ACL Reconstruction with LARS Ligament Surgical Technique
ACL repair and reconstruction using the LARS ligament

LARS are a range of synthetic ligament augmentation and reconstruction devices, suitable for a wide variety of applications from ACL and PCL reconstruction to ankle and shoulder repairs.

LARS ligaments are intended for intra and extra-articular reconstructions of ruptured ligaments. They are designed to mimic the normal anatomic ligament fibres. The intra-articular longitudinal fibres resist fatigue and allow fibroblastic ingrowth, the extra-articular woven fibres provide strength and resistance to elongation.

The use of LARS ligaments can allow immediate repair of knee kinematics by re-centring the knee. The LARS ligament is used as an internal fixation device to aid the healing process.

LARS can be used in conjunction with the remnants of the ruptured ligament, or as reinforcement of an autologus reconstruction. In both cases LARS allow the original ligament tissues to heal during the immediate post-operative period, when an excess of traction would otherwise elongate the tissue.

These ligaments must always be placed in the joint in an anatomic and isometric position. The diameter of the bony tunnels must correspond to the specific technique for each type of ligament and as a general rule should be as small as possible. The fixation of the ligament extremities must always be extra-articular. In acute cases, the artificial ligament must be placed at the centre of the autologus remnant. Ligament extremities are cut flush with the fixation.

LARS can be used for extra-articular reconstructions in tendon repairs such as Achilles tendon, patella tendon, biceps tendon, rotator cuff, etc.

Mechanical in vivo tests for resistance, fatigue and creep have shown that LARS ligaments are highly effective ligament reconstruction and augmentation devices and long-term clinical results are excellent.
Indications

LARS ligaments can be considered for:
- acute (less than 3 weeks old) cruciate ligament injuries in young active patients;
- multiple ligament injuries;
- late or chronic injuries where a good ligament stump remains with evidence of vascularity.

Use of isolated synthetic ligaments for ligament reconstruction can be considered for:
- older patients who want to stay active;
- professional athletes who may require an immediate return to training on the understanding that the synthetic ligament may provide a short-term solution only.

In young patients with chronic injuries, with no ACL remnants, an autologous reconstruction reinforced with a LARS Actor Ligament is recommended.
Pre-operative planning

Depending on surgeon preference, an MRI, arthroscope, clinical examination or Telos stress X-ray are used to confirm the clinical diagnosis and are the basis for an objective evaluation.

A true lateral X-ray of the hyper-extended knee enables the surgeon to:

- identify isometric femoral and tibial landmarks;
- measure the slope of the roof: if this is too vertical a notch plasty may be required.

The “isometric” femoral point (F) lies in the centre of an arc of approximately 140° formed by the posterior condyle. It is also located at 60% of a line drawn parallel to the Blumensat line and passing through the most prominent point of the posterior condyle. Point F is at a variable distance (6-3mm) from the posterior wall (p.w.).

The isometric tibial point (T) lies in the centre of ACL tibial insertion, at 50% of the width of the tibial plateau.
LARS synthetic ligaments

LARS ligaments are manufactured in different sizes corresponding to the number of fibres in the ligament. Resistance to traction varies with the number of longitudinal fibres. The strength of LARS ligaments is approximately 1,500N for 30 fibres, 2,500N for 60 fibres, 3,600N for 80 fibres, and 4,700N for 100 fibres.

The intra-articular part of a LARS ligament consists of longitudinal free fibres in two bundles orientated clockwise or anti-clockwise for right and left knees to mimic the natural ligament.

Orientation of the free fibres helps to minimise the effects of fatigue during flexion and extension of the knee and provides for fibroblastic ingrowth.
Operative set-up

Position the patient supine with the leg to be operated on hanging free over the end of the surgical table. Make sure that the knee is able to flex freely beyond 90°. A tourniquet is usually applied over the thigh.

Position the Image Intensifier (C-arm) to obtain a lateral view of the knee with the femoral condyles superimposed. The C-arm can be placed inside or outside drapes. (Type 1)

The C-arm may alternatively be inverted. This set-up is recommended for isolated ACL procedures only. (Type 2)
1. Placement of the femoral K-wire

Create an antero-lateral portal for viewing. Make an antero-medial portal located almost next to the medial border of the patellar tendon and low at the level of the tibial plateau, avoiding injury to the medial meniscus.

Introduce a sharp, double-ended K-wire through the medial portal.

The K-wire should form an angle of approximately 25° with the tibial plateau and the tip should point towards the intercondylar wall of the lateral condyle to the centre of a semicircle formed by the posterior condyle – the isometric point established on pre-op X-rays.

NOTE: for a 6mm drill use a 2.5mm K-wire, for 7.0mm and 7.5mm drills use a 3.0mm K-wire.

Confirm the position of the K-wire with X-ray fluoroscopy. Drill the K-wire through the femur and allow the K-wire to exit over the thigh.

Place the drill onto the femoral end of the K-wire and pull the wire back up into the intercondylar notch until it is flush with the lateral wall.
2. Drilling the K-wire into the tibia

Extend the knee to approximately 50° of flexion and start drilling the K-wire into the tibia. Make sure through the arthroscope that the tip of the K-wire hits the middle of the ACL footprint.

When satisfied, advance the K-wire through the tibia and allow the K-wire to exit over the proximal tibia.

X-ray control should show that the K-wire forms an angle of approximately 65° with the tibial plateau [25° of initial K-wire position + 40° (90° of initial flexion - 50° of flexion for tibia drilling)].

The K-wire passes through the femur, the knee joint and tibia in a straight line ensuring perfect alignment of the bony tunnels. The K-wire should not impinge the wall of the notch.

Make sure that the leg is carefully supported to avoid bending the K-wire.
3. Drilling the tunnels

Use an outside-in technique and the correct size of drill according to the size of the selected implant.

On the femoral side, use the graduated telescopic tubes over the K-wire, which will allow for the introduction of the drill guide through the soft tissues.

Use the correct size drill and again only just break through the notch wall. This should ensure minimal damage to the remnants of the ACL.

On the tibial side make a small skin incision over the K-wire to allow the placement of the drill guide over the K-wire. When the tibial plateau is reached, take care only to break through the cortex to avoid damage to the ACL footprint and stump.
4. Suturing of ruptured ligament or re-tensioning the stump

Insert the long cannulated tube over the K-wire. Remove the K-wire and drill guide and leave the tube in place so that it sits in the femur with the opening of the tube visible through the arthroscope in the notch.

Assess the stump/ruptured ligament. Introduce a long needle (from the instrument set) through the antero-medial portal and advance it through the ligament and then into the mouth of the tube in the notch. You should be able to retrieve the needle at the tube exit on the femoral side. Pass the first thread of a non-absorbable suture through, and then repeat for the second thread.
5. Inserting the LARS ligament

Advance the long cannulated tube through the tibial tunnel until it exits over the proximal tibia.

Through the tube, introduce a flexible wire (wire loop) from the femoral side as well as the 2mm blunt screw guide wire.

Remove the long cannulated tube from the femoral side ensuring that the flexible wire and the guide wire stay in place by holding them with an instrument. Pull back the guide wire so that it sits only in the femoral tunnel.
5. Inserting the LARS ligament - continued

Pass the leaders of the LARS ligament through the loop in the wire loop. Pull on the femoral side of the wire loop to pull through the ligament leader thread. Pulling on them gradually introduces the ligament into the tunnel. Prevent the screw guide wire from backing up the femoral tunnel.

Pull the ligament through whilst observing through the arthroscope. Stop pulling the ligament once the free fibres of the ligament are positioned 1–2mm outside the femoral tunnel.
6. Femoral fixation

Introduce graduated soft tissue expanders to allow the placement of the drill guide over the guide wire. Choose a LARS screw at least 1mm larger in diameter than the size of the tunnel.

Using a LARS screwdriver, introduce the interference screw. If you have retensioned or repaired the ACL stump, tension the sutures through the stump whilst introducing the screw.

The length of the shaft of the screwdriver equals the length of the drill guide. Once the handle of the screwdriver is flush with the drill guide, the screw is fully seated.
7. Tibial fixation

Before you secure the tibial screw, put the knee through a full range of motion several times. Observe the ligament through the arthroscope. If the correct isometric position has been achieved, there should be no movement of the ligament.

Introduce the LARS interference screw over a guide wire but do not pull or tension the LARS ligament, since this may result in an over tight knee.
8. Trimming the ligament

Once fixation of the ligament is completed, the two extremities of the ligament are cut flush with the bone. On the tibial side a scalpel may be used, on the femoral side use a LARS ligament cutter.

If an early return to sporting activity is anticipated, secondary fixation of the ligament on the tibial side is recommended, using a staple or a second interference screw in a separate bony tunnel.
9. Completing the procedure

Inspect the completed reconstruction/reinforcement through the arthroscope. Ideally you should either not see the LARS ligament, or see only a minimal portion with the rest covered by the ACL remains.

Close the skin wounds in your usual manner and apply dressing.

There is no need for post-op bracing.

Obtain post-op X-rays to confirm the placement of interference screws. Telos stress X-rays may be used to assess the outcome of surgery.

NOTE: The surgeon should be careful to diagnose and make repairs to other critical structures both within and outside the capsule of the knee in order to give the patient the best possibility of a trouble free rehabilitation period and long term survival. In chronic cases, if there is significant internal rotational instability, an extra-articular lateral reinforcement (Lemaire or MacIntosh type) must supplement the intra-articular ACL. If there is postero-lateral instability, a postero-lateral reconstruction is suggested. In the case of bi-cruciate injury, the PCL must be reconstructed first, in order to re-centre the knee and return the ACL to its correct position. Except in cases of complete avulsion, moderate MCL lesions can be left to heal naturally as long as the ACL has been properly repaired.

Post-surgery care and physiotherapy

- No post-op bracing or immobilisation
- Full weight bearing and mobilisation to be started the day following surgery
- Isometric quadriceps exercise to be started the day following surgery to recover full extension
- 90° of flexion should be obtained after 7-10 days
- Return to driving should be at patient and surgeon discretion
- Return to work will depend on activity level and the individual recovery time
- Return to sports (jogging) after approximately 2-3 weeks
- Return to full contact sports once proprioception has returned
- Competitive training after approximately 5 weeks
- No limits to full motion
- Isokinetic closed chain rehabilitation
The instrument set

There are two trays in the instrument set. The bottom tray carries a universal tibial/femoral handle, jig attachments for tibial and femoral tunnel placement, the drill guide and blue ligament puller.

The top tray has three drill bits (6, 7 and 7.5mm), guide wires, suture needles, long “passing” cannula and gradated dilators.

NOTE: The length of the screwdriver shaft equals the length of the drill guide. Once the handle of the screwdriver sits flush with the top of the drill guide, the LARS screw has been fully inserted into the bony tunnel and countersunk against the cortex.

LARS cannulated interference screws

These titanium screws are designed for easy insertion into the tunnels by virtue of the conical shape at the tip of the screw.

Deep threaded shoulders and blunt outer edges maximise the fixation without damage to the ligament and ensure maximum contact between the screw and the tunnel wall to prevent tunnel widening.

Flexible wire loops and ligament cutter are also shown.
## Product codes

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