

The cranial cruciate ligament (CrCL) is a ligament that runs through the knee (stifle) of dogs. The stifle is the joint formed between the thigh bone (the femur) and the shin bone (the tibia). Ligaments prevent unwanted motion in joints and together they restrict their joint to moving only in the way that is required for normal function. The CrCL ligament functions to prevent unwanted motion in the stifle, including shearing of the tibia forwards on with respect to the femur, internal rotation of the tibia with respect to the femur and hyperextension of the stifle.

Rupture of the cranial cruciate ligament in the stifles of dogs is a very common problem. The unwanted motion in the joint leads to stretching of the joint capsule and pain. The unwanted motion can also lead to secondary damage to structures within the joint called the menisci (the "cartilages"). It can affect any breed / size of dog, but is most commonly presented as a problem in the bigger heavier breeds like German Shepherds, Rottweillers and Labradors. Dogs that are overweight are predisposed. There are definitely breed associations because for example 25% of Newfoundlands have cruciate disease and we very rarely see this problem in lurchers and Greyhounds. Middle aged dogs are most often presented with this problem, but we have seen it in dogs under a year of age. It usually occurs in older dogs because a degenerative process usually underlies the problem. Degenerative changes lead to partial or complete rupture of the CrCL. This process takes time to develop. The underlying degenerative process explains why both stifles are often affected in the same dog, even if the rupture in each is sometimes separated by a period of time. About 30% of ruptured CrCL are accompanied by cartilage tears and this is most likely in larger dogs, in dogs where the instability has been present for a prolonged period of time, and in dogs where the rupture is complete. Cartilage injuries are treated surgically by removing the torn area of the cartilage.

Degenerative joint disease (DJD) develops in the joints with ruptured CrCL and this occurs even if surgery is done (see separate information sheet on DJD). It is generally accepted that 90% or more of smaller dogs (<10kg) can do fine with conservative (non-surgical) management of CrCL. Surgery is generally reserved for the minority where lameness hasn't markedly improved after a few weeks of conservative treatment, or where there are other anatomical reasons for surgery. It is generally accepted that 90% or more of larger dogs do better with prompt surgical intervention. Canine cruciate surgery falls into two main groups: 1) Suture techniques where a suture is used to limit unwanted joint motion and 2) Bone-cutting techniques where the biomechanics of the joint are changed to reduce the need for a CrCL. Metalwork is used to stabilise the bone cut while it heals, typically over a few weeks.

### Surgical options

#### 1) Ligament replacement

In humans the ruptured ligament is usually replaced with a graft through the joint. Techniques based on this principal like the Over The Top (OTT) technique are now generally considered to give less satisfactory outcomes in dogs.

#### 2) Suture techniques

There are specialists in the USA and in the UK who advocate these techniques above the bone cutting techniques, but they are in the minority. The final results can be very good, but the convalescent period is longer. These techniques are generally cheaper than the bone cutting ones and they obviously avoid the need to cut bone. They include the lateral retinacular suture (LRS) technique and the "Tightrope" technique.

#### 3) Bone cutting techniques

There are a number of these and they all have their advocates. No one technique has been shown to be superior to another and unless this evidence materialises, it is likely that the exponents of each technique will continue to do their favoured technique which is what they are familiar with.

- Closing wedge tibial osteotomy (cwTPLO); this was developed in the late 80's by Slocum in the USA and it is the original bone cutting technique for CrCL rupture. This technique involves making 2 straight bone cuts. The resulting wedge of tibia is removed to drop the slope of the top of the tibia down to something approaching flat with respect to the long axis of the tibia. This reduces the tendency of the tibia to shear forwards with respect to the femur.
- Tibial plateau levelling osteotomy (TPLO); Slocum's refined technique, using one curved bone cut instead of 2 straight cuts.
- Tibial tuberosity advancement (TTA); developed in the mid "naughties" by Montavon in Switzerland. One straight cut is made and a spacer is inserted to advance the point on the front of the shin bone where a tendon inserts. This reduces the tendency for the tibia to shear forwards with respect to the femur. There have been recent advances in this technique using alternative spacers and alternative stabilisation systems.
- Triple tibial osteotomy (TTO); developed in the mid naughties. This is a mixture of TTA and cwTPLO and requires three bone cuts.

We have experience with all of these techniques. In larger dogs we usually use a modern modification of the TTA technique, or TPLOs or cwTPLOs. We usually do cwTPLOs in smaller dogs like Westies. We regularly do LRSs in small dogs, and in cats that needs CrCL surgery.