Southern California Surgical Group

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TIBIAL PLATEAU LEVELING OSTEOTOMY

FOR TREATMENT OF A RUPTURED CRANIAL CRUCIATE LIGAMENT

The most common cause of rear limb lameness in the dog is rupture of the cranial (anterior) cruciate ligament. This derangement results in degenerative changes (osteoarthritis) in the stifle (knee) joint, including cartilage damage, osteophyte (bone spur) production, and meniscal injury. The Tibial Plateau Leveling Osteotomy (TPLO) has proven effective in returning these deranged stifles to full function.

BIOMECHANICS

Although the knee joints of dogs and humans are similarly constricted, the forces applied to the surfaces of these joints during weightbearing are vastly different. This is due to the differences in anatomic configuration. Just as a car resting on a flat surface has no tendency to roll, in humans, the hip, knee, and ankle joints are parallel to each other and perpendicular to the weightbearing surface (foot). We can stand easily with little stress on any ligamentous structure. Dogs, however, stand on their toes with their ankles up in the air and their knees bent forward (Fig.1). The upper portion of the canine tibia (the tibial plateau) is sloped. Weightbearing creates a force that pushes the femur down the sloping tibial plateau, thereby moving the tibia forward. This force is the cranial tibial thrust. It is opposed only by the anterior cruciate ligament (Fig.2). Just as a car resting on a hill would tend to roll down the hill, the ligament acts as a cable attached to the car to resist that downhill roll (Fig.3A). With every step a dog takes, stress is applied to the ligament. Over time, dogs with a high tibial plateau slope (like a steep driveway) place enormous stress on the ligament. Therefore, when the cranial tibial thrust is too great, the anterior cruciate ligament ruptures (Fig.4).

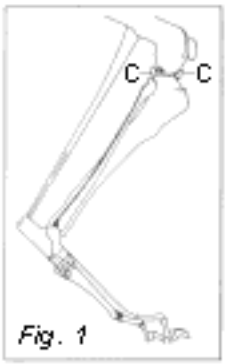

Fig. 1

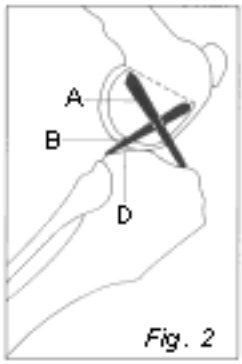

Fig. 2

A=CRANIAL CRUCIATE LIGAMENT
B=CAUDAL CRUCIATE LIGAMENT
C=MENISCUS
D=TIBIAL PLATEAU

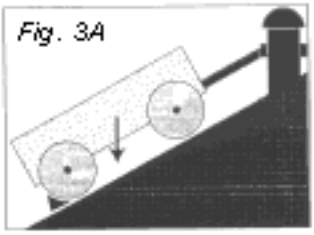
Fig. 3A

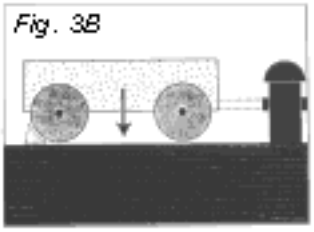
Fig. 3B


Fig. 4


Fig. 5

Ruptures come in several varieties. There are singular incidents which cause a sudden complete rupture with severe pain and a nonweightbearing lameness. Other ruptures occur in small increments or a little bit at a time. These are known as partial ruptures of the anterior cruciate ligament. They cause a small amount of pain and a mild lameness with poor performance. When partial ruptures proceed to complete ruptures, the transition is often gradual.

Two other important structures in the knee are the medial and lateral meniscii (cartilage pads) (Fig.1). They are also prone to injury when the stifle is unstable from a cruciate ligament tear.

The TPLO procedure is most applicable to large, active individuals due to the inherent stability it provides under extreme repetitive stress. Traditional surgery in these individuals requires prolonged confinement to allow healing of the synthetic or natural anterior cruciate ligament replacement. These materials may fail because confining these active individuals for prolonged recovery periods

can be all but impossible. Any activity may lead to stretching the artificial and collateral ligaments, incomplete flexion of the stifle, poor athletic performance and an incomplete return to thigh diameter.

CLINICAL SIGNS

Once the cranial cruciate ligament ruptures, the tibia can slide forward and the femur is free to ride down the slope of the tibial plateau, just as the car rolls down the hill once the cable is cut (Fig.3#A). The meniscus is often damaged as the femur rides over the top of it. When the ligament tears, pain, swelling in the knee, and marked lameness will occur. If not stabilized, the joint will become dramatically arthritic over time. Rest and anti-inflammatory medications have little effect upon the pain and lameness the dog experiences.

DIAGNOSIS

The diagnosis is made upon eliciting forward motion of the tibia (cranial drawer sign). This is easy in acute, complete ruptures, but may be more subtle in chronic or partial tears. Mild sedation to allow muscle relaxation and radiographs (x-rays) to demonstrate arthritic changes and swelling may be necessary to obtain a diagnosis

TPLO SURGERY

The Tibial Plateau Leveling Osteotomy is used to neutralize the effect of cranial tibial thrust (Fig.5). The procedure "levels" the tibial plateau, thereby eliminating the need for the cranial cruciate ligament as a restraint against cranial tibial thrust (Fig.3B). ***In other words, rather than replacing the cable which broke in the first place, this procedure will level the surface and eliminate the need for the cable***. Meniscal injuries are also corrected during the surgery in order to prevent further arthritic changes in the joint.

POSTOPERATIVE CARE

Healing takes about two months for the bone and slightly longer for the soft tissues. Strict confinement is mandatory during the healing process. Because the plateau leveling allows the joint pain to rapidly subside, the major problem during recovery is excessive patient activity prior to the completion of bone healing. Most patients return to controlled activity in 2 months, and full activity in 3 to 4 months. Patients can return to athletic competition (field trial, hunting, agility trials, Schutzhund) usually by 6 months postoperatively.