# Hemi's Blowout

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**Introduction:**

The most common cause of hindlimb lameness in the dog is cranial cruciate ligament (CCL) disease[5]. The underlying cause of cranial cruciate disease is not completely understood however common disorders causing lameness include progressive degeneration, acute traumatic avulsion of the femoral or tibial attachment, and acute traumatic rupture secondary to excessive strain[5]. The cranial cruciate ligament is comprised of two bands; the craniomedial band and the caudolateral band. The craniomedial band is taught in both flexion and extension whereas the caudolateral band is lax in flexion. The cranial cruciate ligament has three main functions: prevent cranial translation of the tibia, prevent internal rotation of the tibia, and to prevent hyperextension of the stifle[3].

The most common means of diagnosis of cranial cruciate rupture is by physical exam. On physical exam, flexion and extension will elicit stifle pain along with variable crepitus and clicking associated with the meniscus. The mainstay of diagnosis on physical exam is the cranial drawer test. In chronic cases, a medial buttress or medial periarticular hypertrophy may be palpated[5]. Radiographs are usually obtained to determine the amount of osteoarthritis present and for surgical planning.

There are many treatment options that can be employed in order to help stabilize the stifle joint after cranial cruciate ligament rupture; however, only two will be discussed in this paper. The gold standard procedure for treatment of a ruptured cranial cruciate ligament is the Tibial Platea Leveling Osteotomy (TPLO). This procedure neutralizes cranial tibial subluxation but doesn't create normal kinematics of the stifle[5]. An alternative procedure is an extracapsular stabilization which utilizes a synthetic suture material to recreate the function of an intact CCL.

Many surgical techniques have been described to perform this procedure, however, this case will be discussing extracapsular stabilization with a bi-cortical bone anchor and metallic crimps.

**History and Presentation:**

Hemi is an approximately 3-year-old male neutered Rottweiler that presented to Animal Health Clinic in Manchester, Tennessee for bilateral hind limb lameness. Hemi first presented to another general practice veterinarian 4 weeks prior for the same problem. At that time Hemi was diagnosed with bilaterally ruptured cranial cruciate ligaments. Without any additional diagnostics, Hemi was referred to an orthopedic specialist. On presentation to the specialist, radiographs were performed for preoperative planning and general evaluation of the stifle joint. Imaging revealed moderate proximal tibial varus bilaterally, but osteoarthritis was not appreciated radiographically. Considering the new findings, the orthopedic surgeon recommended a tibial-plateau leveling osteotomy with a concurrent wedge ostectomy to correct the proximal varus of the tibia. After receiving the estimate for this procedure, the client elected to get a second opinion and find a more cost-effective treatment which led him to present to AHC in Manchester, Tennessee.

At presentation Hemi was bright, alert, and responsive. His vitals were all within normal limits. Hemi was apparently healthy other than an obvious grade 4/5 lameness in the hind-limbs. Upon orthopedic exam, Hemi had severe cranial drawer, tibial thrust, and pain on hyperextension of his stifles bilaterally. Mild crepitus could be appreciated when flexing and extending the joints bilaterally. A clicking noise was audible; thought to be due to a concurrent meniscal tear in the left stifle. A medial buttress was appreciated bilaterally, but more severe on the left femoral condyle. Radiographs from the specialty center were examined and treatment options to correct the joints were discussed. The owner elected extracapsular stabilization of the stifle joints after

considering other options and estimates. A discussion with the owner concerning functionality, post-operative prognosis, and post-operative at home care then took place. It was made clear to the client that the goal of this procedure was to stabilize the stifles, slow the progression of osteoarthritis and decrease pain. A complete blood cell count and chemistry panel was performed to ensure that Hemi was a good candidate for surgery and safe to undergo anesthesia. There were no significant findings on the bloodwork, so Hemi was scheduled for surgery the following day.

**Pathophysiology:**

Despite cranial cruciate ligament disease being a very commonly diagnosed problem, the underlying pathogenesis of the disease is not fully understood. Many theories exist comparing the biology of the disease with the biomechanics of the joint and trying to pinpoint an exact causative agent. It is greatly accepted that CCL disease is a multifactorial disease process[1].

It is agreed upon that dogs weighing greater than 15kgs are at a higher risk to rupture their CCL[4]. Many studies also demonstrate that as the animal ages, they become more at risk for CCL rupture due to decreasing ligament elasticity and decreasing maximal strain energy[1]. The tibial plateau angle is a potential factor to CCL disease. A higher plateau angle allows for more CCL strain due to increased shear force on the joint[5]. Other factors such as obesity and lack of fitness are thought to play a role in the disease process diminishing the activity of passive and dynamic stabilizers[1].

There have been many studies that look at cranial cruciate disease and breed associations. These studies have identified the most at-risk breeds to be the Rottweiler, Newfoundland, Staffordshire Terrier, and the Labrador[1,5]. Rottweiler ligaments have been shown to be more vulnerable to damage because they require half the load per unit body weight to rupture as

compared to Greyhounds[4]. Females are more prone to CCL rupture than male dogs presumptively due to hormonal differences[1]. Neutered dogs, both male and female, also appear to be a higher risk than sexually intact dogs[1].

Cranial cruciate disease is often considered a degenerative process that involves many contributing factors. In about 40% of cases, dogs that rupture one CCL will rupture the contralateral CCL within 17 months[5]. The disease tends to affect large breed dogs at a younger age than small breed dogs[1].

**Diagnostic Approach and Considerations:**

Cranial cruciate ligament rupture can be diagnosed via an orthopedic examination. Findings on orthopedic exam may include pain on flexion and extension of the stifle. On manipulation of the joint, crepitus and/or a "clicking" noise may be present further increasing suspicion of cranial cruciate rupture[3]. A meniscal click is commonly associated with a meniscal tear. In more chronic cases, periarticular hypertrophy or medial buttress on the medial aspect of the stifle may be appreciated. The mainstay of diagnosis is the cranial drawer test[5]. This test is best performed with the animal sedated. The animal is placed in lateral recumbency and the limb should be approached caudally in attempt to cause craniocaudal tibial translation by applying force to the tibia while holding the femur stable. It is imperative to correctly identify landmarks or this test could be falsely interpreted. When performing this test, the thumb of one hand should be placed behind the lateral fabella and the index finger is placed on the patella. The thumb of the other hand is placed behind the fibular head and the index finger is placed on the tibial tuberosity.[5] In an adult dog, any motion is considered abnormal. Puppy drawer or a small degree of physiologic instability may be normal in young dogs.[5] Another common test performed on orthopedic exam is the tibial thrust. In this test, the operator stablizes the femur and places the

index finger of one hand on the tibial tuberosity[5]. The other hand is used to flex and extend the metatarsus and tarsocrural joint. Tibial tuberosity translocation cranially suggest ruptured CCL.

Radiographs are another diagnostic method commonly implemented to rule-out other causes of lameness such as athritis, fracture, and neoplasia. One of the first radiographic findings associated with CCL rupture is loss or effacement of the infrapatellar fat pad shadow by a soft tissue opacity in the lateral view[5]. This finding is consistent with joint effusion. Osteoarthris of the stifle joint is suggestive of a more chronic case. Radiographs are also useful for pre-operative planning.

Hemi was previously diagnosed with bilateral cranial cruciate rupture prior to presentation and radiographs had already been performed. Despite prevoius diagnosis, a full orthopedic exam was performed resulting in a positive cranial drawer and tibial thrust test bilaterally. Surprisingly, little to no evidence of stifle osteoarthris was appreciated on radiographs. A complete blood cell count and chemistry blood panel should be performed to evaluate organ function and deem the patient a good canidate for surgery. In this case, Hemi's CBC and serum chemistry panel were within normal limits.

**Treatment Options and Elected Procedure:**

Tibial Plateau Leveling Osteotomy is considered by many the gold standard surgical treatment[5]. TPLO is a modifying osteotomy of the proximal tibia intended to decrease the tibial plateau angle and concurrently decrease cranial tibial subluxation. This procedure does not create normal kinematics of the stifle because it doesn't prevent tibial rotation or hyperextension. The procedure is more expensive than an extracapsular stabilization because it requires good technique on radiographs for surgical planning, specific surgical equipment, and precisely

applied implants such as bone plates and screws. This procedure is not straight forward and should only be performed by trained surgeons. .

There are many ways to perform an extracapsular stabilization procedure on the canine stifle joint. The goal is to recreate the function of the CCL with a synthetic suture material. The fabella may be engaged or a bone anchor can be placed to serve as the cranial anchor site on the femur. The suture is then ran behind the patella and through a bone tunnel in the tibial tuberosity. Then the suture may be either tied together or metallic crimps may be used to connect the two ends of the suture. No truly isometric points exist between the femoral condyle and tibial tuberosity[7]. The most favorable location for the bone anchor to enter the femoral condyle is at the distal pole of the fabella[2]. This location, paired with a tibial bone tunnel drilled adjacent to the extensor groove and the tibial attachment of the patellar ligament is reasonably isometric[2]. Optimal suture size has not been determined however the pound of test line chosen generally matches that of patient's body weight. The normal standing stifle angle is about 135 degrees[5]. It is best to tension and secure the suture, either by knot or crimp, while the stifle is in extension at 100 degrees as this method consistently results in the least change in suture tension.[2] This procedure tends to be less costly however it is more applicable in small breed dogs due to complication risk. Factors significantly associated with a higher rate of complications are high body weight and young age of the dog at the time of surgery.[5]

In Hemi's case, an extracapsular stabilization with bicortical bone anchor, 80 pound test line, and metallic suture crimps were implemented. Pre-operative radiographs were used to measure the diameter of the femoral condyle at the desired location to place the anchor to provide reasonable isometry. This measurement was then used to order the materials needed for the procedure. Since Hemi is a large breed dog, a bicortical bone anchor was selected to provide

a more rigid anchor and to decrease complication risk. A lateral approach to the joint was made. An athrotomy was performed in order to facilitate removal of the ruptured cranial cruciate ligament and medial meniscus. Using a small drill bit, a pilot hole was made at the distal pole of the fabella. The bicortical bone anchor was then placed. A bone tunnel was drilled in the tibial tuberosity adjacent to the extensor groove. The suture was then lead through the eye of the bone anchor, behind the patella, through the bone tunnel and returned to the lateral aspect of the limb. With the stifle bent at a 100 degree angle, the suture was pulled tight and the metallic crimp was compressed 3 times. The joint and surgical site were lavaged and the arthrotomy and incision were closed routinely. Post-operative radiographs were performed to ensure adequate placement of the bone anchor.

**Case Outcome:**

Hemi presented with bilateral CCL rupture on May 23, 2019. Due to the fact that Hemi was more clinical in the left hindlimb, an extracapsular stabilization procedure as previously described was performed on the left stifle the next day (5/24/19). The procedure went as planned with no complications and Hemi discharged the following day. Hemi went home with instructions that included strict cage rest for two weeks until an incsion recheck could be performed.

When Hemi returned for his 2-week evaluation, his incision was healed and it was noted that he was bearing normal weight on the left hindlimb and was non-painful. Following the recheck exam on June 7, 2019, Hemi was allowed to be leash walked for about 5-10 minutes three times daily and the right stifle procedure was tentatively scheduled for June 21, 2019. However, due to money constraints, Hemi was not able to have the procedure performed at this

time. Instead the surgery was scheduled for July 12, 2019; approximately 7 weeks after the initial surgery on the left stifle.

Hemi presented the morning of July 12, 2019 to undergo an extracapsular stabilization procedure as previously described on the right stifle. At the time of presentation, Hemi was completely weight bearing and showed no signs of pain or lameness in the left hindlimb. The right stifle surgery went as planned and no complications were noted. Hemi was discharged the following day with the same cage restriction instructions as before. Hemi returned for a 2 week recheck and staple removal exam on July 26, 2019. At this time Hemi was weight bearing and did not appear painful. As before, he was allowed controlled leash walks for 5-10 minutes three times daily and an additional recheck was scheduled in 4 weeks (August 23, 2019). At this recheck, 6 weeks post-op, it was deemed that Hemi could return to normal activity.

Hemi is now nearly 4 months post-op from the extracapsular stabilization of his left stifle and approximatley 2 months post-op from having surgery on his right stifle. The owners claim that Hemi is doing great and seems back to his normal self at home. The owners are grateful that this procedure was presented to them as a treatment option for cranial cruciate ligament disease, as it has allowed Hemi to live a more comfortable and pain free life.

With this case in mind, it should be evident that, as veterinarians, we must be an advocate for the animal. Even though an extracapsular stabilization is not considered the ideal procedure for a large breed dog, it has improved Hemi’s quality of life considerably. In conclusion, don’t let financial restraints condem the quality of life of an animal and remember that referral is always a viable option when you have exhausted all other ideas.

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