixation. The degree of fibrous tissue development around the joint to stabilize is variable with the procedure, size and weight of the animal, and the rehabilitation performed post-operatively. Biologic fixation assumes that the only forces acting on the knee are passive. The test for passive laxity of the stifle (knee) is the cranial drawer test (the surgeon will grasp the tibia and the femur and attempt to move the tibia forward relative to the femur while the patient is laying on his/her side). This test does not mimic what happens to your pet when they are standing or stepping.

More plausibly, CrCL is an active model and needs to expand upon the passive model by taking into consideration the biomechanics of the stifle (knee) that reflects the forces created by muscles during weight bearing. One significant active component is the tibial joint surface. The tibia has a downward slope causing the tibia to be pushed forward during each time the dog steps. This is known as tibial “thrust” (to test this, the surgeon will flex the hock (ankle) and demonstrate the tibia thrusting forward). The magnitude of this thrust is subsequent to compression between the femur and tibia, and is proportional to the slope of the tibial plateau. When this forward thrust of the proximal tibia exceeds the strength of the CrCL, tearing of this ligament as well as tearing and stress of the meniscus (a shock absorbing cartilage in the knee joint) occurs. This thrusting results in excessive wear of the cartilage within the joint. In addition, as the tibia thrusts forward it causes stretching of the tissues surrounding the joint. These tissues are richly innervated with sensory fibers and are a significant contributor to the pain that your dog has. Finally, excessive cranial tibial thrust also can result in tearing of one of the cartilage pads in the knee called the medial meniscus.

TPLO Surgery

The objective of the Tibial Plateau Leveling Osteotomy (TPLO) is to redesign the stifle so the cranial cruciate is unnecessary for joint stability. By eliminating the slope of the tibia, thrust is eliminated. We term this “bio-mechanical” fixation. The ‘new’ design of the dog’s knee, then begins to rely on mother nature’s redundancies (other ligaments within the knee) to stabilize the knee over time. The success of the TPLO procedure has been based on the return to full flexion of the stifle, muscle mass and limb function, and the apparent lack of joint inflammation and slowing of progressive degenerative joint disease within the joint. The persistence of cranial drawer (test for passive laxity) after a TPLO is not a valid test for stifle stability and is not a sign of failure. The TPLO is designed to eliminate tibial thrust (test of active laxity). This procedure has provided performance dogs with the ability to return to normal function while handling the highly competitive demands of their sport or work. Thus, a family pet is even better able to participate in normal daily activities without restriction of activities or residual lameness that can frequently be seen with other types of repair.

The TPLO involves making a curved cut in the tibia bone at the level of the tibial plateau. The tibial plateau is then rotated in order to flatten the slope. A plate and screws are used to hold the tibial plateau in place so that the bone can heal.

Healing Phases after TPLO surgery

+Unlike the convalescence from other techniques, recovery from TPLO surgery frequently is more rapid and complete. Typically, within 5-7 days after surgery weight-bearing on the operated will begin.

+At 2 weeks after surgery, a moderate amount of weight-bearing can be expected.

+Radiographs taken at 6 to 8 weeks post-op should reveal healing of the osteotomy site.

+At 2 months after surgery, exercise in the form of leash walks should be gradually increased each week. Increasing the number of walks per day tends to be better than just increasing the duration of each period. Complete recovery can take between 3-5 months.

+At 4 months after surgery most exercise restrictions can be eliminated. Full working activities (hunting, agility, coursing etc) can begin at 6 months after surgery. Unconstrained activity prior to this time can cause spraining of the soft tissues of the stifle (patellar ligament strain) resulting in a prolonged recovery.

+Yearly radiographs of the stifle should be taken to evaluate the degree of arthritis. The TPLO procedure should stop or minimize the progression of degenerative joint disease. Surgeons in the USA who perform this technique have found this to be true for most cases.

+A successful outcome should allow your pet to return to full function on the limb. In general, most dogs will regain normal function of the limb after healing takes place. Only a small number of patients do not respond well to this type of surgery.

Complications

+As with any surgery, complications may arise. Even though rare, anesthetic death can occur. With the use of modern anesthetic protocols and extensive monitoring devices (blood pressure, EKG, pulse oxymetry, carbon dioxide and respiratory rate), most risk problems with anesthesia are minimized.

+Infection is also an unusual complication given that strict sterile technique is used during the surgery and antibiotics are administered while the pet is in the hospital and dispensed for at home use as well.

+Poor healing of the bone can occur if the pet is too active during the initial 2 months after surgery. Failure of the implants (breakage of plate or screws) is nearly always due to lack of compliance to the restriction period.

+If activity is unleashed prematurely, straining of the patellar ligament can occur. Rest and anti-inflammatory drugs are used to resolve this problem.

+Fracture of the tibial crest (narrow front part of the tibia) can occur. This is not common, and usually will heal without any surgical intervention.

+Arthritis usually is present at the time of surgery. Unfortunately, we cannot reverse the arthritic and degenerative state of the joint, but the surgery can help to minimize the progression of this. Clinical signs of arthritis include stiffness associated with heavy exercise and cool damp weather. Anti-inflammatory drugs are useful to settle a flare-up of arthritis.

+Tearing of the meniscus (cartilage pad in the knee) is also a potential complication requiring additional surgery is required. This complication occurs less frequently following the TPLO versus other surgical techniques.

Signs that your dog may have one of these complications include: worsening lameness (ie. Your dog was walking and is now holding the limb up), swelling under the skin that has developed after the first week post-operatively, drainage from the incision, or worsening pain after surgery. If you see these, please call.

The TPLO is an extremely technique sensitive procedure requiring formal surgical training and exceptional orthopedic expertise, obligatory training and a substantial orthopedic caseload for proficiency. We at Ironhorse VetCare Emergency and Specialist Care Center in Dublin are proud to be a premier facility in the San Francisco bay area offering the TPLO.