

## **Cranial Cruciate Ligament Disease (CCLD)**

The CCL is a primary stabilizer of the knee joint and functions very similar to the ACL in people. When it partially or completely tears it results in instability, inflammation and pain in the knee that results in limping. Ultimately, this results in progressive arthritis. Dogs with a CCLD generally have an obvious limp in a single rear leg. Symptoms vary depending on severity of the tear, duration of CCLD and if CCLD is unilateral or bilateral (both knees).

### **Diagnosis**

A tear of the CCL is diagnosed by findings in an orthopedic exam (swelling, instability, pain). The diagnosis is often supported by radiographs that rule out other causes of the pain but show swelling and arthritis in the knee. At the time of diagnosis about 50% of dogs also have a torn medial meniscus (a cartilage pad in knee). *Addressing potential meniscal injury is just as important as treating joint instability.*

### **Treatment**

Nonsurgical/Medical Management: Nonsurgical management of CCLD generally incorporates weight loss if needed, use of a nonsteroidal anti-inflammatory drug (NSAID), use of an omega-3 fatty acid diet (e.g. Purina J/M or Hills J/D), pain medication (e.g. Amantadine) if needed and controlled activity (e.g. leash walks, swimming, cavalettis). Regardless of a patient's treatment plan, medical management is incorporated into the long-term treatment plan to limit symptoms of arthritis. There are many alternative therapies (not approved or regulated by the FDA) that can be considered for the treatment of CCLD or other arthritic conditions. Examples include cetyl myristoleate, glucosamine products, chondroitin products, prolotherapy injections, biologics (e.g. platelet rich plasma, protein products, cell injections) and knee braces. While many factors influence outcome, body weight and meniscal injury may be the most important. It is reported that ~80-90% of small dogs return to good pet function with medical management while only ~50% of large breed dogs achieve good pet function with medical management.

Arthroscopy: Arthroscopy of the knee is ideal because it provides illumination and magnification of the joint allowing for better exploration and treatment of ligament and meniscal problems. For example, it is reported that late meniscal tears occur significantly less often after arthroscopy than arthrotomy. Arthroscopy is generally used with tibial slope leveling surgery, however, in some very chronic cases it can be used without a stabilization procedure.

Suture Stabilization: Suture stabilization of a knee with CCLD usually begins with an arthrotomy, not arthroscopy. The torn CCL is removed and the torn portion of the medial meniscus is removed or, if the meniscus is normal, the caudal pole of the medial meniscus is often prophylactically released so it does not tear at a later date. This is done because the suture is a material and it will not permanently stabilize the knee. Empirically, without prophylactic release of the medial meniscus, a normal meniscus with tear in approximately 15-20% of cases. After exploring the joint, it is stabilized with heavy, nonabsorbable, monofilament suture material from the lateral femoral fabella to the cranio-proximal tibial tuberosity. There are many variations of this surgery described; common variations include placing both lateral and medial sutures, using braided suture material and using suture anchors. Although the suture is nonabsorbable it is seldom necessary to remove it.

Postoperative care can vary but use of antibiotics, use of analgesics, visual inspection of the incision for signs of infection, and exercise restriction (multiple 5-10 leash walks each day with limited access to stairs and jumping) for 2-weeks are common. After 2-weeks, exercise can be increased to long (15-30 minutes) leash walks for 2-weeks. After 4 weeks, activity can return to normal. Empirically, ~90-95% of small dogs and 80-85% of large dogs will return to good pet function by 6-months after surgery. While many things can influence cost, it will range between \$2500-3500.

Tibial Slope Leveling Surgery: Joint leveling surgeries include Tibial Plateau Leveling Osteotomy (TPLO), Cranial Closing Wedge Osteotomy (CCWO) and CORA-based Leveling Osteotomy (CBLO). The goal of these procedures is to change the anatomy top of the tibia (tibial plateau) by cutting it (osteotomy) and stabilizing it (bone plate and screws) in a different position so it better resists femoral-tibial translation/knee instability. The decision of what osteotomy to perform depends on the anatomy of the patient's tibia (the tibia's anatomic and mechanical angle). It has been reported that these procedures provide a better outcome compared to other stabilization techniques (suture, TTA). Like other stabilization techniques, exploring the joint before stabilization is critical; arthroscopic exploration is ideal. After surgery, postoperative radiographs to document the change in the bone and the implants are required.

Postoperative care can vary but use of antibiotics, use of analgesics, visual inspection of the incision for signs of infection, and exercise restriction (multiple 5-10 minute leash walks each day with limited access to stairs and jumping) for 6-8 weeks are common. Suture removal 2-weeks after surgery and recheck radiographs 6-8 weeks (to document bone healing) after surgery may be necessary. Once the bone is healed the implants are not needed but the plate and screws are seldom removed unless they are infected or causing inflammation. Complications include infection, fracture of tibia/fibula, and nonunion (not healing). Empirically, ~90% of patients return to good pet function and 75% of patients return to athletic function. Cost is approximately \$5500-6500.

Tibial Tuberosity Advancement (TTA): This procedure involves making a linear cut along the front of the tibia (tibial tuberosity) and advancing it forward until the patellar tendon is oriented ~90 degrees to the top of the tibia (tibial plateau). In this new orientation, some suggest that the knee is relatively stable independent of the cruciate ligament status. Like the TPLO, the cut in the bone is stabilized with a bone plate and screws. Though the bone plate and screws are not needed once the bone is healed, they are seldom removed unless infection occurs. More recent literature would suggest that limb function after TTA is similar to suture stabilization. Complications include fracture of the bone plate, bone infection, late meniscal tear, patella luxation and non-union (not healing). Cost is approximately \$4,500-6,000.

Total Knee Replacement (TKR): TKR is not used as a primary method to treat CCLD. TKR is reserved for dogs with severe arthritis and knee pain that does not improve with medical management. The severe arthritis might be because of long standing CCLD that was not previously treated, failure of a previous CCLD treatment or other disease in the knee like osteochondrosis dissecans. TKR cases are challenging because of the severity of the arthritis and previous, failed treatments. Empirically, ~75% of cases return to fair to good pet function. Complications include infection and medial collateral ligament instability. Cost is approximately \$9-10,000.