Veterinary
Instrumentation

Surgery Guide

Lateral Suture

Surgery Guide:
Lateral Suture

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 a routine procedure since DeAngelis first reported the technique in 1970. This is an extra-capsular suture technique (the implant is placed outside the joint) and is called a lateral suture, or a fabello-tibial suture.

There have been improvements/ modifications to the technique over the years, and this surgery guide reflects current clinical thinking and best practice,and describes the use of more modern, as well as more traditional, material for performing this procedure.

The lateral suture remains one of the most popular extracapsular surgical techniques performed today, and up until the early 2000s was considered amongst the best surgical techniques available for treatment of cranial cruciate ligament disease in the dog. Since the advent of the tibial osteotomy techniques, primarily TPLO and TTA, and as these osteotomy techniques have evolved, outcomes have improved, and complication rates have reduced. Today, clinical outcome with TPLO and TTA is considered the best available, and superior to outcome with extracapsular suture techniques. But the lateral suture is still commonly performed in first opinion and charity practice.

The ideal lateral suture system would perfectly replicate the origin and insertion points of the cranial cruciate ligament at the femur and the tibia. These are called the isometric points. If perfectly replicated, the distance between these points, and therefore the length of the suture, would remain constant as the stifle is flexed and extended. However, as the cruciate ligament is intra-capsular (within the joint) and the lateral suture is an extracapsular implant (outside the joint), perfect replication of these isometric points is impossible to achieve. Therefore, contact points are chosen that are as close to isometric as possible (quasi-isometric). Utilising a bone tunnel and/or suture anchors can help to achieve location points as close to truly isometric as possible. Please refer to the Vi Surgery Guide - 'Lateral Button Suture' and the Vi Surgery Guide - 'LigaFiba® Isotoggle' for details of extracapsular techniques that utilise these principles.

Contents

Guidelines for Implant Choice

Nylon or LigaFiba®?

Nylon is the traditional choice for lateral suture and has been in use since the technique was first described. It is a monofilament line and therefore carries a lower risk of infection. However, it is stiffer and can be difficult to handle, having what is termed 'good memory' (the line wants to spring back to its original shape). It is also more brittle and does not have very good resistance to abrasion, making it more prone to early weakening and failure.

LigaFiba® is a modern material, made of braided ultra high molecular weight polyethylene (UHMWPE). LigaFiba® has different properties, being much more flexible and considerably easier to handle ('poor memory', does not spring back to its original shape). Being a multifilament line, LigaFiba® carries a theoretical higher risk of infection, but as with all joint surgery, excellent attention to aseptic technique should mitigate any increased risk. LigaFiba® has higher resistance to abrasion than nylon and contours with better ease, making it less prone to early weakening and failure. Weight for weight, or diameter for diameter, LigaFiba® is stronger than nylon.

Choice of material will come down to personal surgeon preference and experience, as well as suitability for the patient.

Whether using nylon or LigaFiba®, if the surgeon is securing the line by crimping, a crimping device appropriate to the line choice will be required.

Fig 1. summarises the properties of nylon and LigaFiba®.

Nylon	LigaFiba®
Traditional	More modern
Monofilament nylon	Multifilament braided UHMWPE
Has high 'memory' - is more difficult to handle	Has low 'memory' - is easy to handle
Difficult to knot	Easy to knot
Can be used with crimps	Can be used with crimps
Available in a variety of sterile presentations	Available in a variety of sterile presentations
	Stronger than nylon for any given diameter
	Better abrasion resistance than nylon

Fig. 1

Scan the QR code to view a video which summarises the properties of LigaFiba® and Nylon.

Size of Line?

There are no set rules on choice of size/weight of line, but Fig.2 gives guidance as to appropriate choice of line. Surgeons may choose to err on the side of caution (i.e. larger sizes of lines or double lines) for boisterous patients, overweight patients, or where there is uncertainty over the owners ability/willingness to comply with post-operative instructions regarding restriction of exercise.

Surgeons should bear in mind that Lateral Suture is particularly prone to failure and poor outcome in larger patients. Surgeons should also consider the size of the bone tunnel required for different weights of line, and whether that bone tunnel size is appropriate to patient bodyweight/anatomy.

Nylon is available in double swaged on lines in all three sizes, LigaFiba® only has the option of a double line in the 250 line. As many as 4 lines may be used, but it is unusual to use more than two. Where multiple lines are used it is recommended to use the double line swaged onto a single needle to minimise trauma in the femoro-fabella region which can be caused the passage of multiple needles. If in any doubt, a surgeon may choose to use the double variant when using nylon instead of going up a size in the single line.

Fig.2 offers guidance as to line choice according to patient bodyweight. If a patient is above their ideal bodyweight, is particularly boisterous, or if there are concerns about postoperative compliance, a surgeon may choose to go up a size at their own discretion.

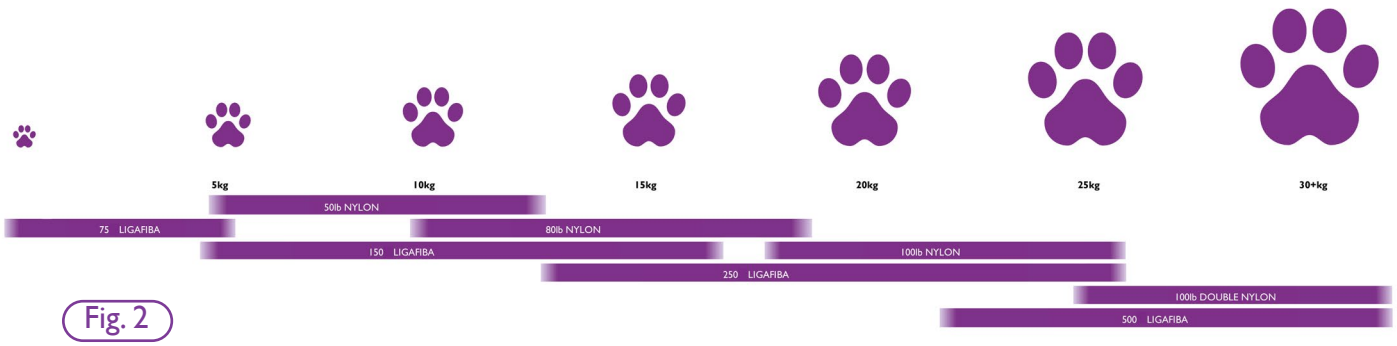


Fig. 2

Surgical Technique

1. Patient Positioning

The dog is positioned in dorsal recumbency which gives good access to all aspects of the stifle but particularly cranial and lateral. The leg can be moved as required during the surgery for best possible access. The upper limb and foot are fully draped as per normal sterile surgery protocol (Fig. 3). Use of adhesive antibacterial drapes is recommended.

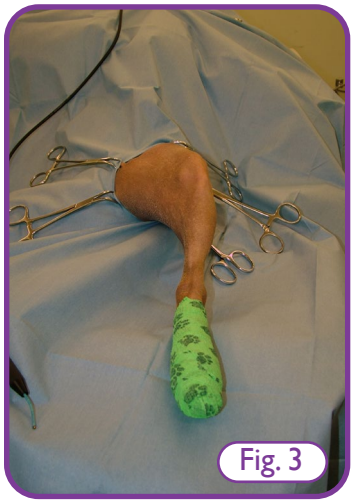


Fig. 3

2. Surgical Approach

Approach the stifle joint via a lateral para-patellar incision (Fig. 4). Incise through the aponeurosis of the biceps femoris and tensor fascia lata ie. the lateral retinaculum. Leave sufficient fibrous tissue on the patella to facilitate easy closure ie. make an incision several mm lateral to the patella. Do not incise into the joint capsule at this stage if possible.

Fig. 4

Staying outside the joint, reflect the biceps femoris caudally and dissect between it and the joint capsule to identify and expose the lateral fabella. The fabella is a sesamoid in the lateral head of the gastrocnemius, palpable on the caudal border of the femur just proximal to the condyle. It is not visualised directly but felt as a small protuberance; initially it can appear to be part of the femur but it is slightly mobile. If probed, it will move slightly, confirming the correct position (Fig. 5).

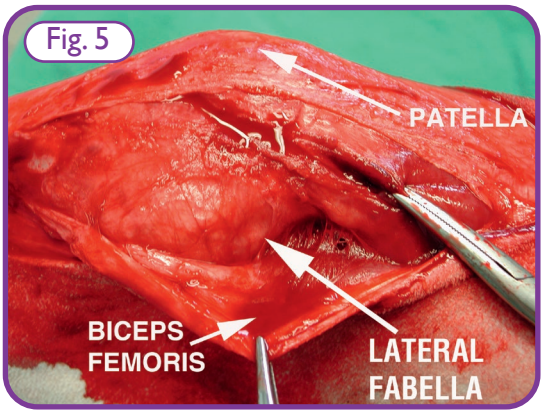


Fig. 5

The anatomy is not easy for the inexperienced surgeon. It is strongly advised to perform a full dissection on a cadaver to identify the various structures which attach the fabella to the femur, ie. the femoro-fabella ligament. It is this fibrous tissue upon which the suture will depend. Failure to pass the suture through enough fibrous tissue is the most common cause of failure.

3. The Arthrotomy

Incise into the lateral joint capsule. Ideally, only do a sub-patellar 'mini' lateral arthrotomy, ie. do not extend the joint capsule incision proximally through the fibrous lateral femoro-patellar ligament, as it is not necessary to do a full lateral arthrotomy, and to do so induces more degenerative joint disease.

Insert a blunt-tipped Gelpi retractor medio-laterally ie. one foot under the patella ligament and the other under the joint capsule. Insert a stifle distractor appropriate to the patient size proximo-distally with the proximal foot in the most cranial aspect of the intercondylar notch, and the distal foot at the cranial aspect of the tibial plateau. Gently squeeze the handles of the stifle distractor to distract the joint – if good visualisation is not achieved, repositioning the feet of the stifle distractor is usually helpful. If using a spinlock stifle distractor, the spinlock is used to hold the distracted position. Do not use the spinlock to distract the joint. Gelpis and stifle distractors are available in a wide range of sizes to suit all patient sizes.

The combination of Gelpi medio-laterally and stifle distractor proximodistally should allow for best intra-articular visualisation (Fig. 6). It can also sometimes be useful to use a Senn retractor or fat pad retractor to retract the fat pad for improved visualisation. Excellent surgical lighting is also required to adequately examine the inside of the stifle joint – a head torch may be useful.

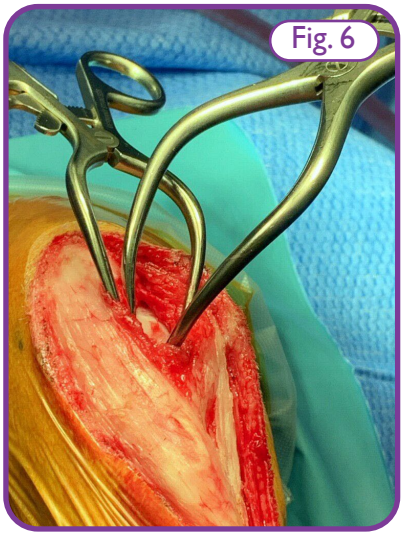


Fig. 6

4. Meniscal Inspection and Surgery:

Make a thorough intra-articular inspection of the stifle joint. In particular check both the lateral and medial menisci.

The lateral meniscus is attached to the femur via the caudal menisco-femoral ligament and therefore moves with the femur, which minimises the chance of traumatic crushing and meniscal tear. Lateral meniscus tears are very rare.

The medial meniscus is securely attached to the tibia via the cranial and caudal menisco-tibial ligaments, but it is not attached to the femur. As such, the medial meniscus does not move with the femur and is thought to get trapped when the tibia thrusts cranial relative to the femur in the cruciate deficient stifle. The medial meniscus is therefore prone to injury and there is a high risk of medial meniscal tear. Injuries to the medial meniscus are common.

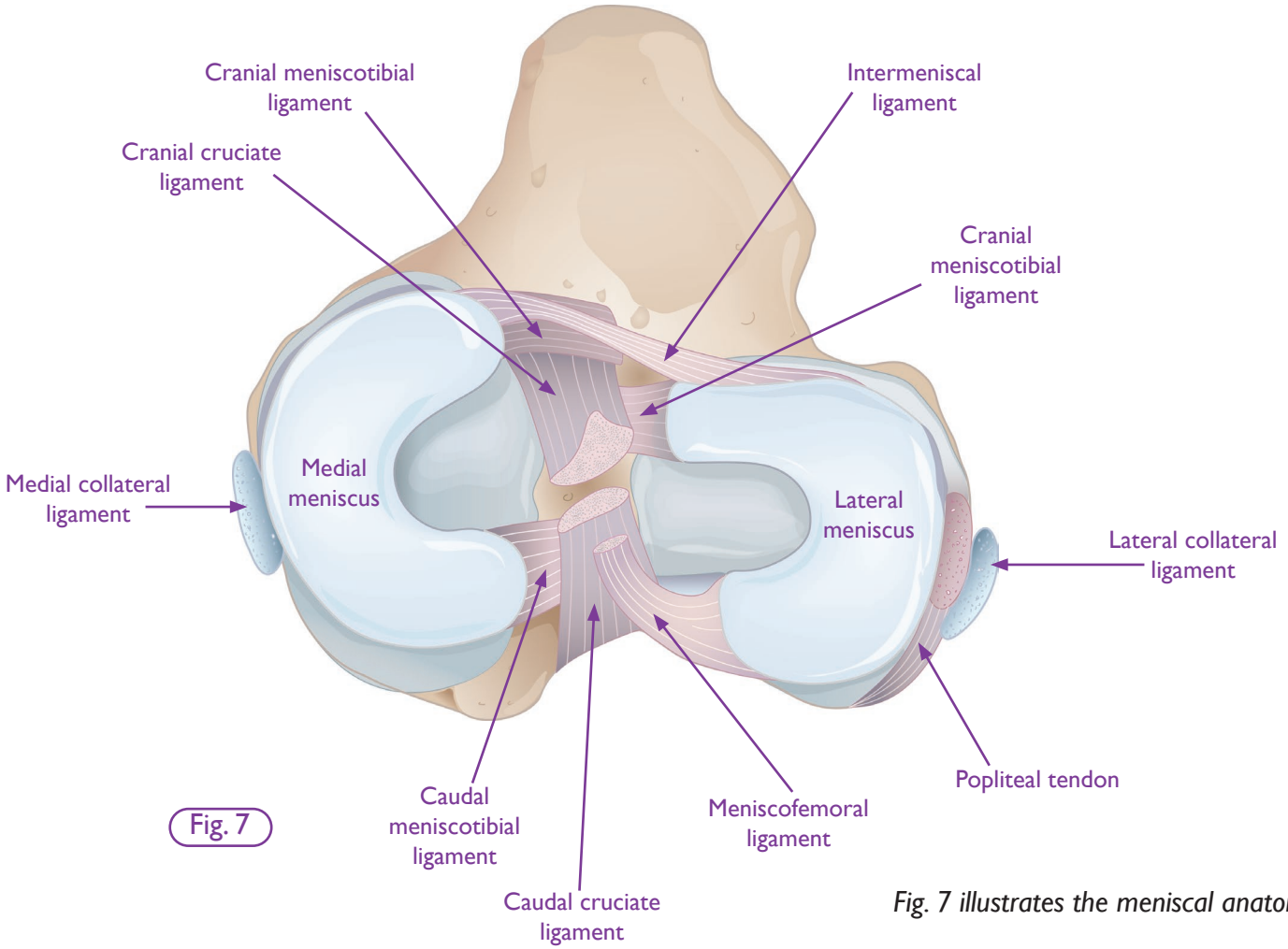


Fig. 7

Fig. 7 illustrates the meniscal anatomy

The more damaged the cranial cruciate ligament is, the easier the menisci are to see. If the cruciate ligament is fully ruptured, good distraction can be achieved with the stifle distractor and then good visualization of both menisci can be achieved. However, if there is only a partial rupture of the cranial cruciate ligament, the remaining ligament will resist and limit the ability to open up the joint by the stifle distractors. This in turn will make examination of the caudal stifle, including the caudal horns of the menisci, very difficult and sometimes impossible. Fortunately, there is less likely to be a meniscal injury with a partial cruciate injury as the degree of stifle instability is also less i.e. at the same time the menisci are more challenging to visualize, the less the chance of a meniscal tear.

To establish if any tears are present it is important to fully visualize and probe the menisci directly. A small meniscus probe or Dandy nerve hook are ideal for this purpose; the proximal (upper) and distal (under) surfaces of the meniscus should be probed. A normal meniscus is tough and does not move much with probing, whereas if the meniscus is torn, the torn section will be unstable to probing, or the meniscal probe may get stuck in the tear.

The axial (inner) surface of the medial meniscus may be seen with a wavy or undulating edge which may not be fully in contact with the tibial plateau; this is normal, and is not a sign of a meniscal tear.

Torn and damaged parts of the meniscus should be removed. Damaged sections are difficult to grasp as they are very small and covered by slippery synovial fluid. Toothed Halstead mosquito forceps are very useful for grasping portions of meniscus. Resection of the damaged portion is achieved using a small blade. A no.65 Beaver blade is similar to a small no. 11 and is perfect for most meniscal surgery. If required, the no.65A is even smaller.

If the meniscus is normal, no surgical action is taken.

Once the joint has been explored thoroughly and the menisci treated as appropriate, the joint is thoroughly flushed, the stifle distractor and Gelpi retractor are removed and the joint capsule is closed using absorbable suture material such as PDS.

5. Placement of the Lateral Suture

The lateral fabella is re-accessed. Gelpi self-retaining retractors can be helpful to retract the biceps and lateral retinaculum caudally, making access easier.

Passing the suture in the correct location around the origin of the lateral head of the gastrocnemius just proximal to the fabella is the most difficult part of the procedure. This is because the femoro-fabella ligament is very thin and broad in this location, and the space between the bone and the tendon and is very small and tight. It is highly advisable to practice this dissection and surgery on a cadaver before attempting surgery in a live patient.

The suture material may be passed around the fabella using a variety of techniques, but it is simplest and least traumatic to use a curved single-use needle with swaged on suture, and a pair of heavy-duty needle drivers (Figs. 8a & 8b).

Fig. 8a

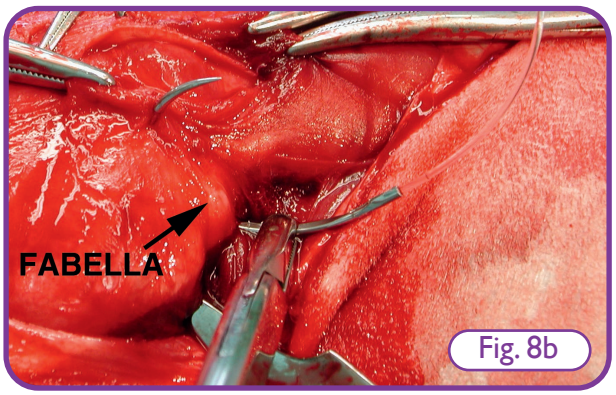


Fig. 8b

The fabella is identified by palpation. By walking the needle tip over the cranial/proximal/medial edge of the fabella, the needle is driven from medial to lateral under the femoro-fabella ligament. Keep the needle as close to the bone as possible. Driving the needle should be very tight and difficult, ensuring the suture has good purchase. If the needle passes easily, it has not engaged the femoro-fabella ligament correctly, and will be loose or will quickly loosen. Do not place the needle distal to the fabella as the suture will slip distally and quickly loosen.

The suture material is pulled through and security of placement is tested. If the suture material is in the correct place it should possible to virtually lift the dog up from the table without tearing through. If the suture is not secure and strong, it should be removed and replaced, and tested again to ensure its security.

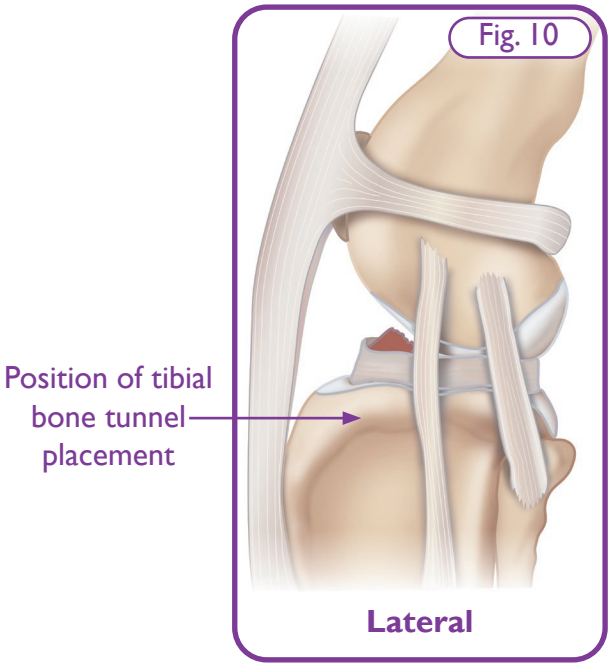
Suture anchor/screw. If secure purchase of the suture at the fabello-femoral ligament cannot be achieved, then an alternative technique is to place a suture anchor or suture screw in the femur immediately adjacent to the position of the lateral fabella and the femoro-fabella ligament. This is most likely to be necessary in small dogs, and is frequently required in cats.

6. Tibial Tunnel Placement

Drill a hole wide enough to accept the suture material (please refer to Fig. 9 for suggested drill bit sizing. Surgeons should also consider whether that bone tunnel size is appropriate to patient bodyweight/anatomy). The bone tunnel should be located as close as possible to the insertion point of the cranial cruciate ligament (quasi-isometric). In other words, the hole should be as proximal and as close to the tibial plateau as possible (Fig.10).

LigaFiba®		Nylon	
Size	Drill Size	Breaking Strain	Drill Size
150	2mm	50lb	2.5mm
250	2.5mm	80lb	2.7mm
500	3.5mm	100lb	3.5mm

Fig. 9



Elevate a small section of cranial tibial muscle from the proximal aspect of the tibia close to Gerdy's tubercle i.e. just cranial to the long digital extensor tendon. Use a periosteal elevator to elevate from the muscle from the bone. As proximally and caudally as possible, drill a hole from lateral to medial across the tibia. The hole and dissection can be temporarily marked by inserting a K-wire until ready for the next step.

Using a haemostat from lateral to medial and just proximal to the bone tunnel just drilled, open a small soft tissue tunnel in the distal fat pad; at the medial aspect, use a 11 blade to make a small hole in the medial retinaculum to allow the haemostat to exit. The exit point of the haemostat should be close to the exit point of the tibial bone tunnel.

7. Passing the Suture Through the Bone Tunnel

Either a figure of 8 (Fig. 11a) or an encircling loop (Fig. 11b) extra-capsular suture can be placed, or both; there is little evidence that one is better than the other.

Depending on which is intended, one strand of the suture is passed through the tibial bone tunnel lateral to medial, and then returned from the medial tibia by grasping with the forceps used to make the soft tissue tunnel, and retracting laterally.

The suture is easiest to pass if already loaded onto a straight needle, or a wide bore hypodermic needle can be used to guide the way. LigaFiba® is supplied with a curved fabella needle swaged onto one end and a straight needle swaged onto the other end, to facilitate the passing of this more flexible line through the bone tunnel. Nylon is stiffer and therefore easier to pass through the bone tunnel.

If using LigaFiba®, the straight needle can be cut from the line once passage through the bone tunnel is complete. Cut the LigaFiba® near the needle where the line has been stiffened, using the dedicated LigaFiba® scissors (normal scissors will struggle to cut through LigaFiba®).

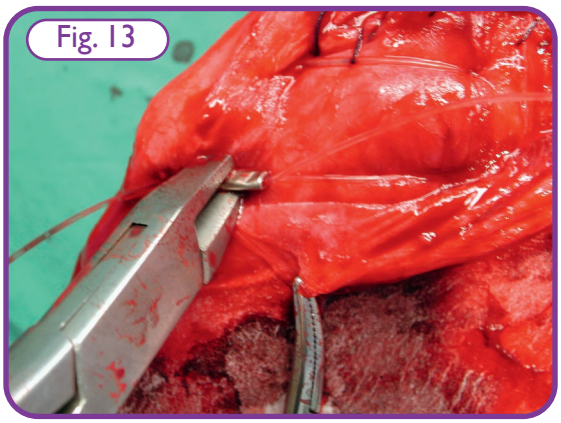
8. Tensioning and Crimping

The suture is laid as intended. One free end of the suture is passed through crimp tube. The other free end is fed through the other end of the crimp tube. The crimp is free to slide at this time and is best positioned mid-length i.e. in between the fabella and the tibial bone tunnel (Fig. 12).

Tensioning of the line may be carried out by hand or tension may be applied using instrumentation (see below for further details on tensioning devices). The stifle is positioned in mid flexion. Assuming tensioning is being carried out without the aid of tensioning devices, using needle holders on each free end of the suture, the suture material is pulled tight in the crimp.

Pull the suture tight enough to eliminate cranial drawer and check for full range of stifle motion. Take care not to create so much tension as to restrict stifle range of movement or cause external rotation of the tibia relative to the femur. Too much tension is as significant a technical error as too little.

The crimping device is used to firmly place a single crimp in the middle of the crimp (Fig. 13).



Scan the QR code below to view a video giving details of the crimping devices available from Vi.

Tension is checked (the suture should be tight and eliminate all cranial drawer). Stifle range of movement is checked for excessive restriction. There should be a good range of movement but there may be some restriction to full flexion and extension. Once the surgeon is happy with the tension, place an additional crimp at either end of the crimp tube giving a total of 3 crimps on the crimp. Avoid crimping right at the edge/end of the crimp. Once satisfied, cut the free ends of the suture as close to the crimp as you can. If using LigaFiba®, use the dedicated LigaFiba® scissors (normal scissors will struggle to cut through LigaFiba®).

Tension may be applied using instrumentation. The tensioning device (091132A, Fig. 14a &14b) grips the free line and pulls it through the crimp with a spin lock device. Alternatively, tensioning clamps (091132P, Fig. 15a &15b) attached to the free ends of the line are then distracted using a pair of standard Gelpis.

Fig. 14a

Fig. 14b

Fig. 15a

Fig. 15b

Scan the QR code below to view a video giving details of the tensioning devices available from Vi.

Advice on Correct Crimping Technique

The crimp is oval in shape. It is important that the crimp is crimped across the wide part and perpendicular to the direction of suture. In addition, care should be taken to make sure that all the crimps are in the same plane on the tube, otherwise the crimps neutralize each other. To hold and keep the crimp in the correct orientation for successful crimping, use a small haemostat if necessary.

Crimping Errors

Unless the crimp is correctly performed, early failure of the loop may occur. The crimp must be secured with 3 evenly spaced crimps, placed with evenly-applied pressure. One or two crimps are not enough to ensure closure. Crimping too close to the end of the tube will damage the line and lead to early failure (Fig. 16).

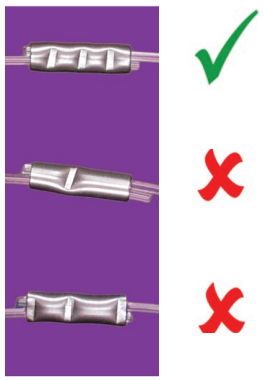


Fig. 16

With thanks to Gareth Arthurs PGCertMedEd MA VetMB CertVR CertSAS DSAS(Orth) FHEA FRCVS RCVS Recognised Specialist in Small Animal Surgery (Orthopaedics) for his invaluable assistance with the revised version (2023) of this Surgery Guide.

9. Closure

- Flush the surgical site thoroughly.
- Close the fascia of the proximal cranial tibial muscle and the medial tibia.
- Close the lateral retinaculum.
- Close the subcutaneous fascia and the skin.

Final stability of the repair is due to periarticular fibrosis. The suture will typically fail between 6-10 weeks post-op and may show itself as a transient lameness of 1-2 days. Most stifles stabilized by extra-capsular suture are unstable to palpation at 6-8 week re-check.

Featured Products

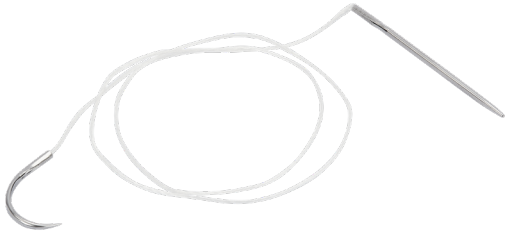
Please note, the following featured products are only a selection of those available in the range.

LigaFiba® Lateral Suture With Crimp Starter Kit

LFLSCRSTARTER LigaFiba® Lateral Suture with Crimp Starter Kit
LFLSCRSTARTER/S LigaFiba® Lateral Suture with Crimp Starter Kit For Smaller Breeds

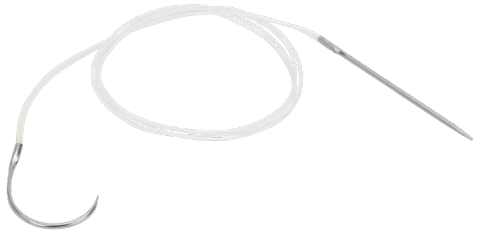
Please contact a member of the Vi team for a list of the contents of these kits.

LigaFiba® Lateral Sutures



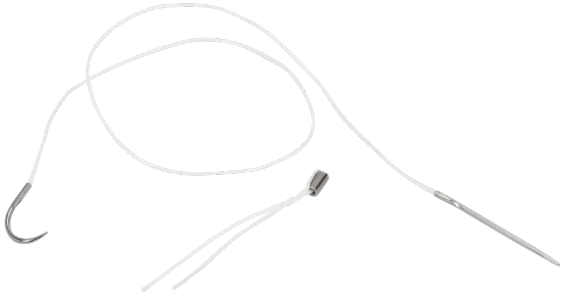
LFLS75 75 LigaFiba® Lateral Suture (300mm)
LFLS150 150 LigaFiba® Lateral Suture (500mm)
LFLS500 500 LigaFiba® Lateral Suture (600mm)

Double LigaFiba® Lateral Suture



LFLS250D Double 250 LigaFiba® Lateral Suture (500mm)

LigaFiba® Lateral Sutures With Crimp



LFLSCR75 75 LigaFiba® Lateral Suture (300mm) + Crimp
LFLSCR150 150 LigaFiba® Lateral Suture (500mm) + Crimp
LFLSCR250 250 LigaFiba® Lateral Suture (500mm) + Crimp
LFLSCR250D Double 250 LigaFiba® Lateral Suture (500mm) with 2 Crimps
LFLSCR500 500 LigaFiba® Lateral Suture (600mm) + Crimp

Nylon Lateral Suture Starter Kits

091154 CCL Suture System (Swaged on) Basic Kit Crimping Forceps 2x Each Size Nylon/Needle/Crimp Sterile Packs

091150 CCL Suture System (Swaged On) Compound Action Kit 2x Each Size Nylon/Needle/Crimp Sterile Packs

091151 CCL Suture System (Swaged On) Basic Kit Plus Forceps 2x Each Size Nylon/Needle/Crimp Sterile Packs Plus Heavy Duty Needleholders

Please contact a member of the Vi team for a list of the contents of these kits.

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

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)

Double Leader Line Loop on Needle

091160 50lb Double Line (500mm x 2 As Loop) On V Small Fabella Needle
091161 80lb Double Line (800mm x 2 As Loop) On Small Fabella Needle
091162 100lb Double Line (800mm x 2 As Loop) On Medium Fabella Needle

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)

Instrumentation For Lateral Suture

Heavy Duty Needle Driver

091153 Heavy Duty Needle Driver With Tungsten Jaws 195mm Long

Crimping Forceps

091135 Crimping Forceps 195mm Long

Compound Action Crimper

091135C Compound Action Crimper 230mm Long

Compound Action Crimpers For LigaFiba®

091135M LigaFiba® Compound Action Crimpers 245mm

Bone Tunnel Borer

001070M Bone Tunnel Borer 2mm Modular
001073M Bone Tunnel Borer 2.5mm Modular
001071M Bone Tunnel Borer 2.7mm Modular
001075M Bone Tunnel Borer With Countersink Modular Set

LigaFiba® Scissors

LFS140TC LigaFiba® Scissors T.C. 145mm

CCL Tensioning Devices

091132P CCL Tensioning Device (Pair - Gelpis Not Included)

091132A CCL Loop Tensioner 175mm

091158 Lateral Suture Tensioner 170mm

Crimps For Nylon

091140 10mm Tube Crimp for 50lb Line (Non Sterile)
091136 12mm Tube Crimp for 80lb + 100lb Line (Non Sterile)
091133 14mm Tube Crimp (Non Sterile) Suitable For Nylon Over 100lb
091140/10 10mm Tube Crimp For 50lb Line (Non Sterile) 10 Pack
091136/10 12mm Tube Crimp For 80lb+100lb Line (Non Sterile) 10 Pack
091133/10 14mm Tube Crimp (Non Sterile) Suitable For Nylon Over 100lb 10 Pack

LigaFiba® Crimps

LFCRIMP75 Crimp for 75lb LigaFiba®
LFCRIMP150 Crimp for 150lb LigaFiba®
LFCRIMP250 Crimp for 250lb LigaFiba®
LFCRIMP500 Crimp for 500lb LigaFiba®
091135M LigaFiba® Compound Action Crimpers 245mm

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