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SURGERY FOR CRUCIATE LIGAMENT DISEASE AT NATTERJACKS

Disease or rupture of the Anterior Cruciate ligament (ACL) is the most common cause of hindlimb lameness in the dog. It affects the stifle joint, the equivalent of our knee. The ACL can rupture suddenly but most commonly we see a progressive degeneration of the ligament. This can result in a partial or complete tear. The ACL is an important primary support mechanism for the knee. It prevents excessive forward and backward sliding of the femur (thigh bone) on the tibia (shin bone) known as tibial thrust and limits internal rotation of the joint ('Pivot Shift'). When the ACL tears it is painful and the joint becomes unstable. The instability can also damage the meniscal cartilage in the knee which is the primary 'cushion' between the femur and the tibia. Untreated legs usually become very arthritic and painful from the instability.

Does my dog need surgery?

The primary concern is arthritis will progress more rapidly if the joint is not stabilised. In dogs weighing less than 10kg, some studies have suggested that strict cage confinement for 8 weeks may allow a reasonable recovery but even so arthritis can be expected to develop more quickly than if the joint is stabilised. For larger dogs there is no benefit to a "wait and see" approach and stabilization of the joint should be performed promptly even for partial tear cases. With surgery, a good to excellent outcome can be expected in over 90% of dogs.

Surgical options

An injured Cruciate Ligament can only be corrected by surgery. There are numerous surgical corrections currently being performed. There are three main techniques for cruciate disease management: TTA surgery, TPLO surgery and the lateral suture system (LSS).

(1) Osteotomy techniques – the Tibial Tuberosity Advancement (TTA), Tibial Plateau Levelling Osteotomy (TPLO) and Closing Wedge Tibial Plateau Levelling Osteotomy (CW-TPLO)

The 'osteotomy' procedures are the newest techniques and probably the best options for most dogs over 15kg in weight. The forces within the knee are very complicated and change as the knee is rotated through its range of motion. In a normal standing position there is a tendency for the lower end of the femur to slide backwards on the floor of the knee formed by the flat top of the tibia (which is known as the 'tibial plateau'). This force is known as 'tibial thrust' and can be corrected by either cutting the tibial plateau and rotating it

into a flatter position (TPLO) or by counteracting this force by changing the angle of pull of the very strong Patellar Tendon by advancing the Tibial Tuberosity (TTA).

Opinion varies as to whether a TTA or a TPLO is the better technique - both carry a similar success rate and any differences between the two are very small. Some studies have suggested that the TPLO procedure can still allow rotational instability (pivot shift) and this may lead to the progression of arthritis as the dog ages - this pivot shift does not seem to be a problem with the TTA procedure because it results in more control of rotation by the large quadriceps muscle which pulls on the Patellar Tendon. However some studies have shown that the risk of post-surgical/late meniscal tears may be higher with TTAs – ultimately it often comes down to the personal preference of the surgeon and the individual anatomy of the dog. The physics of the osteotomy procedures is explained below.

Another osteotomy technique which is sometimes used is the **'closing wedge tibial plateau levelling osteotomy' (CWTPLO or CWO)**. This is particularly suited to certain smaller breeds with very steep tibial plateaus and involved removing a wedge of bone from the tibia below the knee to tilt the tibial plateau forward. It is also explained in more detail below.

(2) Lateral Suture Systems (LSS) or Extracapsular Repair

There are numerous different methods that have been employed to stabilise the stifle joint by effectively replacing the ruptured ACL with a prosthetic implant. In the past a normal suture material or thick nylon have been used to apply a tight band around the outside of the joint to try to counteract the rotation and tibial thrust and this has been very successful in many cases. However there is a risk that implants can snap or cause irritation resulting in ongoing problems. At Natterjacks we now use a new material known as 'Ligafiba' which is made from a braided 'ultra-high molecular weight polyethylene' material (which is also used to form joint replacements in people!) which better resists the forces within the joint and tends to better tolerated. Furthermore, rather than just tying it to the outside of the joint it is anchored with titanium buttons which help spread the load and reduce the risk of failure or rejection. Using these anchors also improves the angular pull (isommetry) of the prosthetic implant so that it better mimics the role of the ACL in resisting thrust and pivot shift.

The LSS technique is also associated with a high success rate (over 90%) and is an excellent first choice for smaller dogs and cats. It is also a perfectly acceptable technique for much larger dogs as well but there is always a higher risk of implant failure in larger dogs and osteotomy techniques are often considered the 'gold standard' as they correct the underlying joint problems that caused the ACL to fail in the first place. Nonetheless it is still a very good technique and being about a third to a half of the cost of a TTA or TPLO is certainly a good option where affordability is a concern.

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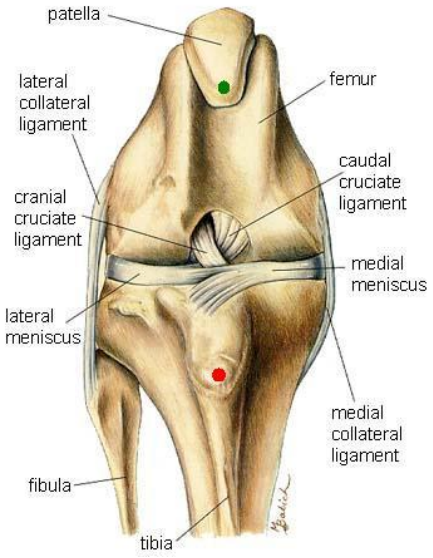
The Science behind the TTA procedure – The Normal Knee



The normal Knee Joint (also known as the Stifle joint), has multiple structures which are important to its function. This drawing shows a view from the front with the muscles removed. The Patellar Tendon has been removed from the front so that you can see behind it. The Patellar Tendon is a thick, tough band that runs from the Patella or 'knee-cap' (green dot) to the Tibial Tuberosity (red dot).

Normal Joint

The normal joint, viewed from the side, shows the upper bone, the femur and the lower bone, the tibia. The Tibial Plateau is the actual point of contact between the femur and the tibia and forms the 'floor' of the knee joint. In this diagram the Patellar Tendon is clearly visible. It is this structure that must offset the abnormal forces that are created with a rupture of the cranial cruciate ligament.

Typical Joint Angle

In the typical joint, the angle formed between the Tibial Plateau and the Patellar Tendon is about 115 degrees when the leg is in a normal standing position. This will result in a tendency for the femur to slide backwards and push the tibia forwards – this force is known as tibial thrust.

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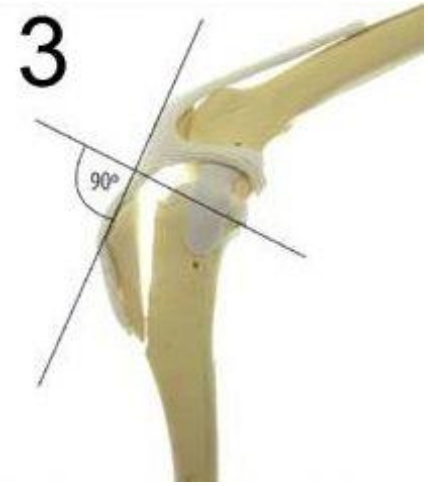
Corrected Angle

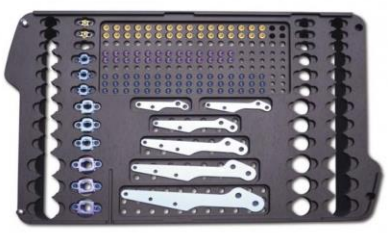
After TTA Surgery, the corrected angle is now 90 degrees which means that these forces are completely neutralised. The femur can now sit on the tibial plateau without being pulled forwards or backwards. Without this 'tibial thrust', there is no longer any force acting on the cruciate ligament and the knee can now work perfectly well without a functional cruciate ligament.



Surgical Appearance

This shows the knee once it has been stabilized with the appropriate Titanium implants. These implants are very lightweight and are designed to stay in permanently.

Titanium TTA cruciate repair systems

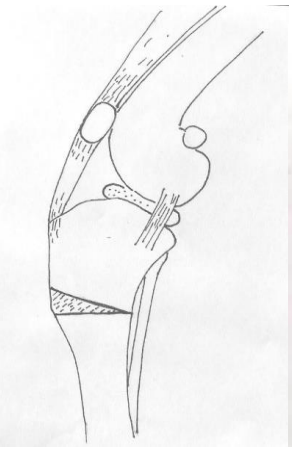


(3) Closing Wedge Tibial Plateau Levelling Osteotomy (CW-TPLO)

As mentioned previously, another osteotomy technique which is sometimes used is the tibial closing wedge tibial plateau levelling osteotomy (CWTPLO or CWO). We often recommend using a CWTPLO/CWO technique in small dogs with steep tibial plateau angles (as previously explained for the TTA procedure), but who are too small for a TTA as they do not have a large enough tibial crest to allow for a tibial advancement. This is something that is very commonly seen in West Highland White Terriers. We may also use both CWTPLO/CWO (or TPLO) in larger breed dogs if they have small tibial crests as well.

As outlined with the TTA, the tibial plateau is the top of the tibia which forms the 'floor' of the knee joint. This usually has a down-slope of about 25 degrees, but in some breeds like West Highland White Terriers it can be 40 degrees or more. A CWO or TPLO aims to reduce this slope to something in the region of 5 degrees. This allows dogs to use the knee much more comfortably despite the ruptured cruciate ligament.

In CWO, two cuts are made in the tibia so that a wedge of bone can be removed (see pictures below). A wire is placed at the front of the bone between two bone tunnels and by tightening it, the gap in the bone is reduced. This tilts the floor of the knee forward and reduces the slope of the tibial plateau. The two ends of the bone are then held together with a specially constructed and very strong TPLO plate whilst bone healing occurs.

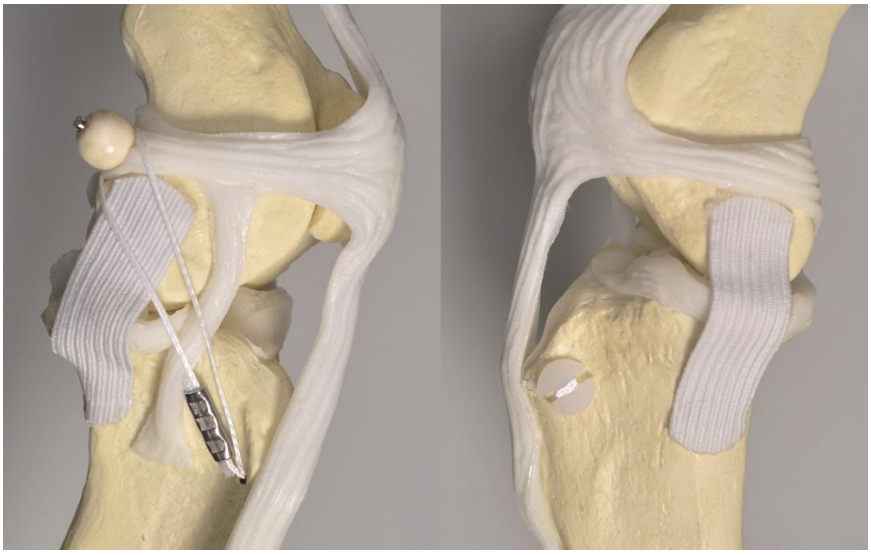


The Implants

All the implants for TTA surgery performed by Natterjacks are made from titanium. Titanium is expensive but stays strong and flexible during use. It is considered the most biocompatible of metals and is much better than the cheaper stainless steel implants used by some surgeons.

Lateral suture technique

The picture below gives an idea of how the ligafiba material is used to stabilise the joint as described above; the suture is anchored to the femur and tibia in such a way as to reduce any fore and aft movement between the two bones as well as preventing rotation. Over time, thick fibrous tissue grows around the ligament and it is often this which provides most of the support for the joint.



Meniscal Injury

The menisci (singular meniscus) are important C-shaped disks of fibrocartilage that help cushion the floor of the knee. When we perform ACL surgery we are careful to assess the menisci for any damage. Damage to the meniscus is seen in about 30% of cases of cruciate disease as the excessive movement in the joint can result in tears to these cushions. Tears in the menisci are painful and limit recovery so it is important to carefully remove the torn areas. In some cases this damage may result in tears appearing at a later date and cause complications in the recovery from surgery or even some years later – see the later section about 'late meniscal tears'.

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AFTERCARE

What to expect?

Your pet will almost certainly be hospitalised with us overnight following the surgery so we can give them medication, intravenous fluids and pain relief as required so be prepared to collect them the day following surgery.

It is important to remember that your pet will be recovering from a major surgical procedure and the after effects of the anaesthetic can make them a bit subdued and disorientated for few days so do not worry if they seem out of sorts and are not their normal self during this period. They will almost certainly also be feeling rather sore and uncomfortable so will need to be encouraged to settle quietly in a warm, familiar spot and sleep it off. The first few days are always the hardest in this respect but once the first 4 to 5 days have passed their behaviour should slowly return to normal. A thick duvet or memory foam mattress should be provided for bedding to help cushion the area and any bedding should be thoroughly washed to reduce the risk of infection. They will need to be kept in a very clean, dry environment at all times during the first 14 days whilst the skin incision heals to minimise the risk of any infection entering the wound.

They may also be a bit nauseous for a day or two so we usually recommend dividing their usual portion into several smaller meals for the first couple of days. Offering something palatable and easily digested like cooked chicken, white fish, cottage cheese or a chopped boiled egg with either rice, pasta or mashed potato is often advised - we can provide you with a tasty, high energy tinned diet for this period if requested.

It is quite normal after being starved for an anaesthetic for animals not to pass any stools for a few days so this should not be concern as long as they are eating well and drinking and urinating normally.

They must also not be allowed to lick the area excessively. A small t-shirt or buster collar *must* be used to keep the area protected if they are left alone for long periods.

The surgical site will need to be checked regularly in the first few days - at least twice a day. A slight ooze of blood is normal in the first two to three days and a degree of redness, bruising and a fluidy swelling may develop over a period of 4 to 5 days. This can be quite marked around the ankle area as gravity causes the fluid to gather below the operation site and is nothing to worry about. However if the ooze of blood seems excessive or the wounds appears to be opening up then we should be contacted. Any discharge can be cleaned away with cotton wool and a saline solution made by adding two teaspoons of salt to a pint of cool, previously boiled water. Any adhesive dressings applied to the wound post operatively may come unstuck in the days following surgery and there is no need to replace them as long as the incision looks clean and dry.

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Post-op checks

These are often carried out by a veterinary nurse after 4-5 days and then again after 10-14 days by a vet. We will then usually see them at 8 weeks for follow-up x-rays before a final check at 12 weeks to hopefully sign them off and give the green light to be let off the lead! The check-ups may be more frequent if concerns arise or if we administer cartrophen injections or laser therapy post-operatively (see later).

REHABILITATION:

ICE/COLD THERAPY (DAYS 1 to 3): To reduce swelling and discomfort we recommend applying a soft ice pack to the area for the first 3 days. A suitable ice pack can be made from a bag of peas wrapped in a clean hand towel and should be applied to the area for 10 minutes three times a day. Alternatively an ice cube can be gently moved across the skin surface around the outside of the wound.

WARM COMPRESS (DAY 5-14): This can be started after the first op check and only if the incision is clean and dry. Use a hot water bottle (with cover on ie not too hot - it should be comfortable to touch) to warm the knee for 10 minutes.

RANGE OF MOTION EXERCISES (DAY 5-28): These should be very gentle with no attempt to go beyond what is comfortable. Get them to lie on their good side and gently flex and extend the affected knee while supporting the leg. Being very patient and careful, perform 10 slow repetitions. Repeat this three times daily. You should only do this is if it is within your pet's comfort level

CONTROLLED EXERCISE PROGRAM:

Your pet will need to be restricted to house and garden rest for the first 14 days following surgery. They should be encouraged to get up and walk around every few hours rather than lying completely still as this will help reduce stiffness and improve the circulation to the area. They should be kept on a lead when visiting the garden to avoid any sudden movements. They should also be carried up any high steps or staircases for the first 6 weeks and any sofas/chairs etc should be out of bounds during this time as well.

Exercise in the form of controlled lead walking should be introduced as follows (days following surgery):

0-14: House/garden rest only (taken outside every few hours as above)

Expect a fair amount of swelling and very little weight-bearing on the leg in the first 7 days; over the course of the second week they should be increasingly happy to put the leg to the ground and use it when walking.

14-28 days (2-4 weeks): 5-10 minutes slow lead walking two to three times a day.

During this period they will begin to use the leg most of the time but will be stiff and sore after resting.

28-42 days (4-6 weeks): 10-15 minutes lead walking two to three times a day. You can also start doing some sit/stand exercises to improve the range of motion and reduce stiffness by getting them to repeatedly sit and stand for 10 repetitions twice daily. Use of a small treat can help with this! This should only be performed voluntarily - do not push down on the rump.

During this period they can be expected to be increasingly confident on the leg, generally using it fairly normally and will be gradually less stiff on it.

42-56 days (6-8 weeks): 15-20 minutes lead walking twice a day

By now they will begin to think that they can go back to normal but it is still very important to keep to the exercise plan as in the case of a TTA/TPLO bone healing will not be complete and in the case of ligament replacement the repair will not have attained full strength. Follow up x-rays are normally performed at the end of this period.

56-84 days (8-12 weeks): Allowed off the lead but exercise should be 'controlled' (no balls or chasing squirrels etc) and limited to a maximum of 30 minutes two to three times a day for a further 4 weeks. Gentle swimming may be permitted during this period but only if it can be carefully controlled in a proper pool with clean water and if they can be carefully led into the water avoiding any big leaps etc.

After 12 weeks: They should be weight bearing fully on the leg now and can gradually go back to normal levels of exercise.

Remember that every dog is different and some take longer to recover than others – if there is a lot of arthritis present in the joint then recovery can take much longer and there may be a need for ongoing treatment for lameness. Likewise some dogs are very comfortable on the leg within a matter of days and may feel like using the leg normally. However always remember that with a TTA or TPLO the cut bone takes at least a couple of months to heal and in the case of the ligament replacement it takes a similar time for the implant to attain full strength - the consequences of over exertion could be very serious indeed so stick to the exercise plan!

MEDICATION AND ONGOING CARE

Your pet will be sent home with some anti-inflammatory medication, painkillers and antibiotics which should be given as advised - be sure to check when each medication should be given and complete the full course prescribed.

We usually recommend giving a course of weekly Cartrophen injections to assist the healing process commencing with the second post-operative check-up. This has a multitude of benefits including the repair

of damaged cartilage and ligaments as well as reducing scar tissue and inflammation. It can also help limit the development of arthritis in later years.

We are now also offering post-operative laser therapy which can also significantly improve healing times and reduce pain following the surgery. Laser can be used alongside the cartrophen for maximum benefit both in the recovery from surgery and for longer term management of any joint problems - visit www.natterjacksvet.com/laser for more.

Good quality glucosamine and chondroitin supplements as well as oils rich in Omega 3 can also help support joint function in the longer term. Many contain additional ingredients such as the natural plant based anti-inflammatory (Boswelia) which can provide additional benefits – ask us for advice on which products might be suitable for your pet.

COMPLICATIONS

With any surgery complications can and do occur. Perhaps the most common is something known as a 'late meniscal tear'. This can occur in around 10% of cases and is due to a tear in the cartilage. This causes pain and discomfort. Cases often appear to be doing well but will suddenly become lame again. Sometimes your dog will require further surgery to remove the damaged piece of cartilage. Despite every attention to sterility, surgical site infections can occur in approximately 5% of cases. These may resolve with antibiotics or require implants to be removed. Rare complications of surgery include a slipping knee cap (0.4%) and in the case of TTA tibial fracture (0.08%).

Despite surgery, arthritis can also be expected to progress though this will be much reduced by stabilising the joint employing the methods described above. Nonetheless every dog is different in this regard and we will help you manage this eventuality in the months and years to come.

Also be warned - rupture of the ACL in the other leg has been reported to occur in over 40% of dogs within two years of the first leg. There is little you can do to avoid this but try to be prepared both emotionally and financially!