

- **Tibial crest transposition:** movement/realignment of the insertion of the straight patellar ligament. This transposition results in realignment of the quadriceps muscle, the patella and the patellar tendon. Once repositioned, the bone is fixed in its new position with a pin or wire implants.



- **Tightening and/or Release of the ligaments surrounding the patella.** (medial and lateral femoral-patellar ligaments)

- **Realignment of the femur and/or tibia** (generally only required when angular bone deformities are present). See Figures 4-7.

Figure 6. Lateral Knee Radiograph of Canine Patient. This is a post-operative image of a patient who has had a femoral straightening (patellar luxation) and a TPLO (cranial cruciate rupture).



Figure 7. Ventral-Dorsal Knee Radiograph of Canine Patient. This is the same patient as Figure 6.

The Presence of Multiple Conditions

Some pets, notably larger bow-legged breeds such as mastiffs, pit bulls and some Labrador retrievers, can have patellar luxation concurrent with cranial cruciate ligament tears. Usually these pets have had an undiagnosed or untreated patellar luxation for some time and the instability of that condition has predisposed them to acute injury of the CCL.

The presence of multiple conditions requires thorough physical and radiographic examination to unravel the anatomic complexities and to determine the proper surgical corrections necessary to return your pet to pre-injury status. See Figures 6-7.

Post-Operative Recovery

Our staff will establish a post-operative treatment plan personalized to your pet. We commonly prescribe analgesics (pain medications) and anti-inflammatory drugs in the initial recovery period. Physical therapy, including cold compresses, gentle range-of-motion movements and sitting, standing and walking maneuvers may be recommended after the initial weeks of recovery. Occasionally we will discharge your pet with a light bandage or splint along with instructions on necessary bandage care. Exercise is substantially restricted for 6-10 weeks post-surgery. Your pet's healing progress may be monitored with follow-up radiographs at scheduled intervals.



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The Knee

Problems and Solutions
for the Injured Knee



Come. Sit. Stay.
Heal...

Common Knee Problems

Animals, like people, may suffer a variety of disorders of the knee that weaken the joint and cause significant pain and lameness if left untreated. Common knee problems in domestic animals involve either tears in the cranial cruciate ligament and/or dislocation of the knee cap (patella luxation). Both of these conditions can be surgically treated, returning your pet to a more active and comfortable routine. See Figure 1.

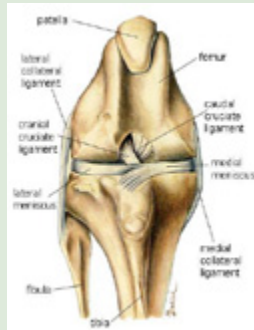


Figure 1. Frontal View of the Canine Knee (normal anatomy)

Cranial Cruciate Ligament Insufficiency (Rupture)

A complete or partial tear of the cranial cruciate ligament (CCL) renders your pet's knee unstable. Consequently, the knee may buckle when weight is placed on the affected limb. Inflammation and effusion (fluid in the joint) can ensue. See Figure 2. Subsequently, your companion may develop stiffness, soreness and lameness when standing or after prolonged periods of rest (such as first rising in the morning). These symptoms may improve somewhat as your pet moves around and limbers up. They may also become worse after exercise or exertion but usually improve with rest. If left untreated arthritis will result, leading to progressive lameness.

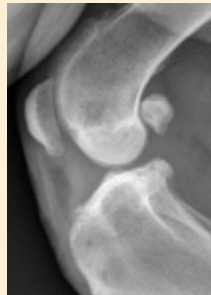


Figure 2. Lateral Knee Radiograph of Canine Patient with Partial Cranial Cruciate Tear. Note bone spurs, joint effusion and cranial subluxation of the tibia.

Without intervention there is a chance that scar tissue will stabilize the knee and that your pet will be able to use the leg again. However, this kind of recovery rarely occurs if there is accompanying meniscal cartilage damage. The torn meniscus acts like a stone in a shoe, causing significant discomfort and gait abnormality. Often, even if the knee does "self-stabilize," it does so in an abnormal position promoting arthritis to accumulate rapidly in the joint.

Surgery benefits your pet by allowing removal of excess effusion along with remnants of the torn ligaments and damaged portions of the meniscus. There are a variety of surgical procedures to treat cranial cruciate ligament injuries in dogs and cats. These include passive repairs such as the extracapsular suture, fascial strip ligament replacement, fibular head transposition, and fiber wire augmentation as well as functional or biomechanical repairs such as the tibial plateau leveling osteotomy (TPLO) and tibial tuberosity advancement (TTA). Please see the VSC brochure on cranial cruciate ligament

rupture for more information on these functional repairs.

Knee Arthroscopy: During surgical treatment for CCL injury the knee joint must be explored to confirm that the CCL is torn, examine the cartilage surfaces, and to examine and treat the meniscus if it is damaged. This now can be done minimally invasively using a small arthroscope. Arthroscopy significantly lowers the morbidity associated with joint exploration, provides a more accurate assessment of the internal knee structures, and in many cases can provide a more comfortable and quicker return to use of the limb. See images A and B.

Regardless of the technique(s) used, the goal of surgery remains to prevent patellar instability, to create a more functional joint, to minimize further arthritic deterioration, and to restore comfort and function to the patient.

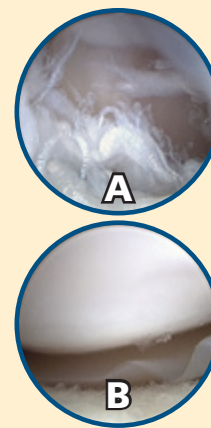


Image A: Arthroscopic view of a torn cranial cruciate ligament.

Image B: Image of a healthy/non-damaged medial meniscus in a dog.

Patella Luxation: Instability of the Knee Cap

The patella resides in the front of the knee joint within the tendon of the quadriceps muscle of the thigh. See Figure 1. Normally, it glides up and down in the groove of the femur (thigh bone): two bony ridges (trochlea) at the lower end of the femur create the groove that confines the movement of the patella. The quadriceps muscle, the patella and the patellar tendon (which attaches to the tibial crest below the knee) together form the mechanism that extends the leg and are normally well-aligned with each other.

Luxation of the patella is characterized by the knee cap slipping out of this groove, over the trochlea and onto the side of the femoral condyle. See Figure 3. This abnormal motion causes damage and wear to the cartilage, effusion (fluid accumulation in the joint), inflammation, pain (bone to bone contact), and limb weakness.

Uncorrected, this luxation can cause irreversible damage to the femur and patella as the instability gradually grinds away cartilage leading to osteoarthritis and associated pain. In all animals the abnormal position of the patella destabilizes the knee and predisposes affected pets to rupture of the cranial cruciate ligament.



Figure 3. Frontal knee radiograph from a Canine Patient. This patient has a medially luxated patella.

Symptoms

A luxating patella may cause few to very mild symptoms or, more commonly, significant lameness. Often pets will demonstrate intermittent limping in the rear leg(s). A symptomatic pet may stop suddenly when running and may vocalize in pain; it is also common to observe brief periods in which your companion holds up the affected leg as the patella spontaneously luxates. After the pet shakes the leg or lifts it for a minute or two, the quadriceps muscle relaxes allowing the patella to resume its normal position, the pain or discomfort is relieved, and your friend resumes normal activity.

Diagnosis

Luxating patellae are diagnosed by palpation of the knee. Radiographs (x-rays) may be taken to evaluate the extent of secondary changes such as osteoarthritis and to diagnose other possible abnormalities. Luxating patellae are divided into four grades (Grades I-IV) based on the severity of the luxation; note that a normal, healthy patella cannot be manually luxated.

Surgical Options

Patellar luxations that do not cause any clinical signs (typically grades I and some II) are monitored but do not usually warrant surgical correction. Surgical treatment of patellar luxation is more difficult when combined with cranial cruciate disease, hip dysplasia or abnormal femoral angulation (bow-leggedness) of the long bones. See Figure 4. The correction required is dictated by the abnormalities present in a specific patient but usually involve a combination of the following procedures:

- **Wedge recession:** a deepening of the femoral groove so that the patella seats deeply in its normal position and is less likely to luxate.



Figure 4. Ventral-Dorsal Hip and Knee Radiograph of Canine Patient. This patient has bilateral varus (bow-legged) deformities and a right sided medially luxated patella.



Figure 5. Ventral-Dorsal Hip and Knee Radiograph of Canine Patient. This patient has had a distal femoral osteotomy (femur straightening) to correct femoral varus and patellar luxation.