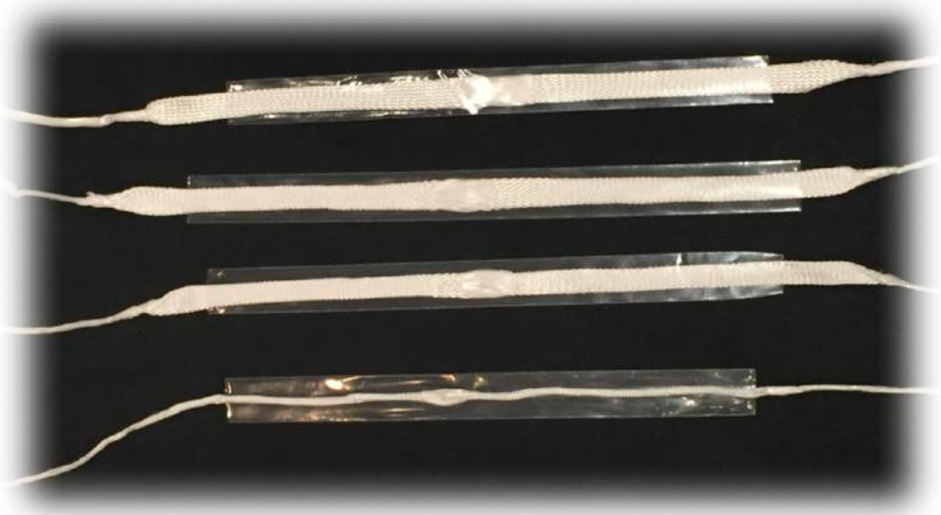
CRANIAL CRUCIATE LIGAMENT RECONSTRUCTION

VETLIG GLOBAL

The free fibers for the respect of biology

STIF SAS
SOFT TISSUE INTERNAL FIXATION

THE CHOICE OF LIGAMENT DEPENDS ON THE ANIMAL'S WEIGHT AND ACTIVITY.



WEIGHT	LIGAMENT
3 - 7 kg	16 fibres / 10mm fibres libres
7-12kg	24 fibres / 15mm fibres libres
12-25kg	32 fibres / 17mm fibres libres
+ 25kg	48 fibres / 19/22/25mm fibres libres

Note:

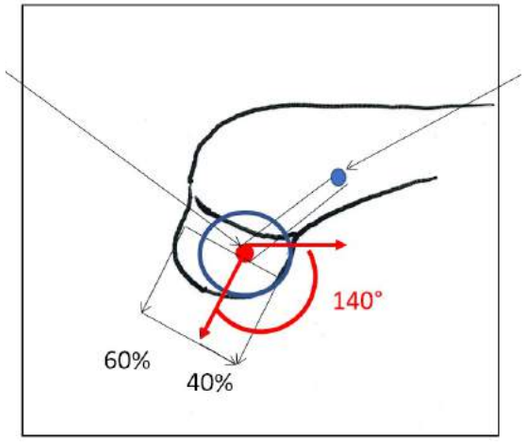
For the 48 fibers ligament, the length of the intra-articular fibers is determined intra-operatively according to the length of the original ligament estimated with a scaler (intra-articular distance between the entrances to the tibial and femoral tunnels).

Anatomical reminder:

Femoral insertion of the cranial cruciate ligament

The center of the anatomical insertion on the medial side of the lateral condyle corresponds to the center of the 140 ° arc formed by the posterior portion of the condyle. The radius of the circle varies depending on the size. This is where the synthetic ligament has to be inserted as it is the most isometric zone.

ENTRANCE POINT



EXIT POINT

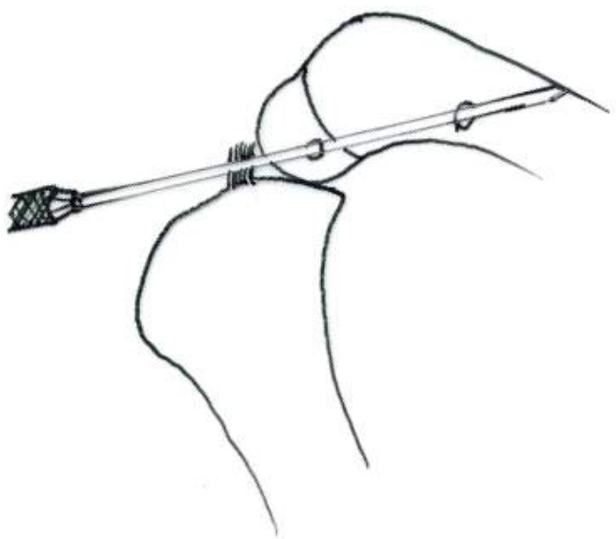
RESPECT FOR THIS ISOMETRIC POINT IS FUNDAMENTAL FOR THE SUCCESS OF THE PROCEDURE.

Surgical Technique

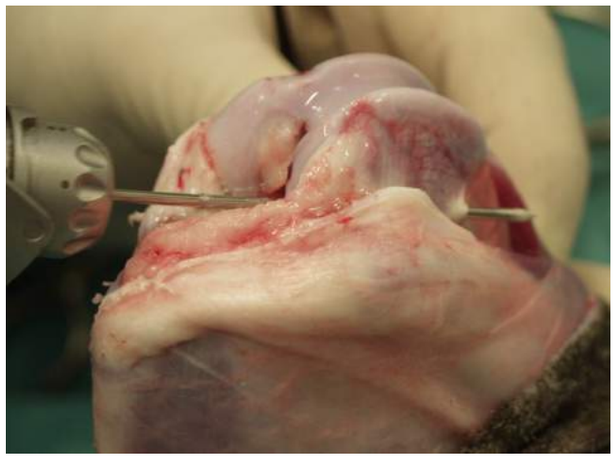
Arthroscopic placement is certainly the ideal technique, but requires specific training and equipment.

The path of choice is an internal arthrotomy starting from the tibial tuberosity inside the crest, passing 1 cm from the edge of the patella and then inside the vastus medialis.

The external dislocation of the patella and the hyperflexion provide a very good view of the intercondylar notch and, after resection of the fat pack under the patellas, allows a complete exploration, particularly of the menisci.



Step 1: Placement of the femoral guide pin:



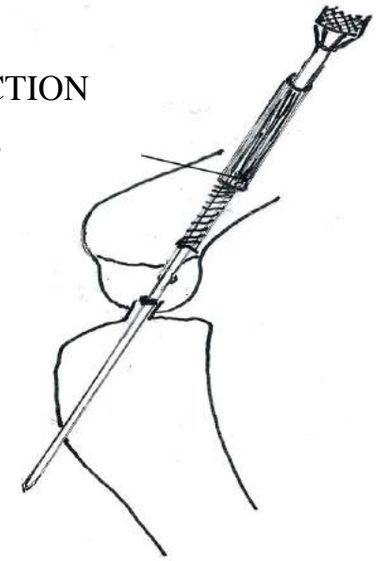
The joint is in hyperflexion; a 2mm double-pointed pin is inserted into the external condyle from inside to outside from the insertion area to the midline of the external femur.

Care must be taken to ensure that the pin is at equal distance from the outer and inner edge of the notch to avoid subsequent friction. The pin inserted from the inside out enters the stifle flush with the tibial plateau, passes over the middle of the tibial insertion of the LCCr, and crosses the edge of the lower third of the anterior aspect of the posterior crossbite.

Note: If a 16 or 24-fibers ligament will be be inserted, this 2mm pin will then be replaced by a 1mm pin, which is suitable for guiding the 2.5mm and 3mm cannulated drill but is too flexible for the initial drilling.

Step 2: Drilling the femoral tunnel

PROTECTION SLEEVE



The protective tube is placed over the drill bit to protect the soft tissue. The femoral tunnel is drilled from outside to inside with the cannulated drill to avoid damage to the remains of the broken cruciate and cartilage.

The diameter of the drill is chosen according to the ligament used:

LIGAMENT	RECOMANDED DRILL BIT
16 fibers	2,5mm
24 fibers	3,0mm
32 fibers	3,6mm
48 fibers	4,2mm

Notes:

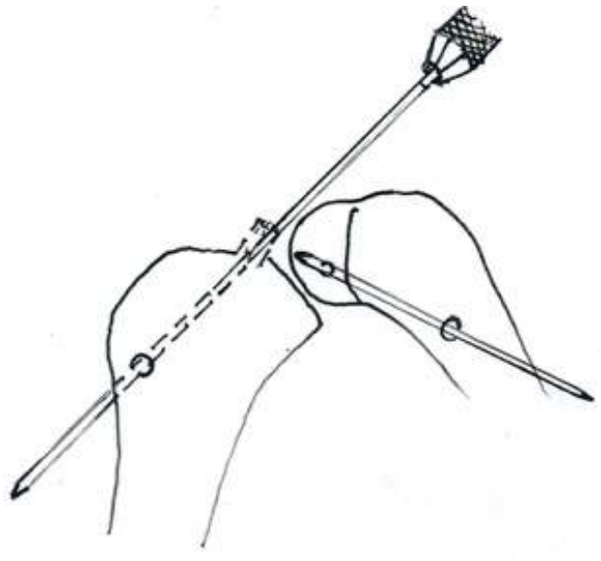
- It is important to stay in line with the guide pin that has been previously inserted when drilling the tunnel.

- The drilling of the femoral tunnel then provides some latitude to correctly place the guide pin in the middle of the tibial insertion of the native cruciate ligament for the next step.

Step 3: The guide pin is pushed into the tibia.

The guide pin, which is reinserted in the femoral tunnel, is inserted from top to bottom into the tibia. The flexion is adjusted so that the point of penetration is in the posterior part of the foot of the LCCr.

Step 3bis: Another option for the tibial guide pin



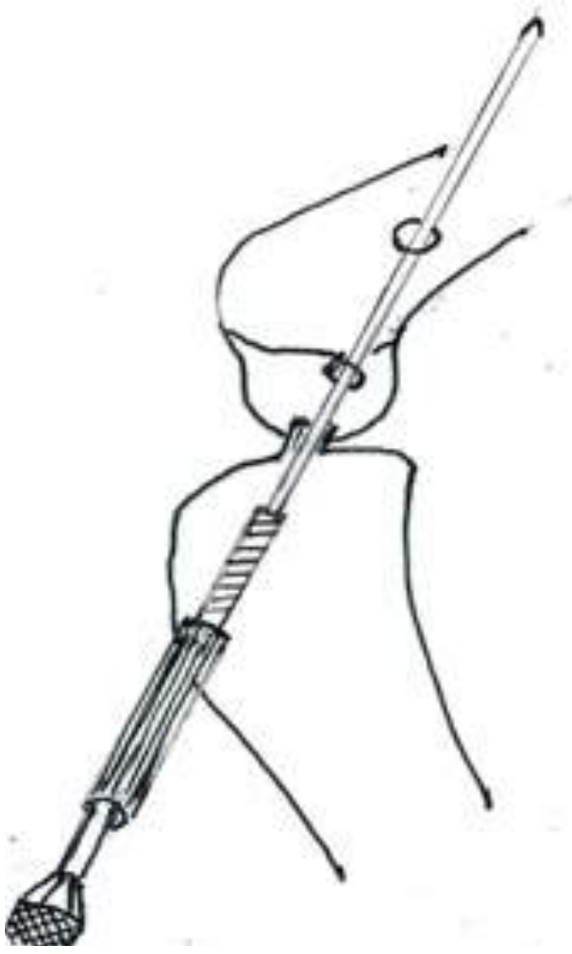
If the orientation of the pin in place in the external condyle does not allow perfect placement of its penetration point in the tibia and there is a risk of friction of the ligament on the edges of the notch; a second pin is then inserted directly.

Its tip is placed in the posterior part of the tibial insertion and pushed by the motor towards the medial cortex.

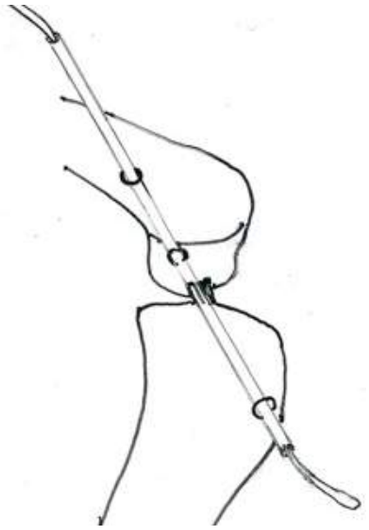
Step 4: Drilling the tibial tunnel

The cannulated drill bit adapted to the ligament to be used is guided by the pin.

The tunnel is drilled from outside to inside and the drilling is stopped as soon as the tibial plateau is crossed.



Step 5: Passage of the ligament



The loop tube is threaded onto the guide pin through the tunnels and the metal loop is inserted into it. The operation is performed in two steps if the femoral and tibial tunnels are not aligned (see step 3 bis with the tibial pin placed separately).

The loop tube is then removed, the ligament traction wire is passed through the loop and the ligament is pulled through the bone tunnels until the free fibers are centred in the joint.

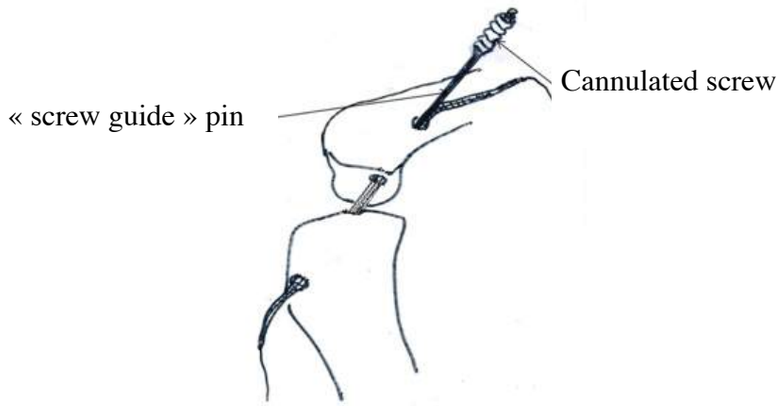
<u>Points of attention:</u>

- It is important to engage the end of the ligament in the tunnel entrance before pulling on the traction threads (if necessary, enlarge this entrance).

- It is also important that none of the braided fibers engage in the joint, as these have much lower fatigue strength and especially torsional resistance than the free fibers.

Step 6: Femoral fixation

The round pin (0.9 mm or hexagonal pin depending on the screw diameter) is inserted into the tunnel, parallel to the ligament to prevent the screw from diverging.



Choice of screws and corresponding screwdriver:

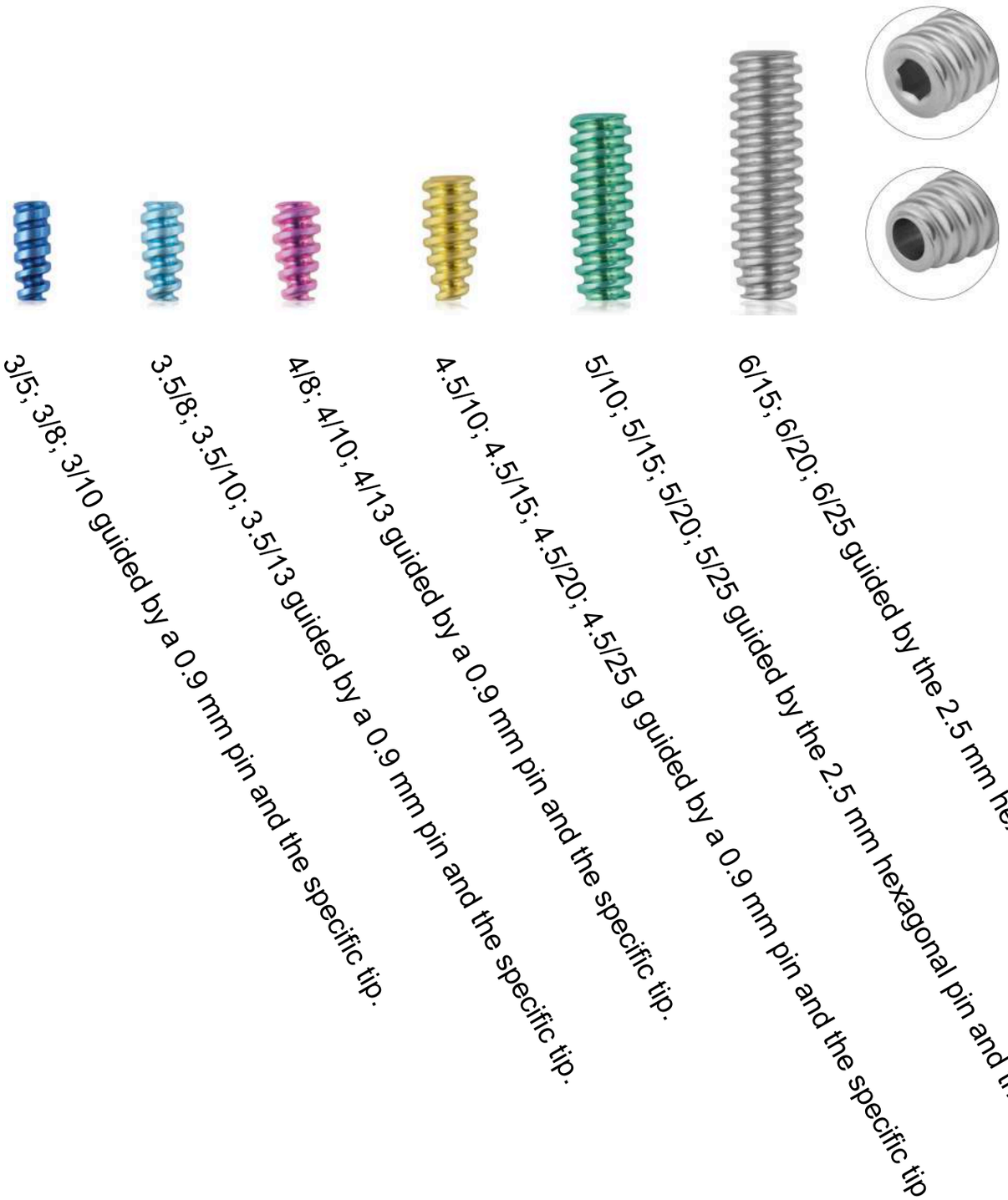
In general, the screw diameter should be 0.5 to 1 mm larger than the tunnel diameter.

The screw is selected according to the length and diameter of the tunnel: the choice of diameter also depends on the density of the bone and the firmness of the screw. The screw head must be flush with the cortex.

This screw inserted in the primary tunnel is primarily intended to prevent any transverse movement of the ligament in the tunnel to avoid any risk of secondary widening.

Different screw sizes are available:

Measurements in mm: diameter / length



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There is 1 single screwdriver handle with 3 different bits for the different screws :

- A specific hexagonal tip cannulated at 1 mm, used for screws from 3 mm to 3.5 mm (guided by the 0.9 mm pin).

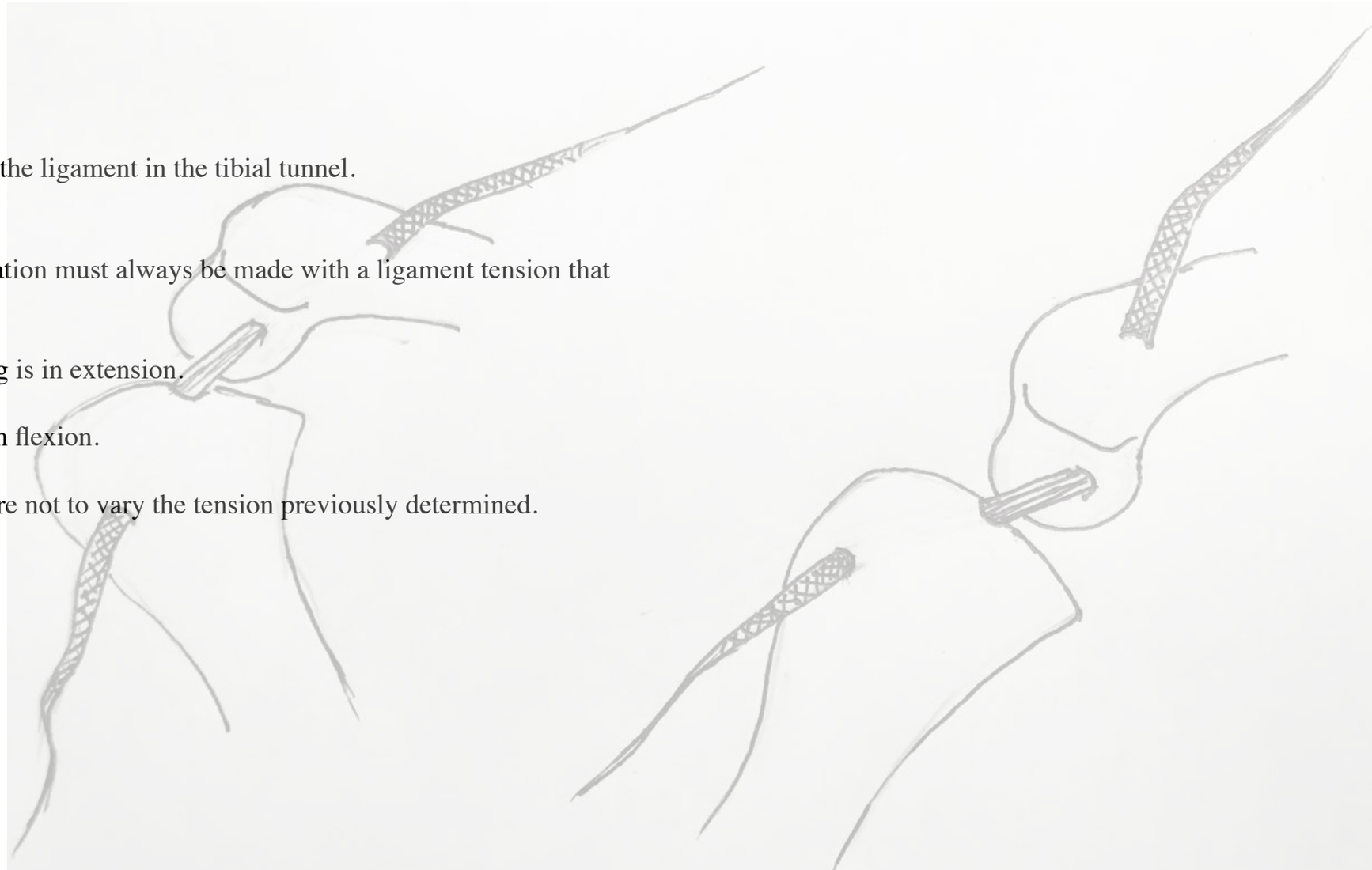
- A specific hexagonal tip, cannulated at 1mm, used for 4mm and 4.5mm screws (guided by the 0.9mm pin).

- A specific hexagonal cannulated tip adapted to the hexagonal pin, used for 5 mm and 6 mm screws.

Step 7: Tension adjustment and tibial fixation

The patella is put back in place.

The ligament is then held relatively taut by its tibial end (between the surgeon's fingers or with a clamp) and the joint is successively flexed and extended.



If the placement is isometric, there is no swallowing of the ligament in the tibial tunnel.
If the placement is not completely isometric :

A swallow of 1 or 2 mm is acceptable, but the tibial fixation must always be made with a ligament tension that allows complete mobility, namely:

- Place the screw in the extension position if swallowing is in extension.
- Place the screw in the flexion position if swallowing in flexion.

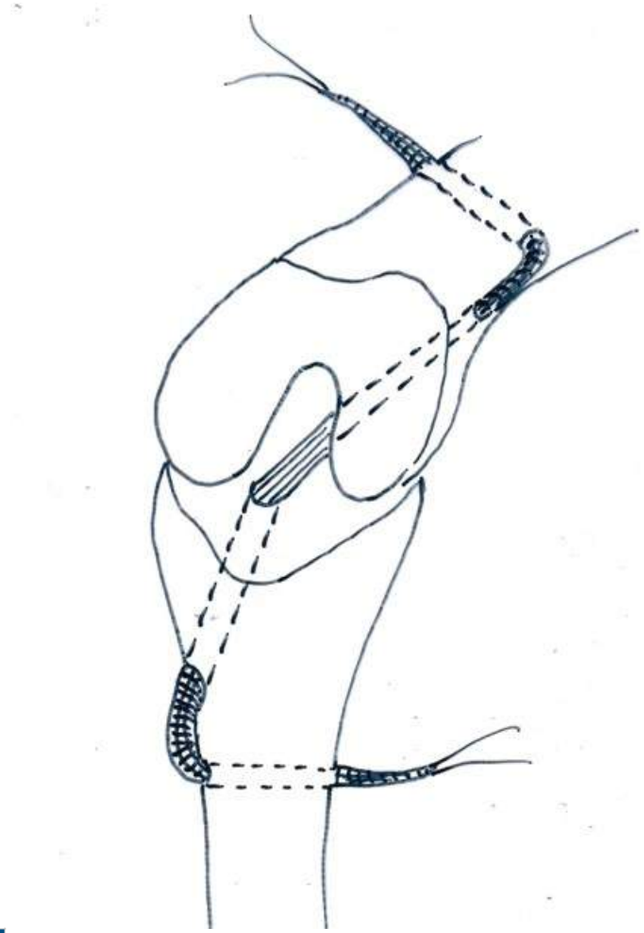
Insert the screw guide pin and then the screw, taking care not to vary the tension previously determined.

<u>Note:</u> If laxity is found, it is important to remember that relative laxity does not necessarily mean instability!

If the ligament is not placed completely isometrically and a slight laxity exists, the surgeon must judge whether this is acceptable or whether it is necessary to renew the fixation by giving the ligament more tension.

However, under no circumstances should the tension of the ligament prevent the joint from moving completely!

Step 8: additional fixing



For immediate mechanical fixing, it is necessary to double the fixing carried out in the primary tunnels.
A transverse tunnel is drilled 10 to 15 mm above the exit of the primary femoral tunnel.
The cortex must be well cleaned of any soft tissue between the two tunnels to avoid any interposition under the ligament. The ligament is passed through with a metal loop and then tightly stretched. A suitable interference screw blocks the ligament.

As on the femoral side, a transverse tunnel is drilled from inside to outside 10 mm under the primary tibial tunnel.
To do this, it is necessary to make a 3 cm incision in the fascia along the tibial crest and to recline the muscles of the antero-external lodge to protect them from the drill with a retractor or a rugine.
The ligament is passed through this tunnel and blocked by a final screw. Stability and mobility are further checked before cutting the ligament ends flush with the bone.

The knee is thoroughly washed, additional haemostasis is applied and the knee is closed plane by plane.
Post-operative care: No immobilisation, no splinting. Immediate support. Control the animal's activity until the wound is healed.

Summary table :

LIGAMENT	WEIGHT	RESISTANCE (NEWTON)	PRIMARY TUNNEL DIAMETER	PRIMARY TUNNEL SCREW	SECONDARY TUNNEL DIAMETER	SECONDARY TUNNEL SREW
CCL 16/10	3 - 7 KG	2 000 N	2.5MM	3 MM OR 3.5 MM	2.5MM OR 3MM	3MM; 3.5MM OR 4MM
CCL 25/15	7 - 12 KG	3 000 N	3MM	3.5 MM OR 4 MM	3MM	3.5MM OR 4MM
CCL 32/17	12 - 25 KG	4 000 N	3.6MM	4MM OR 4.5MM	4MM	4;5MM OR 5MM
CCL 48/19	+ 25 KG	6 000 N	4.2MM	4.5MM OR 5MM	4MM OR 4.5MM	4;5MM; 5MM OR 6MM
CCL 48/22	+ 25 KG	6 000 N	4.2MM	4.5MM OR 5MM	4MM OR 4.5MM	4;5MM; 5MM OR 6MM
CCL 48/25	+ 25 KG	6 000 N	4.2MM	4.5MM OR 5MM	4MM OR 4.5MM	4;5MM; 5MM OR 6MM

Note: This table is a guide to help the veterinarian by indicating the size of the most commonly used screws. The surgeon is the sole judge of which screw to use, particularly in relation to the bone density, which varies from one animal to another. The aim is to have a good grip in the bone without damaging the ligament and without risk of fracture.

STIF SAS

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Société par actions simplifiées au capital de 375 530 €

Head office : 651 C Chemin de la Martourette

06530 Le Tignet

France

RCS n° 522 917 939 - Grasse

SIRET : 522 917 939 00038

Intracommunity VAT number: FR 86 522 917 939

Code APE : 7219Z

VETLIG GLOBAL

Email : contact@vetlig-global.com

-

leo.brunel@vetlig-global.com

Tel : +33 (0)6 34 36 79 69

-

romain.gaucher@vetlig-global.com

Tel : +33 (0)6 84 09 60 67

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