

SURGICAL TECHNIQUE ACL RECONSTRUCTION

ST3/ST4 pedicle
CorTTape Small® - CorTTape Screw®
with inside-out femoral guide
+/- independent ALL

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SURGICAL TECHNIQUE

ACL RECONSTRUCTION

ST3/ST4 pedicle
CorTTape Small® - CorTTape Screw®
with inside-out femoral guide
+/- independent ALL

Preamble:

This is a biological reconstruction technique for the ACL that preserves the native ligament, as described by *Sonnery Cottet et al. (SAMBBA) (Arthrosc Tech., Vol 3, N°6, Dec 2014)*. The goal is to preserve the native attachment of the semitendinosus to the tibia and to preserve the native ACL. This technique uses an inside-out femoral guide, +/- completed by independent ALL reconstruction.

Advantages of preserving the tibial remnant:

Reduction of the risk of subsequent rupture

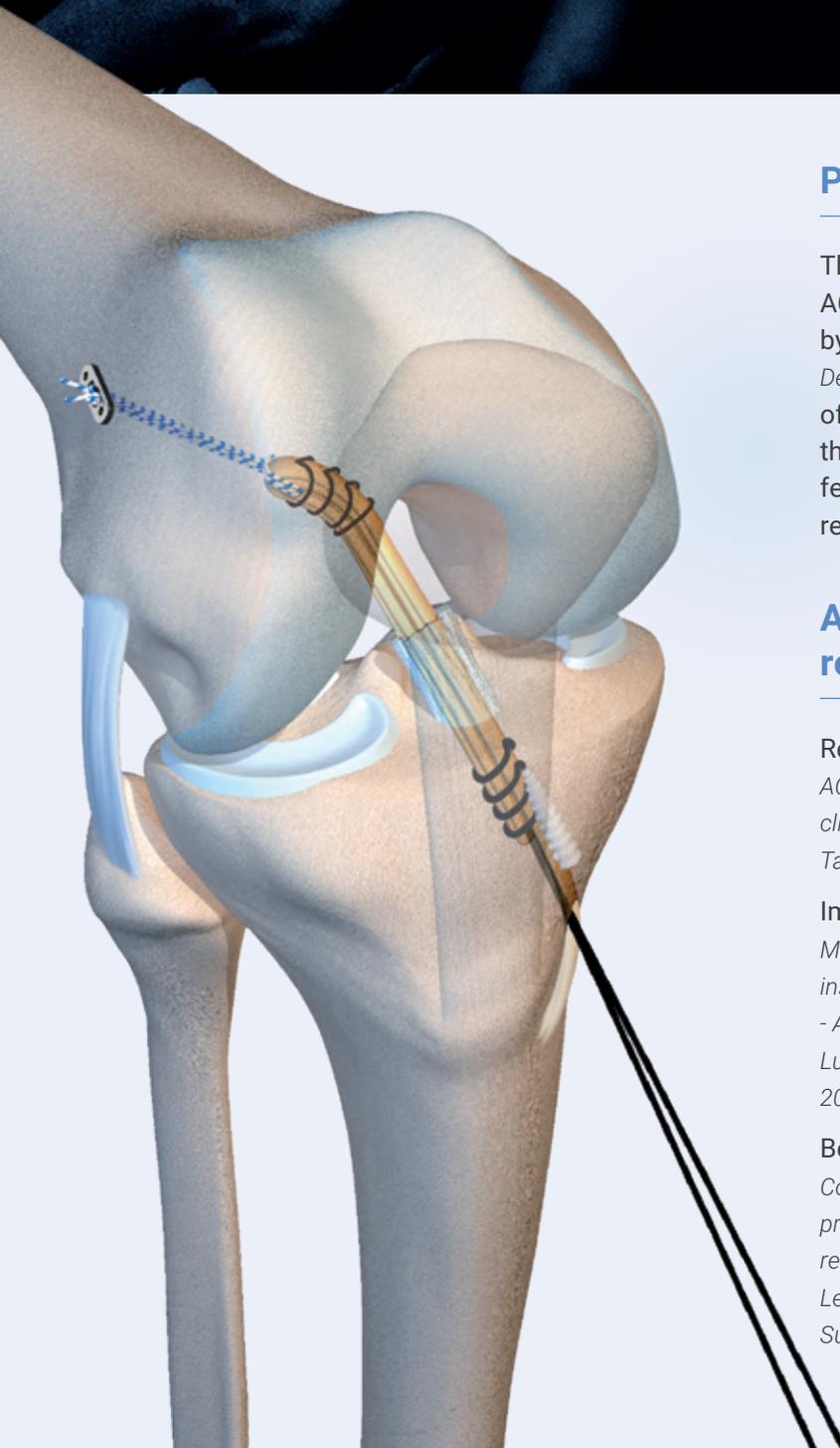
ACL reconstruction preserving the ACL remnant achieves good clinical outcomes and can reduce subsequent graft rupture, Takazawa Y et al. 2013 Orthop J Sports Med

Improved strength of tibial fixing

Mechanical advantage of preserving the hamstring tibial insertion for anterior cruciate ligament reconstruction - A cadaver study. Bahlau D, Clavert P, Favreau H, Ollivier M, Lustig S., Bonnomet F, Ehlinger M. Orthop Traumatol Surg Res. 2019 Feb.

Better proprioception

Comparison of clinical results according to amount of preserved remnant in Arthroscopic anterior cruciate ligament reconstruction using quadrupled hamstring graft. Byung-III Lee et al, Arthroscopy: The Journal of Arthroscopic and related Surgery, Vol 24, No5 (May), 2008:pp 560-568)



1. Patient positioning

- Patient in dorsal decubitus with lateral support on the thigh.
- Position two wedges for the foot, to place the knee at 30° and 90° of flexion.
- +/- The tourniquet is positioned at the top of the thigh.



2. Arthroscopic exploration

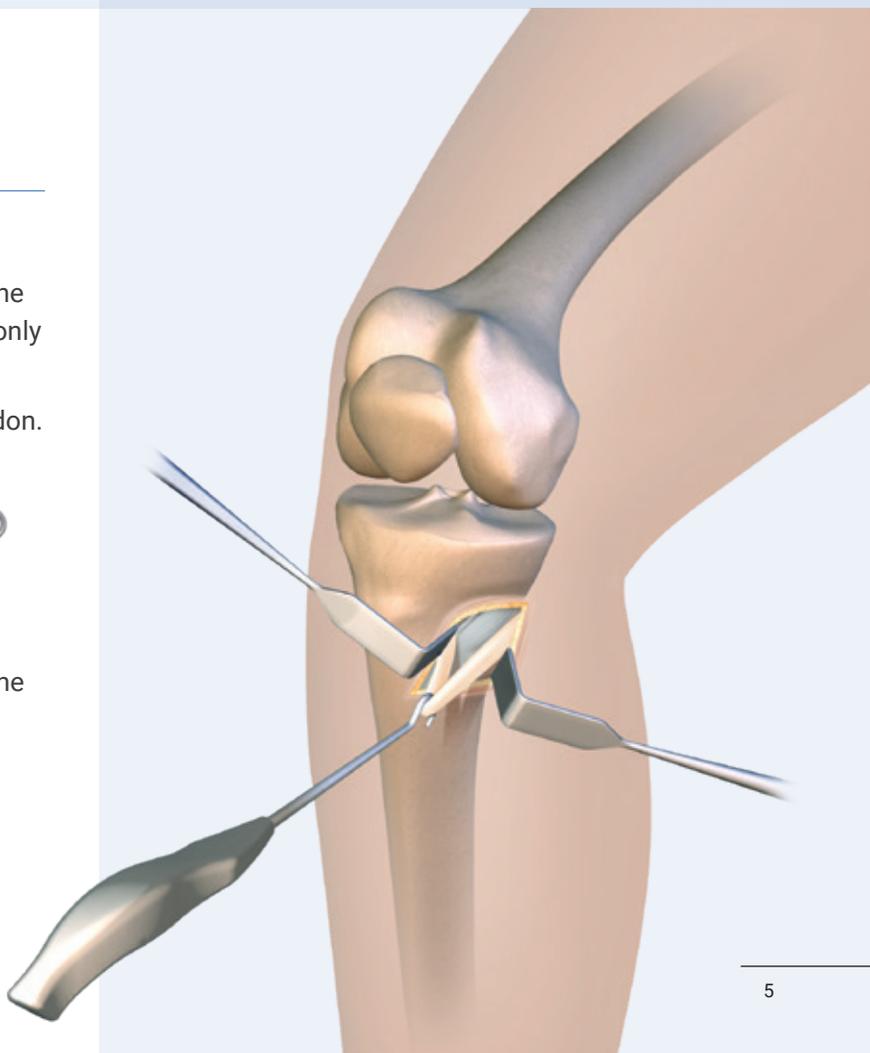
An initial arthroscopy of the knee enables analysis of the knee lesions: evacuation of articular bleeding, examination of the menisci to identify any lesion or detachment, examination of the joint cartilage.

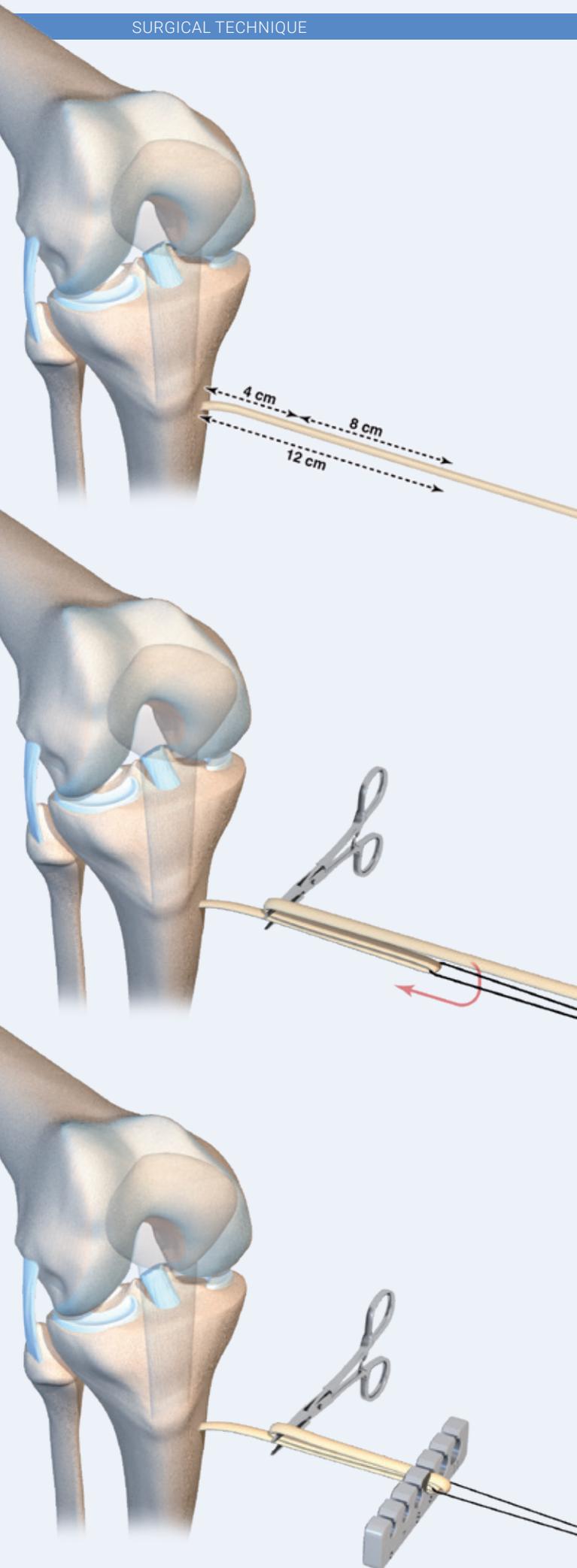
3. Graft harvesting: semitendinosus

- The knee is positioned at 90° of flexion.
- A short medial incision is made in alignment with the pes anserinus to harvest the semitendinosus (ST) only (+/- gracilis in the case of ALL).
- A harvesting hook makes it easier to grasp the tendon.



- The vincula are sectioned to release the tendon.
- The semitendinosus tendon is not detached from the tibia to ensure a pedicle graft.





4. Pre-calibration of the graft

Pre-calibration is necessary to estimate the diameter of the graft and therefore the diameter of the femoral and tibial tunnels. The length is approximate at this stage. It will be determined more accurately at a later stage, once the tunnels have been created.

- For a **man**, the approximate length is generally **12 cm**.
- For a **woman**, the approximate length is generally **11 cm**.
- **A second mark** is applied at **4 cm**. This mark corresponds to the entry of the graft in the tibial tunnel (insertion-tibial tunnel distance).
- Application of marks on the graft at 4 cm and 12 cm for a man, using a dermatograph marker.
- The semitendinosus is left as a single thickness for 4 cm and the remaining length is folded into 3 to obtain 3 or 4 thicknesses (ST3) over the 8 cm of the graft for a man or 7 cm for a woman (average).

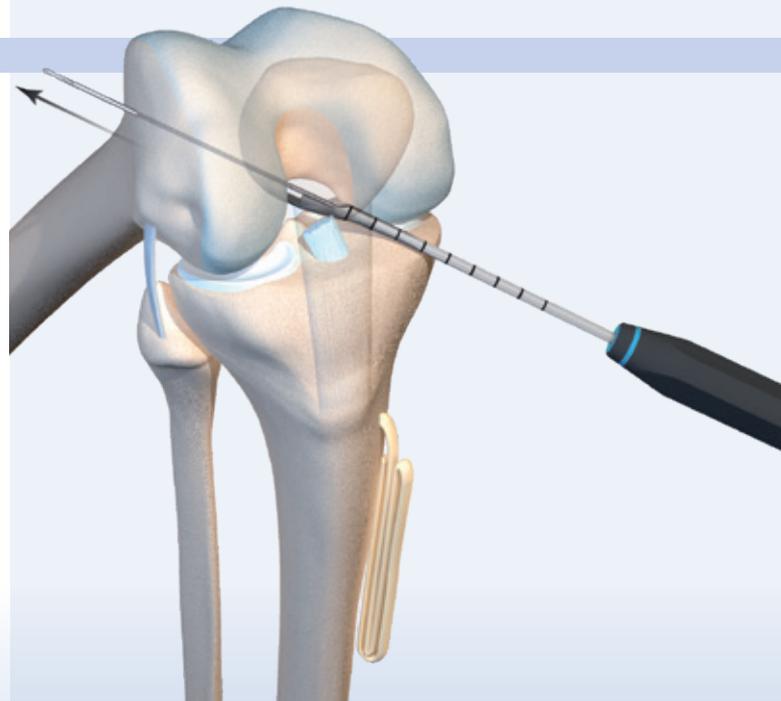
The goal is to obtain a graft diameter of AT LEAST 8 mm. If less than 8 mm, the gracilis must be used in addition (STG pedicle).

When folding the graft onto itself, the last fold should extend beyond the curvature to make it easier for the graft to pass through the tunnels.

Set aside the graft while performing the arthroscopy and creating the femoral and tibial tunnels (can be left at the incision of the tibial harvesting site).

5. Preparation of the notch

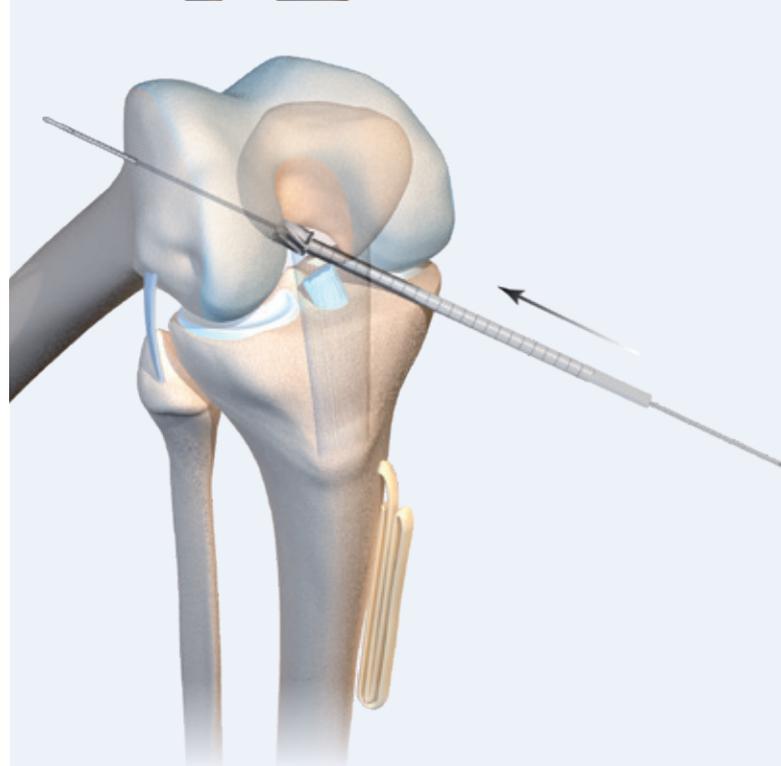
- The remnant ACL is preserved.
- Minimal debridement of the notch.
- Only the femoral insertion zone is debrided to mark the posterior limit of the notch.



6. Femoral phase

IN/OUT femoral guide

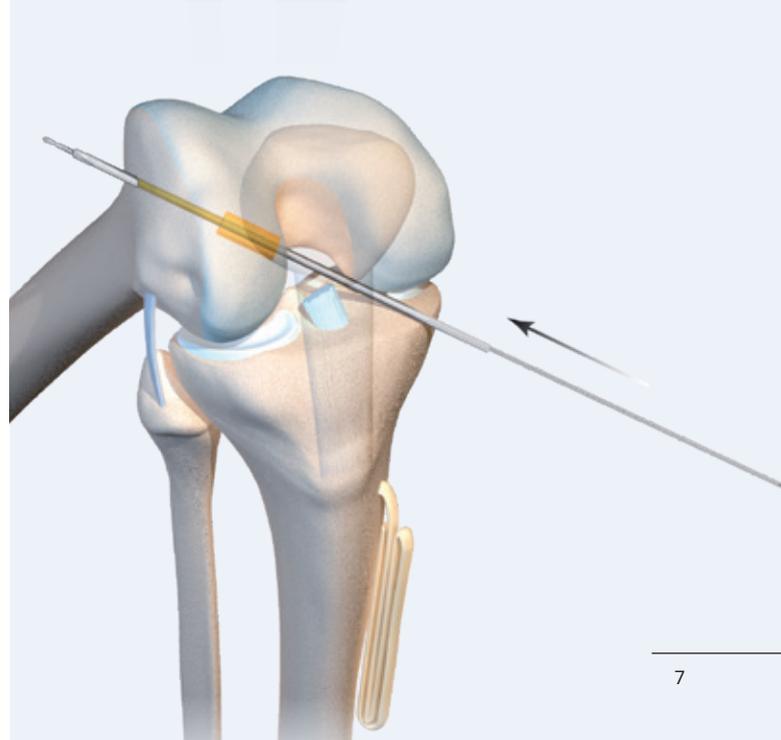
- Knee at 90° of flexion before positioning the guide.
- Positioning of the offset femoral guide (adapted to the graft diameter) via the anteromedial approach, the spatula is positioned against the posterior edge of the lateral condyle (see CorTTape® guide table in the appendix).
- Move the knee to the hyperflexion position.
- Insert the eyed pin, length 425 mm Ø2.4 mm, until it passes through the external cortical and skin.

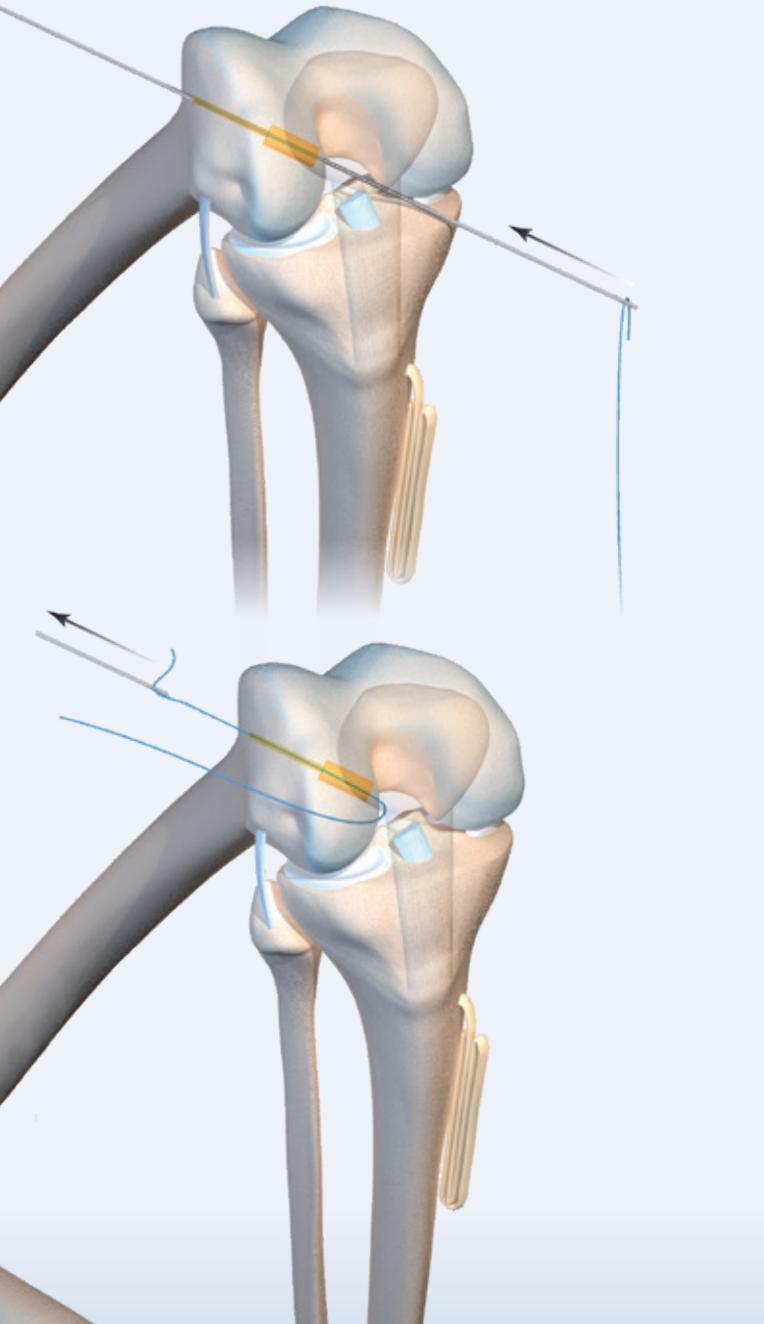


Make sure the knee remains in the hyperflexion position.

Drilling the femoral tunnel

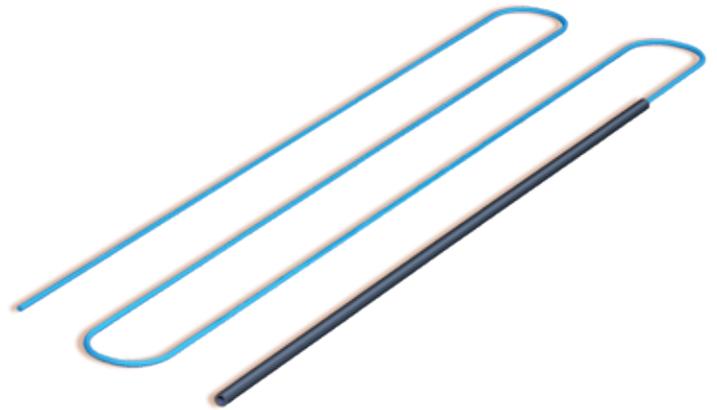
- Using a reamer, make a tunnel **of the same diameter as the graft** (8 mm in our example) **to a depth of 20-25 mm**.
- The length of the tunnel is directly indicated by the graduated drill bit (either at skin level or intra-articular).
- Perform bicortical drilling at **4.5 mm along the entire femoral length for button passage**.
- Hold the guide pin with kocher forceps while drilling the femoral tunnel.



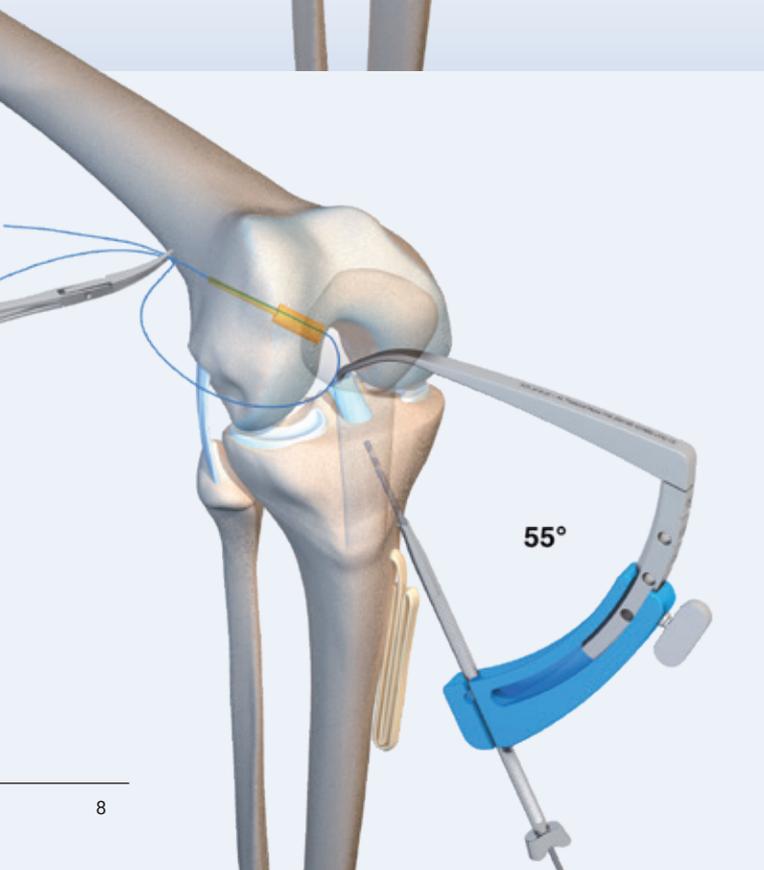


Passage of the femoral pull wire

Use a CorTTape Stick® to pass the femoral pull wire.



- Remove the blue thread from the black plastic tube.
- Pass the rigid part of the CorTTape Stick® wire through the eye of the pin (**single strand**).
- Block the wire with Kelly forceps until the tibial tunnel is ready.
- This wire will later serve as a guidewire to pass the graft through the tunnels.



7. Tibial phase

OUT/IN tibial guide

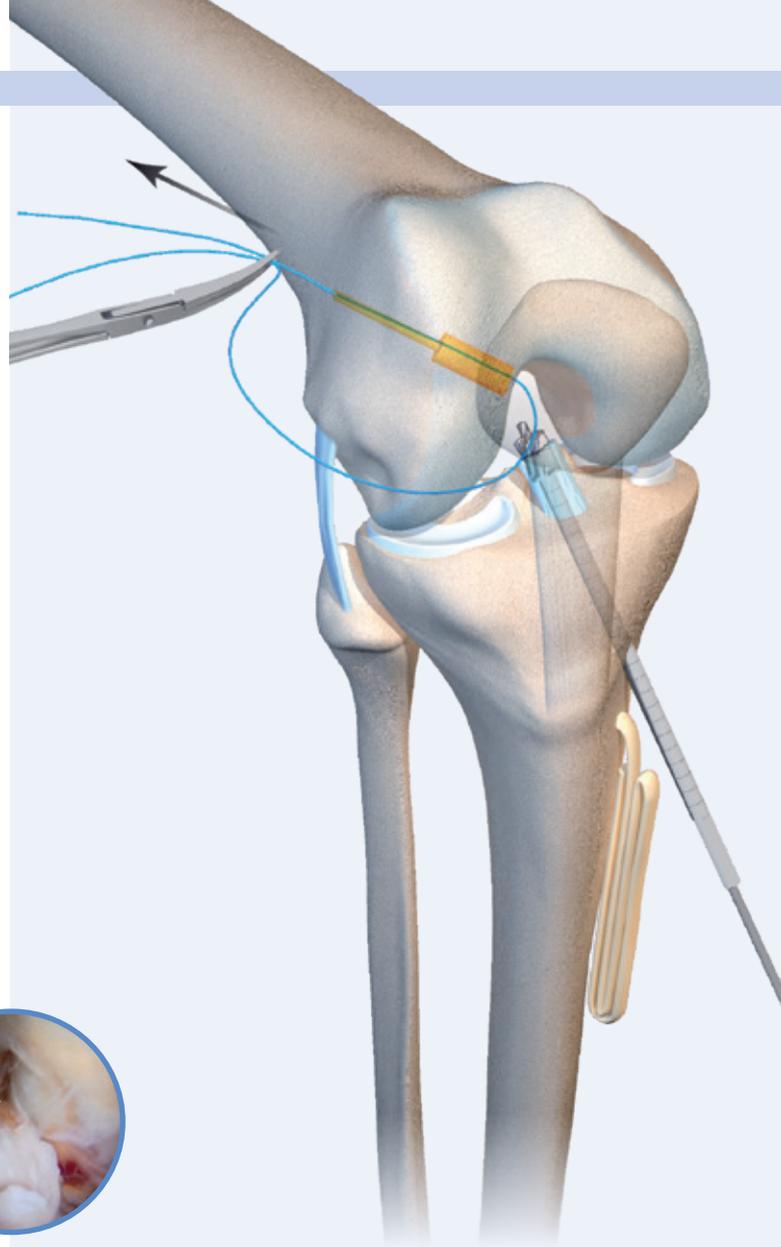
- Knee at 90° of flexion before positioning the guide using the anteromedial approach.
- Position the tibial guide (approx. 55°) to obtain a tunnel of sufficient length. This length can be verified directly on the guide bushing.
- The tip of the guide is hooked onto the tibial footprint of the ACL.
- Insert a pin Ø2.4 mm.
- Check that the future position of the graft does not cause any conflict in the notch.

Drilling the tibial tunnel

- Start by drilling 6 mm on the guide pin along the entire length.
- This enables adjustment/rectification of the pin position if necessary (anterior/posterior and medial/lateral) to best preserve the native ACL remnant.
- The guide pin is repositioned, attempting to **thread it** into the remnant of the native ACL.
- To achieve this, it is easiest to position the knee temporarily at 30° of flexion, to try to preserve as much of the remnant as possible.
- Then, drill again along the entire length at the diameter of the graft (8 mm in our example).
- The 4.5 mm shaver is passed through the tibial tunnel and through the entire “sleeve” of the tibial remnant of the ACL to clear it out and allow graft passage.

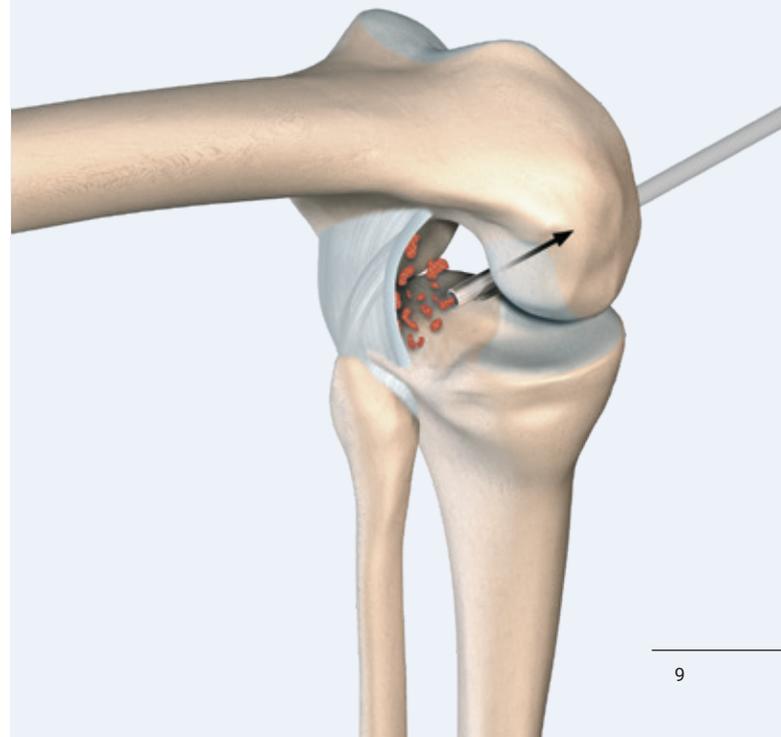


Do not use the 5.5 mm shaver, which might pierce the sleeve.



8. Cleaning the joint

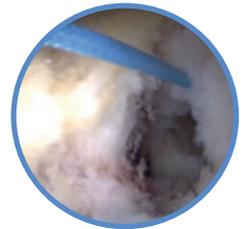
Use the shaver or a cannula to clean up any bone waste that may have been deposited in the recesses and the posterior corner of the joint capsule.



9. Verification of graft length (correspondence with preliminary measurements)

- Using wire guide forceps, retrieve the pull wire of the **CorTTape Stick®** via the tibial tunnel.
- The wire now passes through the knee, through the two tunnels.

- The **CorTTape Stick®** tube is rethreaded on the wire on the tibial side.



- Forceps are put in place on the distal part of the **CorTTape Stick®** wire, just before the tube (to block it) and the wire on the femoral side is pulled to move the **CorTTape Stick®** further up in the joint.
- The end of the **CorTTape Stick®** is blocked at the bottom of the femoral tunnel. Verify by placing the arthroscope in the anteromedial approach.

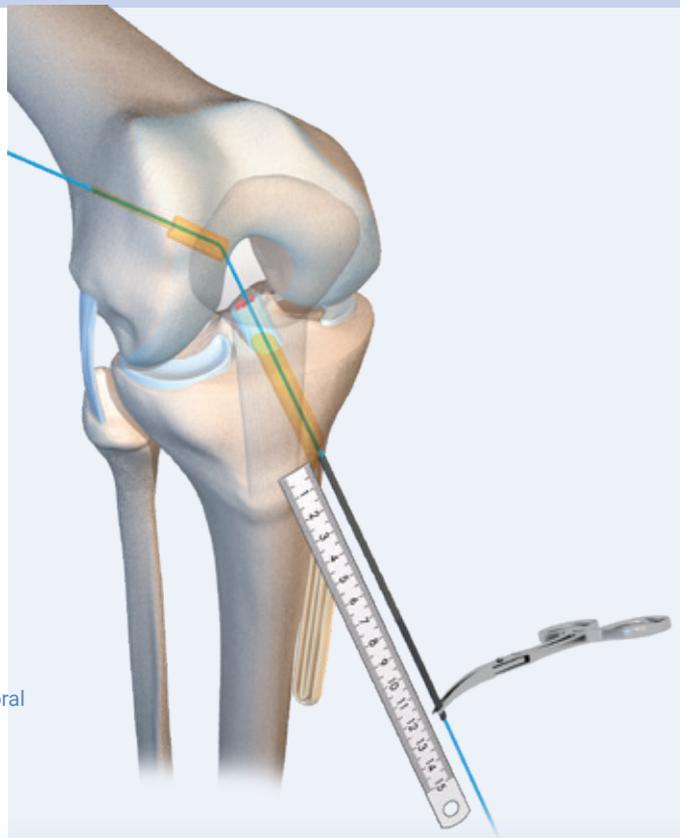


The **CorTTape Stick®** should be positioned at the bottom of the femoral recess, without entering the 4.5 mm tunnel intended for the button.



- Forceps are put in place on the tibial side of the **CorTTape Stick®**, at the ST insertion on the pes anserinus (knee at 90°), while checking the correct positioning of the **CorTTape Stick®** on the femoral side.
- The distance between the forceps and the end of the **CorTTape Stick®** corresponds to the length of the graft's journey **from the tibial insertion of the ST to the bottom of the femoral recess**.

- The graft is finally prepared 5 mm shorter than the measured length to provide tension.
- For example, if the measured length is 12.5 cm, the graft should be prepared for a final length of 12 cm.
- The **CorTTape Stick**[®] tube is removed by sliding only. The guidewire must be left in place.



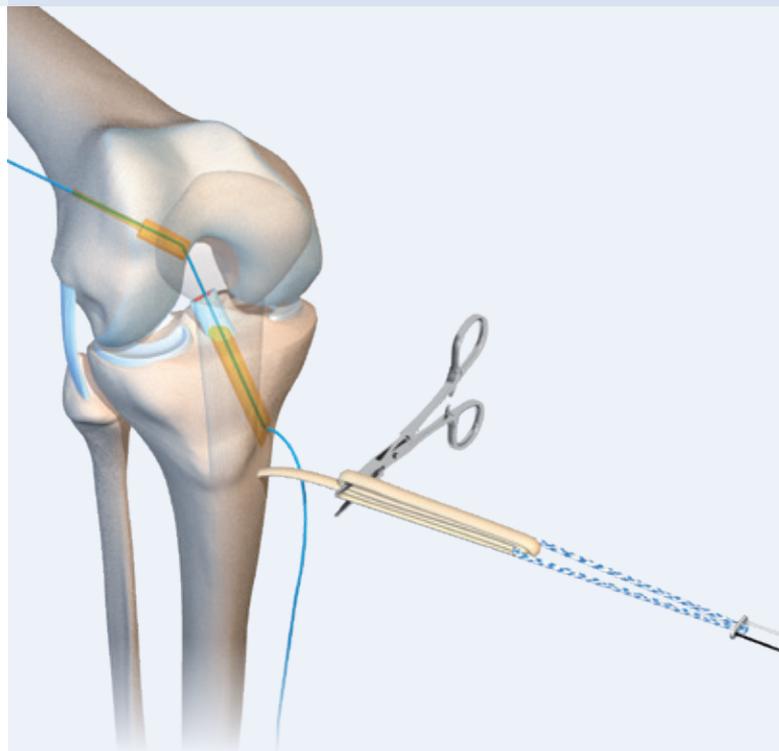
10. Final preparation of the graft

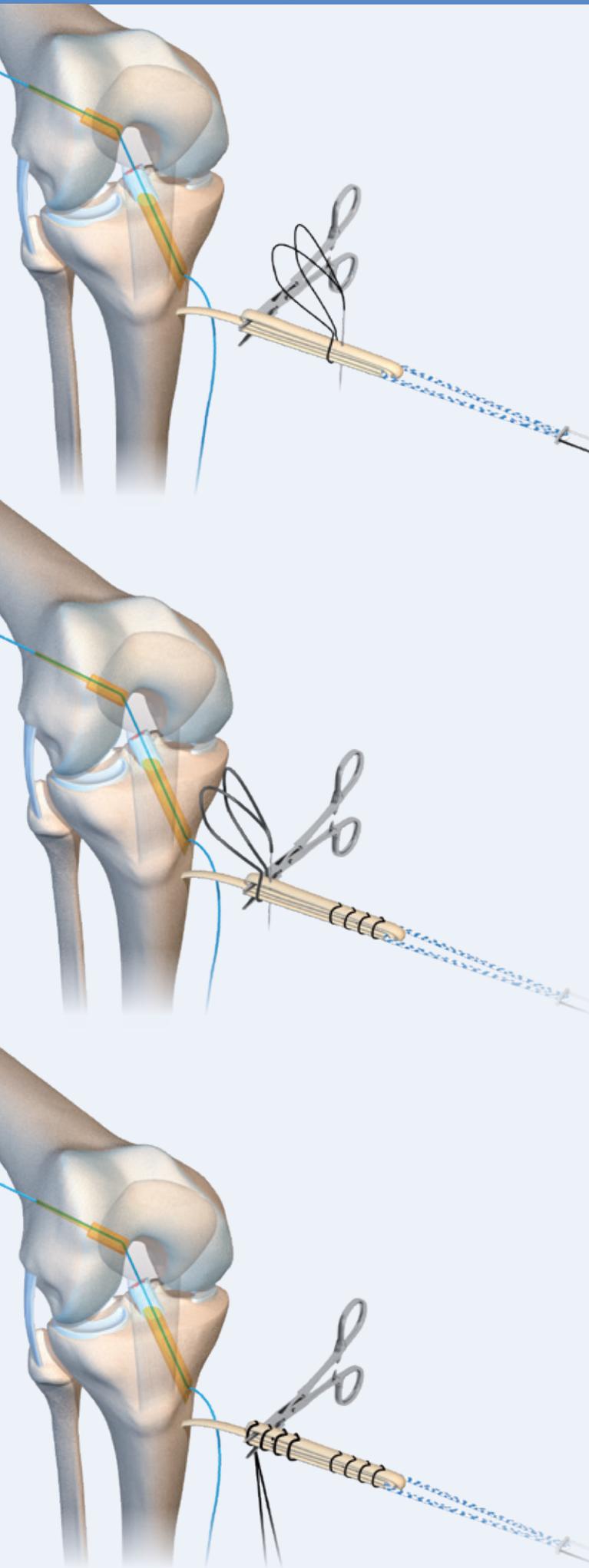
- Graft length is adjusted according to the measurement (5 mm less than the measured length), i.e. 12 cm in our example.
- The **CorTTape Small**[®] loop is put into position at the 12 cm mark.
- The graft is folded up onto itself (tripled or quadrupled, depending on the length available) and sutured.

Recommendation

We recommend using the **CorTTape Small**[®] with a 9 cm loop.

- The first advantage is to be able to move the button upwards without the graft pressfit causing an obstacle in the tibial tunnel.
- The second advantage is to have a visual check of the femoral tunnel.
- The third advantage is to have enough graft length on the distal side to exert counter-tension to check that the button flips correctly.





To suture the graft quickly with regular stitches, we recommend using **the FH Loop® USP 0 (femoral part)** and **the FH Loop® TAPE 1.4 mm (tibial part)**. The goal is to obtain a graft with a homogeneous diameter.

- Start on the loop side of the CorTTape Small® with the FH Loop® USP 0.
- And finish on the side nearest to the tibial insertion with the FH Loop® TAPE 1.4 mm.

We recommend using FH Loop® Tape 1.4 mm to protect the graft (which will be in contact with the tibial screw).

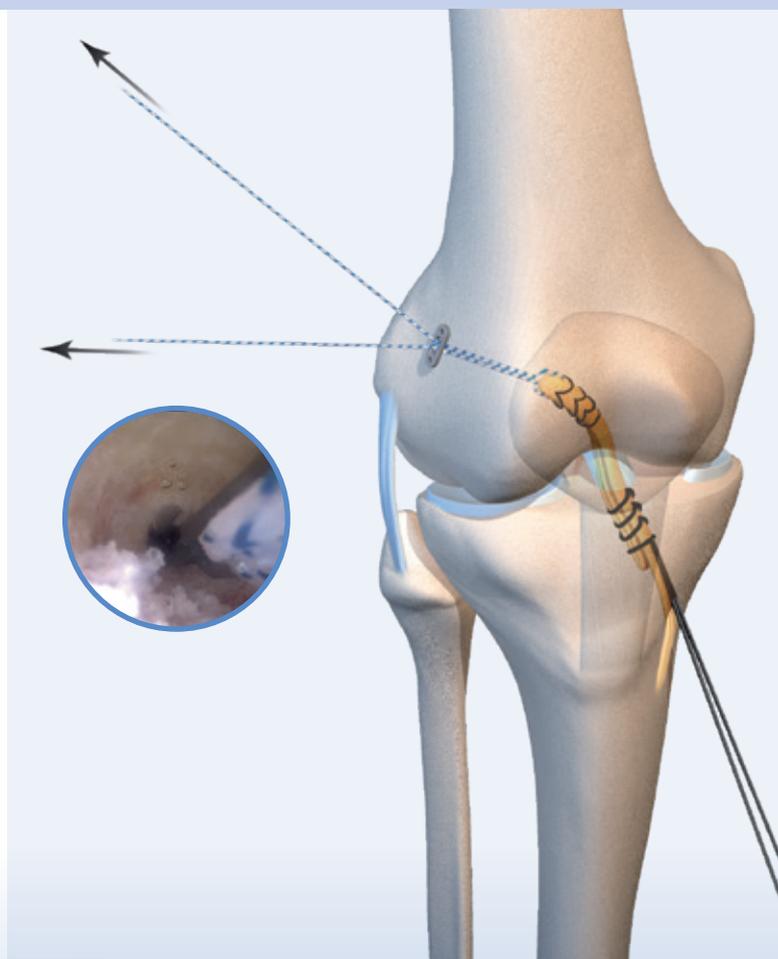
For the “femoral” wire, the wires must be cut short to prevent obstruction of the passage of the graft in the tunnels. For the tibial side, keep enough length to be able to exert counter-tension if necessary.

11. Passage and positioning of the graft

- The two wires of the loop and the two pull wires of the **CorTTape Small® 90 mm** are **knotted at the suture of the CorTTape Stick®** to enable their retrieval on the femoral side.
- Once the wires have been retrieved at the femoral level, the button is moved upwards in the joint.
- This passage can be checked visually by inserting the arthroscope in AM.
- The button will be flipped. Flipping is checked by applying counter-tension to the graft.

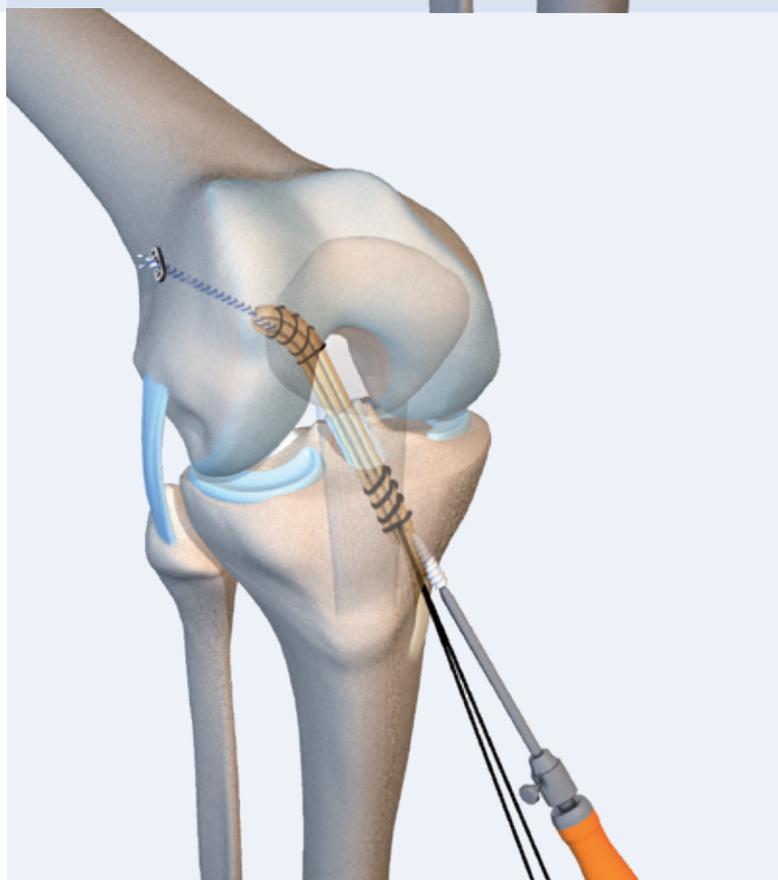
The arthroscope must be put back in AL to avoid obstruction of the graft passage.

- The graft is moved upwards and tension is applied by pulling alternately on the two wires of the loop of the **CorTTape Small®**, with the knee in flexion between 0 and 30°.



12. Tibial fixing with a CorTTape Screw®

- The guide pin is positioned in the tibial tunnel.
- Its position is checked visually intra-articular.
- A **CorTTape Screw®** of the **same diameter as the tibial tunnel and 20 or 30 mm long** (at the surgeon's discretion and depending on the estimated length of the tibial tunnel) is then placed on the tibial side, with the knee in flexion between 0 and 30°.
- To position the screw, pull on the tibial wires of the graft (see explanation above).
- This also enables extra tension to be applied if the graft length has been incorrectly estimated (too long).



Using a screw with a larger diameter than that of the femoral and/or tibial tunnel can: damage the graft, make screw insertion impossible, and even cause the screw to break. We recommend using a screw whose diameter is less than or equal to (\leq) that of the tunnel. No threading is required because it is a self-threading screw.



SURGICAL TECHNIQUE

ANTEROLATERAL LIGAMENTOPLASTY (ALL)

Additional operating time
independent of ST3



Caution: The femoral tunnels of the ACL and of the ALL reconstruction must not cross one another!

1. Reconstruction order

- ALL reconstruction can be performed before or after the ACL reconstruction.
- In all cases, it is essential to secure the ALL definitively after the ACL to restore the native centre of rotation the knee.
- If you start with the ALL, you can still make the incisions and tunnels but the graft will only be secured after securing the ACL.

3 palpable anatomical markers

- Lateral femoral epicondyle
- Gerdy's tubercle
- Fibula head

2. Making the incisions

- The percutaneous technique is applied. It is therefore important to identify the bone markers before making the incisions.

Femoral side

The incision must be 5 to 10 mm, longitudinal to the axis of the femur, centred on a point 5 mm posterior and 5 mm proximal to the femoral epicondyle.

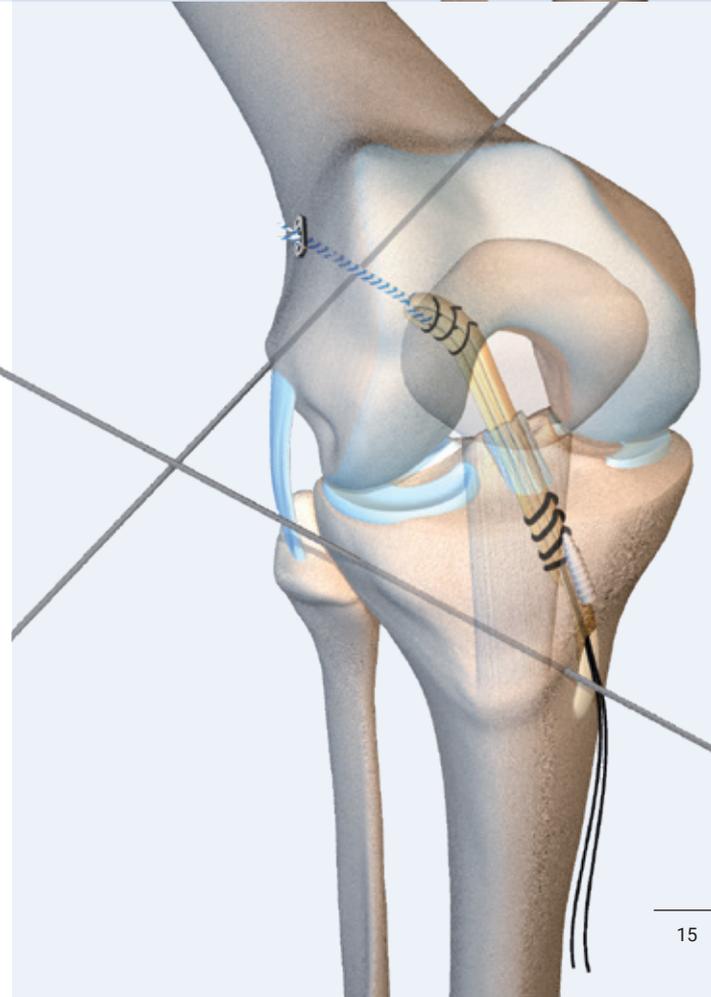
(The anterolateral ligament: Anatomic implications for its reconstruction, T.Neri and all, the knee Journal, VOL 24, October 01, 2017).

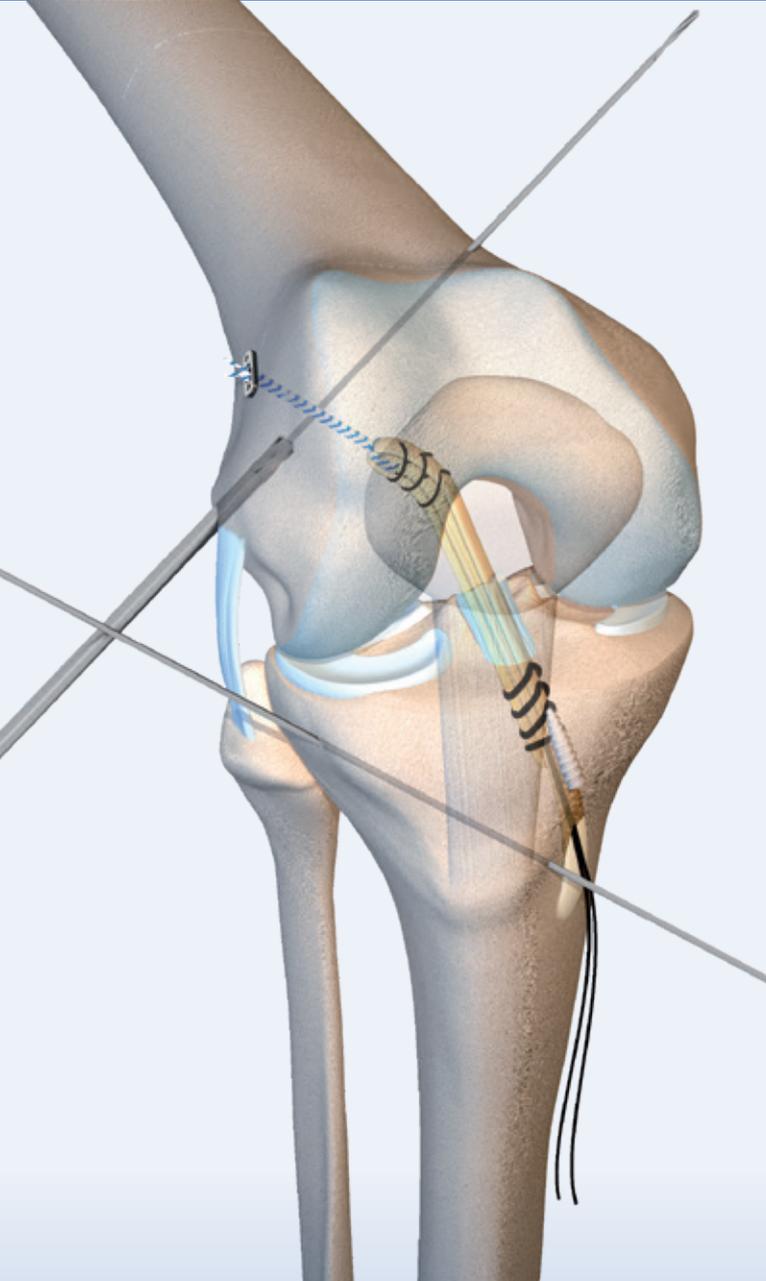
The iliotibial band is incised parallel to the axis of the fibres.

Tibial side

The incision is made longitudinal to the tibial axis, equidistant from the Gerdy's tubercle and the fibula head, 5 to 10 mm distal from the joint line.

(The anterolateral ligament: Anatomic implications for its reconstruction, T.Neri and all, the knee Journal, VOL 24, October 01, 2017).





3. Femoral phase

There are two possible solutions for femoral fixation: interference screw or anchor.

Interference screw.

- Positioning of an eyed guide pin.
- This pin is inserted on the lateral surface of the femur 5 mm posterior and 5 mm proximal to the femoral epicondyle.
- Creation of a blind tunnel, 25 mm long, using a 6 mm diameter cannulated drill bit.

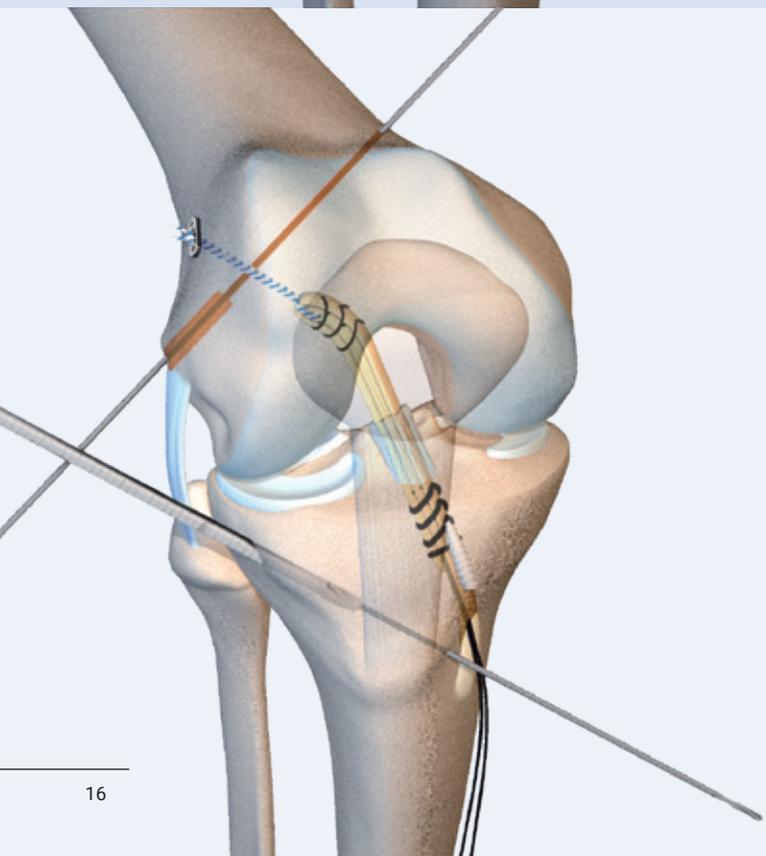
To prevent collisions with the ACL tunnel and the femoral trochlea, it is oriented 10° proximal and 40° anterior.

Optimal Combination of Femoral Tunnel Orientation in Anterior Cruciate Ligament Reconstruction Using an Inside-Out Femoral Technique Combined With an Anterolateral Extra-Articular Reconstruction. Am J Sports Med. 2022 Ajsm

An interference screw of the same diameter is used for fixation. This step is described below.

Anchor

Note: it is possible to use an anchor system to avoid the femoral tunnel. The anchor is positioned in the femoral footprint of the ALL, i.e.: 5 mm posterior and 5 mm proximal to the femoral epicondyle.



4. Tibial phase

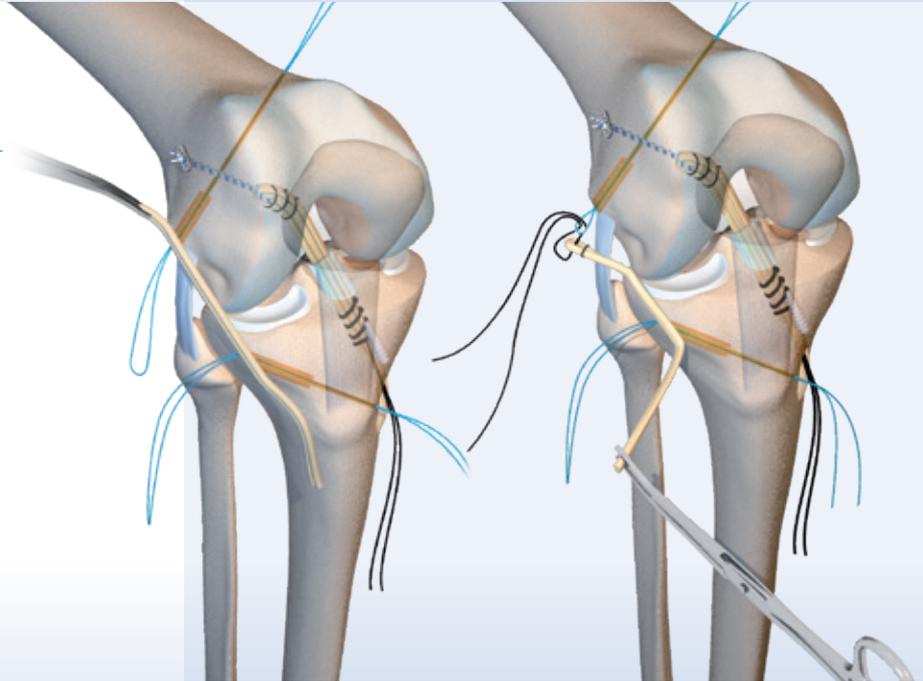
Reminder: this final step is carried out after securing the ACL.

- Positioning of an eyed guide pin.
- This pin will be inserted on the anterolateral surface of the tibia, equidistant from the Gerdy's tubercle and the fibula head, 5 to 10 mm distal from the joint line. It will be removed via the anteromedial incision of the harvesting site of the pes anserinus tendon.
- To avoid collision with the tibial tunnel of the ACL, ideally, the pin should be removed via the posterior, distal part of the medial incision.
- Creation of a blind tunnel, 25 mm long, using a 6 mm diameter cannulated drill bit.

For the length, we recommend making a long tibial tunnel to the medial cortical (not going beyond). This overcomes any length problems (no calculation necessary).

5. Passage of the graft

- The gracilis is folded in 2. The 2 free strands are for the tibia and the femur loop.
- Long curved forceps are inserted via the femoral incision and passed under the iliotibial band, exiting via the tibial incision.
- The graft is held on the loop side and passed from distal (tibial) to proximal (femur) using the forceps.



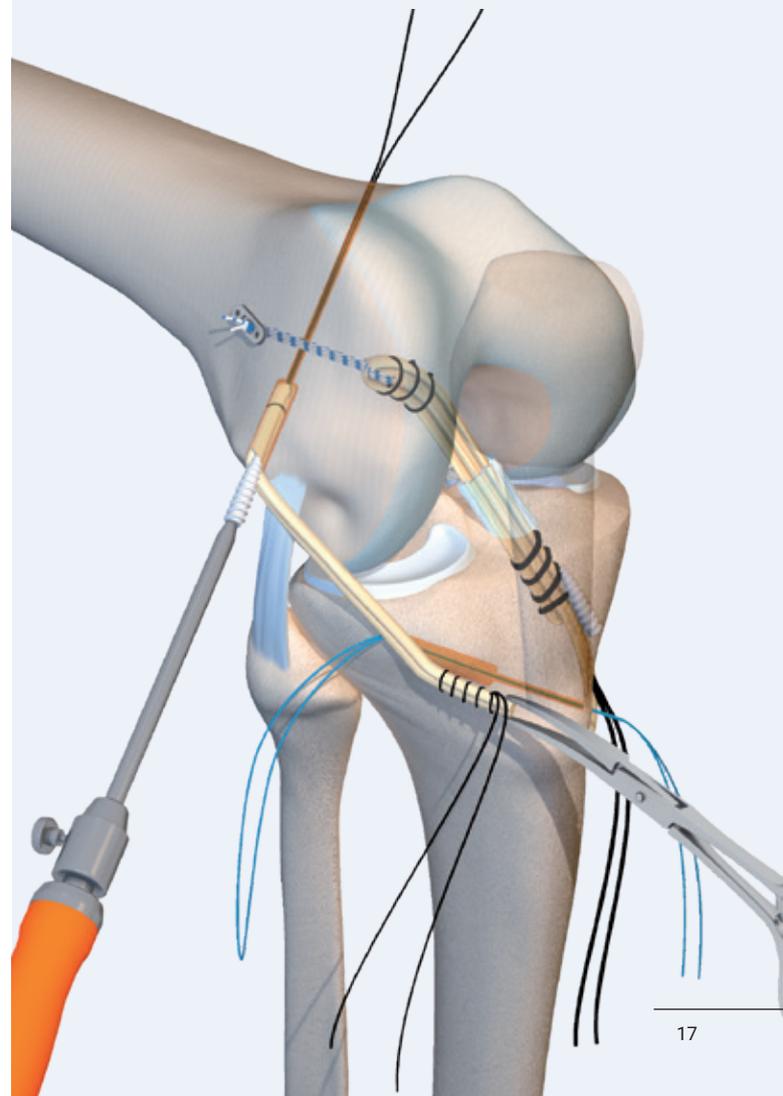
6. Femoral fixation

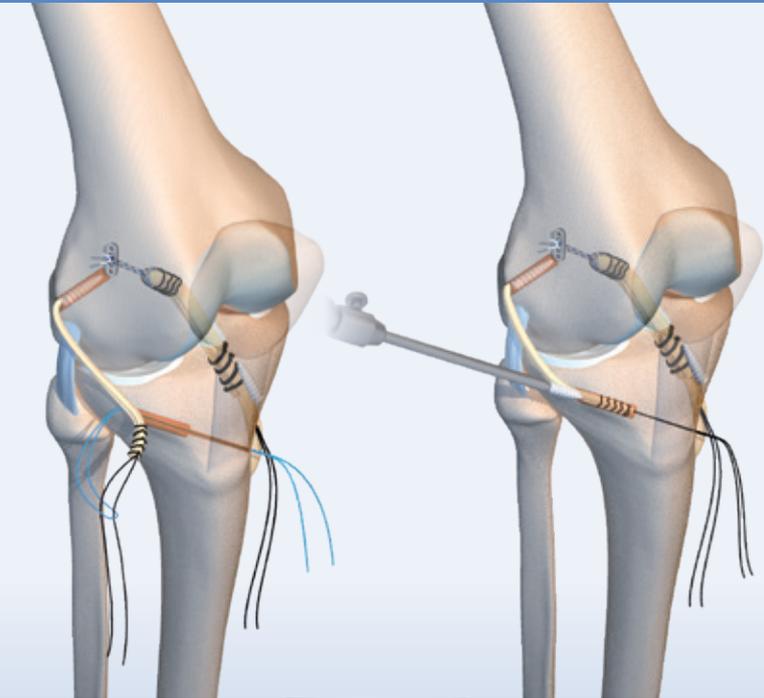
For fixation with the CorTTape Screw®

- The graft is inserted into the femoral tunnel using a guidewire system.
- A free suture is placed in the loop to enable this.
- The graft is secured using a CorTTape Screw® interference screw, 20 mm long, diameter 6 mm.

For the anchor

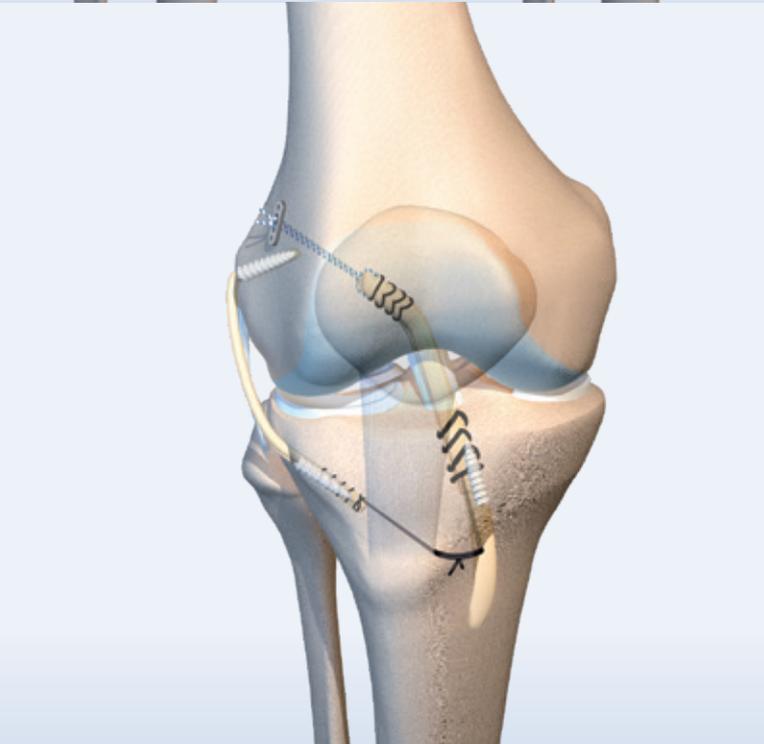
- The footprint is marked, then the 5.5 mm FH Anchors® anchor is put into position.
- Use of the anchor avoids possible conflict with the femoral tunnel of the ACL.
- One of the anchor's 2 sutures is passed through the loop of the graft then sutured directly with the other strand to secure it.





7. Tibial fixation

- The knee is placed at 30° of flexion.
- The graft is marked at the entrance of the tibial tunnel.
- The 2 strands are positioned using the FH Loop® 2-0 over a length of 20 mm.
- The 2 positioned strands are then inserted into the tibial tunnel using a guidewire system.
- The graft is secured using a CorTTape Screw® interference screw, 20 mm long, diameter 6 mm, with the knee at between 0 and 30° of flexion and the foot in neutral rotation.



8. Testing at the end of the procedure

- The combined ACL and ALL plasty should be tested at the end of the procedure.
- The Lachman-Thrillat test should present a hard stop, there should be no rotation pivot shift, and no limitation in flexion or extension.

Postoperative care

Rehabilitation should be started the day after surgery. A standard rehabilitation protocol is implemented. The addition of ALL reconstruction does not change the postoperative care.

Notes

Références instruments

ST4/ST3 attached/KJ/STG knee ligament instrumentation reference
A271 063



Eyed trocar pin 2.3 x 250 mm
Ref. 269 207



Guide IN/ OUT 6 mm Medin
Ref. 269 000



Reamer Ø5 x 180 mm cannulated 2.4 mm Medin
Ref. 268 991



Reamer Ø8 x 180 mm cannulated 2.4 mm Medin
Ref. 269 097



Reamer Ø11 x 180 mm cannulated 2.4 mm Medin
Ref. 269 100



Wire guide
Ref. 256 010



ACL tibial point to point
Ref. 264 927



Larp Eurocrew® screwdriver
Ref. 267 558



Open closed stripper - **OPTION**
Ref. 269 069



Closed tendon stripper - **OPTION**
Ref. 245 405



Threaded eyed pin Ø2.4 L.425 mm
Ref. 255 636



Guide IN/ OUT 7 mm Medin
Ref. 269 001



Reamer Ø6 x 180 mm cannulated 2.4 mm Medin
Ref. 269 095



Reamer Ø9 x 180 mm cannulated 2.4 mm Medin
Ref. 269 098



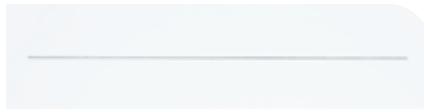
TLS® calibrator
Ref. 265 643



TLS® handle set
Ref. 264 930



Strip cutter CorTTape
Ref. 269 341



Guide pin Ø1 L. 300 mm
Ref. 265 761



ACL tibial point to angle - **OPTION**
Ref. 264 940



Guide corrector - **OPTION**
Ref. 242 046



Guide IN/ OUT 5 mm Medin
Ref. 268 999



Guide IN/ OUT 8 mm Medin
Ref. 269 002



Reamer Ø7 x 180 mm cannulated 2.4 mm Medin
Ref. 269 096



Reamer Ø10 x 180 mm cannulated 2.4 mm Medin
Ref. 269 099



Open tendon stripper
Ref. 265 664



TLS® guide bushing
Ref. 264 939



Cannulated dilator Ø7 mm for ligament
Ref. 271 661



Angulated tip - **OPTION**
Ref. 265 641



ACL femoral point to point - **OPTION**
Ref. 265 072



Niti pin Ø1 L. 300 mm - **OPTION**
Ref. 271 242

Instrument set
Ref. 269 367

Lid
Ref. 269 368

Silicone mat
Ref. 269 339

Implant references



CorTTape Screw®

Ref.	Designation
269 935	CorTTape Screw® 100% PLA Ø6 mm L. 20 mm
269 936	CorTTape Screw® 100% PLA Ø7 mm L. 24 mm
269 937	CorTTape Screw® 100% PLA Ø7 mm L. 30 mm
269 938	CorTTape Screw® 100% PLA Ø8 mm L. 24 mm
269 939	CorTTape Screw® 100% PLA Ø8 mm L. 30 mm
269 940	CorTTape Screw® 100% PLA Ø9 mm L. 24 mm
269 941	CorTTape Screw® 100% PLA Ø9 mm L. 30 mm
269 942	CorTTape Screw® 100% PLA Ø10 mm L. 30 mm
269 943	CorTTape Screw® 100% PLA Ø11 mm L. 35 mm



Cross Lig® 55

Ref.	Designation
256 391	CROSS lig® 55 screw - Ø7 mm L. 20 mm - R
256 392	CROSS lig® 55 screw - Ø7 mm L. 25 mm - R
256 393	CROSS lig® 55 screw - Ø7 mm L. 30 mm - R
256 394	CROSS lig® 55 screw - Ø8 mm L. 25 mm - R
256 395	CROSS lig® 55 screw - Ø8 mm L. 30 mm - R
256 397	CROSS lig® 55 screw - Ø9 mm L. 25 mm - R
256 398	CROSS lig® 55 screw - Ø9 mm L. 30 mm - R
256 400	CROSS lig® 55 screw - Ø10 mm L. 30 - R



Cross Lig® 30

Ref.	Designation
257 345	CROSS lig® 30 screw - Ø7 mm L. 30 mm - R
256 403	CROSS lig® 30 screw - Ø8 mm L. 25 mm - R
257 346	CROSS lig® 30 screw - Ø8 mm L. 30 mm - R
256 404	CROSS lig® 30 screw - Ø9 mm L. 25 mm - R
257 348	CROSS lig® 30 screw - Ø9 mm L. 30 mm - R
257 349	CROSS lig® 30 screw - Ø9 mm L. 35 mm - R
256 405	CROSS lig® 30 screw - Ø10 mm L. 30 mm - R



CorTTape Small® - CorTTape Stick®

Ref.	Designation
271 639	CorTTape Small® blue/white & adjust. loop 90 mm
271 638	CorTTape Stick® blue USP2, L. 99 cm, black tube



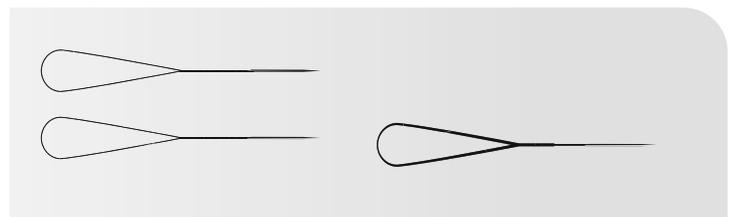
FH Link®

Ref.	Designation
271203	FH Link® blue/white USP2 - Needle 36 silver & 26 mm black



FH Tape®

Ref.	Designation
271 636	FH Tape® blue/black 2 mm - Needle 48 mm black triangular tip
271 637	FH Tape® blue/black 1.4 mm - Needle 26 mm black round tip



FH Loop® - FH Loop Tape®

Ref.	Designation
271 631	FH Loop Tape® black 1.4 mm - Straight black needle
271 632	FH Loop® black USP2/0 - Straight black needle
271 633	FH Loop® black USP0 - Straight black needle

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