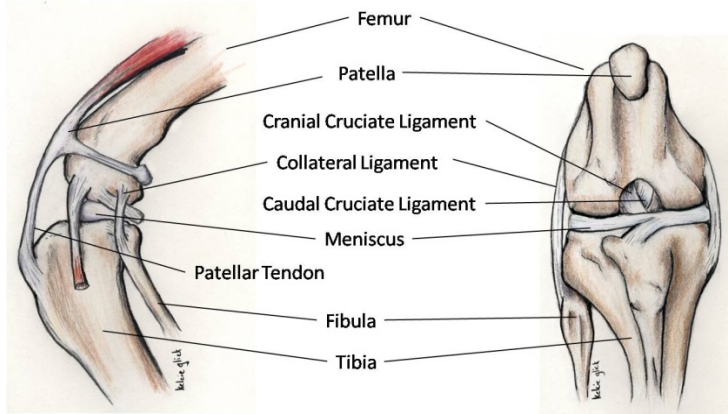


Patella Luxation

What is the normal anatomy of the knee and what keeps the patella (knee cap) stable?

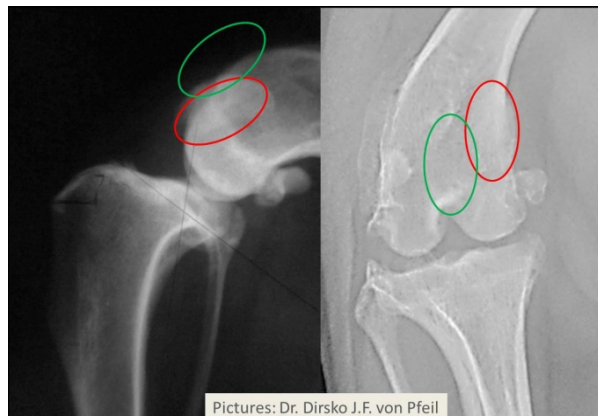
Proper alignment of the muscles and bones of the hind limb results in normal function and the patella stable. In a normal dog, the femur (thigh bone) and tibia (shin bone) are straight and in one line with the patella (knee cap). The quadriceps muscles (those in front of the thigh bone) attach to or insert on the patella. The patellar ligament (the tendon your doctor hits on to perform the “knee jerk reflex”) runs from the patella to the top of the tibia. The presence of the patella properly tracking in the groove (trochlea) at the end of the femur permits efficient extension of the stifle. In the normal knee, the patella sits solidly within the trochlea.



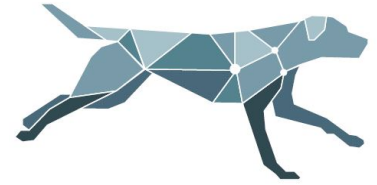
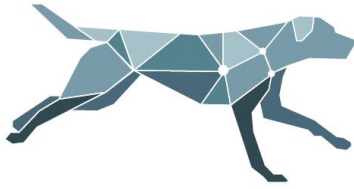
Normal anatomy of the stifle joint. Note the patella (knee cap) being reduced within the trochlea (groove of the femur – or thigh bone). There is no luxation.

What is a patella luxation?

Patella luxation is a common cause of lameness. It describes the condition when the knee cap is dislocated (slips out) of the trochlea (“tracking groove”). When the patella is tracking normally, it is “reduced.” When the patella is not tracking in the trochlea, it is said to be “luxated.”



X-rays of the knee with patella luxation. Red = luxated patella. Green = normal position of the patella.

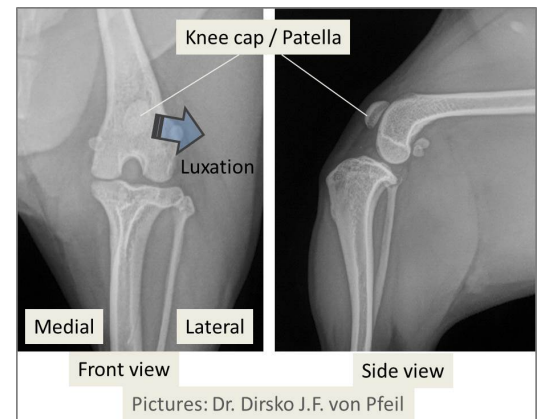
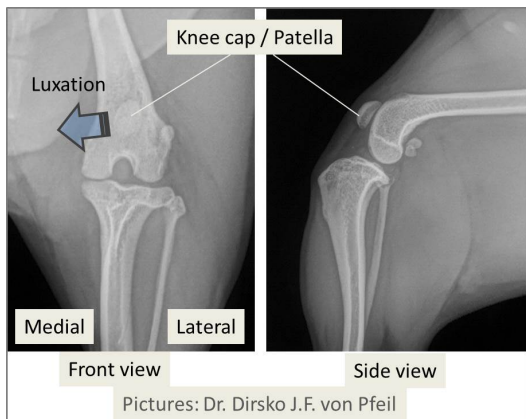


Why does patella luxation occur?

Patella luxation can be caused by a sharp blow to the knee, but is more commonly the result of abnormal anatomy: the groove is too shallow, the femur or thigh bone are bowed, the insertion of the patellar ligament is located too much towards the inside or the outside of the leg. If the quadriceps muscles are not lined up properly with the femur, this will force the patella out of alignment and it will not remain in the trochlea.

Does the patella always luxate into one direction or can it be both?

The patella can luxate towards the “inside” (medial) of the knee or the “outside” (lateral). Medial patella luxation (MPL) is mostly seen in small-breed dogs. This disorder can be identified in larger dogs, but these often show lateral luxation (LPL).



Normal radiographs (x-rays) of the stifle joint. With patella luxation, medial (left) or lateral (right) movement is seen (blue arrows).

What are the clinical signs with patella luxation?

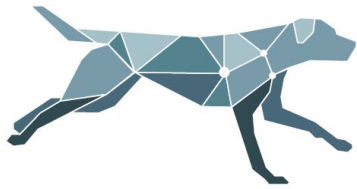
Most clinically affected dogs have a history of an intermittent, non-weight-bearing lameness and have a grade II or grade III luxation (see specific classification below). That is, when the patella is in its normal location, pets walk normally. When the patella luxates, the pet will lift the leg until the patella slides back into place. Patients with grade IV luxations walk in a crouched position because of the inability to extend the stifles normally.

Some dogs with patellar luxation can have additional problems in the stifle. The most notable concomitant problem is rupture of the cranial cruciate ligament (aka CCLR; see specific handout on this condition). This can occur because the chronically medial patella luxation results in increased stress on the cranial cruciate ligament which eventually ruptures. Patella luxation alone but specifically when in combination with CCLR can result in pain, osteoarthritis and degradation of the articular cartilage, all declaring themselves as signs of intermittent or permanent lameness.

How is patella luxation diagnosed and are there several severity grades?

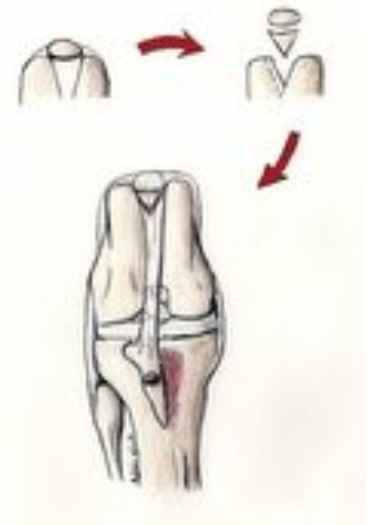
The diagnosis is typically made by clinical examination. Radiographs and in certain cases CT are imaging options to be considered. The grade (severity) of patella luxation depends on the amount of luxation.

- Grade I: The patella can be manually forced out of the trochlea, but will reduce itself immediately.
- Grade II: The patella will luxate spontaneously, but will also reduce spontaneously.
- Grade III: The patella is luxated most of the time, but can be manually reduced. Following reduction of the patella, re-luxation occurs when the stifle is flexed or extended.
- Grade IV: The patella is luxated and it is impossible to reduce without surgical intervention.



What effect does patella luxation have on the knee and when is surgery indicated?

With patellar luxation, the trochlea can be very shallow because it fails to develop properly. The movement of the patella back and forth from the trochlea to the medial or lateral side of the femur will cause erosion of the cartilage on the end of the femur and on the underside of the patella. Additionally, the support structures of the opposite side to patella luxation tend to stretch out and the structures on the side to which the patella luxates towards tend to tighten - thus exacerbating the condition. As explained above, CCLR (ACL-rupture) may occur as well. In cases with significant clinical lameness, in high-grade luxations, and in animals with MPL and CCLR, surgery is indicated.

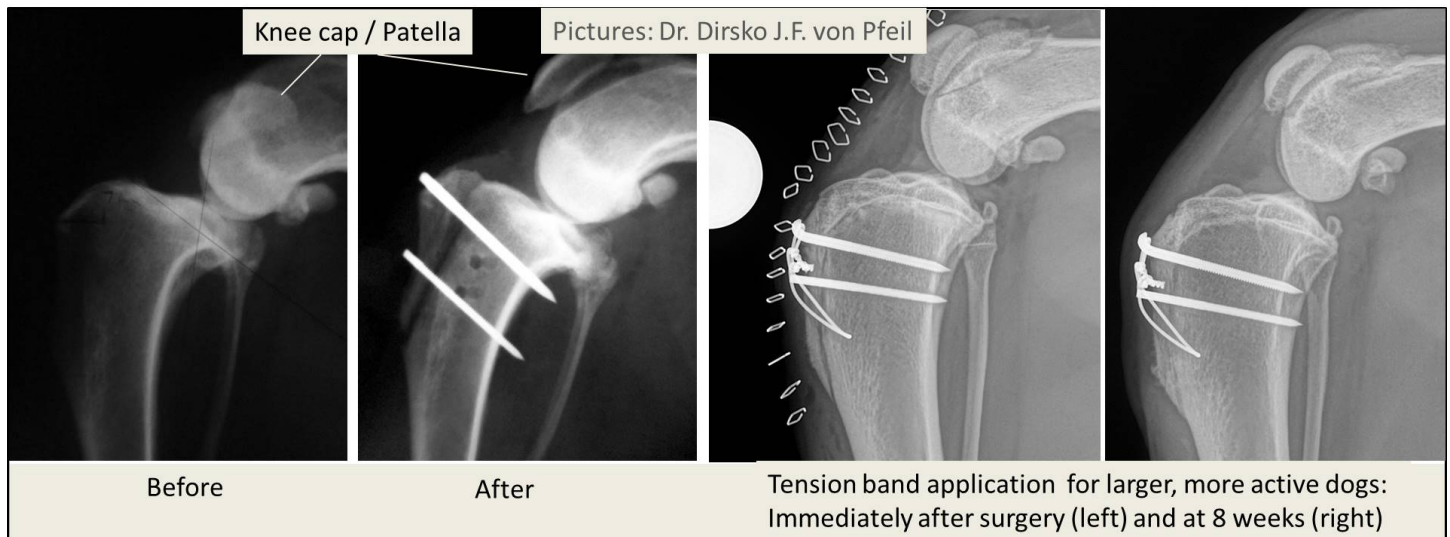


What is the treatment for patella luxation?

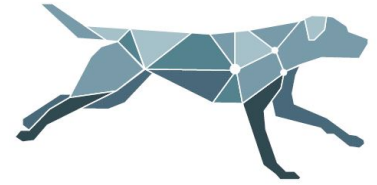
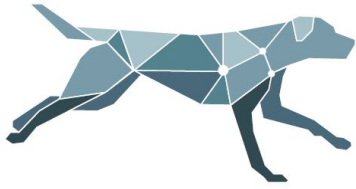
Various methods can be employed during surgery. Appropriate options specific to the individual will be addressed by the surgeon. Because patella luxation is a problem with the alignment of the quadriceps muscles, the establishment of proper alignment is critical for success. In most patients one or all of the following first four procedures are performed; the last one is applied in only very specific cases:

1.) Deepening of the trochlear groove: If the depth of the trochlear groove is insufficient to hold the patella in place, it must be deepened. A trochlear wedge or block recession is performed (drawing on the right). Both of these techniques involve removing a piece of bone with attached cartilage from the center of the femoral trochlea. The wedge or block is set aside and the “hole” from which it came is deepened. The wedge or block of tissue is then placed in the deeper hole which thus results in a deeper trochlear groove. In very small patients, trochlear abrasion is performed; this entails drilling a new groove.

2.) Tibial tuberosity transposition: Using an osteotome (bone chisel), the top part of the tibia (shin bone) with the attached patellar ligament is elevated from the shaft of the tibia and moved against the side of luxation. This will realign the quadriceps muscles. The tibial crest is held in place using one or two stainless steel pins. These pins are generally left in place. In very active or large dogs, a “tension-band” is applied as well to increase stability (see images below).



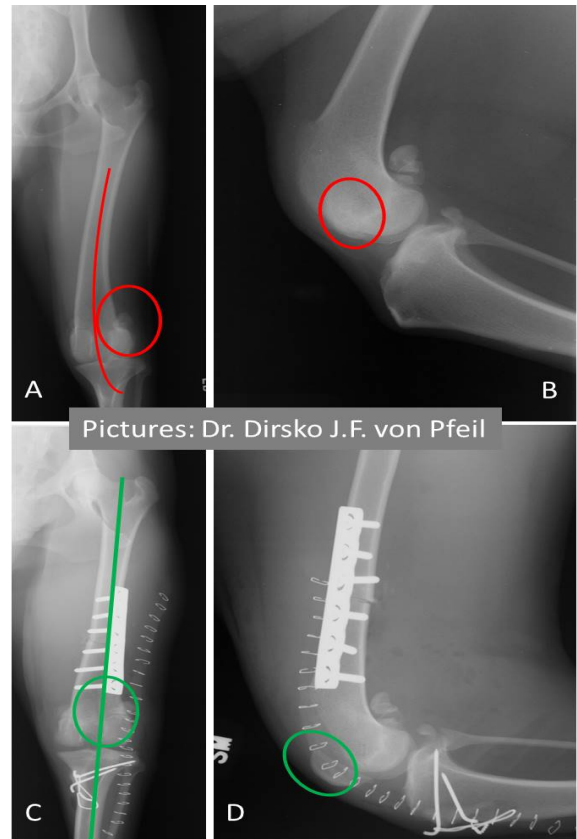
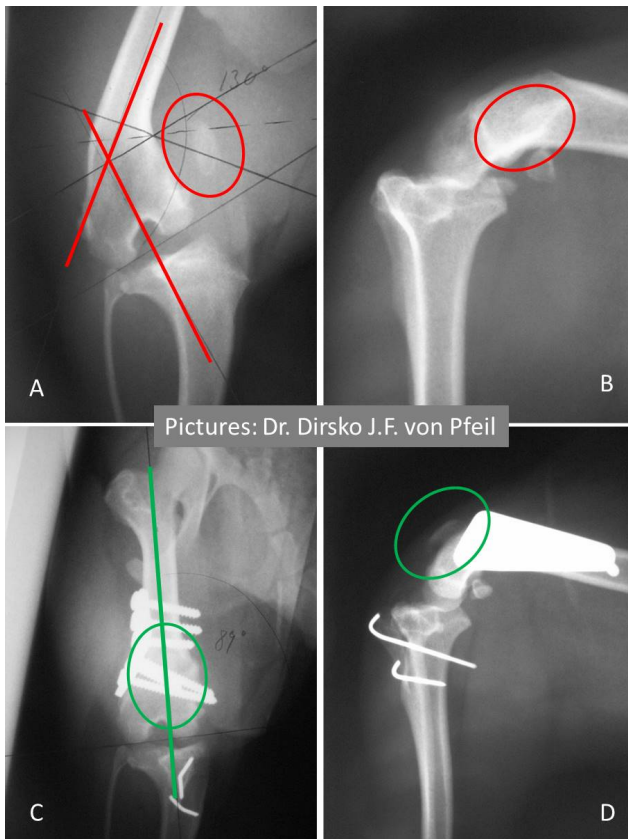
Radiographs (aka x-rays) showing a side view prior to (note the patella is not riding on top of the femur) and after surgery (note how well the patella can now be seen). The dog in the 2 radiographs on the left also had a cranial cruciate ligament rupture, secondary to chronic medial patella luxation. This was addressed at the same time surgery was performed for the patella luxation. The 2 radiographs on the right show an example of a dog with block recession and tension band application for additional protection in a very active dog.



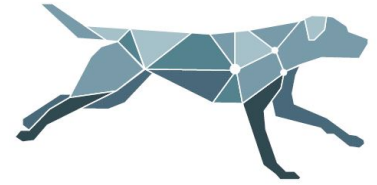
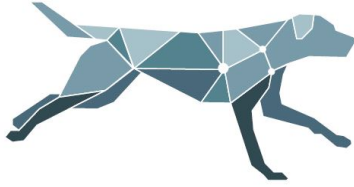
3.) Retinacular imbrication: If the soft tissues around the patella are severely stretched, the redundant tissue is removed and the remaining tissue is apposed in order to help hold the patella in place.

4.) Retinacular / muscle release: In many patients the soft tissues (retinaculum or muscles) have tightened to the extent that it is limiting the proper repositioning of the patella. Severing or releasing these tissues may be necessary to allow the patella to move into the anatomically correct location.

5.) Corrective femoral osteotomy: In cases with extreme femoral alignment abnormalities (the thigh bone is bowed), this bone might need to be cut and re-aligned (straightened) in order to allow normal patellar tracking. This is called a corrective femoral osteotomy. It is rarely necessary, but carries a good outcome when performed appropriately. In most of such cases, the steps above are still indicated.



Examples for grade IV medial (left) and lateral (right) patella luxations due to femoral bowing. Note the location of the patellas (red ellipses) prior to (A,B) and after surgery (green ellipses; C,D). Both dogs underwent straightening of the femur (thigh bone) to achieve normal alignment (straight green lines) and result in appropriate tracking of the patella.



What is involved in post-operative care?

Medications: We utilize a combination of medications including analgesics (pain killers), non-steroidal anti-inflammatory drugs and local anesthetics to control post-operative pain. Antibiotics are also occasionally prescribed. Specific instructions will be provided at the time of discharge from the hospital.

E-collar: The “cone of shame” has to be left on the neck at all times until removal is permitted by a veterinarian. Not following this instruction can lead to severe complications (licking, infection, bandage damage), which can be difficult and expensive to treat.

Bandage: On a case-to-case basis, bandages are applied for additional support after surgery. These have to be kept clean and dry at all times. A protective bootie has to be placed over the bandage every time the dog is taken outside. If there should be any concerns, please contact us. The bandage(s) is/are removed at 2 weeks after surgery.

Incision: If no bandage is applied a small Band-Aid will cover the incision. This can be removed 2-3 days after surgery. After removal of this dressing, the incision has to be inspected twice daily or signs of excessive swelling, redness, pain, discharge, or foul odor. If there should be concerns with the incision after bandage removal, the incision will have to be monitored in the same way.

Activity is heavily limited until the bone is healed. Short leash walks only are allowed outside. When inside, strict cage rest x 4 weeks is mandatory, followed by very limited activity in one small room for another 4 weeks. The pet is not allowed to run, jump, race uncontrolled through the house or play roughly with other animals in the house. When maneuvering stairs is necessary, the pet should be carried or guided with a firm grip on the collar up- and downstairs. Babygates have to be put up to avoid uncontrolled movement up- and downstairs.

When are rechecks scheduled?

10-14 days: Removal of skin sutures and/or the bandage(s) as well as incision inspection are performed at the 10-14 day recheck. Some redness of the skin is expected to be seen after bandage removal and will improve over time.

4 weeks: On a case by case basis, another recheck is performed 4 weeks after surgery to assess the stability of the patella. We may recommend initiation of controlled physical rehabilitation during the recovery period and will select what appears to be best for your specific pet.

8 weeks: Radiographs are taken at week 8. Bone healing is determined by radiographs that time.

What are possible complications?

Complications occur in the minority of patients and they vary depending upon many factors. They are seen more frequently in dogs with very high activity level during the recovery period and in cases of high grade patella luxations. The incidence of complications is typically associated with the experience of the surgeon. Therefore, an experienced board-certified surgeon should treat your pet. Complications are rare, but may include and are not limited to skin irritation, infection, recurrence of luxation, seroma, or pin migration if a tibial tuberosity transposition is performed, possible revision surgery. A mild degree of arthritis after surgery is to be expected and occasional administration of anti-inflammatories may be needed if lameness should be seen. However, this should not impair the overall comfort level of the dog.

What is the prognosis?

Most dogs with patella luxation have an excellent prognosis after corrective surgery, if healing of the surgical site occurs without complications and post-operative instructions are followed closely. Function as a pet should be excellent.