VETLIG GLOBAL

CRANIAL CRUCIATE LIGAMENT RECONSTRUCTION VIART (Vetlig Intra Articular Reconstruction Technique)

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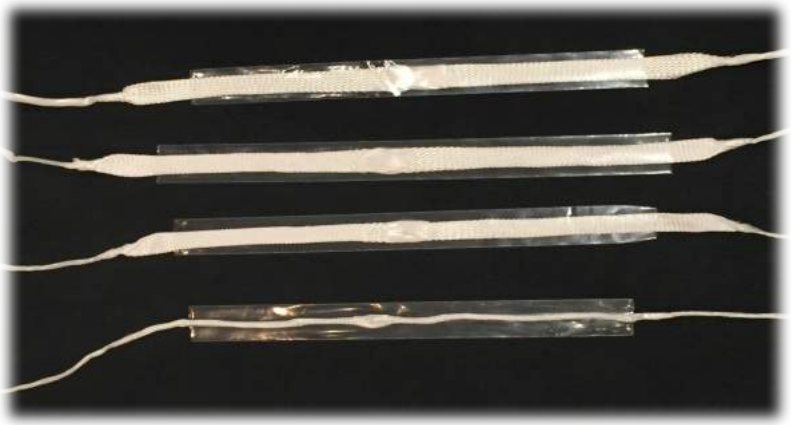
STIF SAS

SOFT TISSUE INTERNAL FIXATION

LIGAMENT CHOICE / SURGICAL TECHNIQUE

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



The best is to select the most resistant ligament compatible with the size of the bones and tunnels which can be made, and the inter-condylar notch must be wide enough to avoid any risk of friction.
As an indication :

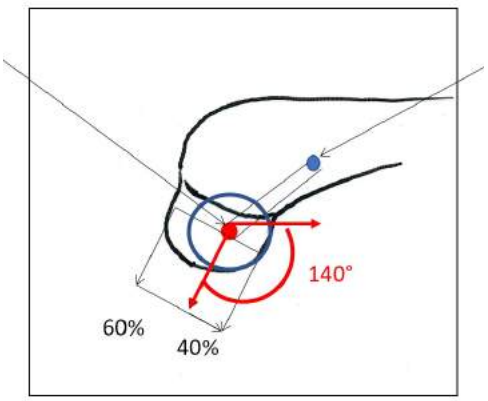
- Dog's weight 3-7 kg - ligament recommanded : 16 fibers (approx 2000 N)
- Dog's weight 7-12 kg : ligament recommanded : 24 fibers (approx 3000 N)
- Dog's weight 12-25 kg : ligament recommanded : 32 fibers (approx. 4000 N)
- Dog's weight over 25 kg : ligament recommanded : 48 fibers (approx 6000 N)
- In some rare cases, active dogs over 70 kg, it's possible to combine 2 ligaments

The length of the free fibers is determined intra-operatively according to the length of the native ligament.

Femoral Insertion of 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.

ENTRY POINT



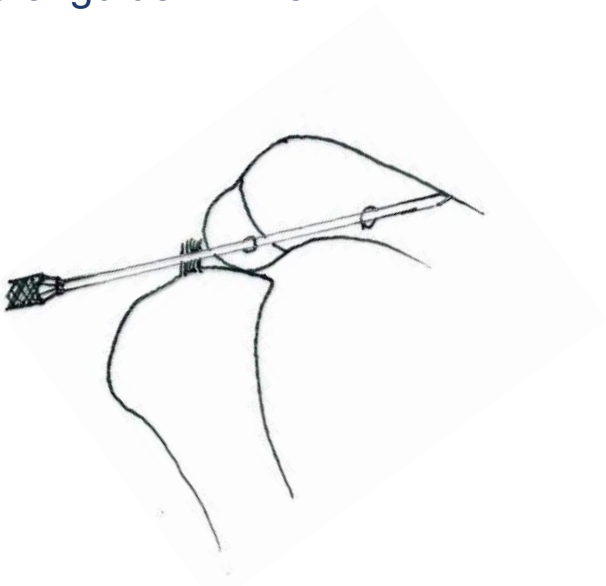
EXIT POINT

Respect for this isometric point is fundamental and conditions the success of the procedure.

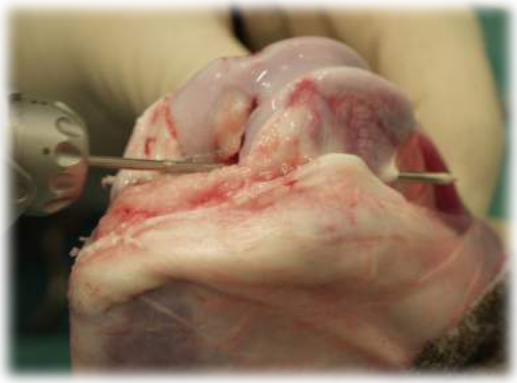
Surgical approach

Arthroscopic placement is certainly the ideal technique but requires specific training and equipment.
The best approach is a medial para-patellar arthrotomy starting from medial aspect of the tibial tuberosity, passing 1 cm from the edge of the patella and then along the medial edge of the vastus medialis. The lateral dislocation of the patella and hyperflexion offer a very good view of the inter-condylar notch and after excision of the infrapatellar fat pad allows a complete check up of the joint. The remnants of the torn CrCL must be kept as they contain the seeds for fibroblastic ingrowth inside the free fibers.

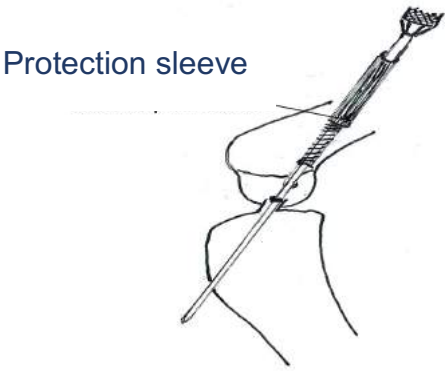
Step 1: placement of the femoral guide K-wire



With the joint in hyperflexion, a double trocar-ended 2 mm K-wire is inserted into the lateral condyle inside out from the insertion point to the middle part of the lateral cortex of the femur.
Care must be taken to ensure that the pin is equidistant from the medial and lateral edges of the notch to prevent further friction. The K-wire placed from inside out penetrates into the stifle flush to the tibial plateau, passes over the middle of the tibial insertion of the CrCL, and crosses the lower third part of the lateral edge of the caudal cruciate.
In case the 16 fibers or 24 fibers ligament is to be used, this 2 mm K-wire can then be replaced by a 1 mm pin suitable for guiding the 2.5 mm or 3mm drill but too flexible for drilling.



Step 2: drilling of the femoral tunnel

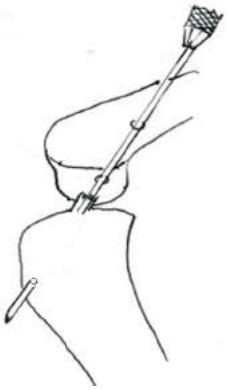


The protection sleeve is put in place on the drill bit to protect the soft tissues. The femoral tunnel is drilled outside-in with the cannulated drill bit to avoid damaging the remnants of the torn cruciate and the cartilage.
The diameter of the drill is chosen according to the selected ligament:

- 4.2 mm cannulated drill for 48 fibers ligaments
- 3.6 mm cannulated drill for 32 fibers ligaments
- 3 mm cannulated drill for 24 fibers ligaments
- 2.5mm cannulated drill for 16 fibers ligaments.

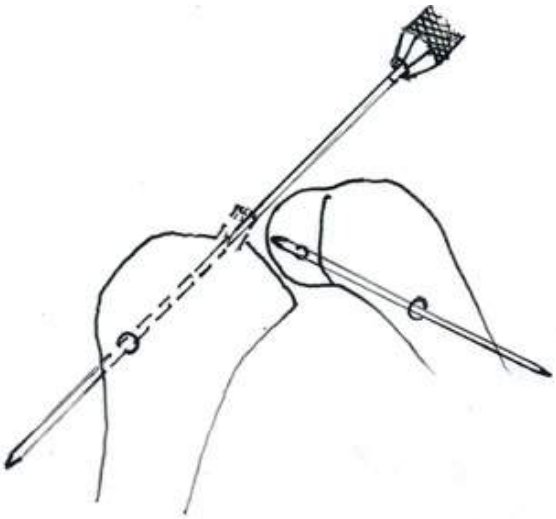
The primary drilling of the femoral tunnel makes it more easy for a correct placement of the 2mm guide K-wire in the middle of the tibial CrCL foot print.

Step 3: the guide K-wire is inserted into the tibia



The guide K-wire is drilled downwards inside-out into the tibia. Flexion and rotation are adjusted to allow the entrance of the K-wire into the posterior part of the CrCL foot print and the exit at 2 cm at least below the joint line on the medial aspect of the tibia.

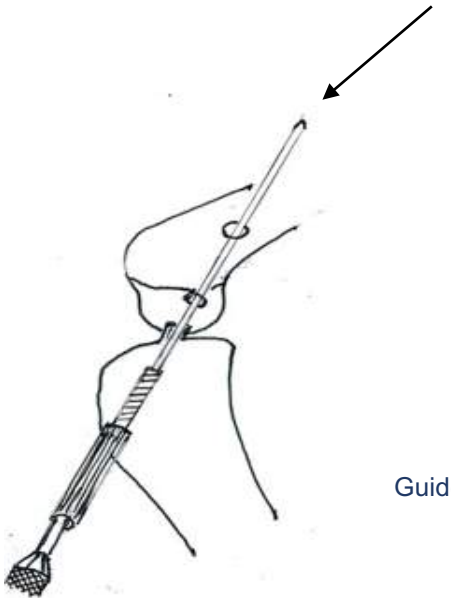
Step 3 bis: another option for the tibial K-wire



If the orientation of the K-wire in the femur does not allow a proper direct placement in the tibia or could lead to a friction of the ligament against the notch, the K-wire can be drilled separately with the joint in hyper flexion.
The K-wire is placed into the CrCL's foot print and drilled down towards the medial tibial cortex.

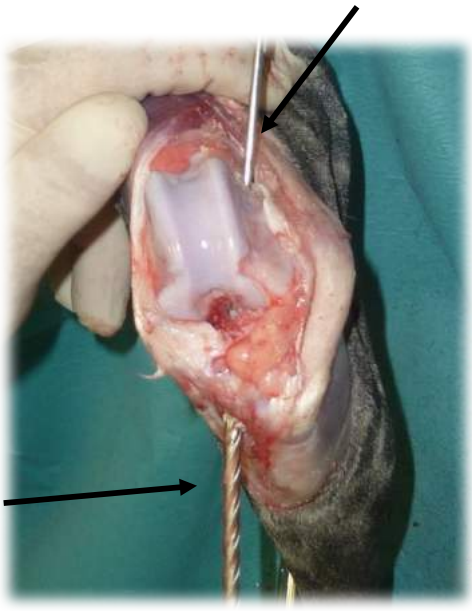
Step 4: drilling of the tibial tunnel

Hold the K-wire during the tibial drilling



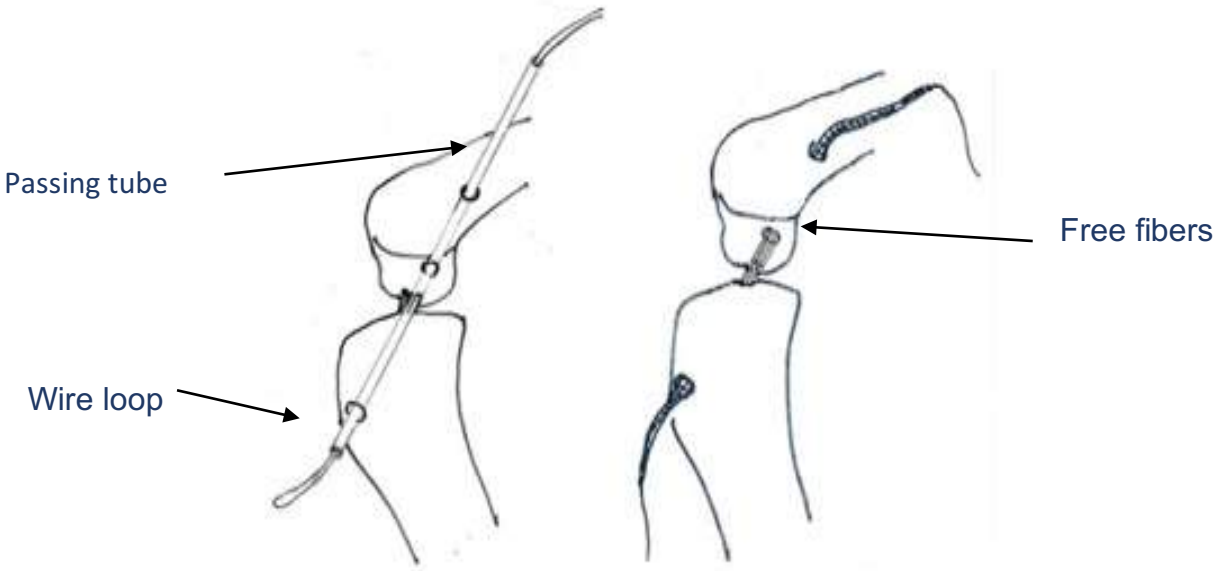
femoral K-wire exit

Tibial drill bit
Guided by the K-wire



The cannulated drill bit adapted to the size of the ligament is guided by the K-wire. The drilling is performed from outside-in and is immediately stoped when the tibial plateau is reached to avoid damages to remnants and cartilage.

Step 5: passage of the ligament



The wire passing tube is placed through the tunnels followed by the wire loop. The passing tube is removed.
This procedure is in fact performed in 2 different steps if the femoral and tibial tunnels are not aligned (femoral and tibial guide K-wires inserted separately).

The leading thread of the ligament is inserted through the loop and the ligament is pulled until the free fibers are adjusted intra articularly.

Important note:

- It is important to engage the end of the ligament into the tunnel entrance before pulling the leading threads (if necessary, enlarge this entry).
- It is also essential that the braided fibers should not be engaged in the joint, because their resistance to fatigue and in particular to torsion is much less than the resistance of the free fibers.

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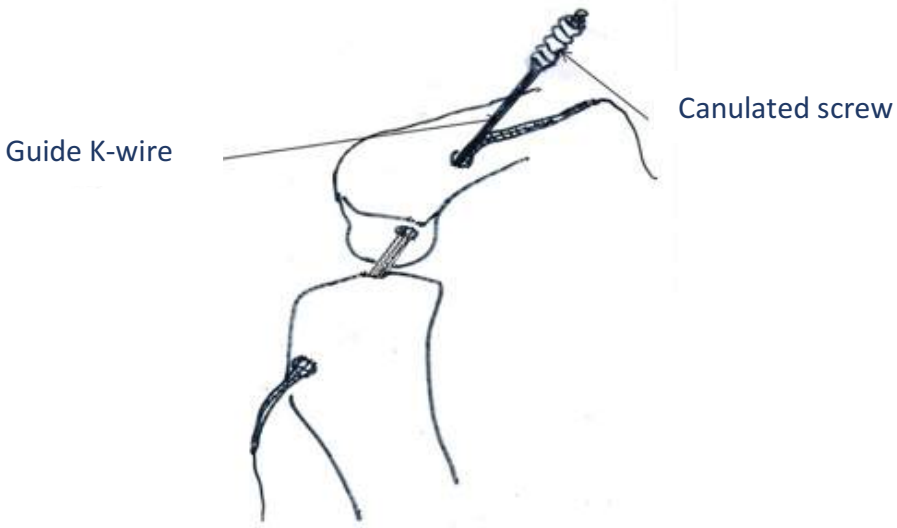
Step 6: femoral fixation



A blunt I mm K-wire or the hexagonal pin is selected according to the diameter of the selected screw. The K-wire is placed into the tunnel along the ligament, parallel to it, to guide the screw and avoid any divergence in the spongious bone.

The screw must be adapted to the length and the diameter of the tunnel: usually the diameter of the screw should be 1mm bigger than the diameter of the bone tunnel. If the density of the bone is poor, a bigger screw must be used.

For a strong immediate mechanical fixation, it is mandatory to complete the primary fixation. A transversal tunnel is drilled 10 mm above the exit of the primary tunnel with the adapted sharp drill bit. The ligament is passed through this tunnel with the help of the wire loop and tightened.

A screw selected according to the bone density will firmly fix the ligament.
The screw head should be flush to 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 enlargement.

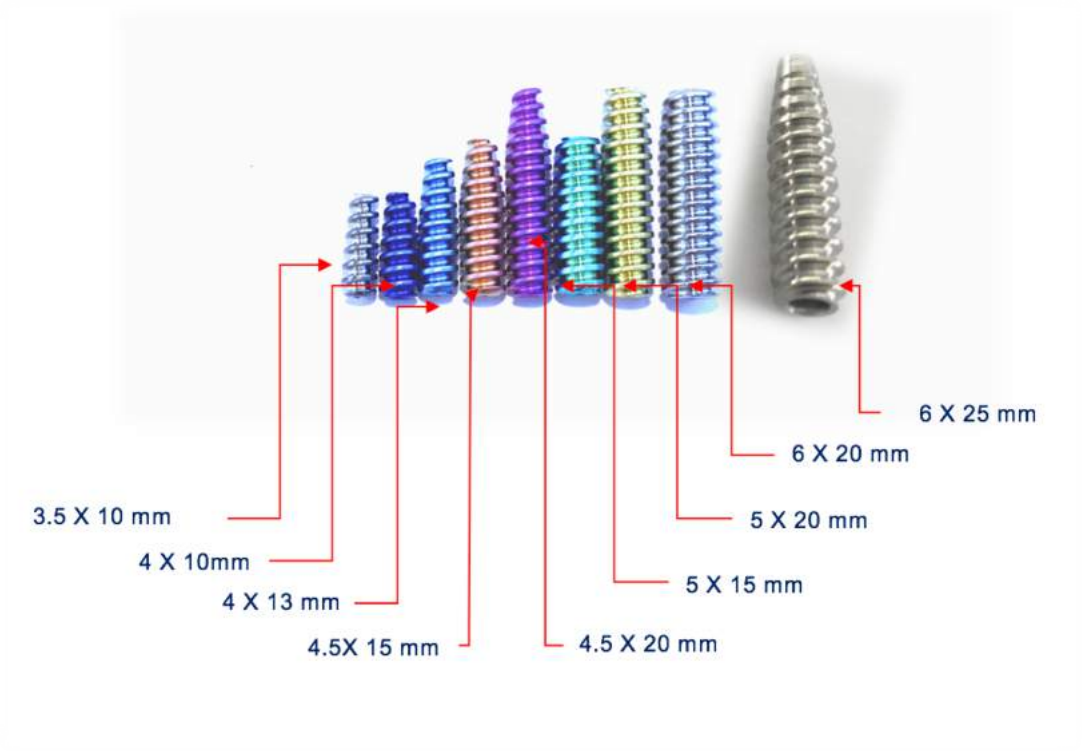
Choice of the screws and corresponding screwdrivers

In general, the diameter of the screw must be at least 1 mm greater than the diameter of the tunnel.

The screw is chosen according to the length and the diameter of the tunnel. The screw should be only along the braided part of the ligament and not reach the free fibers. The choice of the diameter depends on the density of the bone and the firmness of the screwing.

Different sizes are available :

- 3.5 mm X 10 mm guidées par une broche de 0.9 mm.
- 4 mm X 10 mm / 4 mm X 13 mm
- 4.5 X 15 / 4.5 X 20 guidées par une broche de 0.9 mm.
- 5 mm X 15 mm / 5 X 20 / 6 X 20 / 6 X 25 guidées par la broche hexagonale de 2,5 mm.



There are 3 different screwdrivers :

- A specific torx screwdriver cannulated at 1mm, used for the 3.5mm screws with the 0.9mm K-wire.
- A male hexagonal screwdriver, cannulated at 1mm, used for the 4mm and 4.5mm with the 0.9mm K-wire.
- A female screwdriver cannulated for a hexagonal K-wire which is used for 5mm and 6mm screws.

Step 7: adjustment of tension and tibial fixation

The patella is replaced into the trochlea.
The ligament is pulled by its tibial end (between the fingers of the surgeon or a clamp) and the joint is moved: flexion and extension are made several times.

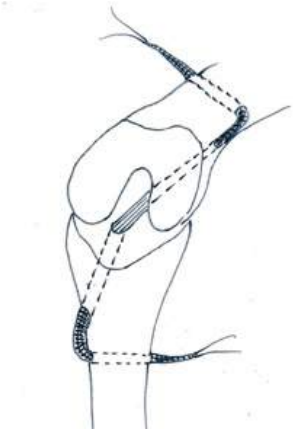
If the placement is isometric, there is no “swallowing” of the ligament into the tibial tunnel during the full range of motion.
If the placement is not totally isometric:

- A small sliding of 1 or 2 mm is acceptable but the tibial fixation should always be done with a tension of the ligament which allows a complete range of motion. The ligament must never be over tight:
  a) Put the screw in position of flexion if the ligament is swallowed in flexion
  b) Put the screw in position of extension if the ligament is swallowed in extension.

The screw guide pin and the screw are inserted being careful not to change the tension previously determined.

Note: if a laxity is observed, it should be kept in mind that (relative) laxity does not necessarily mean instability. If the ligament is not placed completely isometrically and a minor laxity is found, the surgeon will judge whether it is acceptable or whether it is necessary to renew the fixation by giving a higher tension on the ligament but always in the appropriate position as defined above.

Step 8: completion of tibial fixation



Likewise it has been made on femoral side, a transverse tunnel is drilled 10 or 15 mm under the primary tibial tunnel.

To do this, it is necessary to incise the aponeurosis on 3 cm along the tibial crest and to retract the antero-leteral muscles to protect them from the drill with a retractor or a rug.

The ligament is passed through this tunnel and fixed by a screw.
Stability and mobility are checked once more before cutting the ligament ends flush to the bone.

Recapitulative table:

MODEL	RESISTANCE (Newton)	DIAMETER OF PRIMARY TUNNELS	PRECONISED SCREW - PRIMARY TUNNEL	DIAMTER OF TRANSVERSAL TUNNEL	PRECONISED SCREW - TRANSVERSAL TUNNEL
CCL 16/10	2 000 N	2.5 mm	3.5 mm	2.5 mm or 3 mm	3.5 mm or 4 mm
CCL 24/15	3 000 N	3 mm	4 mm or 4.5 mm	3 mm	4 mm or 4.5 mm
CCL 32/17	4 000 N	3.6 mm	4.5 mm or 5 mm	3mm or 4 mm	4.5 mm or 5 mm
CCL 48/19	6 000 N	4.2 mm	5 mm or 6 mm	4 mm or 4.5 mm	5 mm or 6 mm
CCL 48/22	6 000 N	4.2 mm	5 mm or 6 mm	4 mm or 4.5 mm	5 mm or 6 mm
CCL 48/25	6 000 N	4.2 mm	5 mm or 6 mm	4 mm or 4.5 mm	5 mm or 6 mm
CAT 32/20	4 000 N	Depends of the available surface	Depends of the tunnel	X	X
CAT 48/25	6 000 N	Depends of the available surface	Depends of the tunnel	X	X

Post-operative care:

- No immobilization nor brace are necessary
- Full weight bearing
- Control the activity of the dog until the wound is healed

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Oct-19