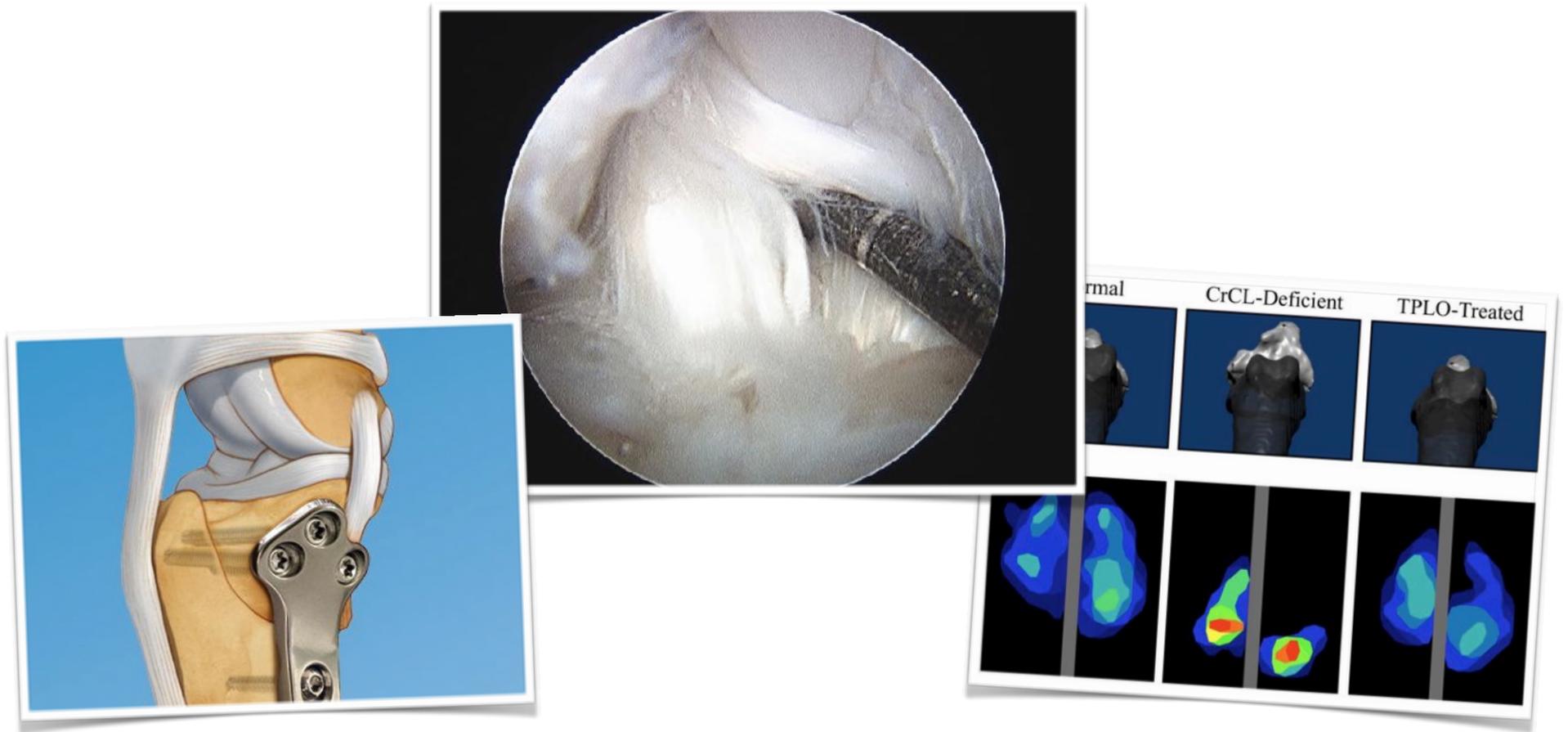


# Cruciate Ligament Injury

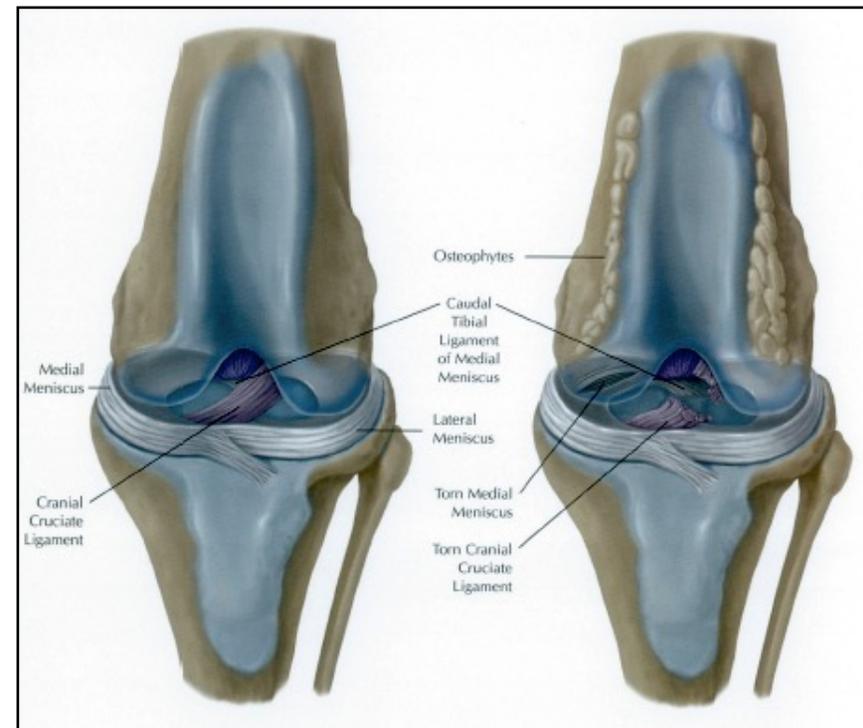
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## INTRODUCTION

The stifle, or knee joint, is made up of the bones of the upper leg (femur) and the lower leg (tibia), as well as the supporting ligaments. Four major ligaments support and stabilize the stifle in the dog. The external stabilizers are the medial and lateral collateral ligaments. The two important internal stabilizers are the cranial and caudal cruciate ligaments. The two cruciate ligaments are analogous to the anterior (ACL) and posterior (PCL) ligaments in people. These ligaments allow for normal range of motion while they prevent abnormal forward and backward sliding of the tibia, known as cranial and caudal tibial thrust, respectively.

Deterioration and tearing of the cranial cruciate ligament is one of the most common causes of hind limb lameness, pain and degenerative joint disease (osteoarthritis) of the stifle in dogs. The condition is a degenerative one in dogs, with daily wear and tear resulting in damage to the ligament that cannot properly heal. Often a minor injury such as occurs after a twist and accelerate or hyperextension activity causes a partial or complete rupture of the cranial cruciate ligament. Once the cranial cruciate has even a partial tear (sprain), the daily strains on the stifle with any weight bearing activity will eventually result in complete cranial cruciate ligament rupture. Rupture of the cranial cruciate ligament results in instability and abnormal forward sliding of the tibia with every weight bearing step (cranial tibial thrust). Confirmation of this instability generally requires palpation of the joint under sedation. If the instability is not treated within a few weeks of the



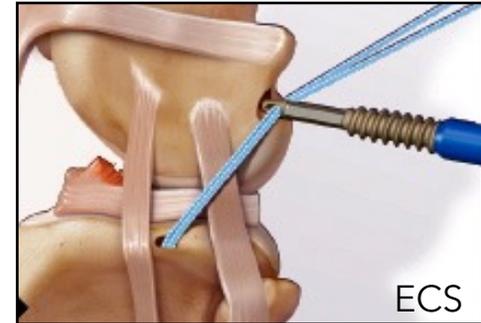
injury, irreversible osteoarthritis begins to develop. Often, if the original injury was severe, or if the injury is very old (chronic), damage to other structures in the stifle may also occur.

Certain breeds of dogs may have a body conformation (for example very straight hind legs or bow-legged hind legs) that predisposes them to rupture of the cranial cruciate ligament even with normal daily activity. Obesity may be one of the single most important contributing factors leading to osteoarthritis, excessive strain and ultimately rupture of the cranial cruciate ligament.

Damage to the medial meniscus (which is one of the two "shock absorbing" fibrocartilage pads) occurs in many of the patients with cranial cruciate ligament rupture. When present, the damaged areas of the meniscus must be resected (removed).

### **SURGICAL TREATMENT**

Although a number of different surgical procedures may be employed depending on the patient's size, conformation, age, temperament and activity level, the basic premise of treatment is to remove the damaged ligament and stabilize the stifle. Inspection and removal of the damaged structures can be done with an open incision (arthrotomy) or by less invasive arthroscopy. Stifle stabilization is generally accomplished using heavy suture material to counteract the cranial tibial thrust and allow scar tissue (fibrosis) to provide augmentation to the remaining ligaments. This technique is called Extracapsular Stabilization (ECS). The traditional suture for this technique is a monofilament nylon. Other less elastic braided suture materials may be used such as Fiberwire®, Tightrope®, SwiveLock®, IsoLock® and others.



Alternatively, most patients with conformational predisposition to this injury would benefit from a procedure to neutralize the cranial tibial thrust (abnormal forward sliding.) This procedure, known as Tibial Plateau Leveling Osteotomy (TPLO), involves making a curved cut (domed osteotomy) in the tibia, rotating the top (plateau) to a more "level" position and stabilizing the rotation with a specially designed bone plate and bone screws. This is a force neutralization procedure and does not stabilize the stifle in the same way as Extra-capsular Stabilization. The return to function seems much quicker and the progression of osteoarthritis appears to be much slower with this technique.

In cases, of excessive tibial plateau slope the osteotomy might be made lower in the tibia in order to level the plateau. This is called a CORA-Based TPLO and may be a better option in patients with tibial conformation that will not accommodate standard TPLO or patients that have had other failed procedures in the past.

Tibial Tubercle Advancement (TTA) is a technique developed in Switzerland that reduces cranial tibial thrust, as well. This technique involves an osteotomy (cut) in the tibial crest and advances this segment forward/cranially. The advanced segment is held in place with a Titanium basket, bone plate and bone screws. Bone graft is applied to speed up the healing process. Surgeons at VMSG were involved during the early development of this technique and are leaders in this technique in Southern California. Because of the predisposing conformations and forces causing a cranial cruciate ligament injury, replacing the damaged cruciate with a graft is not generally successful. However, the surgeons at VMSG are at the cutting edge of this field and always evaluating techniques, including graft replacement procedures, to improve outcome, lessen pain and decrease the progression of osteoarthritis.



Your pet's surgeon will discuss which procedures may be best for your pet.

### **BIOLOGICS**

In addition to biomechanical stabilization surgery to treat the unstable stifle joint, biologic agents are employed to improve healing. During surgery we routinely use hyaluronic acid and platelet rich plasma (PRP) to improve the health of the joint fluid, cartilage and synovium (joint lining).

New medications to prevent and treat osteoarthritis (Slow Acting Disease Modifying Osteoarthritis Agents or SADMAs) are available and may be recommended for some patients after surgery. Examples of these include hyaluronic acid, PS-GAGs (Adequan®), glucosamine/ chondroitin, and omega-3 & 6 essential fatty acids (EFAs).

### **AFTER CARE**

Proper care of your pet at home after surgery is crucial to a successful outcome. Patients must be confined to a small pen or crate and not be allowed off leash for 3 months. A bandage or cast may be used for a few days. Physical rehabilitation therapy consisting of range of motion exercises, leash controlled walks and other modalities can be initiated under the direction of your pet's surgeon and Certified Rehabilitation Therapist. With TPLO, CBTPLO and TTA, radiographs are required at 2-3 and 8 weeks after surgery to evaluate progression of healing of the osteotomy. Even though return to full function is expected by 3 months, a full six months to one year recovery period is necessary for all of the soft tissue structures (ligaments, tendons, muscles.)

### **PROGNOSIS**

Some osteoarthritis is expected in every case and some persistent or recurring stiffness and pain may require periodic or lifelong medical therapy. With proper evaluation and treatment of meniscal injuries,

meniscal injuries in the future are rare (roughly 0.5-1%). Likewise, the rate of infection is quite low (less than 5%) in our facility.

### **ABOUT THE AUTHOR**

*Dr. Kenneth Bruecker, DVM, MS, DACVS, DACVSMR  
Board Certified Veterinary Surgery  
Board Certified Veterinary Sports Medicine and Rehabilitation*

*A San Fernando Valley native, Dr. Bruecker attended Pierce College then received his bachelors degree in Animal Science from the University of California at Davis.*

*He graduated from the University of California at Davis, School of Veterinary Medicine in 1983. After one year of general small animal practice in San Fernando, Dr. Bruecker completed an additional year of clinical internship at the West Los Angeles Veterinary Medical Group. He received his master of science degree at the completion of a three year surgical residency at Colorado State University and moved back to Ventura County in 1988 to establish specialty veterinary care. Dr. Bruecker is Founder, Medical Director and Chief of Surgery at the Veterinary Medical and Surgical Group in Ventura, California. He also provides consulting and training services throughout the world.*

*Dr. Bruecker provided regular surgical support for practices in the state of Hawaii from 1996 through 2011.*

*In 2015, Dr. Bruecker founded Continuing Orthopedic Veterinary Education (COVE), a company whose mission is post-graduate veterinary orthopedic education, training, mentoring and surgical coaching around the world.*

*Board Certified in Surgery since 1990, Dr. Bruecker's primary clinical interests are spinal surgery, sports medicine/orthopedics (including arthroscopy, TPLO, TTA, and limb deformity correction), minimally invasive surgery (such as laparoscopy) and peri-operative pain management. He is well respected for his expertise in arthroscopy, limb deformity, disorders of the knee, fracture management and disorders of the spine. He has authored numerous articles and book chapters on Wobbler syndrome, treatment of intervertebral disk degeneration and spinal fracture management. He is an active participant in working groups on elbow dysplasia, shoulder injuries, advanced techniques in small animal arthroscopy and cranial cruciate ligament repair. Dr. Bruecker was the first to offer TPLO surgery, TTA surgery, cementless hip replacement, arthroscopy and laparoscopy to owners of pets in Ventura, Santa Barbara and San Luis Obispo Counties, as well as to the State of Hawaii. He holds a patent for the first locking Triple Pelvic Osteotomy plate used to treat hip dysplasia. He has been an innovator in the development of many new surgical techniques and orthopedic implants.*

*Dr. Bruecker became a Diplomate of the American College of Veterinary Sports Medicine and Rehabilitation in 2015 and thus is now Board Certified in this field, as well as surgery.*

*Dr. Bruecker is a past program chair of Neurosurgery for the American College of Veterinary Surgeons and a past program chair for the veterinary technician program for the American College of Veterinary Surgeons. He served as the orthopedics program director for 2004 and 2005 for the American College of Veterinary Surgeons. He was also program director for orthopedics, pain management and anesthesia for the 2006 American Veterinary Medical Association annual symposium. He has served as the program chair for the Association for Veterinary Orthopedic Research and Education (AVORE). He is a past Executive Board Member (2004-2007) and is Past-President (2014-2015) of the Veterinary Orthopedic Society.*

*Due largely to his commitment to education and training, Dr. Bruecker was chosen as the Veterinarian of the Year by the California Veterinary Medical Association in 2004. He is an invited speaker and educator*

*throughout the United States, Latin America, South America, Europe, Asia and the South Pacific on a variety of topics in orthopedics (fracture management and arthroscopy), neurosurgery and pain management. He splits his time between global veterinary education and clinical practice.*

*Dr. Bruecker and his family farm avocados and citrus in Ventura County. He is an enthusiast of classic cars.*