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PATELLA LUXATION

GENERAL INFORMATION, ANATOMY AND FUNCTION OF THE PATELLA:

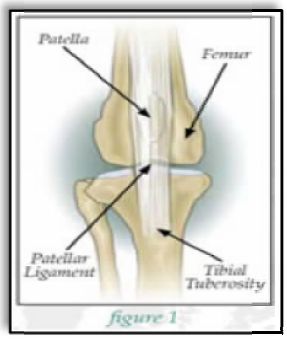

figure 1

The stifle (knee) is a complex joint connecting the femur and the tibia bones (see figure 1). The patella or kneecap is small bone embedded in the patella ligament that connects the quadriceps muscle of the thigh to the tibia. The attachment of the patella ligament at the tibia is called the tibial crest or tuberosity. The patella travels in a groove on the femur called the trochlear groove and is held in place by the patella ligament and a medial (inner) and lateral (outer) collateral patella ligament that prevents it from luxating (dislocating) out of the trochlear groove. In addition the ridges of the trochlear groove are a physical barrier to luxation of the patella. The trochlear groove is lined with cartilage and when held in its correct anatomic position, the patella glides smoothly and non-painfully during flexion and extension of the knee. The purpose of the patella is to aid the quadriceps muscle in the extension of the tibia while providing alignment support of the femur and tibia during extension and flexion of the stifle. The entire system is called the extensor mechanism. The patella can luxate medially to the inside of the stifle, termed medial patellar luxation (MPL) or laterally to the outside of the stifle, termed lateral patellar luxation (LPL). In certain cases the patella luxation can luxate both medially and laterally. Patella luxation can either be unilateral affecting only one stifle, or bilateral affecting both stifles. Bilateral patellar luxation occurs in 36% to 46% of cases with increasing body weight reducing the percentage of bilateral disease.

CAUSE OF PATELLAR LUXATION:

- **NON-TRAUMATIC:** This is generally a congenital or developmental misalignment of the entire extensor mechanism and is a hereditary genetic defect. Animals that demonstrate non-traumatic patellar luxation at an early age should not be bred. The patella can luxate secondary to a number of different abnormalities:

Excessive patellar ligament length	Abnormal conformation of the hip joint, most commonly hip dysplasia
Shallow trochlear groove	Atrophy and secondary tightness (bowstring effect) of the quadriceps muscle
Malformation of the tibia	Angular and rotational deformity of the tibia
Deviation of the tibial tuberosity	Weak medial and lateral collateral patellar ligament

- **TRAUMATIC:** This form is usually sustained after a blunt force impact to the stifle. It is generally associated with acute pain, swelling and immediate non-weight bearing lameness that slowly resolves over time. The patellar luxation becomes permanent despite resolution of the swelling and pain. This form of patellar luxation can also occur secondary to other diseases like cranial cruciate ligament (CCL) injury. This form is not hereditary and these animals can be bred.

GRADING OF PATELLAR LUXATION:

- **GRADE 1:** The patella can be manually luxated but easily comes back into normal position. The animal may or may not intermittently carry the affected limb.
- **GRADE 2:** The patella luxates on flexion of the stifle and remains luxated until manually replaced or animal extends and rotates the stifle to reposition the patella back to normal. The animal intermittently carries the affected limb with the stifle flexed.
- **GRADE 3:** The patella remains luxated most of the time but can be manually reduced (placed back into normal position). Flexion and extension of the stifle reluxates the patella. The animal transfers most of the body weight to the front limbs, bunny hops or carries the affected limbs and appears bowlegged (MPL) or knock-kneed (LPL).
- **GRADE 4:** The patella is permanently luxated and cannot be manually repositioned back to normal. The quadriceps muscle group starts to shorten making it difficult to extend the leg fully. The animal transfers most of the body weight to the front limbs, bunny hops or carries the affected limbs and appears bowlegged (MPL) or knock-kneed (LPL).

CLINICAL SIGNS OF PATELLAR LUXATION:

Clinical signs of patellar luxation can vary greatly based upon severity of the disease. In very mild grade 1 cases there may be no clinical signs and the patellar luxation may be an incidental finding on physical examination.

- Transient pain and lameness with carrying of the affected limb with the stifle flexed.
- Intermittent skipping or a stiff gait without bending of the affected limb.
- Sudden signs of lameness.
- Couching, bowlegged or knock-kneed stance.
- Poor ability to flex the stifle joint with a post-legged stance.
- Osteoarthritis or crepitus (crunching) as the stifle is rotated.
- Abnormal sitting posture with the affected limb in an extended position.
- Exercise intolerance due to pain with the rear legs.

PLEASE TURN OVER

DIAGNOSIS OF PATELLAR LUXTION:

- **PALPATION:** Physical displacement of the patella out of the trochlear groove is the key to diagnosis of patellar luxation. Physical manipulation of the patella through a range of motion will determine how the patella tracts through the trochlear groove, its ability to be reduced to normal positioning and the severity or grade of patellar luxation.
- **STANCE AND GAIT ANALYSIS:** Observation of the animal in a standing position and with movement will reveal abnormal stance and lameness to confirm patellar luxation. Signs of lameness will vary depending upon the severity and duration of the patellar luxation.
- **RADIOGRAPHS:** Radiographs will identify bony deformities, joint alterations, degree of tibial rotation and rule out underlying conditions which may precipitate and/or complicate patellar stabilization.

Animals may be tense, scared and/or painful upon examination. Muscle tension can temporarily provide stability to the stifle and the patella. Sedation to reduce muscle tension and pain may be required for a through evaluation of the stifle. This is especially true if the animal is large or extremely tense.

TREATMENT OF PATELLAR LUXATION:

- **NON-SURGICAL TREATMENT:** It is not uncommon to diagnose patellar luxation during a routine physical examination with no history of limb lameness or a single to few transient episodes of lameness. A good percentage of animals with grade 1 to 2 patellar luxation can live in a relatively pain-free, fully functional manner without any treatment or occasional Non-steroidal anti-inflammatory treatment. The success of non-surgical treatment is related to age and severity of the patellar luxation. Patellar luxation without clinical pain does not typically warrant surgical intervention and usually only requires monitoring.
- **SURGICAL TREATMENT:** Surgical intervention should be considered in patellar luxation of grades 2 and above. Surgical treatment is more complex in large breed dogs and can be complicate by underlying conditions such as hip dysplasia, CCL disease, angulation of the long bones, etc. Many techniques of surgical correction exist to treat patellar luxation. Since patellar luxation in a complex disorder, a single method of patellar stabilization may be possible or it may be necessary to combine procedures and techniques. In young dogs only soft tissue surgical procedures are recommended because of growth plate deformities that may occur with bone reconstructive procedures. This will often allow the young animal to grow with little bony deformity and will increase success and reduce DJD in the event a more definitive procedure is required at a later date. Surgical treatment may involve reconstruction of stifle soft tissue, deepening of the trochlear groove, placement of surgical monofilament suture, cutting and transposing the tibial tuberosity and correction of abnormally shaped femurs.

PROGNOSIS WITH CORRECTION OF PATELLAR LUXATION:

Superior results are evident when dealing with less severe grades of patellar luxation, namely grades 1 and 2. As severity increases surgical considerations become more complex and a successful outcome without physical signs of disability and medical management in some form increases. Therefore the younger the patient, the more severe the grade the more guarded the prognosis. The prognosis is less favorable in larger animals and when patellar luxation is combined with other underlying conditions. Osteoarthritic (OA) disease is expected to progress, albeit at a significantly reduced rate. OA disease present at the time of surgery is not reversible. Proper body weight is a large factor in prognosis and progression of OA disease. A study by Wilhlhauer and Vasseur in 1987 reported a 92% success rate with patellar stabilization. In more recent clinical studies over 90% of owners were satisfied with the outcome of their animal's surgery and animals treated early in the process had an 85% to 100% success rate for full return to function.

UNTREATED PATELLAR LUXATION:

- **CHRONIC STIFLE PAIN:** As the patella luxates out of the trochlear groove it promotes cartilage erosion leading to bone wear, osteophyte production, an inflammatory joint environment and eventually severe degenerative joint disease (DJD).
- **MUSCLE ATROPHY/LOSS OF RANGE OF MOTION:** Muscular atrophy and scarring of the joint capsule secondary to DJD will result in loss joint range of motion,
- **CRANIAL CRUCIATE LIGAMENT (CCL) INJURY:** 15% to 20% of animals will rupture their CCL due to internal rotation of the tibia placing excessive stress on the CCL, poor support of the extensor mechanism placing excessive stress on the CCL and DJD promotes the degeneration of the CCL.
- **CHRONIC PAIN/DJD OF THE HIP/SPINE/ELBOWS:** DJD and pain may develop in other areas secondary to the animal trying to shift their body weight off their rear limbs.
- **LIMB DEFORMATION:** Abnormal alignment of the patella causes the tendon to act as a bowstring preventing the animal from proper leg extension and may lead to serious leg deformation.

COMMON BREEDS AT RISK FOR PATELLAR LUXATION:

Patellar luxation can occur in many breeds and even in cats but small breed dogs have a significantly higher incidence of disease. The most common breeds associated with patellar luxation include Maltese, Bichon Frise, Miniature Pinschers, Toy Poodle, Miniature Poodle, Yorkshire Terrier, Pomeranian, Chihuahua, Boston Terrier, Pekinese, Cavalier King Charles Spaniel, Akita, Labrador Retriever, Golden Retriever, Malamute, Boxer, Husky, Saint Bernard, Newfoundland. The most common cat breeds are the Devon Rex and Abyssinian.

PREDISPOSING FACTORS FOR PATELLAR LUXATION:

- Breed/Body Weight – 74.5% of cases are in small breed animals and bilateral disease occurs in 46% of small breed cases.
- Overweight/Obese animals – female dogs tend to have a higher incidence of obesity.
- Females – 58.5% of cases are female animals.
- Age – Mean age for surgery is 1.6 years for large breed animals and 3.4 years for small breed animals. This may suggest that larger breed dogs are less likely to be asymptomatic regardless of patellar luxation grade.
- Medical Conditions – certain underlying orthopedic conditions such as hip dysplasia predispose patellar luxation.