Gluteal Tendon Repair and Reinforcement
Surgical technique
Corin would like to thank Dr Greg Janes, Perth Orthopaedic and Sports Medicine Centre - Australia, for his contribution to this surgical technique.
Greater trochanteric pain syndrome (GTPS) is a term used to describe chronic pain overlying the lateral and sometimes posterior aspect of the hip, previously described as trochanteric bursitis\(^1\).

The prevalence of unilateral GTPS is 15.0% in women and 8.5% in men, and that of bilateral GTPS is 6.6% in women and 1.9% in men\(^2\).

Recent improvements in the understanding of the pathology of GTPS have revealed that tears in the gluteal tendons are the most common cause of GTPS\(^3,4\). Gluteal tendon tears are similar in pathology to a rotator cuff tear in the shoulder\(^5\) and can be a result of traumatic injury, degenerative changes or total hip arthroplasty surgery\(^6\). Degenerate tears of the gluteal tendons were seen by Bunker et al\(^5\) in 22% of patients with intracapsular femoral neck fractures.

Whilst surgical repair of gluteal tendon tears by transosseous or bone anchor suture techniques report good pain relief\(^7,8,9\), high re-rupture rates of 11% at six months and 31% at twelve months\(^8,9\) indicate a more substantial repair construct may be required.

As a synthetic scaffold LARS™ (Ligament Augmentation & Reconstruction System) is designed to provide initial stability, allowing biological healing to take place, while eliminating post-operative elongation. The LARS™ ligament is used to reinforce primary suture and anchor based repairs, providing immediate strength and stability to the repair\(^10\).

Recent publications, including those by Bucher et al\(^10\) and Bajwa et al\(^6\), describe the use of a LARS™ synthetic ligament to reinforce the repair of gluteal tendon tears with significant improvements in patient outcomes.
LARS™ overview

Material
LARS™ is a system of synthetic scaffolds intended for use in general surgical procedures for reinforcement of soft tissue where weakness exists, suitable for specified applications in the body. LARS™ scaffold material is made from polyethylene terephthalate (PET-Polyester) which has been used in medical devices since the early 1940s. The material is woven using an inverse warp knitting technique, providing resistance to weave loosening and elongation. Each scaffold configuration has been designed with the optimal shape, size and mechanical property for the specific application in the body.

This surgical technique guide has been developed to detail the use of LARS™ scaffolds for gluteal muscle and tendon repairs.

General considerations
There are certain factors that must be considered with the use of LARS™ scaffolds. Being a non-biological material, LARS™ does not have the elongation properties of autografts or allografts. Therefore it is important to fix the scaffold at its longest length throughout the range of motion to avoid impingement or inhibition of movement. Furthermore, it is important to use non-absorbable sutures to secure the scaffold material in place. For optimal results, repairs with LARS™ scaffolds should be done as acutely as possible.

Graft options

IT32RA (product code: 104.135)
- LARS™ IT32RA: 32 fibres and can withstand forces up to 1500N
- This scaffold is a flat band with a cylindrical ‘feeder’ end with leader threads – 300mm in length, 20mm in width

Fixation in bony tunnels should be completed by titanium interference screws: sizes Ø5.2 x 15mm, Ø5.2 x 20mm or Ø6.0 x 30mm.

ACTOR 10 (product code: 104.110)
The flat open end of the LARS™ ACTOR 10 ligament can be used as an alternative. The free fibre portion of the ligament does not form any part of the repair or reinforcement.

- The flat portion of this scaffold is 32mm in width x 160mm in length and can withstand forces up to 2000N

Fixation in bony tunnels should be completed by blunt threaded, titanium LARS™ interference screws at least 1mm larger than the tunnel diameter, and maximum length permitted by the tunnel length: sizes Ø5.2 x 30mm or Ø6 x 30mm.

CR25 (product code: 104.225)
- LARS™ CR25: 40 fibres and can withstand forces up to 700N
- LARS™ CR30: 48 fibres and can withstand forces up to 1000N

Two sizes are available:
- The flat proximal portion, rectangular (CR25 – 25mm x 50mm; CR30 – 30mm x 50mm)
- The distal portion, made of two cylindrical cords ended with leader threads – Ø3.5mm, 120mm in length

Fixation in bony tunnels should be completed by titanium interference screws: sizes Ø4.7 x 15mm, Ø5.2 x 15mm or Ø5.2 x 20mm.
Indications

LARS™ is indicated for the reinforcement of tears in the gluteus medius and minimus tendons in patients presenting with lateral hip pain, focal tenderness over the greater trochanter and tenderness on resisted abduction, and a positive FABERE (Flexion, ABDuction, External Rotation, Extension) test. LARS™ can also be used in patients who have failed conservative treatment options and when the gluteal tendons are damaged during antero-lateral approach to total hip replacement surgery.

Diagnosis of gluteal tendon tears can be confirmed by MRI scan with 91% accuracy.

In the context of gluteal tendon repairs, LARS™ should be used as reinforcement after direct suturing of the tear with non-resorbable sutures. If the tear cannot be sutured directly, then the tissue should be re-attached to the insertion point on the greater trochanter using transosseous or bone anchor suturing to ensure correct tensioning of the tissue prior to reinforcement with LARS™.

LARS™ acts as an internal splint to reinforce the repair and aid healing. In supporting the primary repair, the addition of the LARS™ ligament facilitates earlier mobilisation and rehabilitation by permitting immediate weight bearing as tolerated by the patient.

Contraindications

LARS™ should not be used in patients with evidence of hip joint osteoarthritis, as evidenced by x-ray or MRI. The device is contraindicated for use in patients with:
- Active or latent infection,
- Decreased vascularity,
- Pathologic soft tissue conditions that would prevent secure fixation.

The device is contraindicated for use in any patient with mental or neurologic conditions who is unwilling or incapable of following postoperative care instructions.

The device is contraindicated in uses that require rolling, folding, or layering, and which may create a space impermeable to fluid, cells, and blood vessels. Such uses may result in excessive inflammation, drainage, extrusion or infection.

LARS™ is not intended for use as a replacement for normal body structures or to provide the full mechanical strength to support structures.

Surgical approach

With the patient in the lateral decubitus position, a longitudinal incision is made just anterior to the mid-point of the greater trochanter, as per the antero-lateral approach to the hip. The wound is deepened to expose the fascia lata which is incised longitudinally.

A 1-2cm Y-shaped decompression of the tensor fascia lata investing fascia is performed, proximal to the greater trochanter.

The insertion of the gluteus medius tendon is exposed by excision of the thickened trochanteric bursa.

Note: It may be necessary to detach the superficial attachment of the tendon in partial thickness tears for preparation for repair, as it is common for the tear pattern to be a delamination involving the deep portion of the tendons.

Degenerate tissue is excised and any enthesophytes removed. The insertion footprint on the anterior lateral greater trochanter is decorticated to remove sclerotic bone and create a bleeding bone surface to receive the prepared tendon.

Fixation

Titanium soft screw with tapered edges

Two diameter sizes available:
- Ø4.7mm x 15mm length
- Ø5.2mm x 15, 20 or 30mm length

Titanium soft screw with parallel edges

One diameter size available:
- Ø6.0mm x 30mm length

Fixation of LARS™ ligaments in bony tunnels should be completed using non-resorbable, blunt threaded LARS™ interference screws at least 1mm larger in diameter than the tunnel. The ligament should also be fixed at its longest length to allow full range of movement.

⚠️ All sutures used in the repair procedures should be non-resorbable #2 sutures as they form an integral part of the repair strength.
A2. Tunnel placement and drilling

A sharp tipped K-wire is drilled through the greater trochanter from the footprint of the gluteus minimus to a point posterior and lateral on the greater trochanter. A bone tunnel is created by drilling over the K-wire with a 4.5mm cannulated drill bit.

Note: It is not always possible to complete the tunnel drilling in a single step. It may be necessary to drill converging tunnels from the gluteus minimus footprint and from the posterolateral point to join in the middle.

A1. Identification of tendon involvement

Once the extent of the damage to the gluteus medius and minimus tendons have been identified, any avascular or degenerative tissue is resected. The insertion point for the tendons on the lateral greater trochanter should be decorticated to aid biological healing.

Frequently, delaminating tears will appear superficially intact. Digital palpation of the tendon will help in identifying the extent of the underlying tear. Further detachment of the tendons may be required to fully expose the affected area.

Repair choice

In cases where there is a full thickness tear in the gluteus medius or both gluteus medius and gluteus minimus tendons are involved, the LARS™ IT32RA or ACTOR 10 can be used.

The IT32RA reinforcement is a flat band, 20mm in width at one end and tubular at the other, and can withstand forces up to 1500N.

The flat portion of the ACTOR 10 is 32mm in width x 160mm in length and can withstand forces up to 2000N

The free fibre portion of the ACTOR 10 ligament does not form part of the repair or reinforcement.
A3. Suturing of the LARS™

One end of the flat LARS™ ligament is sutured to the under-surface of the gluteus medius, or the reflected gluteus minimus if involved, using non-resorbable #2 sutures. Stay sutures in the reflected tendon ends will help aid retraction of the tendon during attachment of the LARS™.

The free end of the LARS™ ligament is then passed through the bone tunnel, from proximal anterior to distal lateral, using the flexible wire loop.

A flexible wire loop is passed through the tunnel so that the looped end exits the antero-medial tunnel opening. This wire will be used to pass the LARS™ ligament later.

Lateral view of LARS™ ligament passing through drill tunnel from superior anterior to distal lateral.
A5. Completion of repair

If there are concerns about the strength of the repair or tissue quality, the repair can be further reinforced as necessary. The free end of the LARS™ exiting the lateral end of the bone tunnel is folded back up over the superficial gluteus medius tendon and sutured to the tendon using #2 non-resorbable sutures to complete the repair.

It may be necessary to hold the gluteus medius tendon in place using a tissue grasper or stay-sutures whilst suturing of the LARS™ is completed.

Trim any excess LARS™ ligament prior to wound closure.

Do not over-tension the LARS™ as this may reduce range of movement and lead to early graft failure.

A4. Fixation of LARS™ in the bone tunnel

The LARS™ ligament is drawn through the bone tunnel until the gluteal tendon is in contact with its footprint. Once the tendons are reduced to the insertion point on the greater trochanter, bone anchors or transosseous, non-absorbable sutures are used to secure the medius and minimus tendons to the bone. The LARS™ is secured in the bone tunnel using a 5.2 or 6.0mm blunt threaded LARS™ interference screw inserted over a blunt guide-wire.

Note: If the sutured tendon-LARS™ construct repair is secure, the excess LARS™ can be cut at the lateral opening of the bone tunnel prior to wound closure.

Use leader threads to maintain suitable tension during fixation.
Superficial/incomplete gluteal lesions technique

Repair choice
For more superficial or incomplete gluteal tears the LARS™ CR25 or CR30 can be used. These reinforcements can withstand forces up to 700N or 1000N respectively. The flat proximal portion is rectangular (CR25 – 25mm x 50mm; CR30 – 30mm x 50mm). The distal portion is made of two cylindrical cords ended with leader threads – 120mm in length and 3.5mm in diameter.

B1. Tunnel position and drilling
Once the extent of the damage to the gluteus medius has been identified, any avascular or degenerative tissue is resected. The insertion point for the tendon on the lateral greater trochanter should be decorticated to aid biological healing. Two 3.5mm tunnels are drilled starting inferior to the greater trochanter, exiting anterior to the lesser trochanter. A flexible wire loop should be passed through each tunnel so that the looped end exits the lateral tunnel opening.
B2. Suturing of the tendon
It is recommended that tears in the gluteal tendon are repaired directly prior to LARS™ being applied as a reinforcement. The tendon should be sutured using non-resorbable #2 sutures. If lesions in the tendon cannot be close by direct suturing, suture anchors can be used to re-attach the tendon to its insertion point on the greater trochanter.

B3. Suturing of the LARS™
The flat portion of the LARS™ CR25 or CR30 is sutured over the affected region using non-resorbable #2 sutures. The two cylindrical cords of the LARS™ are pulled through the bone tunnels from lateral to medial using the flexible wire loops.

B4. Final fixation
Once the desired tension has been achieved, the LARS™ can be secured in the femoral tunnels using 4.7 x 15mm LARS™ blunt threaded interference screws inserted over a blunt guide wire. The head of the screw should be flush with the cortical surface to ensure maximum fixation strength.

Trim any excess LARS™ ligament prior to wound closure.

⚠️ Do not over-tension the LARS™ as this may reduce range of movement and lead to early graft failure.
**Rehabilitation guidelines**

The pace of rehabilitation is individual to the patient and should be tailored to their demands, response to therapy and their wound healing. Return to activity should only be recommended when both objective and subjective outcomes are satisfactory.

- Weight bearing as tolerated, with crutches for first week
- Passive range of movement to 90° flexion from week two. Avoid hip flexion beyond 90° and active abduction for first six weeks
- Increase weight bearing from four weeks as tolerated
- Full weight bearing should be possible from six weeks with active range of motion in all planes
- Hydrotherapy and gait education to continue as necessary
- Return to full activity is dependent on the patient's individual recovery and should be at the recommendation of the surgeon or physiotherapist. Generally this is possible four to six months post-surgery.

⚠️ **LARS™** is strong immediately after implantation, therefore there may be a temptation for a patient to be less diligent with physiotherapy. Physiotherapy is essential to the longevity of the **LARS™**, and ignoring rehabilitation steps may lead to excessive wear of the **LARS™** ligament.

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**Ordering information**

**LARS™ ligaments**

- 104.135 IT32RA
- 104.110 ACTOR 10
- 104.225 CR25
- 104.230 CR30

**Screws**

**Ti soft screw with tapered edges**

- 104.470 Ø4.7mm 15mm
- 104.515 Ø5.2mm 15mm
- 104.520 Ø5.2mm 20mm
- 104.530 Ø5.2mm 30mm

**Ti soft screw with parallel edges**

- 104.630 Ø6.0mm 30mm

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**LARS™ gluteal tendon repair instrument set**

- 204.026 3.5mm x 150mm drill bit
- 204.025 4.5mm x 150mm drill bit
- 204.068 4.5mm cannulated drill
- 204.069 5mm cannulated drill
- 204.051 6mm cannulated drill – U01151
- 204.001 LARS™ screwdriver
- 104.201 Ligament pin 2 x 250mm – pointed – U01003
- 104.202 Ligament pin 2 x 250mm – blunt – U01004
- 204.008 Wire loop pack of 5 – U014011
- 299.510 Outer box
References


