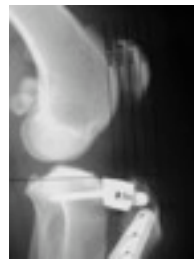


# Torrington Orthopaedics



Tibial Tuberosity Advancement

## Cranial Cruciate Ligament Pathology

This is the most common ligament injury in our patients. It can occur as a result of injury, however most of our patients present due to degeneration of the ligament. Often both knees are affected at the same time.

The canine knee is very similar to ours, with the key difference being the angle at which the knee is held. Inside the knee there are two main ligaments. These are the Cranial and Caudal Cruciate Ligaments. These ligaments stop the shin bone

(Tibia) from sliding forward and backward respectively, relative to the thigh bone (femur) as you see in Figure 1. Without the Cranial Cruciate Ligament (CCL), the shin bone slides forward when the leg is loaded (Fig 2).

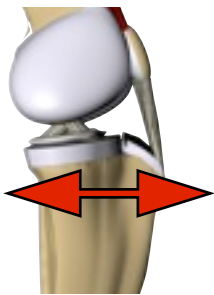


Fig 1



Fig 2

As a result of this your dog reduces the load through the leg and appears lame. A dog with cruciate ligament rupture will also have a sore knee and therefore will be less inclined to bend it when moving the leg forward. This can result in an awkward way of walking.

Because both knees can be affected at the same time, some dogs will partially handstand when walking. Dogs will often sit unusually, without bending their knees, resulting in their leg being held straight out when they are sitting rather than tucked up. Most dogs will get up stiffly after rest and whilst this may warm out after a few minutes, the lameness is unlikely to disappear altogether.

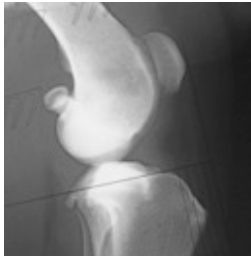
## The effects of Cranial Cruciate Ligament Rupture

All dogs with a ruptured Cranial Cruciate will develop osteoarthritis as they grow older. The effects of this can be kept to a minimum by keeping your dog's weight down and engaging in regular exercise. Medicine is unlikely to be needed every day, but from time to time, especially in later years.

Inside the knee there are two cushion-like shock absorbers called menisci attached to the tibial surface. The inner meniscus is damaged in over half of all patients with Cranial Cruciate rupture. If this happens,



it may result in greater lameness before surgery and the damaged portion will need to be removed. Some dogs with intact menisci at the time of surgery may damage the inner one within 6 to 9 months of the primary surgery to manage the cruciate ligament (Late Meniscal Injury). This will necessitate further surgery unfortunately in order to remove the damaged portion of meniscus. We are currently trialling new innovations in the surgical technique of TTA to reduce this risk below the current 8% incidence post surgery.



## Making a diagnosis of Cruciate Rupture

The first step in diagnosing CCLR is the clinical examination and evaluation of

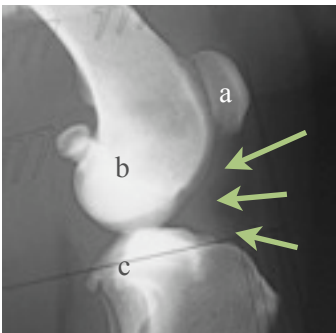
the lameness. This takes place in the consulting room and generally follows history taking and so forth. Following this, the accuracy of the diagnosis is increased by tests performed under anaesthetic. These include X rays, palpation of the knee and taking a sample of the joint fluid. Some patients

need arthroscopy which is the use of a small camera inserted into the joint to see the Cruciate Ligaments and give the final diagnosis.

When these diagnostic tests are completed we should have an accurate diagnosis of the cause of your dog's lameness. We will also know the size of implants needed for your dog's surgery.

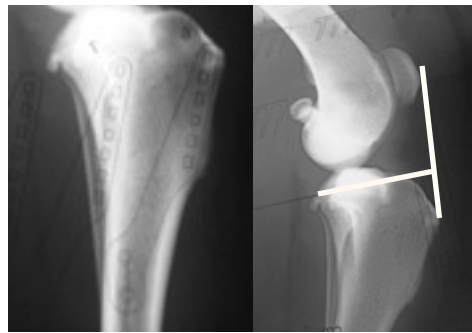
In general the surgical management will generally follow this, however if there is any evidence of infection in the joint, in the surgical area or if there is a raised White Cell Count we will defer surgery whilst we deal with this.

### X Rays



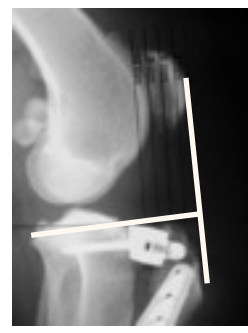
The x-ray above is the side on projection of a dogs knee. You can see the knee cap (a), the Thigh bone or Femur (b) and the shin bone or Tibia (c). The green arrows show the outline of a cloudy appearance within the joint. This indicates that the knee is swollen because it is producing too much joint fluid. There are many reasons why this may be seen on an x-ray of the knee, but the most common cause is rupture of the cranial cruciate ligament. The tearing of the ligament is often partial and sometimes we will hear that lameness has been grumbling on and settling down for a few months before coming to see us. Each phase of lameness being associated with further tearing of the ligament.

### Templating



The other reason we take X-Rays is to size up the components needed for your dog based on the anatomy of your dog's tibia and the angle between the tendon running from the patella to the tibia. We know that if we can change this angle so that it is as close to 90 degrees as possible, this will give a knee that is stable when the leg is loaded. This mechanical effect is present immediately after surgery. It is for this reason that many patients will use the leg within a few days of surgery. Measuring and changing this angle is critical to achieving a good clinical outcome post surgery. We hold a full set of implant sizes in order that we can perform the surgery without any delay.

### The Surgery



In order to perform the surgery we need to make an incision on the inner aspect of your dog's shin bone and knee. We open the knee joint and inspect the degree of damage to the Cruciate Ligament and remove any damaged portions of the meniscus. We then make a cut in the front of the shin bone and apply the plate. Using the measurement from the templating X-Rays we then insert a cage between the body of the shin bone and the front of the shin bone (the Tibial Tuberosity). The cage and plate are held in their final position with screws. A bone graft is then packed into the cage and the gap of the bone in order to accelerate healing of the fracture gap.

## Why use TTA?

For a long time, our only options when faced with patients with Cranial Cruciate Rupture, were to replace the damaged ligament with a graft or to replicate its function with a nylon band placed outside the joint. With both of these techniques, the time from surgery to good weight bearing is over 8 weeks. This can be a great problem if the other knee is failing simultaneously which is a common occurrence. With TTA, we get very much earlier limb load.

## How Does TTA Work?



### The Normal Knee

When a dog loads its hindlimb, the shin bone moves forward a little and then returns to its normal position when the leg is lifted. How far the shin bone moves is determined by the length and strength of the cranial cruciate ligament. The reason for this movement is that the forces applied across the knee are not parallel during loading of the limb but are at a slight angle to each other. This angle results in forward thrust of the shin bone. This thrust is resisted by the Cranial Cruciate Ligament. The slight movement of the shin bone creates a degree of shock absorption during the load phase of the stride in dogs with a normal cranial cruciate ligament.



### Changing the Angle

By changing the position of the tip of the shin bone (advancing the Tibial Tuberosity), we can make the two force lines 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 a cranial cruciate ligament and thus makes the ligament redundant. From the patient's perspective this is an instantaneous improvement over the pre operative instability that caused much of their lameness before surgery. Because the patient uses the knee earlier than with other procedures due to this early stabilising effect, we can if necessary, operate on the other knee earlier than we could with other procedures.

## Healing

We leave a gap between the body of the shin bone and the advanced tuberosity of 3,6,9 or 12 mm depending on the size of the cage used. This gap is filled with bone graft. Until the gap is filled with bone however, the implants are resisting the pull of the muscles above the knee. In order to prevent failure of the implants due to stress, we need to protect them by limiting your dog's activity (see over). The gap has generally healed by week 6 to 8 and therefore it is this early period that we need to take extra care. The implants are made of Titanium and are therefore very strong, but all metals suffer from fatigue if they are cyclically loaded and unloaded as would happen if a patient does too much exercise too early following surgery. As well as cyclic load, we must reduce the incidence of repetitive overload such as may happen due to bouncing or jumping.



## Post Operative Exercise

Can I go for a walk yet?



Adhering to the following exercise instructions ensures the best chance for an uncomplicated recovery. We need to protect the implants until the bone has healed:

Weeks 1 and 2: House and garden only for a sniff around and toileting. When in the garden your dog should be on lead in order to prevent explosive activity. If your dog is being very boisterous in the house, interrupt this behaviour by going to the garden.

Weeks 3 and 4: You can begin short 5 minute lead walks up to five times daily. These are in addition to toilet breaks in the garden.

Weeks 5 and 6: Lead walks can be extended to 15 minutes three times daily. Over-boisterous activity in the house can be interrupted by additional (infrequent) five minute sessions.

Weeks 7 and 8: Activity can progress to 30 minutes twice daily on lead in this phase. You should start at 20 minute sessions initially and gradually increase to the 30 minute mark.

Weeks 9 to 12: You should progress gradually through this phase aiming for one lead walk of 45 minutes and one to two sessions in addition not to exceed 30 minutes in total. Once 45 minutes has been achieved for 7 to 10 days you can start short periods of off lead activity following a warm up period.

## Comments

Increased stiffness after rest may be noticed as the exercise progresses. As long as this is short lived and your dog is not uncomfortable, it is nothing to worry about. Any increased lameness that is persistent or if your dog appears uncomfortable, please contact us. This is especially the case in the first 6 to 8 weeks. If you see an increased level of lameness after this period it may indicate late meniscal injury.

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## General Post Operative Advice



Please administer all the medicines given to you at discharge. Our nurses can give you advice if you are having trouble administering any medicines. Should your dog develop diarrhoea or vomiting whilst taking pain relief, please contact us.

Surgical wounds heal within a week to 10 days of surgery. A pad will cover the wound at the time of discharge from the hospital. This should be removed at day 2 or before.

There will be no external stitches. The stitches under the skin dissolve, but a knot at each end may cause a blister to form where the knots are at the top and bottom of the incision. This is nothing to worry about unless there is significant discharge or irritation. As the incision is over a joint, the body tries to stop the surgical layers from sticking to each other by creating a fluid film between each layer. If the wound is knocked or your dog is being over active, the body will pump more fluid into one or more of these layers. This is called a seroma. It will reduce over time and this can be hastened by using ice massage or hot and cold compresses. Please call us for advice if this happens. The fluid should not be drained as this will result in leakage of fluid and may permit bacteria to enter the surgical site and cause infection.