TPLO and TTA

General Information and Postoperative Care

Tibial plateau leveling osteotomy (TPLO) and tibial tuberosity advancement (TTA) are two common procedures for treating cranial cruciate ligament (CrCL) injuries in dogs. The CrCL is analogous to the anterior cruciate ligament (ACL) in people and functions to maintain a consistent relationship between the two bones of the knee (femur and tibia) when load is placed upon the limb. Simply put, the CrCL tethers the femur and tibia together and does not allow the tibia to move in a forward direction relative to the femur during weightbearing and of course, more vigorous activities. When the CrCL fails, the forces of weightbearing create a situation where the forward motion of the tibia is not restrained, resulting in joint instability that is termed tibial thrust. Both TPLO and TTA are procedures that eliminate tibial thrust by altering the geometry and hence the biomechanics of the knee joint. They are often termed geometry altering procedures. The knee geometry is changed by creating cuts (termed osteotomies) in the tibia, the lower bone of the knee. TPLO alters the knee's geometry through an arc shaped cut that isolates the joint cartilage of the tibia and underlying bone. This cartilage surface, the tibial plateau, is rotated along the arced bone cut and "leveled" relative to the shaft of the bone (Fig. 1 and 2) and another reference line perpendicular to the first line. It is important to note that cartilage is not shaved or reshaped during this procedure, only the bone is cut and the cartilage moves as the bone is being moved. Calculations are made prior to surgery to determine the initial angle of the tibial plateau (commonly 20-25 degrees) and the amount of correction or leveling required. The tibial plateau angle after leveling is typically 5-10 degrees, with 6 degrees considered ideal. The bone and newly leveled tibial plateau are held in position using a plate and screws. These implants can be made of stainless steel or titanium.

TTA eliminates tibial thrust through advancement of the tibial tuberosity, the anchor point for the ligament of the kneecap (patellar tendon) and therefore, the anchor for the entire quadriceps mechanism, the large muscle group at the front of the thigh responsible for extending the knee joint. In the TTA procedure, a cut is made down the front of the tibia bone, and the tibial tuberosity is moved forward and held with a titanium spacer called a cage. The bone is held in the new position through the use of a titanium plate and screws as well (Fig 3 and 4). A bone graft material is placed in the defect to facilitate the healing process. The advancement of the tibial tuberosity moves the patellar tendon into a position perpendicular (a 90 degree angle) to the tibial plateau. This geometric change results in a dramatic alteration in the muscle balance around the knee joint, eliminating the tendency for the tibia to move forward when the limb is loaded (during weightbearing). Both TPLO and TTA are powerful techniques that result in a very stable knee postoperatively. Joint range of motion is typically well

preserved and a high degree of limb function is usually achieved. There is good evidence that TPLO, and especially TTA, may slow the progression of arthritis. Both procedures are technically demanding however, and special equipment and expertise are required to achieve consistently good results.

Why and how did your dogs CrCL fail? We feel that CrCL ruptures in dogs are <u>not</u> primarily the result of trauma (as they are in people). It is currently thought that a degenerative process leads to progressive degradation and weakening of the ligament (in fact the process is often bilateral, affecting both knees simultaneously or the opposite knee sometime in the future in at least 30% of dogs). There is much speculation about the factors that contribute to degeneration of the ligament. Genetic, hormonal, conformational, and immune-mediated factors may all play a role. Diet, bodyweight, and metabolic or endocrine diseases may also be factors in development of CrCL failure. In most dogs, the damage to the ligament begins as a partial tear and then progresses over weeks to months to a complete tear. There is no proven strategy that is known to prevent progression of a partial tear to a complete rupture. As a result, surgery is typically recommended soon after the tentative diagnosis of a partial CrCL tear. Early surgery is thought to prevent rapid progression of arthritis in the knee and may help to avoid the additional complication of meniscal tear. Of course, surgery is suggested as soon as is practical in cases of complete CrCL tear. Many clients are interested in nonsurgical options. Unfortunately, a conservative approach to CrCL rupture is rarely successful and dogs that do not have surgery typically have rapid and severe progression of arthritis and chronic lameness. Nonsurgical management of CrCL rupture may be rarely elected if a patient is very small or if there are other extenuating medical conditions such as Cushing's disease or cancer.

General anesthesia is required for repair of CrCL tears. We take an aggressive approach to pain control (analgesia) using epidurals, fentanyl pain patches, nonsteroidal anti-inflammatory drugs (NSAIDs), and oral Tramadol. Please let us know if your pet has already been prescribed some of these medications and whether it is on other medications such as thyroid supplementation or antiepileptic therapy. Aspirin and steroids such as prednisone can cause serious complications when given with NSAIDs so please inform us if your pet is currently taking one of these medications. Aspirin can be very problematic due to it's effect on platelet function, leading to increased bleeding during surgery. It is recommended that dogs cease aspirin therapy 5-7 days prior to surgery. Patients under anesthesia are also very closely monitored using the most modern equipment available to ensure a safe anesthetic episode.

What should I expect when my pet comes home? Most clients are surprised by how well their dog uses the limb when first arriving home. A fair amount of controlled weight bearing is desirable in the first week postop and we in fact become concerned if a patient is unwilling to use the limb after 3-5 days. But while weight bearing is encouraged, it MUST BE CONTROLLED! **Sling or towel walking is recommended for the first 7-10 days postop when traveling on stairs or over slippery surfaces**.

Your pet should always be on a leash when outside (no off-leash activity will be allowed until 6-8 weeks after surgery). Failure to restrict activity could result in catastrophic complications. **Short leash walks to urinate and defecate are all that is allowed in the first month.** When your pet is unsupervised, we advise restricting to a kennel or small room. It is not unusual for swelling and bruising to appear around the ankle 3-4 days after surgery- this is the result of fluid weeping from the tissues as a result of surgical trauma and following gravity to create swelling lower in the limb. Cold compresses can be applied to this area, as well as the incision, for 5 minutes, 3-4 times daily. The incision should be inspected daily for excessive redness, swelling or drainage. **An E-collar will be provided to protect the incision**- failure to use the E-collar (even for a few moments) consistently leads to trauma to the incision from licking and chewing and may ultimately lead to wound infection. If you are concerned about a possible infection, please call our office. **Sutures are usually removed 8-10 days after surgery**.

TPLO and TTA patients are seen routinely at 4 and 8 weeks postop. Radiographs (x-rays) are taken during these appointments to assess healing. Some early healing is usually seen at the 4 week appointment. If this is the case and the orthopedic implants (plate and screws) appear stable, activity can be increased in a gradual fashion. We usually recommend starting with 10-15 minute slow leash walks twice daily. The walks can be increased in duration by 5 minutes every week thereafter. Formal physical therapy sessions can begin after 4 weeks as well (we can provide information on several excellent facilities in the metro area). Off leash activities, including playing with other dogs, are discouraged until at least 8 weeks after surgery. However, increased activity can be allowed in the house, including travel in stairs and jumping on low furniture if allowed. The x-rays at 8 weeks usually show nearly complete healing of the bone and most patients are bearing consistent weight on the operated limb, many without obvious lameness. At this point, off leash activities can begin with a goal of completely normal activity level over the following 3-4 weeks. Athletic activities, dog parks, and explosive exercise are allowed at the end of this period. Many patients show some mild lameness after intense activity and a “crooked” sitting posture for another 2-3 months- this is not a concern.

Patients that have had TPLO and TTA typically have excellent limb function after healing is complete. Occasionally a patient will exhibit lameness again in the operated limb in the future. Often this is the result of irritation from the implants (more common with TPLO) or from additional damage to the joint, particularly the medial meniscus, a cartilage structure within the knee joint. Removal and culture of the plate in suspected cases of implant associated lameness is advised and a rapid recovery is usually seen. Subsequent meniscal damage occurs in 5-10% of dogs having TPLO and TTA, usually within 18 months of surgery, and requires another procedure to resolve. The damaged meniscus can be removed arthroscopically, with a rapid return to excellent function in the limb. All patients that have a CrCL tear ultimately develop arthritis so ongoing treatment for joint inflammation is very appropriate. We

recommend using high quality glucosamine/chondroitin and fatty acid supplements (Dasuquin, Welactin) and NSAIDs as needed. Most clients are very pleased with their pets function and improved quality of life after TPLO or TTA. If you have questions about your pet's limb function at any time after surgery, please contact our office.