



Lateral Suture System

Management of the ruptured Cranial Cruciate Ligament (CrCL) by placing a non-absorbable suture between the lateral fabella and the proximal, cranial tibia has been routine since DeAngelis first reported the technique in 1970.

Today it remains the extra- capsular technique of choice. Conzemius in 2005 in the Journal of American Veterinary Medical Association, using force plate analysis, compared the outcomes of TPLO and lateral suture performed by the same surgeon. He reported no significant difference in outcomes.

The ideal lateral suture would join points of isometry in the femur and tibia. This would mean that as the stifle is flexed and extended the distance between the location points and therefore the length of the suture would remain constant. The points chosen for the lateral suture, the lateral fabella and the proximal cranial tibia, are not fully isometric but are chosen because of the ease of placing a suture. Using bone tunnels or suture anchors it is possible to place a suture isometrically but this is more technically demanding.

The dog is placed in dorsal recumbency which gives good access to both cranial and lateral aspects of the stifle. The leg can be flipped one way then the other. Use of the multiarm positioning device allows the limb to be positioned and locked, for examination of the meniscus but also easy to be re-positioned and locked for placement of the lateral suture.



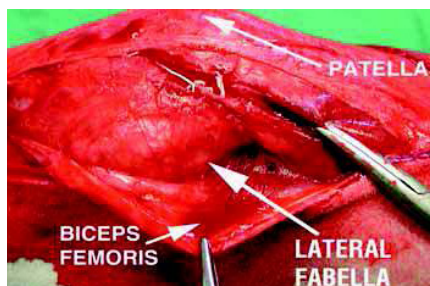
The upper limb and foot is fully draped. Use of adhesive anti-bacterial drapes further reduces the risk of infection.

Approach the stifle joint via a lateral parapatellar incision. Incise through the aponeurosis of the biceps femoris and tensor fascia lata. Leave sufficient fibrous tissue on the patella to facilitate the re-suture. Do not go through into joint capsule at this stage if possible.

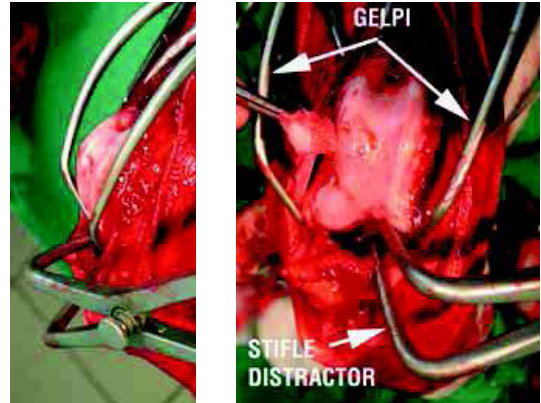
Dissect between biceps femoris and joint capsule to identify and expose the lateral fabella. The fabella is palpable on the caudal border of the femur.

It is a relatively mobile structure which, if probed with a fabella needle will move, confirming its position. If the opportunity arises it is helpful to perform a full dissection on a cadaver to identify the fibrous structures which attach the fabella to the femur. It is this fibrous tissue upon which the lateral suture will depend. Failure to pass the suture through enough fibrous tissue is the most common cause of failure.

Open the joint capsule, again leaving enough capsule on the patella for closure.



Make a thorough examination of the stifle joint checking both the lateral and medial meniscus. The lateral meniscus has a secure attachment to the femur and therefore moves with it which minimises trauma.



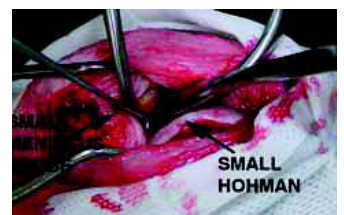
The medial meniscus is not securely attached to the femur. In the unstable joint the femur moves backwards and forwards over the medial meniscus and can cause serious injury. Injuries to the medial meniscus are most common in the large dog with a long standing stifle instability. Conversely smaller dogs appear to be less prone to meniscal injury. Unfortunately the medial meniscus is very difficult to see even with appropriate instrumentation. A Senn retractor will retract the fat pad. A stifle distractor is positioned with one prong sitting in the intercondylar notch and the other in non articular tibial plateau between lateral and medial meniscus. The spin lock is not engaged at this stage. Squeezing the handles will confirm if the tips are correctly positioned. If positioning is correct the femur will separate from the tibia revealing the medial meniscus. If the lower tip is too far cranial the stifle will flex.

If the tips are in the correct positions the spin lock should be engaged and the stifle distracted. Once the tips are engaged the distractor becomes self retaining. A small Hohman or stifle lever will give further focal retraction.

The lateral horn should also be examined by re-positioning the distractor if necessary. Injuries to the lateral horn are far less common than to the medial horn. To establish if any tears are present it is important to probe the meniscus directly. An undamaged

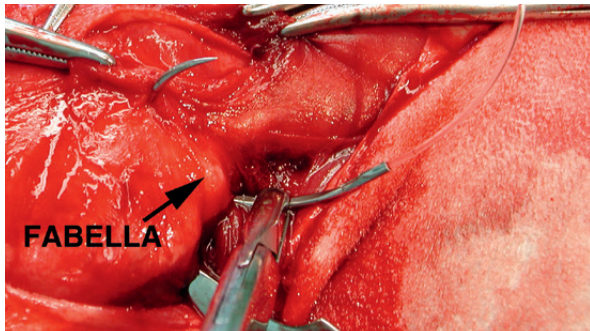
meniscus is tough and will tolerate examination. A small meniscus probe is designed for this purpose.

Damaged parts of the meniscus should be removed. Damaged sections are difficult to grasp as they are covered by very slippery synovial fluid. Toothed Halsteads or a ligament clamp will be necessary. Resection is achieved using a small blade. The most useful is a pointed Beaver blade in a Beaver handle.





A No 65 is similar to a small No 11. The No 65A is even smaller. In larger dogs there is space enough for a No 11 blade in a No 3 handle. The joint capsule is closed using absorbable sutures.



The lateral fabella is re-exposed. Gelpi self-retaining retractors or a Hohman retractor are useful as they hold back the biceps and fascia lata which otherwise obscure the fabella area.

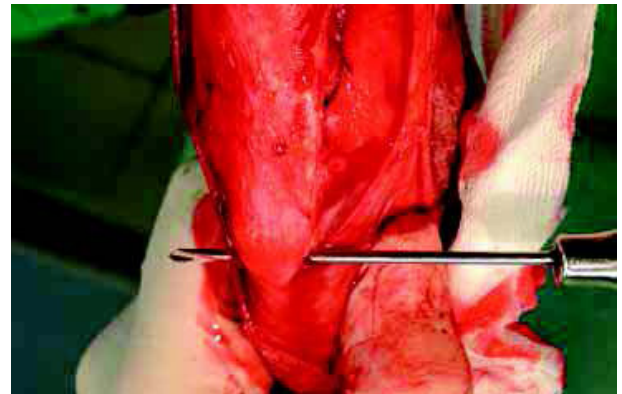
Passing the nylon suture behind the fabella appears to be the most difficult part of the procedure. It is well worth repeating that dissection of the peri-fabella structures on a cadaver specimen to identify fibrous structures is extremely useful.

The nylon may be passed around the fabella using either dedicated cruciate/fabella needles or appropriate graft passers.

The fabella is a relatively mobile structure which can be identified and moved using the tip of the needle. By walking the needle tip over the caudal edge of the fabella it is possible to locate and penetrate the femorofabella ligament. If you are unable to pass the needle between femur and fabella it is essential that the needle passes at least through substantial fibrous tissue adjacent to the fabella. Avoid placing the suture distal to the fabella. If excessive soft tissue is included in the nylon loop, tension will be quickly lost as the nylon 'cheese wires' through. Keep the needle as close as possible to the fabella. Using a needle which is too large will also pick up too much soft tissue.



A single strand of monofilament nylon is pulled through. If the nylon is in the correct place it should be possible to virtually lift the dog up from the table without tearing through. Indeed the loop should be thoroughly tested to check correct positioning.



Drill hole (2.5 to 3.5mm diameter) in the proximal tibia close to the insertion of the straight patella ligament with a bone tunnel borer or drill. The hole should be as cranial and proximal as possible to maximise isometry.

Positioning of distal hole in tibia

In the lateral suture system the proximal position of the loop is always the lateral fabella (but see suture anchors on page 6). There are however some options when it comes to placing the hole(s) in the tibia. Passage and anchoring of the suture through the distal patella ligament is sometimes insecure. An alternative is to use two holes distally. The first hole is as described above but the second is placed more caudally on a line between the lateral fabella and the first hole.



The top strand of the nylon is passed through the distal patella ligament in the lateral to medial direction. The needle should pass through the distal insertion to firmly locate it close to the hole in the proximal tibia.



The nylon strand is passed back through the hole in the proximal tibia using straight graft passer or cruciate/fabella needle.





One free end of the nylon is passed through crimp tube. The other free end is fed through the other end of crimp tube. The crimp is free to slide at this time.



Gently crimp middle of tube so that nylon can be pulled through with some difficulty (about 60% of a full crimp). Until experienced, use incremental squeezes to obtain ideal resistance. Pulling the free ends through will create tension on the loop.

The greater the degree of crimp applied the higher the tension which can be applied without the nylon sliding back through.



Pull the nylon suture tight enough to eliminate anterior drawer and check for full range of motion. Take care not to create an outward rotation of the tibia on the femur. Too much tension is as great a technical error as too little.



Tension may be applied using instrumentation. The tension device on the left grips the free nylon and pulls it through the crimp with a spin lock device. Alternatively the right hand illustration shows nylon tensioning clamps attached to the free nylon which are then distracted using a pair of standard Gelpis. Using instruments it is easy to overtighten.

Guidelines for size of leader line

There are no hard and fast rules, particularly in very large dogs, but these guidelines may be helpful.

Strength of line	Weight of Dog
50lb	10-15kg
80lb	15-20kg
100lb	20-40kg
100lb x 2	40kg+

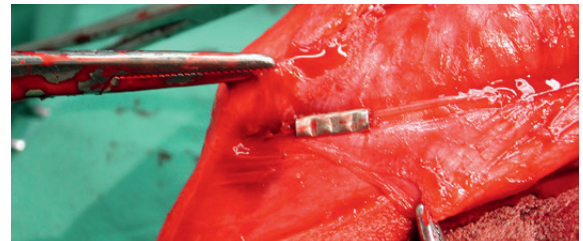
As many as four lines may be used. Where multiple lines are used it is recommended that double lines are used to minimise trauma in the femorofabellar region which is caused by multiple passage of needles.

Some large individuals occasionally have very unstable stifles. In these individuals it is suggested that a medial suture is placed to prevent outward rotation of the tibia as tension is applied to the lateral sutures.



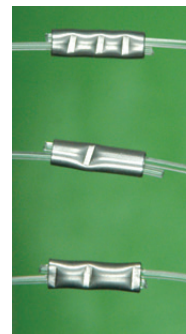
The crimp is oval in shape. It is important that the crimp is crimped across the wide part i.e. at right angles to the two strands of nylon. In addition care should be taken to make sure that all the crimps are in the same plane on the tube, otherwise the crimps neutralise each other. Tensioning the loop tends to

pull the crimp flat to the soft tissues. In order to crimp across the wide part it helpful to pull one strand of nylon to tip the crimp to give the crimper access to the wide part of the crimp.



Squeeze the crimp hard in middle and both ends. Do not crimp too close to the end of the tube. Leave around 1mm uncrimped. Cut off the free ends close to the crimp. The crimp should sit over tibialis cranialis muscle close to the tibia. The arthrotomy is closed in layers.

The illustration shows a crimp tube correctly crimped and in the correct position.



This crimp is correct with 3 evenly spaced crimps



One or two crimps are not enough to ensure closure



Crimping too close to the end of the tube will damage the nylon and lead to early failure

Post Operative Care

A Robert Jones Dressing may be applied for three days.

For the next seven days there should be strict rest other than toilet walks.

Over the next two months leash exercise gradually increasing mobility of the stifle.

Swimming is beneficial to build muscle mass without weight bearing.

Final stability of the repair is due to periarticular fibrosis. The nylon will typically fail between 6 to 10 weeks if it is still stabilising the stifle at this time. Loop failure at this time does not affect outcome but may show itself as a transient lameness of 1-2 days.





Instruments and Implants

Kits

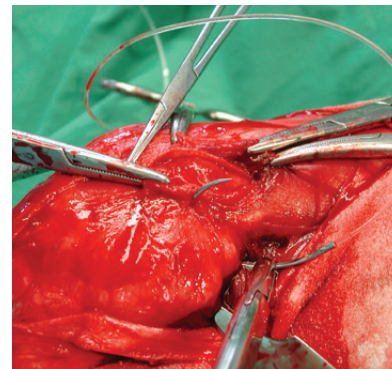
Most surgeons now prefer our sterile procedure packs. If you are new to the lateral suture system our kits represent the most economical means. All kits include a procedural CD.



091154CCL	Suture System (Swaged on) Basic Kit. Forceps, 2 x each size nylon/needle/crimp sterile packs
091151CCL	Suture System (Swaged on) Basic Kit Plus. Forceps, 2 x each size nylon/needle/crimp sterile packs plus H/D needleholders



In addition to the standard crimper as supplied in the kits there is available a compound action version which is more powerful.



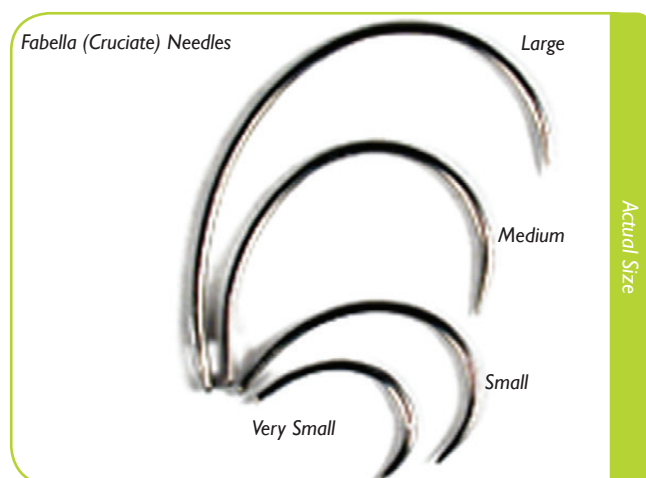
Fabella/Cruciate needles are very large and will damage standard needleholders. We strongly recommend the use of the large tungsten carbide needleholders.



Instruments

Fabella (Cruciate) Needles

Most surgeons now use our sterile procedure packs which include swaged on needle and appropriate crimps. However, if you wish to sterilise your own nylon we offer appropriate needles. They are shown below approximately actual size. Bear in mind that leader line passed through a regular needle creates more damage as it passes through the femoro-fabella ligament. It is this ligament which is relied on for the holding power of the suture. Cruciate needles will pass through a hole created with a 2.7mm bone tunnel borer into the tibial crest.



FABELLA (CRUCIATE) NEEDLES

091144VS	Fabella Needle Very Small - Pack of 6 Has Regular Eye
091144	Fabella Needle Small - Pack of 6 Has Regular Eye
091145	Fabella Needle Medium - Pack of 6 Has Regular Eye
091146	Fabella Needle Large - Pack of 6 Has Regular Eye

Creating a bone tunnel in the proximal tibia is not difficult but using a drill and drill bit can involve a lot of unnecessary unpacking, cleaning and re-sterilising for a single hole. Inclusion of the bone tunnel borer in the cruciate kit saves time. Rotate the borer 90 degrees back and forth to create the hole.

INSTRUMENTS FOR STANDARD NYLON

091135	Crimping Forceps 195mm Long
091135C	Compound Action Crimper 230mm Long
091153	Heavy Duty Needle Driver with Tungsten Jaws 195mm Long
001073	Bone Tunnel Borer 2.5mm 165mm Long

Meniscus Surgery

Meniscus surgery set: Includes a stifle distractor, small Hohman, meniscus probe, toothed Halsteads and Beaver scalpel handle and 5 sharp blades.

MENISCUS SURGERY SET

001116	Meniscus Surgery Set
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Implants

CRIMPS

091140	10mm Tube Crimp for 50lb Line (Non Sterile)
091136	12mm Tube Crimp for 80lb + 100lb Line (Non Sterile)

Sterile Lateral Suture Packs

Sterile Nylon Leader Line

Also useful for other ligament replacement procedures, e.g. hip toggle, collateral ligament repair.

STERILE NYLON LEADER LINE

091141	500mm x 50lb Nylon (Sterile Pack)
091139	800mm x 80lb Nylon (Sterile Pack)
091148	800mm x 100lb Nylon (Sterile Pack)

Sterile Leader Line & Crimp

STERILE LEADER LINE & CRIMP

091142	10mm Tube Crimp + 500mm x 50lb Nylon (Sterile Pack)
091137	12mm Tube Crimp + 800mm x 80lb Nylon (Sterile Pack)
091147	12mm Tube Crimp + 800mm x 100lb Nylon (Sterile Pack)

Sterile Leader Line & Crimp + Needle

This pack contains everything required for a single procedure.

STERILE LEADER LINE & CRIMP + NEEDLE

091155	50lb nylon line x 500mm on swaged-on v. small fabella needle + 10mm crimp (sterile)
091156	80lb nylon line x 800mm on swaged-on small fabella needle + 12mm crimp (sterile)
091157	100lb nylon line x 800mm on swaged-on medium fabella needle + 12mm crimp (sterile)

Double Leader Line + Needle + Crimps

DOUBLE LEADER LINE + NEEDLE + CRIMPS

091165	50lb Double line (500mm x 2 as loop) on v small fabella needle plus 2 x 10mm crimps (sterile)
091166	80lb Double line (800mm x 2 as loop) on small fabella needle plus 2 x 12mm crimps (sterile)
091167	100lb Double line (800mm x 2 as loop) on medium fabella needle plus 2 x 12mm crimps (sterile)

Variations on a theme

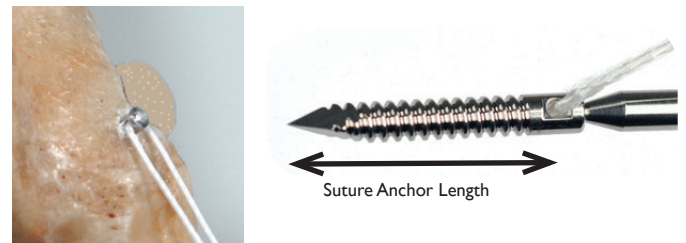
INSTRUMENTS FOR MASON NYLON

091153	Heavy Duty Needle Driver with Tungsten Jaws
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Suture Anchors

The lateral fabella and proximal tibial crest are not isometric points but are convenient as needle passage points for the lateral suture. Use of suture anchors enables the surgeon to position the lateral suture at isometric points. The isometric points around the canine stifle are nicely described by Simon Roe in *VCOT 2008; 21:215-220*.

Arthrex Fastak anchors are generally considered to be the best and a technique using these anchors is described in a separate Arthrex brochure by Brian Beale and Don Hulse.



INSTRUMENTS FOR MASON NYLON

SUTURE SCREWS	Various diameters and lengths
SAP3	Suture Anchor Pins 3mm

