Cranial cruciate ligament (CrCL) rupture is usually a chronic event with varying degrees of stifle inflammation, osteoarthritis and ligament pathology. Bennet coined the term “cruciate disease” to describe the syndrome of lameness, effusion, progressive arthritis and ligament weakening. Thus there is often progressive disease with clinical signs acutely worsening in cases with complete rupture or meniscal tearing. Most cases have some inflammatory process started long before the animal is evaluated for the lameness (Bleedhorn). The chronic lameness leads to disuse muscle atrophy, which can be easily measured using a girthometer. Our group found on average a 7% loss of thigh circumference preoperatively when measured at 70% of femoral length and compared to the contralateral non-ruptured side. The amount of atrophy may certainly vary depending on lameness. Dogs presenting with meniscal tears and complete CrCL ruptures were found to be significantly more lame than dogs with these structures intact in our recent study.

Diagnosis of partial tears and occult ligament pathology can be simplified with comprehensive anatomic knowledge. The cranial cruciate originates on the lateral femoral condyle and inserts on the medial aspect of the cranial tibia adjacent to the cranial horn of the meniscus. This anatomic configuration results in three major functions as it limits: internal rotation, hyperextension and cranial translation of the tibia relative to the femur. In early partial tears, lameness may be minimal and the injury more difficult to diagnose as cranial drawer is negative. Often times loading the ligament in hyperextension will produce pain and lameness increasing the suspicion of a partial CrCL tear. Similarly, flexion and internal rotation can be used to induce a painful response. These maneuvers are compared to the contralateral leg keeping in mind that the disease is often bilateral.

Effusion and periarticular fibrosis resulting from the inflammatory cascade may also be used as an examination tool. Bilateral palpation of the medial aspect of the tibia is done to evaluate buttress formation in the standing position. Additionally, palpation of the patellar tendon between the thumb and index finger is performed paying attention to the prominence of the tendon and associated adjacent swelling. In slender dogs the tendon outline is very evident and may be partially grasped like a pencil while dogs with short confirmation, high body condition or giant breed status may be more challenging. When palpation of effusion is still questionable, effusion is readily imaged with radiography.

Stifle effusion will produce cranial displacement of the infra-patellar fat pad and caudal budging of the joint capsule which obliterates the facial plane cranial to the gastrocnemius (center image below compared to normal stifle image on left). One should take care to produce a true lateral projection with superimposition of the femoral condyles and fabella. A poorly taken lateral projection is often non-diagnostic. Additionally, a film at 90 degrees of flexion will increase the amount of effusion in the cranial compartment adjacent to the infrapatellar fat pad improving sensitivity in cases with mild effusion (image on R). Large amounts of effusion in the suprapatellar region may indicate a more severe inflammatory process such as septic arthritis. Cranial displacement of the tibia relative to the femur in cases with CrCL rupture may also be measured from this view and compared to the intact side (right vs center image below).

Preoperative considerations for repair
Patient size, activity level, client expectations, body condition score and concomitant orthopedic disease are important preoperative considerations. Based on these factors conservative vs operative treatment is first addressed. In previous reports smaller dogs may have a better outcome with non-operative management. Vasseur reported on 28 dogs <15kg that underwent conservative management. He found that 75% were clinically normal after an average follow-up of 36.6 months while 11% were improved. Only 14% required surgery for progressive or continued lameness. He also studied 57 dogs >15kg but found only 19% (11/57) could be medically managed with only 4 of these 11 classified as normal and 7 of 11 improved at an average follow-up of 49.1 months. The remaining 46 dogs had progressive or continued lameness necessitating surgical repair at an average of 10.2 months. The author stated the purpose, size and body condition of the dog must be evaluated, as physical examination did not predict successful non-surgical outcomes. One must also keep in mind this study was retrospective and lacked objective gait analysis. Other experimental studies with large breed
dogs undergoing cruciate transection have shown significant lameness at all time points over a 4-year course of study when force plate gait analysis is used (Budsberg). Contrast this data with a study by Ballagas where experimental CrCL transection was followed by a TPLO, at 18 weeks there was no significant difference in weight bearing from baseline preoperative values.

A recent prospective clinical trial randomized overweight large breed dogs with unilateral CrCL rupture to undergo conservative therapy with weight loss, physical therapy and pain control versus TPLO surgery with these same treatments (Wucherer). Overall the surgical dogs had lower pain scores and significantly higher weight bearing on some outcome measures but not all. Dogs that had at least 85% of normal weight bearing were defined as having a successful outcome in the study. At 6 months and one year 33% and 64% of dogs treated non-surgically, and 93% and 75% of surgically treated dogs were defined as a successful outcome. Bilateral rupture was the most common reason dogs were taken out of the study and this may complicate conservative management. Future contralateral CrCL rupture is reported in 37% of cases at an average of 17 months and 59% if there are radiographic changes at initial evaluation (Vasseur).

Finally limb alignment, coexisting patellar luxation and patient size are important factors in choosing a surgical type. Osteotomy procedures may be considered in cases with malalignment or patellar luxation. Such surgeries may become more complex often involving advanced imaging and planning. In giant breed dogs it is best to avoid lateral suture stabilization due to poorer outcomes in this group. Additionally, while there are many opinions on the “best technique” and the "best technique in my hands", discussion with a non-bias surgeon can point owners in a direction that is best for both the patient and owner. One should always use an evidence-based approach when possible.

A previous systematic review of the literature showed no one procedure as being superior. However, a more recent systematic review of additional studies favored TPLO over lateral suture for restoring dogs to normal function (Bergh). Regarding TTA outcomes, a recent Cornell study showed TTA restored dogs to normal function at a walk. However, when trotting over a force plate dogs receiving a TTA were significantly lame than control dogs. Cases receiving a TPLO had no difference in weight bearing when compared to control dogs at 150–299 days, and >300 days. Dogs receiving a lateral suture repair had significantly lower weight bearing at a walk and trot at all time points throughout the study. Thus TPLO outperformed both procedures, and while TTA improved dogs, there was residual lameness at a trot.

TTA and TPLO were compared in a prospective randomized study with our group. Dogs receiving a TTA did well with short-term recovery, but weight bearing at 24wks was significantly higher in TPLO dogs. At 48 weeks TPLO had higher weight bearing that approached significance. Latent meniscal tears were a major complication in dogs receiving TTAs. No meniscal release was performed in either study group however 50% of dogs that had a complete CrCL rupture and an intact meniscus at the time of surgery went on to have a latent tear in the TTA group which was significantly higher than TPLO cases. Interesting a torn vs intact meniscus or a torn vs partially torn CrCL had no effect on weight bearing as measured by force plate gait analysis. We concluded that a meniscal release should be considered in dogs receiving a TTA and owners with higher performance expectations may consider a TPLO.

References