



TIBIAL PLATEAU LEVELING OSTEOTOMY

FOR TREATMENT OF CRANIAL CRUCIATE LIGAMENT INJURY

The most common orthopedic injury and cause for rear limb lameness in dogs is damage to the Cranial Cruciate Ligament (CCL) of the knee. In people this ligament is called the anterior cruciate ligament, frequently referred to as the ACL. Dogs can injure this ligament in a variety of ways. All shapes, sizes, and ages of dogs can suffer this injury. Damage to the CCL, either partial or complete rupture, results in progressive lameness, development of osteoarthritis, osteophyte (bone spur) production, and meniscal (cartilage) damage.

The Tibial Plateau Leveling Osteotomy (TPLO) is a surgical procedure designed specifically to treat the canine knee with a partially damaged or completely ruptured CCL.

Δ BIOMECHANICS

The knee joints of dogs and humans are constructed in a similar manner with nearly identical ligament and cartilage structures (Fig. 1). The biomechanics of the knee joint, however, differ vastly between dog and human. Dogs walk on their toes, with their heel elevated off the ground and their knee bent forward (Fig. 2). The weight bearing surface of the knee, called the tibial plateau, is sloped backwards (Fig. 1a). As a dog walks, weight is transferred through the hip, down the femur, and across the sloped tibial plateau of the knee. The CCL maintains the integrity of the joint and resists the force of the femur sliding down the sloped tibial plateau (Fig. 3). This force is called “*tibial thrust*” and is simply understood as the tendency for the tibia to be pushed forward as the femur slides down a sloped tibial plateau during normal weight bearing (Fig. 3).

Δ PARTIAL vs. COMPLETE TEAR

The Cranial Cruciate Ligament is composed of thousands of strands or fibers of tissue. Its construction is very similar to that of a cable which is also composed of many, many strands of material (usually steel). Dogs can sustain either a partial or complete injury to this ligament. A partial injury results in tearing of some of the fibers. A complete rupture results in tearing of all the fibers. A frayed cable, in which some of the strands of steel have broken, will still work but it is weakened and will ultimately fail. A partially injured CCL will still support the knee and resist tibial thrust; however, it is weak and does not support the knee completely. Therefore, dogs that have a partial CCL injury will have intermittent lameness and early, mild development of arthritis. Partial CCL injuries **always** progress to complete CCL injuries.

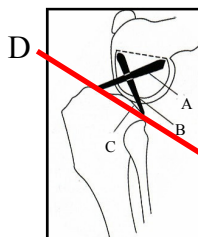
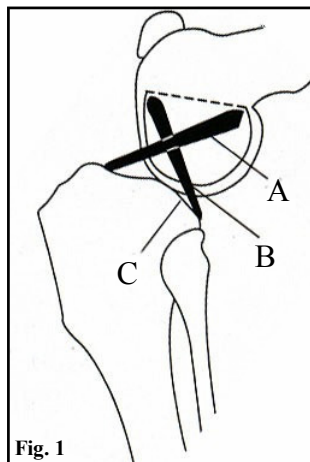
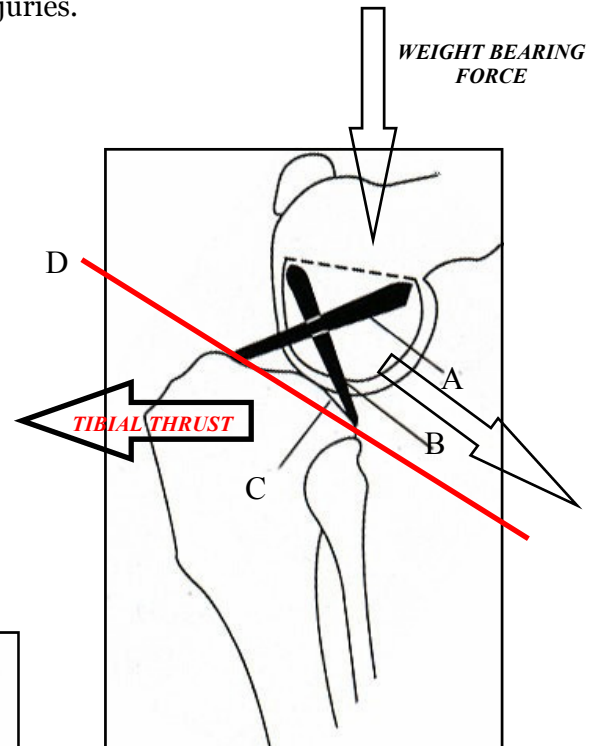


Fig. 1a

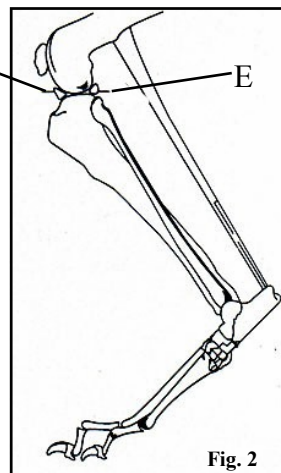
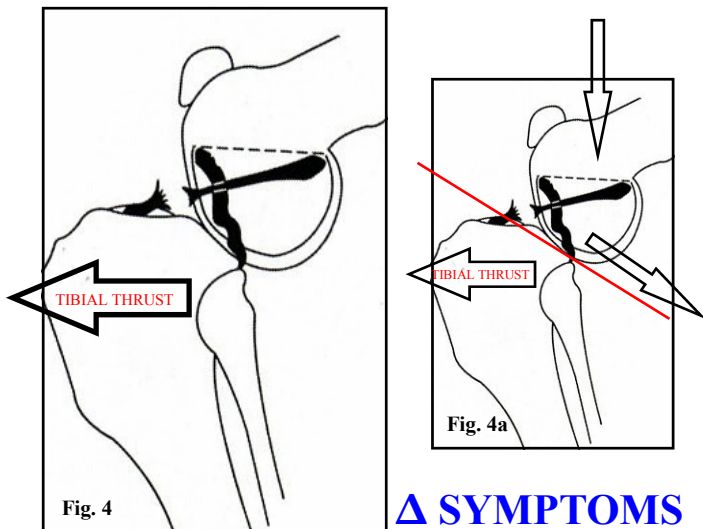


Fig. 2

- A = Cranial Cruciate Ligament
- B = Caudal Cruciate Ligament
- C = Tibial Plateau
- D = Tibial Plateau Slope**
- E = Meniscus (cartilage cushions)

Δ TIBIAL SLOPE

Dogs with a gradual tibial plateau slope, less than 24°, are less likely to injure their CCL. In contrast, dogs with a steep tibial plateau slope, greater than 24°, are at greater risk for CCL injury because the CCL is under constant excess stress due to excess tibial thrust (Fig. 4 & 4a).



Δ SYMPTOMS

Any type of injury to the CCL results in rear limb lameness. Partial tears may result in subtle, chronic, intermittent lameness that can be very frustrating to diagnose. These types of tears may only cause the dog problems during times of heavy activity. Rest and anti-inflammatory medication may resolve the lameness until the next time the dog is very active. These symptoms may be present for months until a diagnosis is made or the partial tear progresses to a complete tear. When a complete tear occurs, the knee is very unstable and painful. Many dogs will carry the affected leg or just touch the toes to the ground. Complete tears can result as a slow progression of a partial tear or as sudden, catastrophic failure of the ligament. Rest and anti-inflammatory medication are usually ineffective at resolving lameness associated with complete CCL tears.

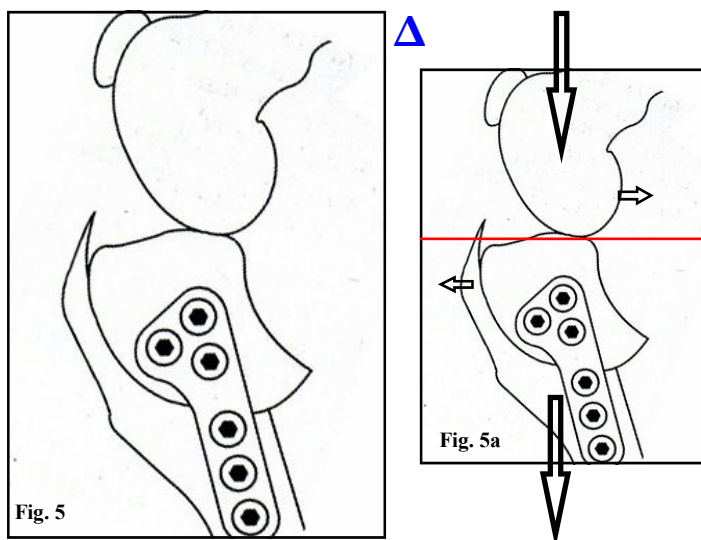
Δ DIAGNOSIS

Cranial cruciate ligament injury is diagnosed with a good physical exam and detailed x-rays of the knee. Typical physical exam findings include swelling or thickness around the knee and instability (positive cranial drawer) of the knee with stress. Dogs that have suffered a meniscal tear in addition to the CCL injury may also have a distinct “pop” or “click” with flexion of the knee. X-rays usually show excess

fluid (effusion) in the joint and early osteoarthritis or bone spur production in more chronic cases. Sedation may be required to allow for more thorough evaluation and testing of the knee for instability. In some cases of subtle, partial CCL injuries, arthroscopic evaluation is needed to confirm the diagnosis.

Δ TPLO SURGERY

The Tibial Plateau Leveling Osteotomy procedure stabilizes the knee by neutralizing tibial thrust, not by replacing the injured CCL (Fig. 5 & 5a). The bone below the tibial plateau is cut with a circular saw blade and rotated to level the tibial plateau slope thus eliminating tibial thrust. The other ligaments in the knee remain unchanged and help to further stabilize the joint. Injuries to the meniscus are treated by removing any damaged portions of this structure.



POSTOPERATIVE CARE

Most dogs feel immediately better following the TPLO procedure and will start to use the operated leg within the first 24 to 48 hours after surgery. Healing of the bone and soft tissues usually takes 8 weeks. Strict confinement is required during this period. Complete healing is confirmed with x-rays, at which time a rehabilitation program is established. Most dogs return to full activity by 3 to 4 months, and to athletic competition (running, swimming, field trial, hunt testing, agility, etc.) by 6 to 9 months postoperatively.

