CRANIAL CRUCIATE LIGAMENT RUPTURE

ANATOMY
There are two cruciate ligaments in the canine knee joint, the cranial and caudal cruciate ligaments (CrCL & CaCL). The same ligaments are present in human knees except they are called anterior and posterior cruciate ligaments (ACL & PCL). The CrCL (or ACL) is most commonly injured in both dogs and people and results in knee instability. Two cartilage pads called menisci are also found within each knee (medial and lateral meniscus).

WHY DID THE CrCL RUPTURE?
In contrast to people, where ACL rupture is almost always caused by trauma, most dogs suffer from a slowly progressive CrCL degeneration. The resulting weakened CrCL can rupture with minimal trauma. We do not yet fully understand the cause of CrCL rupture. Because CrCL degeneration is occurring in both knees, there is a 20-40% chance that dogs will rupture the CrCL in their opposite knee sometime in the future.

CLINICAL SIGNS
Lameness is the most common symptom seen with CrCL rupture. It can vary from a mild, intermittent to a non-weight bearing lameness. Some patients will have a clicking or popping noise in the knee during walking. This may indicate meniscal damage.

DIAGNOSIS
CrCL rupture is diagnosed by palpation (feeling the knee) and radiographs (X-rays). Most dogs with CrCL rupture have instability in the knee called cranial drawer. Dogs that are very tense or those having chronic or partial CrCL rupture may have little cranial drawer detected. Radiographs are helpful in these patients and often show osteoarthritis and joint swelling.

SURGERY
Surgical stabilization of the knee is recommended for treatment of dogs with CrCL rupture. While many different procedures have been developed over the years, we offer two surgical options here at MSU. With either technique, the meniscus is evaluated. If the meniscus is intact, a meniscal release is performed to minimize the chance of later tearing. If the meniscus is torn, it is removed and fibrocartilage (scar tissue) will later fill the void and replaces the function of the damaged meniscus.

• TIBIAL PLATEAU LEVELING OSTEOTOMY (TPLO)

The TPLO was developed about 20 years ago to treat CrCL rupture in large breed dogs. It has become the most commonly performed surgery for treatment of CrCL rupture in dogs, and is the procedure that we recommend for large-breed dogs. Dogs that have a TPLO performed tend to use the affected limb sooner than dogs that have other procedures performed. There is also growing evidence that dogs that have a TPLO develop less osteoarthritis than dogs with other procedures.
Technique:
The procedure produces functional stability of the knee by changing the tibial plateau slope. This is done by sawing the top of the tibia (osteotomy) and leveling the tibial plateau to prevent cranial tibial thrust during weight bearing. The saw cut is stabilized with a special bone plate and screws that hold the bone while it heals. Normally, the intact CrCL stops cranial tibial thrust, a force resulting from tibial compression generated during weight bearing. After TPLO, weight bearing will cause caudal tibial thrust is stopped by the caudal cruciate ligament. Changing the tibial plateau slope stabilizes the knee during weight bearing.

Recovery:
After surgery, a soft-padded bandage will be put on the operated leg. The bandage will be removed before your dog goes home. Your dog’s activity must be restricted to leash walks for a period of 8 weeks after surgery. Restricting your dog’s activity level plays a major role in the success of the surgery.

Recheck:
A recheck examination with radiographs will be required at 8 weeks after surgery to assess bone healing. A second recheck visit is sometimes needed if the bone heals slowly.

Complications:
The following complications have been reported: infection, inflammation of the patellar ligament, fracture of the tibial tuberosity, breakage or loosening of the bone plate or screws, delayed healing of the osteotomy site, rupture of the caudal cruciate ligament, and post-operative meniscal injury. Some of these complications require additional surgery. These complications have been very uncommon at MSU.

Prognosis:
The TPLO is the most commonly performed procedure to treat large breed dogs with CrCL rupture because dogs treated with TPLO have a better functional outcome and decreased development of osteoarthritis than dogs treated with “traditional” methods. Depending upon the severity of osteoarthritis and cartilage damage that your dog already has, s/he may show signs of lameness early in the morning, after heavy exercise, or on cold days. Dogs with severe osteoarthritis may have a persistent lameness.

• MODIFIED RETINACULAR IMBRICATION TECHNIQUE (MRIT)

Technique:
To prevent cranial tibial thrust, the knee is stabilized using strong nylon sutures placed on the outside of the joint capsule. These sutures are anchored at the back of the femur and then pass through a hole drilled in the tibial tuberosity (see picture). Eventually scar tissue aligns itself around the nylon sutures and ultimately it is this scar tissue that holds the knee stable (since the suture will eventually stretch or break).
Recovery:
After surgery, a soft-padded bandage will be put on the operated leg. The bandage will be removed before your dog goes home. Your dog’s activity must be restricted to leash walks for a period of 8 weeks after surgery. Restricting your dog’s activity level plays a major role in the success of the surgery. Physical therapy exercises can be done to help expedite your dog’s recovery. It generally takes up to 3-4 months before your dog will be fully recovered and using the leg well.

Recheck:
A recheck examination is usually not required unless complications develop.

Complications:
The following complications have been documented: irritation, breakage and/or infection of the heavy nylon stabilizing sutures, and post-operative damage to the meniscus. Some of these complications require additional surgery.

Prognosis:
The prognosis following surgery is generally good. About 90% of the dogs will go on to have normal pet function. However, they will have slightly decreased range-of-motion (stiffness) and the osteoarthritis will still progress (although much slower than without surgery). Depending upon the degree of osteoarthritis and the presence of cartilage erosions, your dog may show signs of lameness early in the morning, after heavy exercise, or on cold days. Dogs with severe osteoarthritis may have a persistent lameness.

MEDIAL PATELLA LUXATION

ANATOMY
The patella (knee cap) is part of the quadriceps muscle (large muscle group on the front of the thigh) mechanism. The muscle originates at the top of the femur and inserts, via the patella ligament, onto the tibial tuberosity. The quadriceps mechanism forms a straight line from origin to insertion. The patella rides in a groove in the distal femur called the trochlea.

WHY DOES THE PATELLA DISLOCATE??
If the femur is slightly bowed (as is usually the case in dogs with patella luxation), and the tibial tuberosity (insertion point of the patella ligament) is medially displaced, then the patella is pulled toward the medial side (inside) of the knee. The tissues on the lateral side (outside) of the knee tend to stretch and the patella eventually dislocates medially. The trochlea is often more shallow than normal.

CLINICAL SIGNS
Dogs with medial patella luxation (MPL) tend to intermittently hold up the affected leg and hop on the other leg. Sometimes the dog will straighten the leg behind them and the patella goes back into place. Either leg, or more commonly both legs, are affected. The dog can walk normally in between episodes of MPL.
**DIAGNOSIS**
MPL is diagnosed by palpation (feeling the knee). Radiographs (X-rays) are sometimes taken to assess the conformation of the rear limb(s). A grading system is applied to MPL cases to assist with treatment options. The grading system goes from Grade I to Grade IV. Grade I is the least severe and Grade IV is the most severe. Most MPL patients seen at our hospital are either Grade II or Grade III.

**TREATMENT**
Treatment of MPL is directed toward overcoming the conformational changes that cause the patella to dislocate in the first place. While surgery is tailored to the individual patient’s needs, it usually involves some procedure to deepen the trochlea groove, transposition of the tibial tuberosity, and removal of the stretched lateral joint tissues.

**Trochleoplasty:**
There are several procedures that may be used to deepen the trochlea groove and they are called “trochleoplasties”. The surgeon will select the trochleoplasty that best meets your pet’s needed correction.

**Tibial Tuberosity Transposition:**
In addition to deepening the trochlea groove, the surgeon usually moves the insertion point of the patella ligament and this is called a “tibial tuberosity transposition”. The insertion point of the patella ligament is moved so that the patella and quadriceps mechanism are aligned with the newly deepened trochlea groove. An osteotomy (a cut in the bone) is performed, the tuberosity is repositioned and then held in place with small pins.

**Resection of Excess Lateral Tissue:**
Before closing the joint, any excess (stretched) tissue on the lateral side of the joint is removed. This help to stabilize the patella in its new groove.

**RECOVERY**
After surgery, a soft-padded bandage will be put on the operated leg(s). The bandage(s) can remain in place for about seven days after surgery. Your dog’s activity must be restricted to lease walks for a period of 8 weeks after surgery. Restricting your dog’s activity level plays a major role in the healing of the bone and the success of surgery.

**RECHECK**
A recheck examination at MSU is not necessary. You may bring your dog to your regular veterinarian for bandage and/or suture removal.

**COMPLICATIONS**
Complications are uncommon, but may include: infection, pin loosening, and recurrence of luxation.
**PROGNOSIS**

The prognosis for treatment of Grade I – III medial patella luxation is good. The surgery resolves the clinical signs in most patients. Some patients may experience mild lameness depending on the severity of osteoarthritis that may be present.