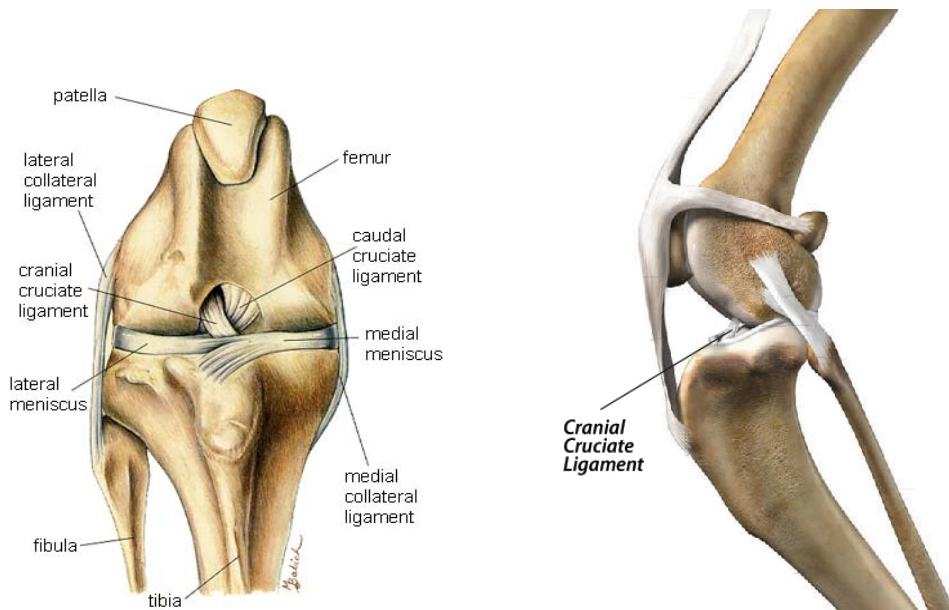


Earlswood Veterinary Hospital

Tibial Tuberosity Advancement (TTA)

TTA is the abbreviation used for Tibial Tuberosity Advancement. This is the surgical procedure used to treat cranial cruciate ligament rupture in the knee joints of dogs. Damage to the cranial cruciate ligament is the most common cause of hind limb lameness in dogs. As a result, TTA and other operations that involve altering the shape of the tibia are common orthopaedic surgical procedures performed in dogs in specialise orthopaedic practices.

The Normal Knee 'Stifle'



The knee joint or 'stifle' in the dog is basically a hinge joint that moves only backwards and forwards in one plane. Although there are many ligaments making up the joint the range of movement is largely controlled by two bands of fibrous tissue that cross over inside each knee joint. These are the cruciate ligaments, one on front of the other therefore known as the cranial and caudal cruciate ligaments. They join the two major bones of the leg, the femur above and the tibia below.

Rupture of the Cranial Cruciate Ligament (CCL)/ Cruciate disease

Without the CCL the tibia (shin) bone slides forward relative to the femur (thigh) bone when the dog takes weight on the limb when walking. As a result of this your dog reduces the load through the leg and appears lame. The stifle is painful and therefore the dog is reluctant to bend it when moving the leg forward and may walk in an awkward way. Some dogs will sit unusually without bending their knees, get up stiffly after rest and lameness is unlikely to disappear without corrective surgery.

There are many reasons why the CCL may rupture. The important difference between the knee in a person and a dog is the angle of the joint, meaning that the CCL is constantly under strain even when standing. Some breeds are more prone to disease of the ligament due to the more abnormal angle of their limb, where over time the ligament eventually weakens and tears. This may start with a partial tear and stretching with only slight or intermittent lameness, ending at some point in complete rupture. There may also be a genetic component to this. Some dogs suffer a traumatic injury caused by twisting of the joint, causing a complete rupture of the ligament. Most commonly

seen in dogs moving at speed then suddenly changing direction or catching their leg causing abnormal movement in the joint. This is a more acute injury and the dog may be very lame with a large painful swollen joint. Overweight dogs may injure and rupture the ligament doing much more simple movements, even stumbling whilst walking. Once torn or ruptured the ligament will never heal because of a poor blood supply and the ongoing shearing forces within the knee during movement.

Diagnosis

The first step in diagnosing a ruptured CCL is a thorough clinical examination, however, this may in dogs need to be carried out under sedation to fully assess laxity or movement in the joint partly due to pain and discomfort. Joint swelling may be obvious and the degree of lameness needs to be assessed.

Radiographs (xrays) are then completed to assess the joint and to rule out other abnormalities or disease. Accurate radiographs are also required to assess what surgical technique is most suitable to correcting the injury.

Arthroscopy (inserting a camera into the joint) may also be carried out occasionally. This can give a good image of the ligaments and also the cartilage within the joint which may also be damaged and require repair.

Surgery - Tibial Tuberosity Advancement

There are various techniques available to stabilise the stifle joint in the dog but one of the most common procedures carried out is the TTA (Tibial Tuberosity Advancement).

This is a demanding operation for the surgeon and requires specialised instruments and implants. Careful planning is required and this is why accurate radiographs are vital before surgery.

How does TTA Work?

Due to the 'normal stifle' of the dog when the dog walks the tibia moves forward a little and then returns to the normal position. How far it moves is determined by the length and strength of the CCL. The reason for this movement is that the forces applied across the knee are not parallel during loading of the limb. This movement and thrust is resisted by the CCL. Without a normal ligament this movement is worse.

Changing the angle?

By changing the position of the front of the tibia we can make the forces line up parallel. When this happens it eliminates the thrust force across the knee when the leg is loaded. This makes the knee stable in the absence of the normal ligament, and thus makes the ligament redundant. From the dog's perspective this is an instantaneous improvement to the pre-operative instability that caused much of their lameness before surgery.

What is done?

Pre operation



Post operation



Assessing the radiographs prior to surgery is important. The position of the cut on the bone, the amount of bone that needs to be advanced and the size of implants all need to be carefully evaluated.

A cut is made along the front of the tibia, then a plate and screws is applied to hold this bit of bone in position. There is a gap left between the pieces of bone which will eventually heal and fill with new bone, this will take some 6-8 weeks to occur.

The implants are made of titanium and are therefore fairly strong, however, all metals suffer fatigue if continually abnormally loaded which occurs if the patient does too much exercise, movement or activity too early following surgery. Until the gap is filled, the implants are resisting the pull of muscles above the knee, therefore to prevent failure, the implants need protected and your dog's activity strictly limited.

Complications after surgery usually arise from movement or bending of the implants, loosening of screws and bone fractures. This is virtually always due to excessive activity of the dog in the early few weeks.

After Surgery?

Knee pain is reduced fairly quickly after surgery as the joint is much more stable. The dog usually starts to walk fairly well and appear much better quickly. Remember that this is because the instability has gone, not that the dog is fine and the leg is 'healed'! The joint and leg now essentially have a healing fracture whereas before a torn ligament so in light of this, rest and time to heal properly is vital. Trying to correct complications or repeat surgery is sometimes impossible.

Once you get your dog home – the following is very important to aid a speedy recovery

Medication and General Health

- Finish all courses of medications and give at the allocated times
- Your dog should be eating and drinking normally, without any vomiting or diarrhoea
- Watch for any signs of blood in stools or 'dark' stools,
- Your dog should be bright and well otherwise apart from the 'sore leg'

- Your dog's leg will be sore as expected and pain relief and anti inflammatories will only do so much, it will take time for things to improve steadily
- Remember if the leg does not hurt the dog will use it
- If you are concerned that the dog is lethargic, off colour, not eating or having any other symptoms then they must be re examined as soon as possible

Wound Care

- There will be a wound on the inside of the dogs leg and the leg will be shaved over a large area. All fur will re grow in 4-6 wks.
- There will most likely be staples in the wound which will need to be removed after 10-14 days. These staples need to stay in so if they fall out or your dog chews them out etc they must be replaced immediately.
- Check the wound daily, some bruising around the area is normal but will subside over days
- The wound should be kept very clean and dry, do not apply any creams or ointments.
- There should be no discharge, redness, swelling or pain around the wound and staples.
- Do NOT allow your dog to lick, chew or rub the wound. If he/she is trying to lick it etc then a buster collar must be used. Licking is NEVER good. This is the most common cause of wound infections which can cause huge complications to the surgery.

Exercise, movement and activity

It cannot be stressed enough that in the first 6-8 weeks, there is a lot of healing taking place. We are depending on a gap filling with bone and that some small pieces of metal are holding things together in the meantime. As stated before, your dog should be walking well but this doesn't mean he/she is now fine! Adhering to the following exercise instructions ensures the best chance of an uncomplicated recovery, protect the implants and allow the bone to heal.

Throughout the first few weeks especially he/she should be able to walk and weight bear fine. There may be a limp but they should be walking ok, if at any point this is not the case, and you think he/she has got worse then we must see them as soon as possible. If at any point they are not weight bearing then there is most likely a problem.

A few simple points....

- Avoid all slippery surfaces, try to stick to carpeted floors, concrete, gravel, grass when outdoors.
- Keep confined in a small area at home for the first 6 weeks, somewhere they cannot be allowed to run, jump etc, keep away from chairs/sofas etc where they may want to jump up.
- NEVER leave your dog at home alone with the opportunity to jump onto something, run or climb stairs, keep closed in small area when unsupervised. If necessary a cage may be a good idea at night or when you are out of the house.
- If unsteady on his/her feet in first week or so use a sling or towel under their tummy to help support walking, especially on slippery floors or if having to encounter steps/stairs.
- Avoid all stairs, steps, slopes where at all possible, stair gates at home can be a good idea
- No bathing at home until instructed
- Your dog must always be on a short lead (not extendable) when outdoors for the first 6 weeks at least. Even if he/she is in the garden, they may see something or someone and suddenly run or chase which could cause an injury. Even if they appear to just be wandering about slowly if not on a lead, anything can happen.

- Please keep all allocated appointment even if he/she is doing well, there is a reason why your dog needs to be examined again.
- If in doubt, ring, check and ask, especially with regard to what your dog is allowed to do.

Our lives are often very busy, so if you must err, err on the side of caution and the 'do less' side of these instructions. Less physiotherapy and rehabilitation will result in a slower return to function but more aggressive activity too early may result in a complete failure.

Week 1

In the first 5 days ice packs can be used to help reduce swelling. A frozen packet of veg etc is sufficient, never apply any solid ice blocks etc. Either wrap the leg in a couple of layers of cling film or wrap the ice bag in cling film or thin cloth first. Never apply directly to skin in case of ice burns. This can be done 3-4 times a day for 10-15 mins, only if your dog is comfortable for you to do this and not causing distress.

Week 1 exercises – range of motion exercises, have your pet lie on his or her good side, grip the front of the thigh with one hand and hold the foot with the other. Slowly push the foot up to flex the knee then slowly pull the foot and push the thigh down to straighten the leg again. Repeat slowly, controlled and smoothly 10 times once daily. Only do if the dog is comfortable and lying still without a struggle, in case of further injury, it may take a few people to help.

Week 1 walking – walking slowly on the lead only, slowly enough so he/she can put the foot down with each step and not hop. Outdoors to toilet is enough activity only. On the lead, 5 minutes walking around the garden twice daily. No more, no further. If he/she is getting very boisterous indoors, best to put on the lead and have a 5 mins wander around the garden rather than jumping around crazy indoors.

Week 2

Once all swelling/bruising has gone can start warm compresses. Hot water bottles wrapped in thin cloth are excellent. Warm compresses to the knee for 5 minutes then exercises.

Week 2 exercises - Again lie on good side, grip front of the thigh with one hand and hold the foot with the other, slowly push the foot up to bend all joints, hold for 5 seconds, slowly push the foot and thigh down again and hold for 5 seconds. Repeat 10 times twice daily. You can apply ice packs afterward for 5-10 minutes. Again do not do this if it is causing pain or distress and your dog is not lying comfortably without struggle.

Week 2 walking – increase the walking to 5 minutes 3 times daily or 10 minutes twice daily. Again only in the garden, yard or around the house. Never off the lead. If space is an issue then 5-10 minutes along a quiet path or grass area, just slow controlled walking.

You should be seeing your vet this week for a wound check or to have staples removed, if you are unsure about the exercises please ask and check.

Week 3

Week 3 exercises – as above for week 2, repeating 10 times twice daily

Sit and stand exercises – have your dog sit and stand repeatedly 10 times 2-3 times per day. Use small treats to encourage this. Do not push his/her rump down. The aim is to encourage proper knee flexion squarely under his/her body, do with the bad leg against a wall if needs be.

Week 3 walking – increase to 10 minutes twice daily, short controlled walking at slow pace only on a lead. If your dog is starting to get agitated, use harnesses/halties etc to stop pulling. Even if your dog wants to do more still remain controlled and never off the lead. You can start to take him/her outdoors for these short walks but 10 minutes at the most. If you think he/she is stiff or sore after a walk, reduce again for a few days.

Week 4

Continue bending/straightening exercises as week 2 + 3 – 10 times 2-3 times per day

Continue sit/stand exercises – 10 times twice daily

Walking week 4 – increasing to 15 minutes twice daily, controlled, slowly and on lead/harness

Start massage – he/she may stand or lie down. Superficial skin massage and deeper muscle massage is required. Skin massage around the knee joint involves using your hand loosely conformed to the surface of the skin, enough pressure applied to move the skin relative to the tissues underneath. Muscle massage involves deeper kneading and pushing of the muscles in the thigh and shin. Perform massage to 10-15 minutes twice daily

Weeks 5 + 6

Continue exercises, sitting/standing and massage

Increase walks with a slightly increased pace. Still no running and always on the lead, increase by 5 minutes each week, and twice daily. Keep on level ground and only encounter steps etc if necessary, in a controlled way.

At 6 weeks we will want to repeat xrays to see how well the bone is healing. We can discuss further plan from there depending on how things look on xrays and examination. If your dog cannot do any of the above exercises or movement within this time scale it is best that we re examine him/her sooner. All of the above should be possible, but no more allowed.

6-8 weeks

Only after 6 weeks, may you start to include stairs and hills when moving around or out walking. Jogging (still on a lead) may be commenced for 5 mins twice daily. Walking can be up to 30 mins once-twice daily. Remember the exercises and massage and continue to do if possible.

8-10 weeks

Activity on a long extendable lead is allowed for 10 mins twice daily, allow to climb stairs slowly a few times per day. Jogging on a lead can be increased to 10 mins twice daily. Swimming is allowed after 8 weeks, controlled swimming ie does not jump or leap into the water, walking him/her into the water and using a lead to get in and out. At this point underwater treadmilling at our Rehabilitation suite may be very beneficial. Still no throwing balls/sticks, no jumping/lunging. Start with a little extra every few days, do not do all of this at once. A little at a time.

At 12 weeks healing should be complete, but remember any setbacks at all need to be checked. If you are unsure, ring us to discuss it.

Weight Management

Many dogs incur the original injury as a consequence of being slightly overweight. With all the resting and rehabilitation weight gain is very common also. Please be very careful that your dog does not gain weight during the recovery period, as they will be doing less reduce the meal sizes by at least 25-30%. It is very tempting to overfeed them when they are at home doing so little, however weight gain dramatically slows the recovery. Remember you may need to use treats to encourage some of the exercises, so keep some food left over to use for this.

A diet we recommend is Hills J/d joint diet, a prescription food designed to improve joint health, preserve healthy cartilage and maintain a more ideal weight with a controlled calorie content. It contains joint supplements glucosamine and chondritin to support cartilage repair and high levels of omega-3 fatty acids, soothing tissues around the joints. Being calorie controlled it is excellent at helping dogs return to their ideal weight which will help their recovery. It is extremely palatable and no dogs seems to refuse it!!

