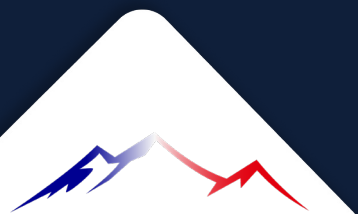
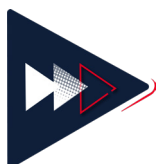


► ACL RECONSTRUCTION

SURGICAL TECHNIQUE
BTB RECONSTRUCTION

BTLOOP[®]





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INDICATIONS, CONTRAINDICATIONS & WARNINGS

SOURCE Indications, contraindications and warnings below are taken from the approved BTLOOP® IFU (ref. MGLOOPNOEN B)

Indication / Performance

The BTLOOP® device is designed to be used as cortical fixation for ACL reconstruction. The PULLUP® device provides adjustable cortical fixation for soft-tissue ligament grafts.

Composition

Materials: Button-plate: Ti-6Al-4V ELI (ASTM F-136).

Sutures: Braided loop: 60% UHMWPE / 40% PET. Traction thread: co-braid UHMWPE/PP tracer. Flip thread: PET. Splice suture: nylon.

Contraindications

- Known allergy or hypersensitivity to implant materials (test if sensitivity is suspected before implantation).
- Insufficient bone quantity or quality — implant efficacy is directly linked to bone quality.
- Insufficient blood supply or recent infection that could delay healing; active infection.
- Conditions that limit the patient's ability or willingness to slow activity and follow recommendations during healing.
- Skeletal immaturity — implants must not overlap, hinder or damage the growth plates; evaluate bone density carefully.
- Do not use for surgeries other than those indicated.

Possible complications & side-effects

Postoperative pain; loss of extension; fluid in the tunnels; graft failure; knee instability or popping; tunnel enlargement; migration of the fixation system and tissue interposition.

Warnings & Precautions

- **Single use:** Single use only. A contaminated or explanted implant must be discarded, never re-treated or re-implanted.
- **MRI:** MR safety unknown — BTLoop® has not been evaluated for safety/compatibility in the MR environment (heating, migration, artefact). Scanning a patient with this device may result in injury.
- **Surgical:** Must be placed by a qualified surgeon with knowledge of anatomy, biomechanics and musculoskeletal reconstruction; inform the patient to temporarily limit physical activity.
- **Sterility:** Gamma-sterilized (25 kGy). Check the sterility expiry date and package integrity before use.



SYSTEM OVERVIEW

The SBM ACL platform delivers a complete BTB workflow — graft preparation, retrograde socket creation, graft passage, and adjustable cortical fixation — from a single instrumentation footprint.

Core components

Component	Role during the procedure
BTLOOP® / BTLOOP® XL	Adjustable-loop cortical suspensory fixation of the bone block (cortical tunnel Ø4.5 mm; XL Ø5–10 mm)
PULLUP® / PULLUP® XL	Adjustable cortical fixation option for soft-tissue graft configurations
RetroTech®	Retrograde, variable-diameter socket drilling, femoral and tibial.
GraftTech®	Bench preparation station for loading and tensioning the graft on the BTLOOP®
POWERTEX®	Non-absorbable USP #2 traction / tensioning sutures
MENIX® / MENIX® DUO	Adjunct meniscal repair (single / double anchor) — see Appendix A.

NOTE Confirm the BTLOOP® reference (standard vs. XL) against the planned cortical tunnel diameter before opening the implant.

WHY BTLOOP® — DESIGN & CLINICAL RATIONALE

▶ Key features

- **Strength & rigidity:** Static and fatigue mechanical testing on the titanium button-plate (RD823, 2012 / RD 1472, 2021).
- **Adjustable, one-size-fits-all:** One adjustable loop fits the full range of tunnel lengths — no pre-op tunnel-length planning; adjust perioperatively (RD 847, 2012).
- **Reproducible:** Controlled locking at the base of the blind tunnel preserves bone stock; 360° graft/tunnel contact.
- **Dual fixation:** Double fixation of the bone block — through the bone plug and at the bone-tendon interface; splices provide a stable lock.
- **System options:** Two versions: cortical tunnel Ø4.5 mm (BTB0001709) and Ø5–10 mm (BTBXL01709).

▶ Clinical evidence

Colombet & Bouguennec (2017) describe BTB ACL reconstruction with adjustable-loop suspensory fixation on both the femoral and tibial sides, combining the tensile strength and tunnel-position control of suspensory fixation with the ability to retighten the graft after cycling — a capability not offered by interference screws. The loop passes twice through each bone block; recommended minimum bone-block length 1.5–2 cm with a ≥ 1 cm bridge between holes; the graft is fixed at $\sim 20^\circ$ of flexion.

Boutsiadis et al. (2018), a comparative cohort of 272 ACL reconstructions at a mean 25.7-month follow-up, found anterior laxity with adjustable-loop suspensory fixation was at least equal to interference screws (1.49 ± 1.98 mm vs 2.32 ± 1.97 mm; $P < .001$), with comparable KOOS and Tegner scores — addressing concerns about adjustable-loop lengthening under load.



GRAFT HARVEST (BONE–TENDON–BONE)

Per the BTLOOP® technique: make an incision along the medial border of the patellar tendon. Open the peri-tendon with an inverted-L incision and raise it. Harvest the central third of the patellar tendon with parallelepiped (rectangular) bone plugs at each end.

Recommended graft dimensions

Parameter	Recommended value	Notes
Graft	Central third, patellar tendon	Parallelepiped bone plugs at both ends
Bone-plug length	1.5–2 cm	Minimum length to safely carry two drill holes
Patellar plug diameter	< tibial tunnel diameter	Enables easy insertion through the tibial tunnel
Overall graft length	≤ 90 mm preferred	If > 90 mm, extend a tunnel or manage excess outside the tibial tunnel

- 1 Incise:** Incise along the medial border of the patellar tendon.
- 2 Open peri-tendon:** Open the peri-tendon with an inverted-L incision and raise it.
- 3 Harvest plugs:** Harvest the central third with parallelepiped bone plugs; keep saw cuts shallow to avoid patella fracture.
- 4 Gauge:** Extract and calibrate the graft; the patellar plug must be smaller than the tibial tunnel.

OPTION A BIO 1® patellar filler part #P822694220 (10 × 10 × 6 mm) may be used to fill the harvest site.

PITFALL Avoid deep or convergent saw cuts at the patella to reduce intra-operative fracture risk.



Prepare the graft on the GraftTech® station. Two BTLOOP® adjustable loops are loaded onto the bone block to create independent cortical suspensory fixation points.

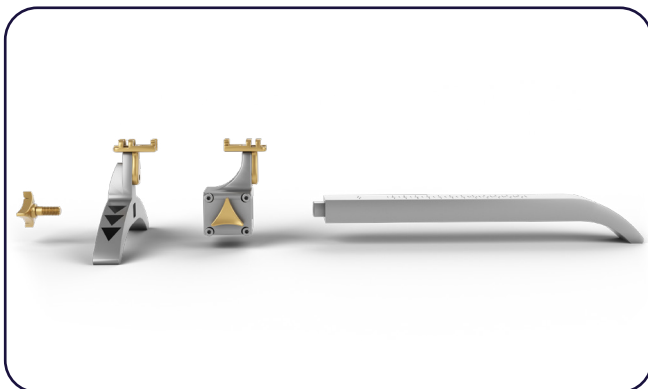
Bone-block specifications

Parameter	Recommended value	Notes
Bone-block length	1.5–2 cm (≈20 mm)	Parallelepiped plugs from the central third of the patellar tendon
Block drill holes	2 × Ø2 mm Optional (you can drill 1 hole)	U.S. standard. One through the plug, one at the tendon/bone-plug junction (optional single Ø2 mm)
Hole placement	~10 mm from end; ≥1 cm bridge	Drilled without detaching the plug from the patella
Patellar plug diameter	< tibial tunnel diameter	Enables easy insertion through the tibial tunnel

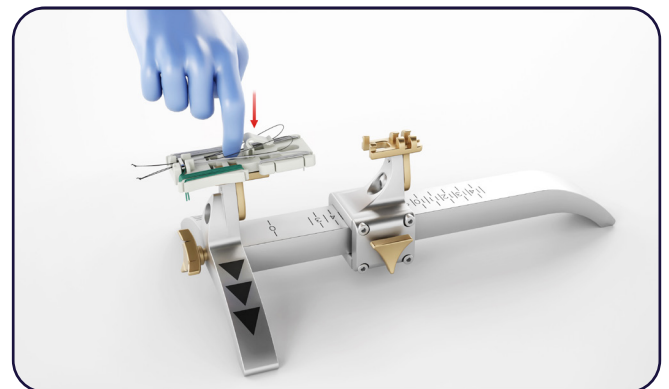
GRAFT LENGTH If overall graft length exceeds 90 mm, adapt: (1) extend the femoral tunnel, (2) extend the tibial tunnel, or (3) manage excess graft outside the tibial tunnel. A BIO 1® patellar filler part #P822694220 (10 × 10 × 6 mm) may be used at the harvest site.

Graft preparation steps

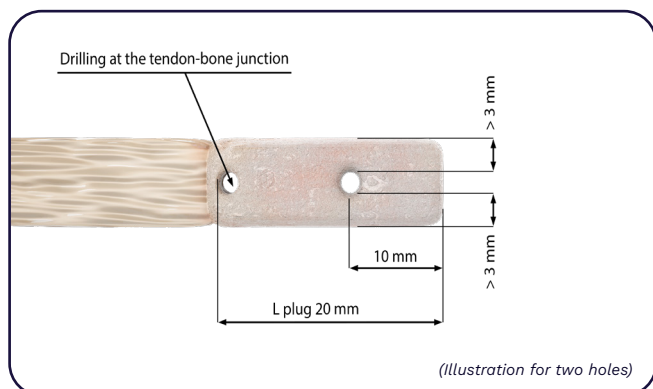
1 Assemble the GraftTech® preparation station



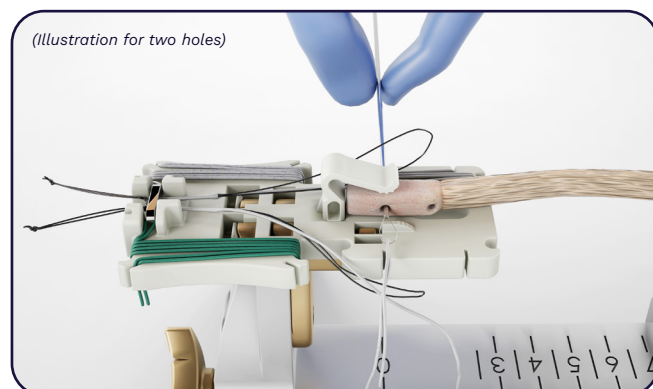
2 Clip the BTLOOP® onto the GraftTech® holder



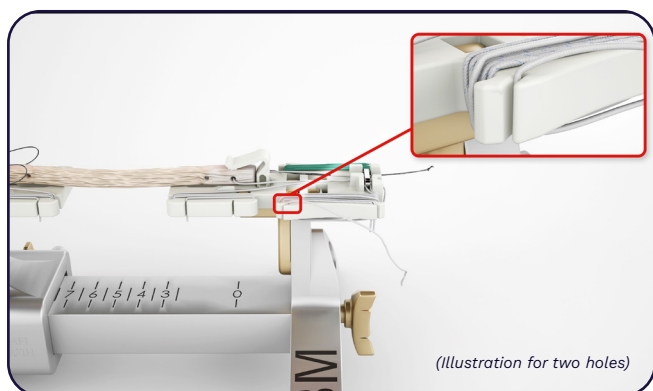
3 ▶ Seat the bone plug; drill two Ø2 mm holes (optional single Ø2 mm)



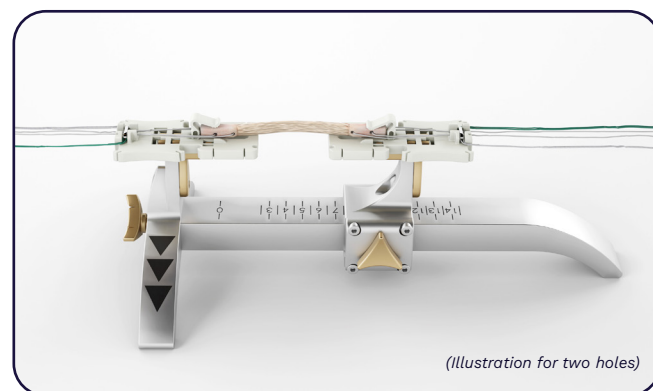
4 ▶ Pass the white braided suture through the plug



5 ▶ Cross the splice to lock the adjustable loop



6 ▶ Repeat for the second BTLOOP®; tension the graft



TIP Verify both loops adjust independently and the block sits flush before going to the field. Keep the bone plug ≥ 4 cm from the plate when unloading from the GraftTech®.

OPTION If using single hole technique in bone block, ensure to pass white suture tails in opposite directions 1 at a time, to facilitate passage you can also use BtLoop suture passer.



METHOD The femoral socket is a blind tunnel created with the RetroTech® retrograde drill (Ø4.7 mm cannulated bit; blade 6–11 mm in 0.5 mm increments; depth 0–100 mm set by the white ring).

Tunnel positioning

Footprint: Knee in hyperflexion (~120°); place the femoral aimer hook against the posterior border of the lateral condyle.

Offset: Aimer offset (hook to pin axis): 6.4 mm with the Ø9 mm aimer; 6.9 mm with the Ø10 mm aimer.

Evolution Guide positioning: Surgeon must change viewing portal to lateral portal and place the evolution guide from the medial portal.

Primary — Retrograde drilling (RetroTech®)

- 1 Insert pin & pilot:** With the knee flexed to ~120°, insert the Ø2.5 mm pin via the femoral guide; Preload drilling guide on to Ø4.7 drill, advance to cortical bone and screw until positive stop before removing Ø4.7 drill. Drill a Ø4.7 mm pilot tunnel with the cannulated bit.
- 2 Insert & open blade:** With the drill at «0», insert into the Ø4.7 mm tunnel; turn the knob to the graft diameter (6–11 mm) and extend the blade.
- 3 Retrograde drill:** Place the white depth indicator at the skin; drill clockwise to socket depth matching the bone-plug length; verify with the depth gauge.
- 4 Close & shuttle:** Return the knob to «0» to close the blade; remove the RetroTech® drill and pass a suture shuttle through the femoral tunnel.

PARAMETER CHECK Socket diameter must equal the gauged bone-plug diameter; femoral depth must match the plug length plus loop travel. Confirm against the graft before drilling.

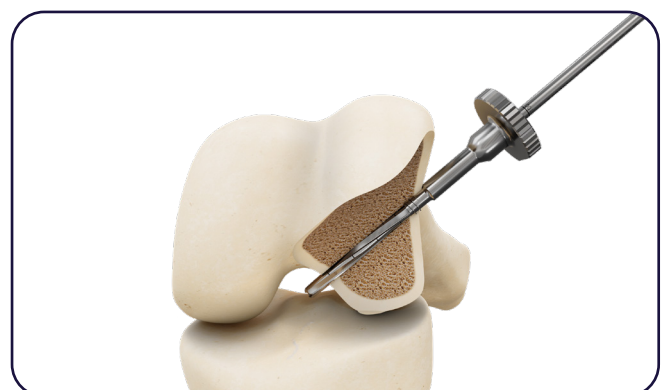
Femoral retrograde drilling steps (Primary)

1 Insert the femoral guide pin



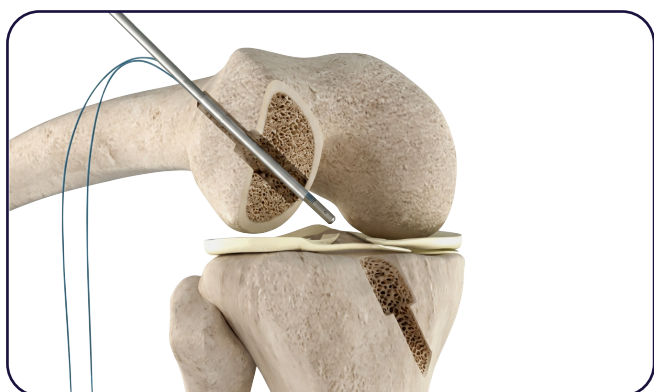
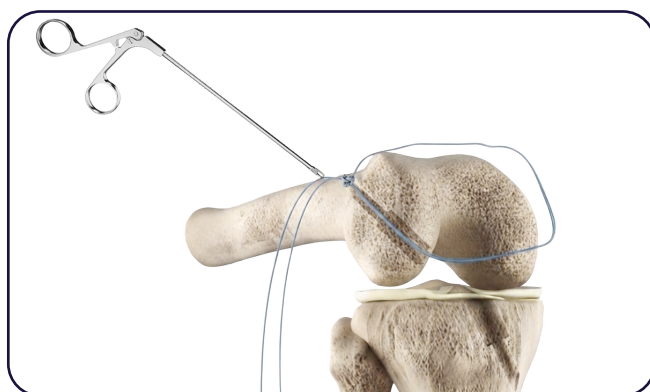
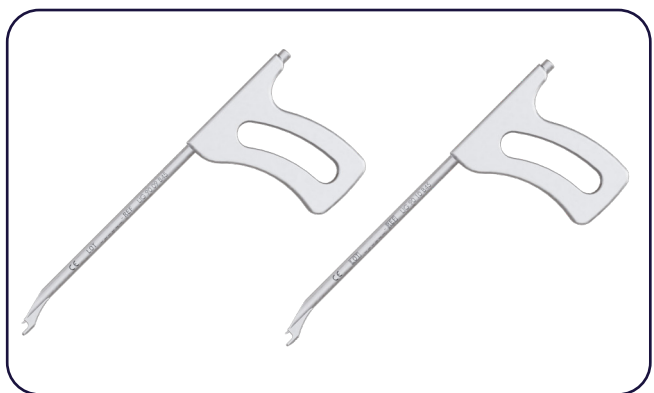
2 Drill the Ø4.7 mm pilot tunnel

Preload drilling guide on to Ø4.7 drill, advance to cortical bone and screw until positive stop before removing Ø4.7 drill.



3 Insert the RetroTech® and open the blade**4 Retrograde-drill the femoral socket to depth****5 Load sutures on eyelet pin and advance in femoral tunnel**

Backload 2.5 x 400 pin with eyelet - load 2 tails of POWERTEX® no needle though the eyelet, pull tails, leave loop close to eyelet, insert into femoral tunnel, retrieve from medial portal, secure loop and tails outside femoral tunnel.

**6 Retrieve the femoral tunnel suture loop****Alternative — Antegrade femoral tunneling (aiming device)**

Antegrade femoral tunneling is optional, using the pistol grip Part #LIG9009B45 or pistol grip Part #LIG9010B45 insert pistol grip from medial portal.

Insert pin 2.5 x 400, using the router matching graft diameter drill to the preferred depth. Remove router and add 2 tails of powertex suture (no needle) to the eyelet, pull from femoral side and lock sutures same as step 5 & 6.

METHOD The gap between the tongue of the aim and the axis of the brooch depends on the diameter of the tunnel; gap from 6,4 with the aim diameter 9 and gap from 6,9 with the aim diameter 10. Why 6.4 and 6.9?

The distance between the tongue and the axis of the brooch allows to guarantee a mini thickness of bone about 2 mm between cortical later(posterior) and the femoral tunnel, to avoid that the tunnel too much takes place.



METHOD The tibial tunnel is a complete tunnel drilled antegrade over the tibial aiming device — first to Ø4.5 mm, then to match the graft diameter. RetroTech® retrograde is available as an alternative.

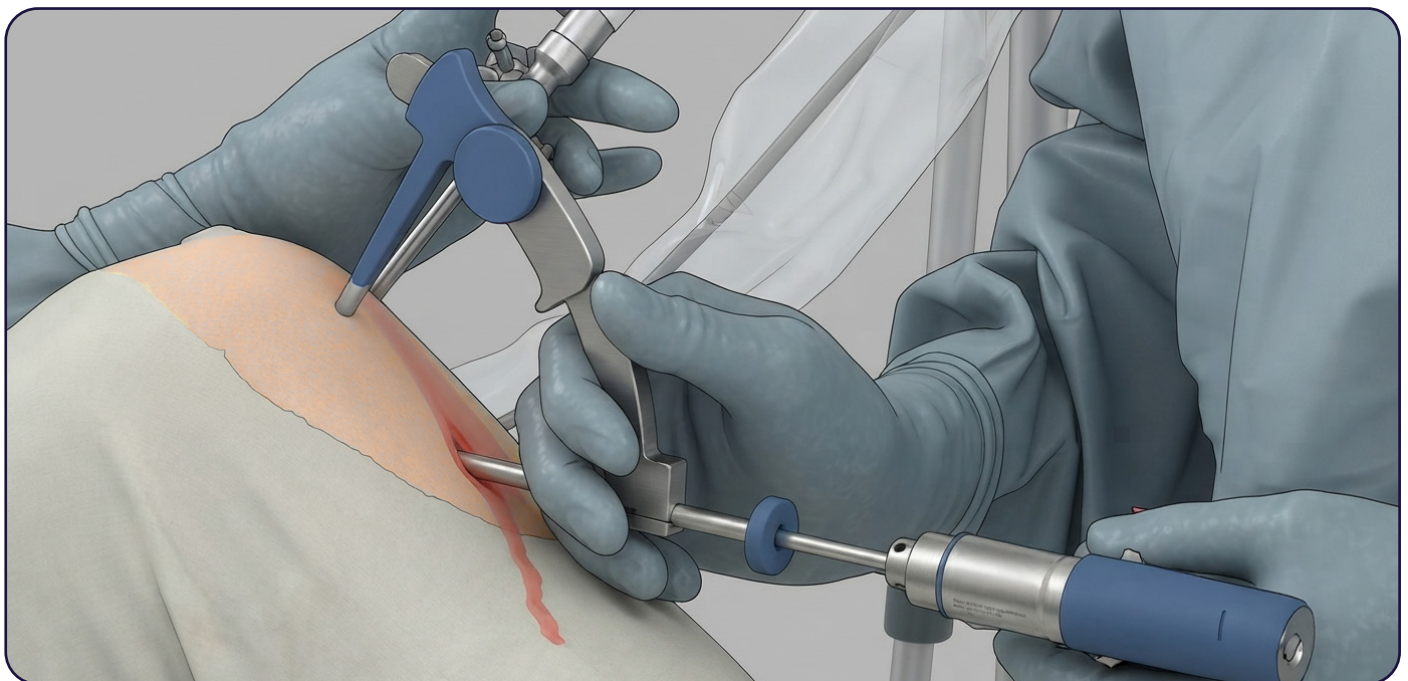
Tunnel positioning

Footprint: Place the tibial aimer hook through the AM portal into the posterior fibres of the ACL remnant — 55°–65° to the tibial axis, upper (superior) branch parallel to the tibial plateau.

Offset: Protect the articular surface with a curette; confirm pin exit under arthroscopy.

Primary — Antegrade drilling (aiming device)

- 1 Position aimer:** Insert the tibial aimer through the AM portal; place the hook in the posterior ACL-remnant fibres at 55°–65° to the tibial axis, superior branch parallel to the plateau.
- 2 Insert Kirschner pin:** Mount the drill guide on the aimer and insert the Ø2.5 mm Kirschner pin; confirm exit under arthroscopy. Remove the aimer, keeping the guide pin in place.
- 3 Drill complete tunnel:** Drill a complete tibial tunnel over the pin — first to Ø4.5 mm, then to match the graft (bone-plug) diameter. Reposition the pin between drillings for the best anatomical position.
- 4 Plug tunnel:** Place the conical stopper in the tibial tunnel to restrict irrigation-fluid loss; keep a pin to place the suture shuttle.

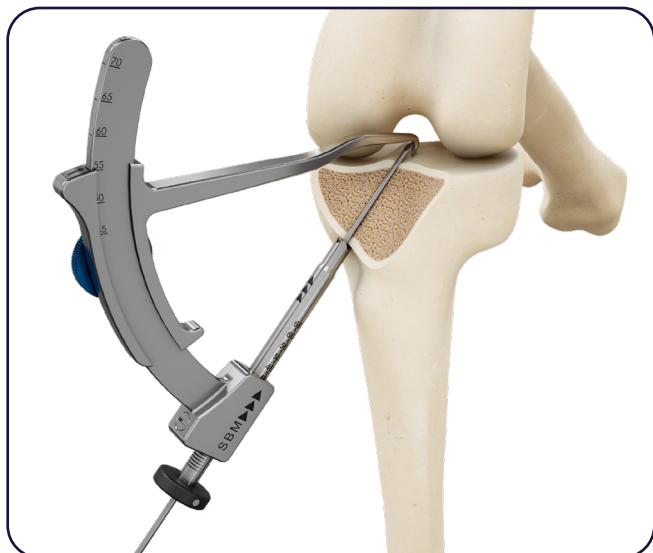


Place the tibial aiming device and drill a complete tunnel — first to Ø4.5 mm, then to the graft diameter (Dr. N. Graveleau technique).

- 1 Insert pin & pilot:** Use the tibial guide to insert the Ø2.5 mm pin. Preload drilling guide on to Ø4.7 drill, advance to cortical bone and screw until positive stop before removing Ø4.7 drill. Drill a Ø4.7 mm tunnel with the cannulated bit.
- 2 Insert & open blade:** With the drill at «0», insert into the Ø4.7 mm tunnel; turn the knob to the desired diameter (6–11 mm) and extend the blade.
- 3 Retrograde drill:** Place the white depth indicator at the skin, drill clockwise to length matching the tibial-plug diameter; verify depth with the gauge.
- 4 Close & remove:** Return the knob to «0» to close the blade; remove the RetroTech® drill and pass the relay suture.

Tibial retrograde drilling steps (alternative)

1 Insert the tibial guide pin

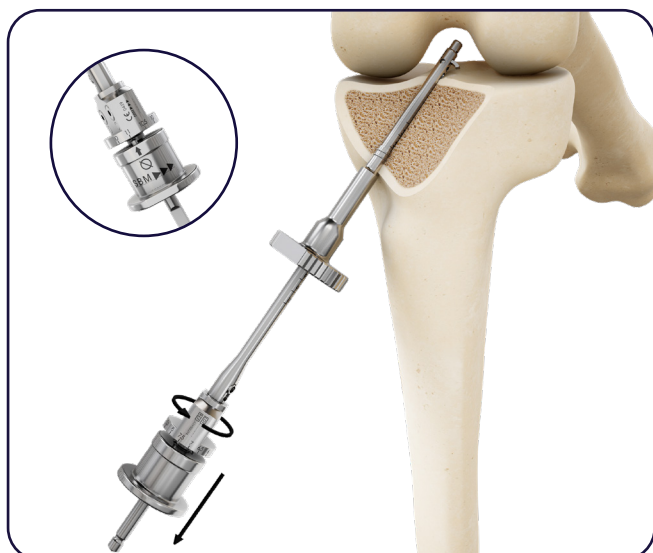


2 Drill the Ø4.7 mm pilot tunnel

Preload drilling guide on to Ø4.7 drill, advance to cortical bone and screw until positive stop before removing Ø4.7 drill.



3 Insert the RetroTech® and open the blade



4 Retrograde-drill the tibial socket to depth





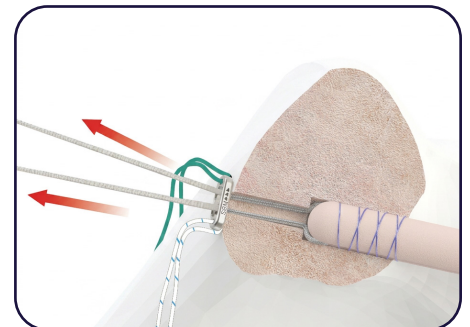
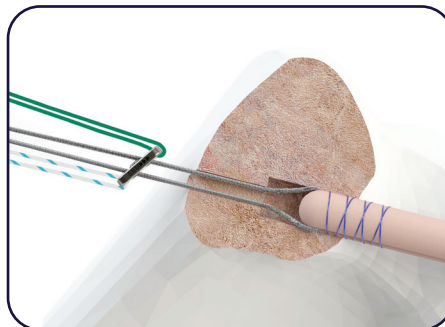
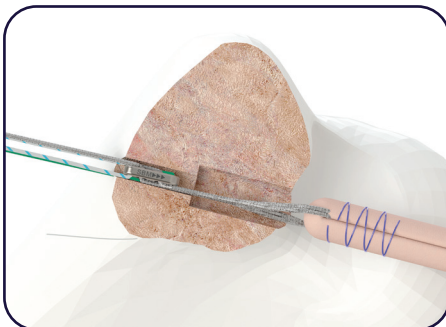
GRAFT PASSAGE & FEMORAL FIXATION

Pass the graft

Pass the traction thread (previously through the eye of the Ø2.5 pin) with the pin via the AM portal through the femoral tunnel; retrieve in the tibial tunnel with Kelly pliers. Pass all BTLOOP® threads through the relay suture loop and pull the graft and threads from tibia toward femur until the plate exits the femoral cortex.

Flip and lock the femoral fixation

- 1 Flip plate:** Flip the button-plate using the green thread. Alternately pull the green and white/blue threads to confirm the plate cleared the cortex and flipped.
- 2 Verify seating:** Apply counter-tension to the graft and confirm the button-plate is flush against the cortical wall.
- 3 Lock femur:** Alternately pull the white BTLOOP® threads until they lock and the plate contacts the cortex.
- 4 Check stability:** Pull on the graft to check assembly stability; confirm proper graft kinematics before tibial fixation.



TIBIAL FIXATION & FINAL TENSIONING

- 1 Flex to 10–20°:** Flex the knee to 10°–20° and apply tension by alternately pulling the white threads until the tibial implant locks.
- 2 Cycle:** Cycle the knee (flexion/extension) to remove construct creep.
- 3 Re-tension in extension:** Position the knee in full extension and tension the implant once more.
- 4 Final inspection:** Under arthroscopic control, check graft tension; remove the green and white/blue threads by pulling one end.
- 5 Trim:** Use cutting pliers to sever the implant's white threads.

EVIDENCE Colombet (2017) fixes the BTB graft at ~20° flexion and notes adjustable-loop fixation uniquely allows the graft to be retightened after cycling.



CLOSURE & POST-OPERATIVE CONSIDERATIONS

- **Closure:** Irrigate, confirm hemostasis, and close the portals and harvest site in layers.
- **Dressing:** Apply a sterile dressing; brace per surgeon preference.

The rehabilitation protocol is determined by the treating surgeon. A typical progression emphasizes early protected ROM, progressive weight-bearing, quadriceps activation, and a criteria-based return to sport.



TIPS & PITFALLS

Stage	Tip / Pitfall
Harvest	Keep saw cuts shallow at the patella to avoid fracture
Graft prep	Confirm both BTL loops adjust independently before going to the field
Femoral socket	Stay posterior to the resident's ridge for an anatomic footprint
Tibial socket	Preserve the anterior cortex to prevent socket blowout
Fixation	Confirm cortical button flip with direct tension before seating the block
Tensioning	Pre-cycle the knee to eliminate creep before setting final tension



APPENDIX A — MENISCAL REPAIR (MENIX® DUO)

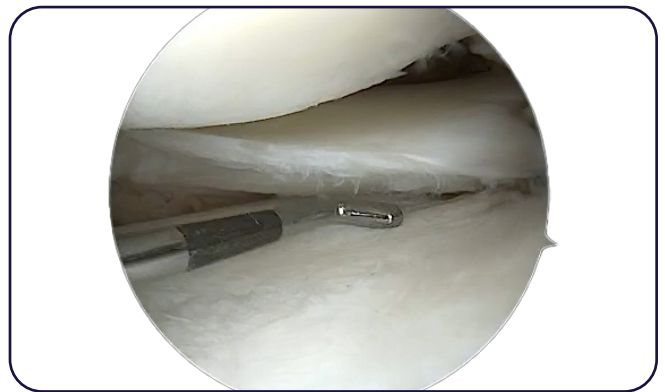
ADJUNCT Meniscus repair is an adjunct to the ACL procedure and has been moved here so the BTB technique reads in surgical order. Figures from the MENIX® DUO surgical technique.

Meniscal repair steps

1 Evaluate and probe the tear



2 Prepare the tear bed (rasp / abrasion)



3 Insert the MENIX® portal skid



4 Advance the MENIX® DUO into the joint



5 Deploy the anchors to depth



6 Tension the repair





CONTRIBUTING SURGEON

► This technique was developed in collaboration with:

► Name, credentials:

► Title / Institution / City, State:



ORDERING INFORMATION

Adjustable fixation — Bone–Tendon–Bone

Reference	Description
BTB0001709	BTLOOP® — Adjustable Fixation System, BTB technique — cortical tunnel Ø4.5 mm
BTBXL01709	BTLOOP® XL — Adjustable Fixation System, BTB technique — cortical tunnel Ø5–10 mm

Adjustable fixation — Soft-tissue graft (PULLUP®)

Reference	Description
PULLU01201	PULLUP® Adjustable Fixation System — cortical tunnel Ø4.5 mm
PULXL01202	PULLUP® XL Adjustable Fixation System — cortical tunnel Ø5–10 mm

Sutures

Reference	Description
SUTRPBLAG1	POWERTEX® non-absorbable suture with needle — BLUE — USP #2 — L 90 cm
SUTRPBNAG1	POWERTEX® non-absorbable suture with needle — WHITE/BLACK — USP #2 — L 90 cm

Resorbable interference screw - round head and flat head (fully threaded)

Reference	Description
COM3007020	LIGAFIX® 30 resorbable interference screw - round head Ø 7 mm - L 20 mm
COM3007025	LIGAFIX® 30 resorbable interference screw - round head Ø 7 mm - L 25 mm
COM3007030	LIGAFIX® 30 resorbable interference screw - round head Ø 7 mm - L 30 mm
COM3008020	LIGAFIX® 30 resorbable interference screw - round head Ø 8 mm - L 20 mm
COM3008025	LIGAFIX® 30 resorbable interference screw - round head Ø 8 mm - L 25 mm
COM3008030	LIGAFIX® 30 resorbable interference screw - round head Ø 8 mm - L 30 mm
COM3009020	LIGAFIX® 30 resorbable interference screw - round head Ø 9 mm - L 20 mm
COM3009025	LIGAFIX® 30 resorbable interference screw - round head Ø 9 mm - L 25 mm
COM3009030	LIGAFIX® 30 resorbable interference screw - round head Ø 9 mm - L 30 mm
COM3009035	LIGAFIX® 30 resorbable interference screw - round head Ø 9 mm - L 35 mm
COM3010R25	LIGAFIX® 30 resorbable interference screw - round head Ø 10 mm - L 25 mm
COM3010R30	LIGAFIX® 30 resorbable interference screw - round head Ø 10 mm - L 30 mm
COM3010R35	LIGAFIX® 30 resorbable interference screw - round head Ø 10 mm - L 35 mm
COM3010030	LIGAFIX® 30 resorbable interference screw - flat head Ø 10 mm - L 30 mm
COM3011030	LIGAFIX® 30 resorbable interference screw - flat head Ø 11 mm - L 30 mm
COM3011035	LIGAFIX® 30 resorbable interference screw - flat head Ø 11 mm - L 35 mm

Meniscal repair (adjunct)

Reference	Description
MEN0201902	MENIX® Meniscal suture system with one anchor
MEN0201901	MENIX® DUO Meniscal suture system with two anchors

Instrumentation sets

Reference	Description
LIG90DT001	LIGAFIX® – PULLUP® complete instrumentation set
PULLFOR001	RetroTech® complete instrumentation set
PULLTAB000	GraftTech® preparation station complete instrumentation set
MEN9000000	MENIX® complete instrumentation set
LIG9000041-01	Eyelet pin Ø2.5 mm — L 400 mm (x1)
LIG9125300-01	K-wire guide pin Ø2.5 mm — L 300 mm for drill bits (x1)

► REFERENCES

1. Colombet P, Bouguennec N. Suspensory Fixation Device for Use With Bone–Patellar Tendon–Bone Grafts. Arthroscopy Techniques. 2017. (Technical note.)
 2. Boutsiadis A, Panisset J-C, Devitt BM, et al. Anterior Laxity at 2 Years After ACL Reconstruction Is Comparable When Using Adjustable-Loop Suspensory Fixation and Interference Screw Fixation. Am J Sports Med. 2018. (n=272; mean 25.7-mo follow-up.)
 3. BTLOOP® Instructions For Use, ref. MGLOOPNOEN B (2022-10-06). S.B.M. SAS.
 4. BTLOOP® / RetroTech® product brochures (SBM USA). Static & fatigue testing: RD 823 (2012), RD 1472 (2021); loop-adjustment ergonomics: RD 847 (2012).
-

► DISCLAIMER

This document is intended for healthcare professionals. It describes a recommended surgical technique; the treating surgeon is responsible for determining the appropriate technique and device use for each patient. Refer to the package insert / Instructions For Use supplied with each device for complete indications, contraindications, warnings, precautions and instructions before use.

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