LARS™ ACJ

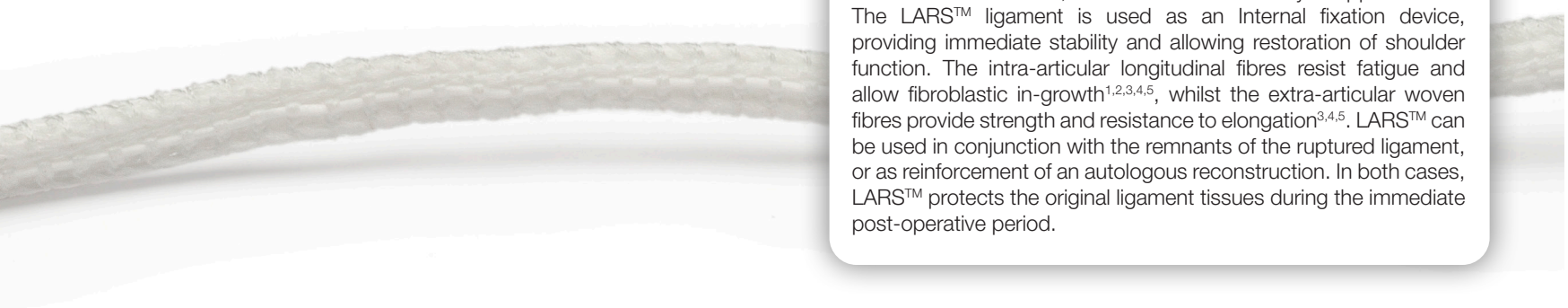
ACJ Reconstruction and Reinforcement
Surgical Technique

Corin
Connected Orthopaedic Insight

LARS™ ACJ

Contents

Corin would like to thank Prof L Funk for his input to this surgical technique.



Overview

LARS™ is a range of versatile synthetic ligament augmentation and reconstruction devices, suitable for a wide variety of applications. The LARS™ ligament is used as an Internal fixation device, providing immediate stability and allowing restoration of shoulder function. The intra-articular longitudinal fibres resist fatigue and allow fibroblastic in-growth[1,2,3,4,5], whilst the extra-articular woven fibres provide strength and resistance to elongation[3,4,5]. LARS™ can be used in conjunction with the remnants of the ruptured ligament, or as reinforcement of an autologous reconstruction. In both cases, LARS™ protects the original ligament tissues during the immediate post-operative period.

LARS™ ACJ

Stability | Versatility | Recovery

LARS™ ACJ

Indications

LARS™ ligaments can be considered for:

- Acute or chronic ACJ dislocations or instability
- Revision ACJ reconstruction surgery

LARS™ synthetic ligament composition

Mechanical in vivo tests for resistance, fatigue and creep have shown that LARS™ ligaments are highly effective ligament reconstruction and augmentation devices and clinical results are excellent [3,6,7,8].

LARS™ ligaments are manufactured in a range of sizes, with various numbers of longitudinal fibres corresponding to varying resistance to elongation and tensile strength. 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 [3].

General considerations

LARS™ ligaments must always be placed in an anatomical and isometric position. When positioning the ligament, it is essential to avoid any abrasion within the joint or obstruction with other surrounding tissues, as this may lead to wear of the ligament fibres [4,5,7]. It is also important to avoid placing the free fibres portion of the LARS™ ligament within the tunnels or at the tunnel edges as these fibres are more prone to damage when in contact with sharp bony edges. At least 2mm of the extra-articular fibres should be visible outside the tunnel entrance, to minimise risk of long-term wear of the ligament.

Acute angles of bone tunnels must be avoided. The diameter of the bony tunnels must correspond to the specific technique for each type of ligament and should typically be as small as possible to encourage bony tissue in-growth

Due to the stiffness of a LARS™ ligament it is crucial to implant the ligament in an isometric and anatomic position with final fixation at the angle where the ligament is longest to avoid any excessive strain on the ligament fibres. LARS™ ligaments should not be over-tensioned during fixation as this will restrict motion and cause undue strain on the ligament. The tension should not be more than that of the repaired anatomic ligament.

The fixation of the ligament is carried out using dedicated cannulated interference screws, which do not damage the ligament and provide maximum contact with the tunnel wall. As a general rule, the interference screw size should be at least 1mm bigger than the tunnel size and its length should be the longest permissible, dependent on tunnel length. The use of resorbable screws is not recommended with the LARS™ ligament.

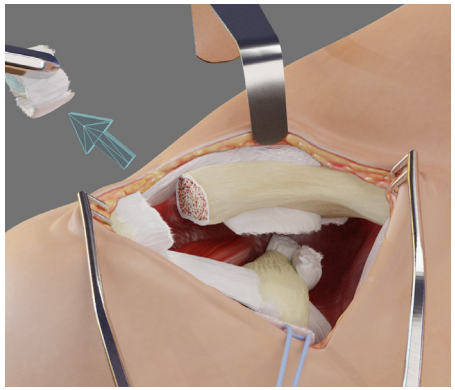
LARS™ in ACJ reconstruction

LARS™ is used to anatomically reconstruct the CC ligaments (trapezoid and conoid). The technique can be modified to add reinforcement to the AC ligament if deemed appropriate by treating surgeon.

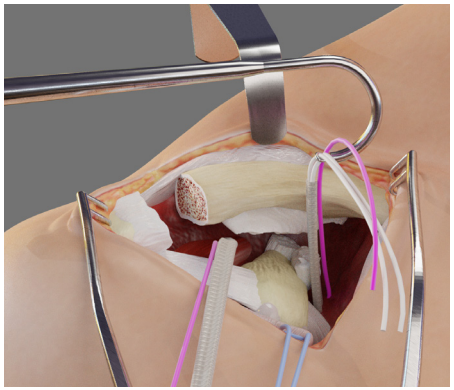
Ligaments	Strength (N)	Tunnel Ø (mm)	Dimensions (mm)	Screw size (mm)
LAC 20 (females and small males)	1000	3.5	300 x 3.5	4.7 x 15
LAC 30 (larger males)	1500	4.5	300 x 4.5	5.2 x 15

There are two LARS ligament sizes for ACJ reconstruction with varying strength and tunnel diameters. The LARS LAC 20 ligament provides sufficient strength for the majority of ACJ reconstructions. In the instance of a revision case a LARS LAC 30 is advised for use. LARS LAC 20 and LARS LAC 30 ligaments are both 300mm in length.

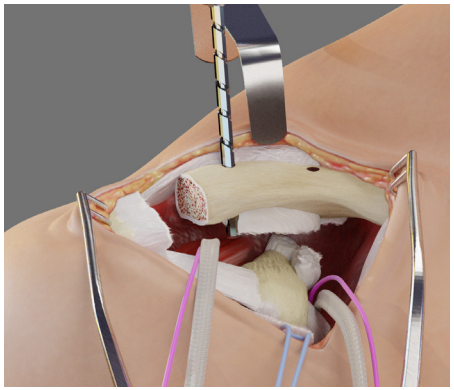
LARS™ anatomic ACJ reconstruction technique summary



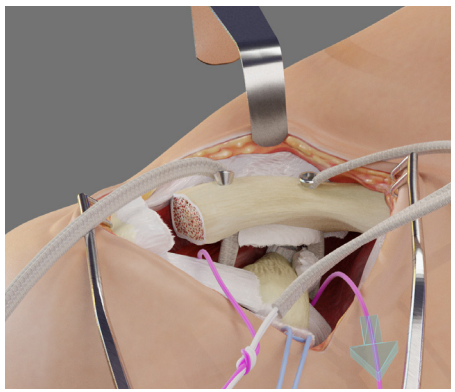
1.The lateral end of the clavicle is excised.



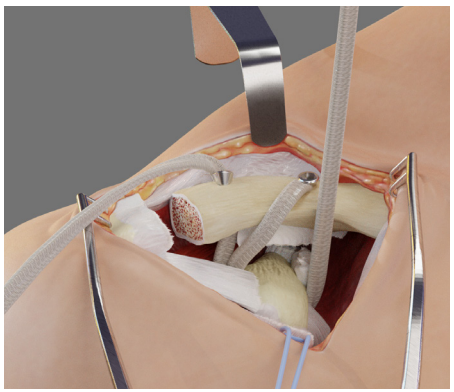
2. the LARS™ ligament is passed under the coracoid.



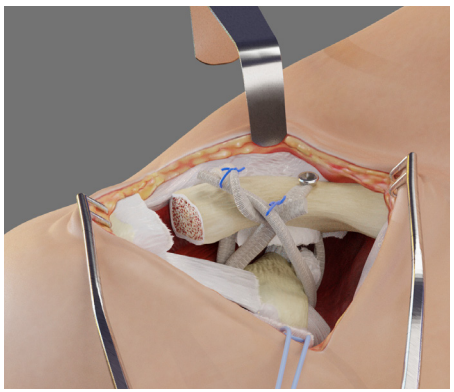
3. Two bone tunnels are drilled in the superior cortex of the clavicle in an oblique fashion.



4. LARS™ ligament is passed through the bone tunnels. The clavicle is reduced and two interference screw are inserted.



5. The medial limb of the LARS™ ligament is passed under the coracoid to improve horizontal stability.

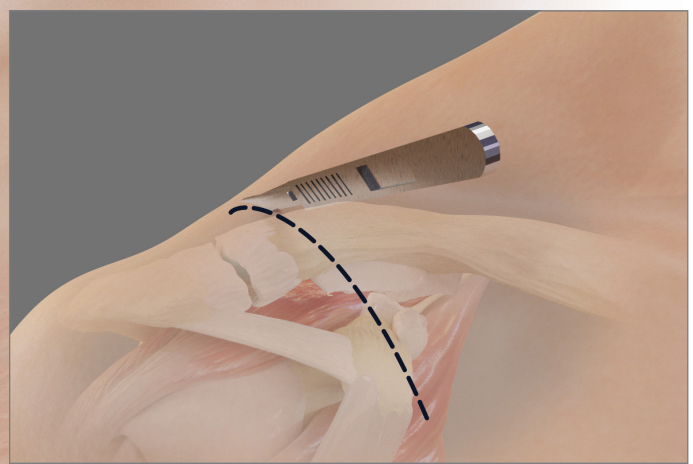


6. The limbs of the LARS™ ligament are sutured together.

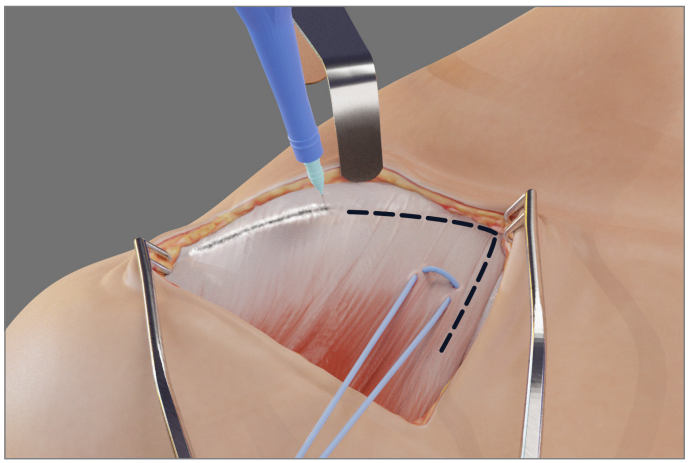
Surgical approach

The patient is positioned in the beach chair, semi-recumbent position, with a firm arm support under the elbow and forearm for counter-pressure during intra-operative joint reduction.

Following standard skin preparation and draping, a sabre-cut incision is made in Langer's lines, about 1-2 cm medial to the lateral end of the clavicle and overlying the coracoid.



1. A sabre-cut skin incision is made in Langer's lines, about 1-2cm medial to the lateral end of the clavicle and overlying the coracoid.



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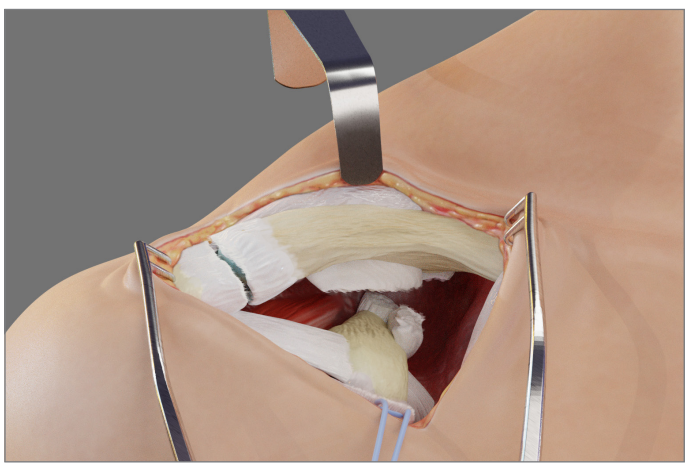

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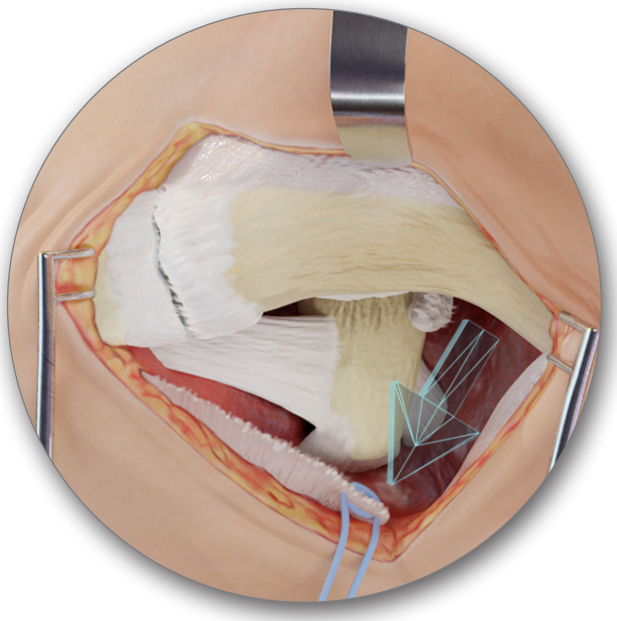
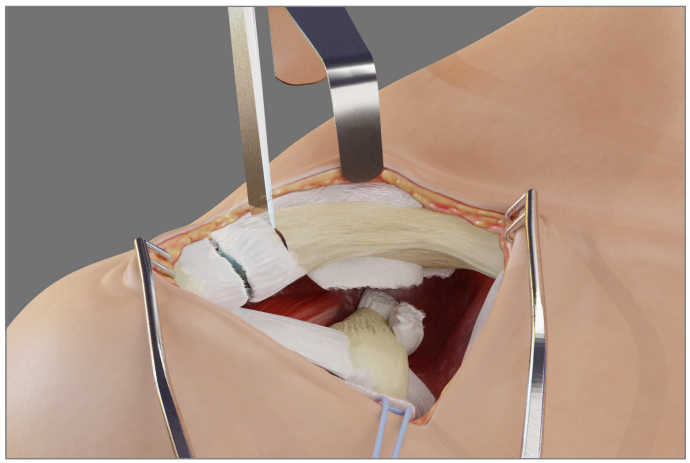


A medial based ‘L’ take-down of the deltoid is performed with a stay suture at the apex of the ‘L’, described by Angus Wallace and Lars Neumann, Nottingham. This is made through the fascial coalescence of the deltoid and trapezius and the trapezius is peeled off the lateral clavicle to expose the clavicle and AC joint.

This exposure allows visual access to the coracoid, pectoralis minor muscle, coracoacromial ligament and conjoined tendon (if needed).



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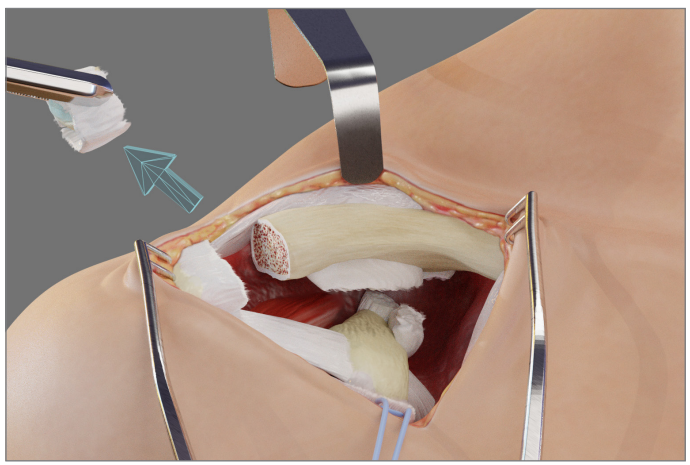
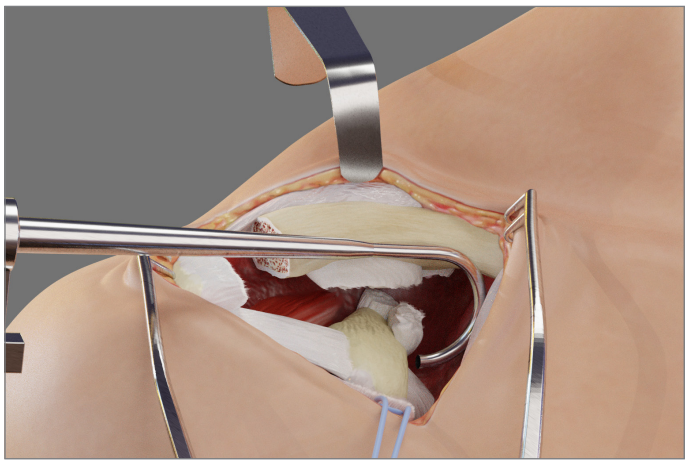


5.

The lateral end of the clavicle is excised. No more than 5-8mm should be removed, to allow for a superior capsular repair on closure.

Any adhesions and scar tissue under the lateral clavicle should be removed, to allow for an easy reduction of the coracoclavicular gap. Ensure reduction and alignment is achieved in both horizontal and vertical planes.



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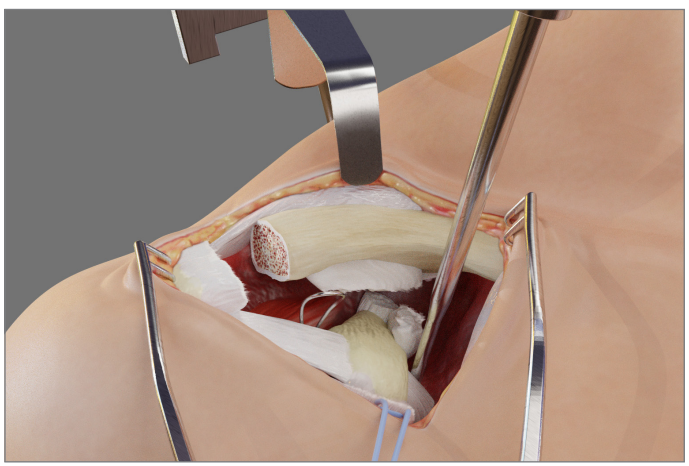
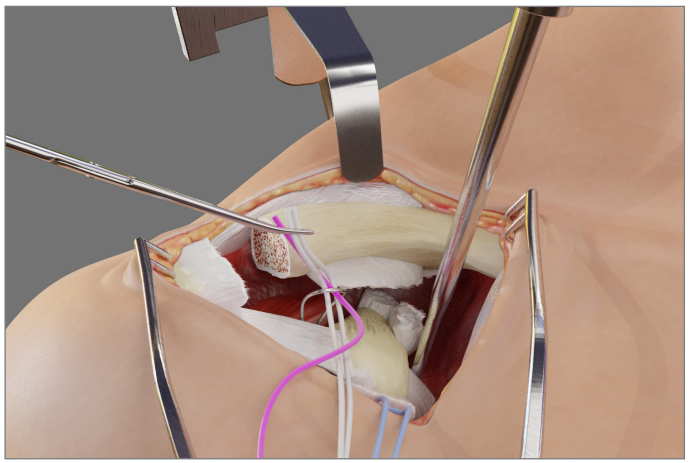


7.

The LARS™ curved guide is passed from medial to lateral under the coracoid process and behind (dorsal) to the pectoralis minor tendon on the medial side and behind (dorsal) to the coracoacromial ligament on the lateral side.

The end of the guide needs to be prominent laterally to push the wire loop out. If it is not, then the cannulated top hat guide can be used.

In larger patients it may be difficult to see the end of the curved guide. In these cases, the cannulated top hat can be used. See technique on page 20.



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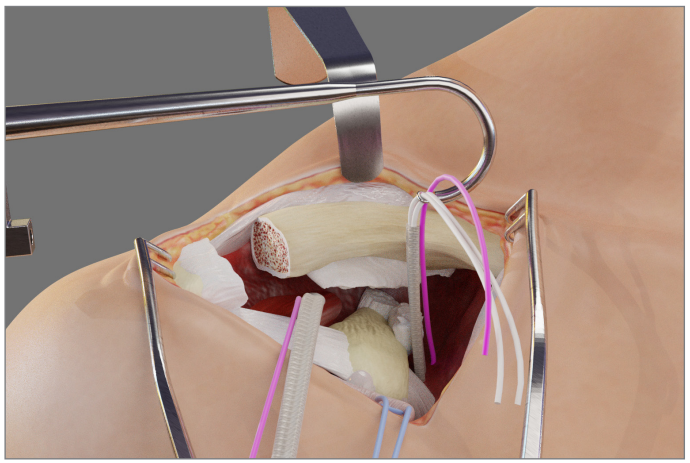

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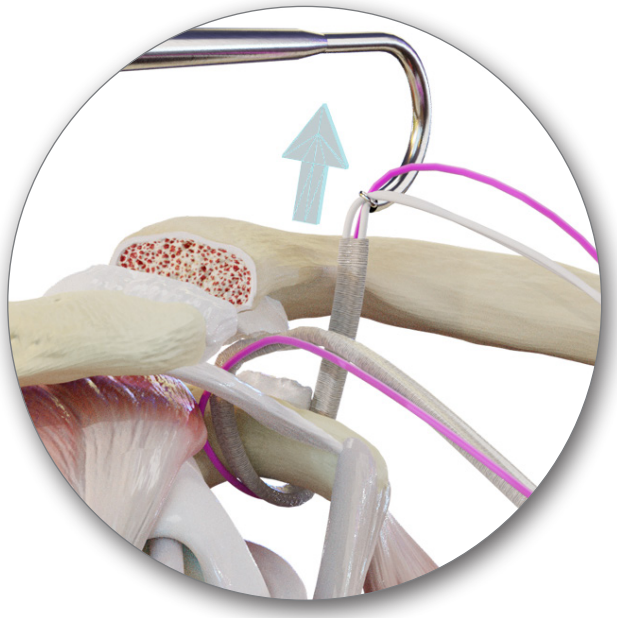
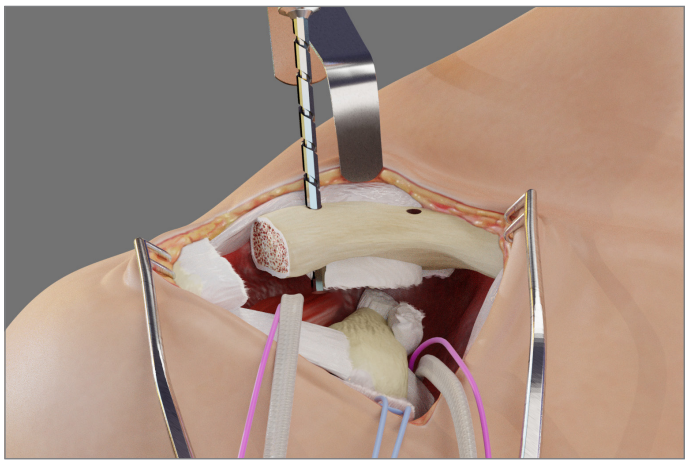


The LARS™ ligament should be soaked beforehand to ease passing. The LARS™ ligament and an additional passing suture (a No. 2 braided high-strength suture) are passed through the wire loop and the curved guide pulled out medially, thus passing the LARS™ ligament under the coracoid.

Check the LARS™ ligament is flush with the under surface of the coracoid by pulling on each end of the ligament reciprocally.



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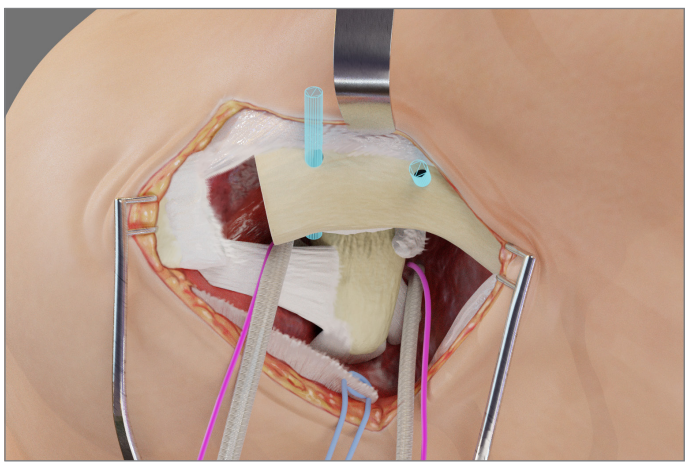


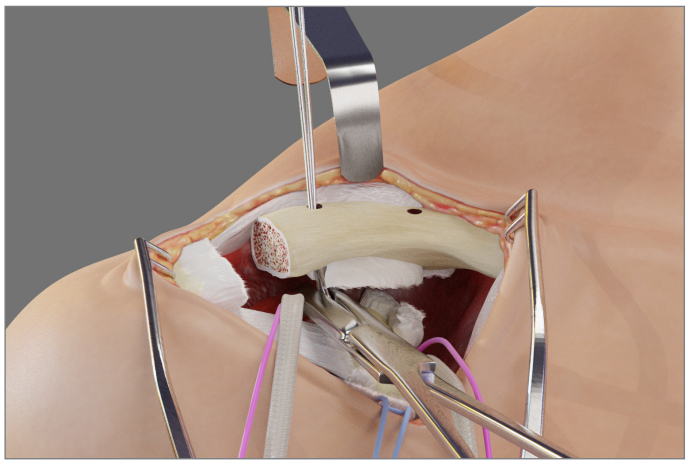
11. View from above

Two bony tunnels are drilled in the superior cortex of the clavicle in an oblique fashion (size 3.5 mm for the LAC 20 and size 4.5 mm for the LAC 30).

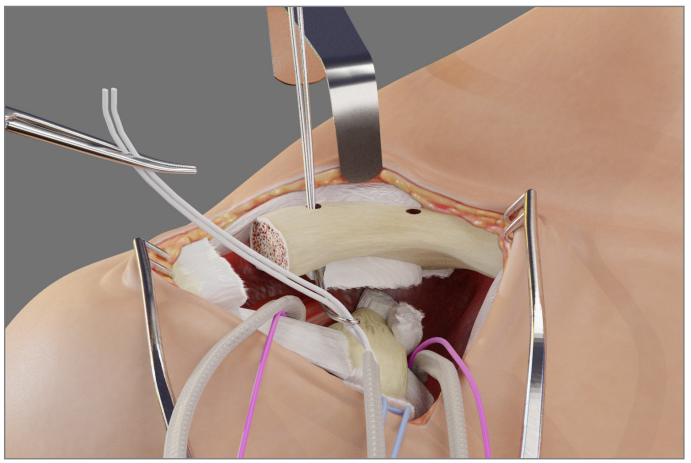
The drill holes should be in the isometric points of the coracoclavicular ligaments and aligned with their orientation.

The medial tunnel is directed from antero-superior to postero-inferior and the lateral tunnel is directed from postero-superior to antero-inferior.

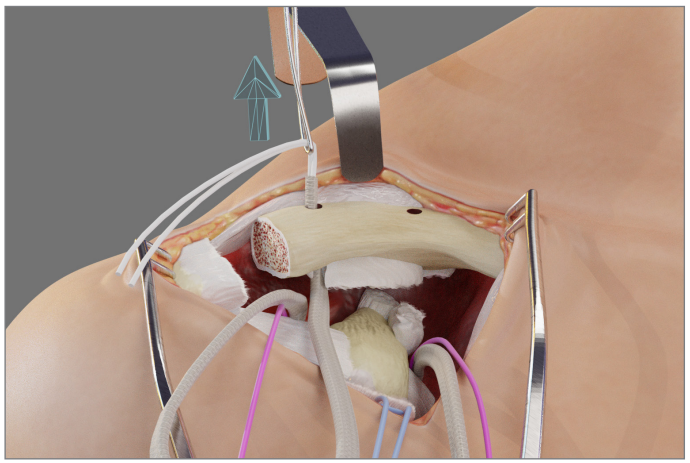
Allow at least one inch space between lateral tunnel and lateral end of clavicle and one inch between the two tunnels to avoid any iatrogenic fractures.



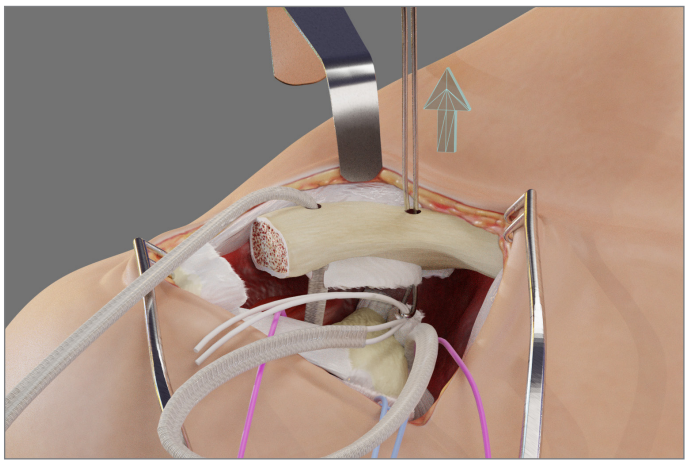
12. Pass the looped wire through the lateral bone tunnel.



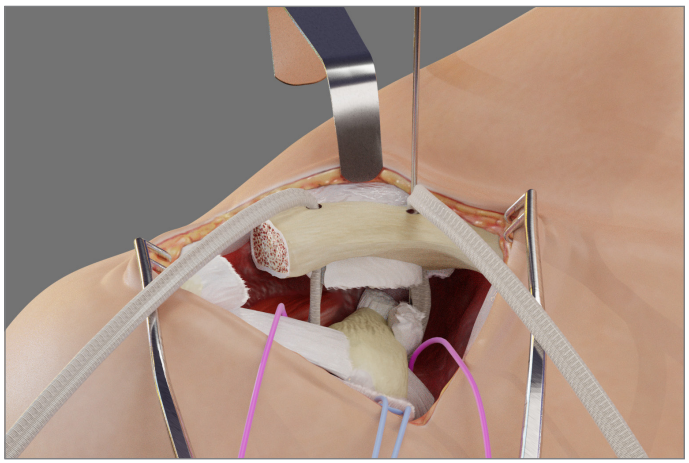
13. Load the looped wire with the LARS™ ligament end, from the lateral side of the coracoid.



14. Pull the looped wired through bone tunnel.



15. Repeat this process through the other bone tunnel.



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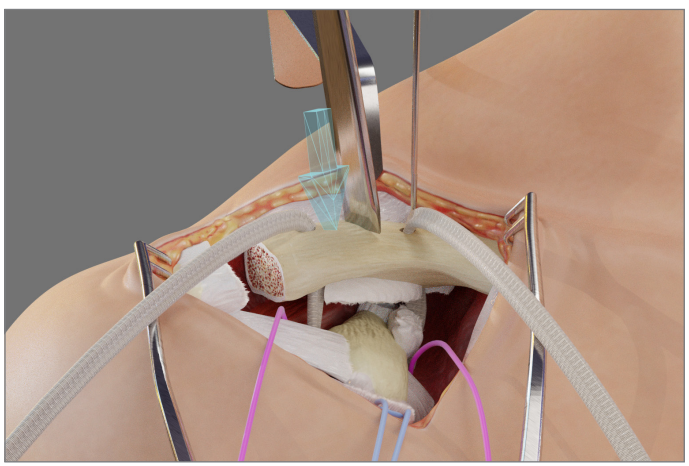
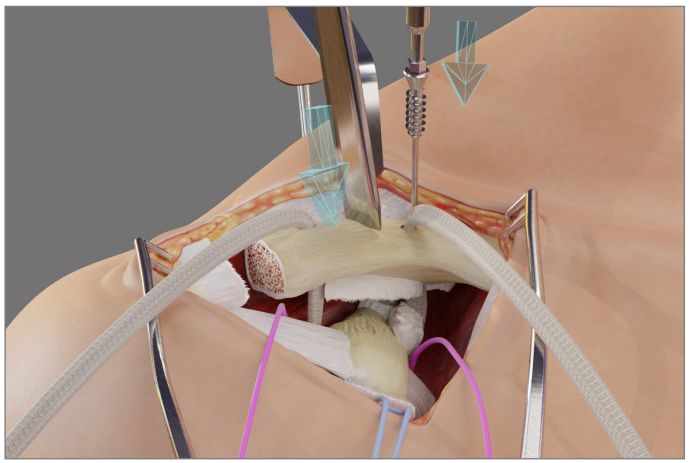


17.

Tap the guide pin into the medial drill hole alongside the LARS™ ligament. Then reduce the clavicle to align with the acromion and reduce the coracoclavicular gap.

Tips:

1. Tension the LARS™ ligament tightly again under the coracoid to ensure good tension whilst reduced.
2. Check ACJ alignment in both horizontal and vertical planes.
3. Don't over reduce the clavicle.



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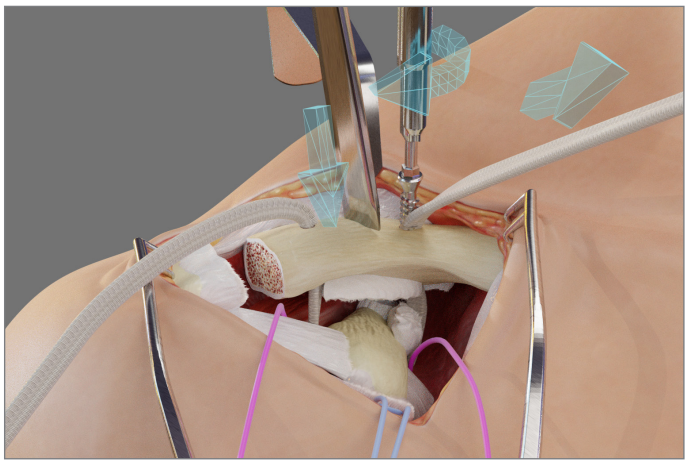

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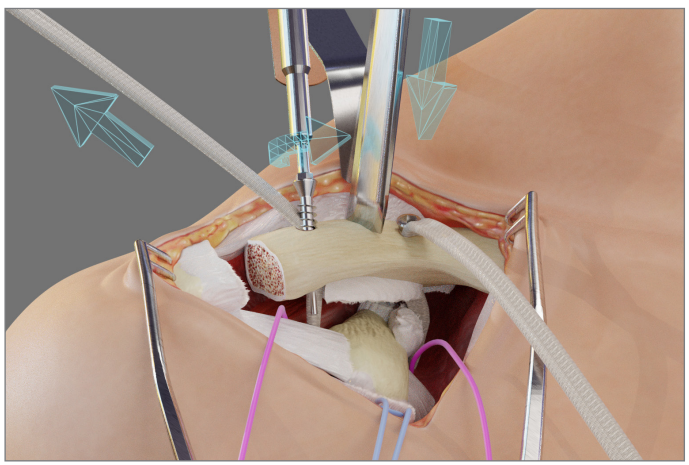


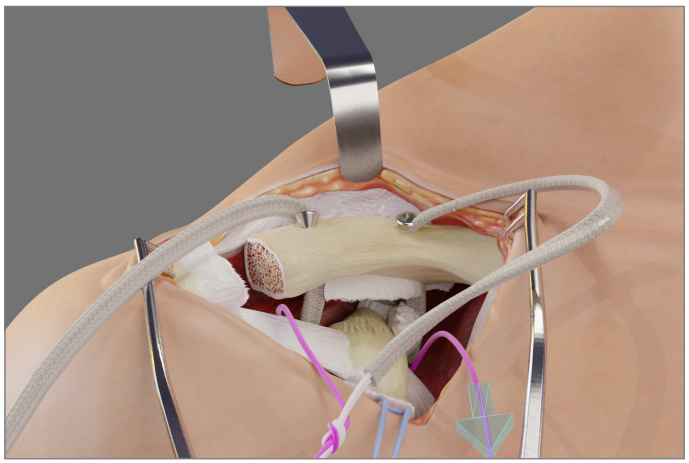
20.

Insert the medial interference screw (4.75 x 15mm for LAC 20; 5.2 x 15mm for LAC 30), whilst pulling tight on the LARS™ ligament and your assistant holds the clavicle reduced (a bone clamp between the clavicle and coracoid can also be used to hold the reduction, but be careful not to over-reduce).

Repeat this process for the lateral screw.

Tips:

1. Keep tension on the LARS™ ligament whilst inserting screws.
2. Insert screw slowly and stop intermittently to relieve torque stresses.
3. In softer bone it may be safer to avoid using the screws and tie the LARS™ ligament, to reduce the risk of iatrogenic fractures.



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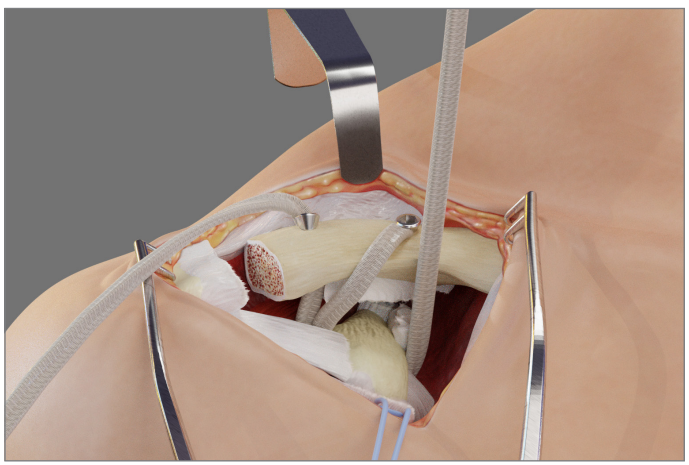

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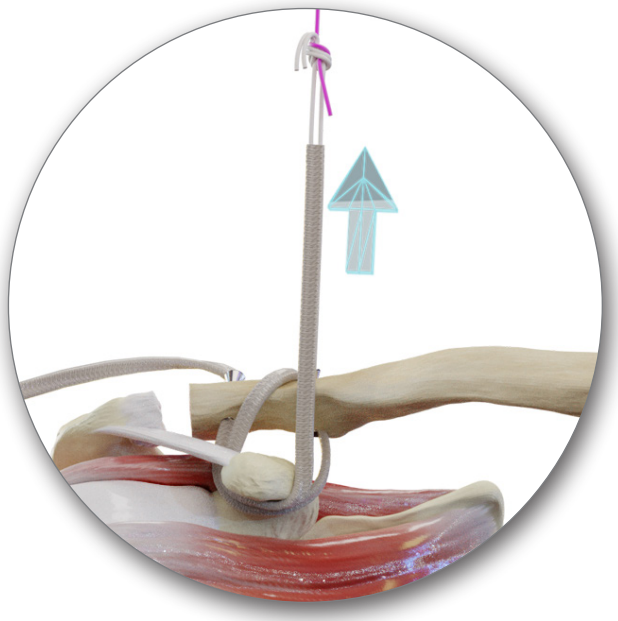
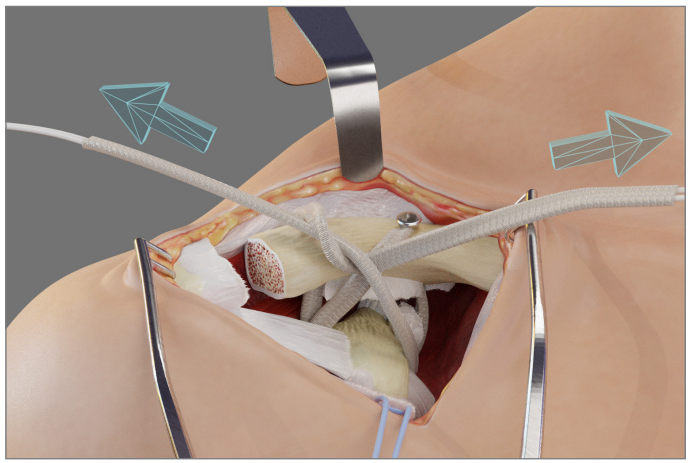
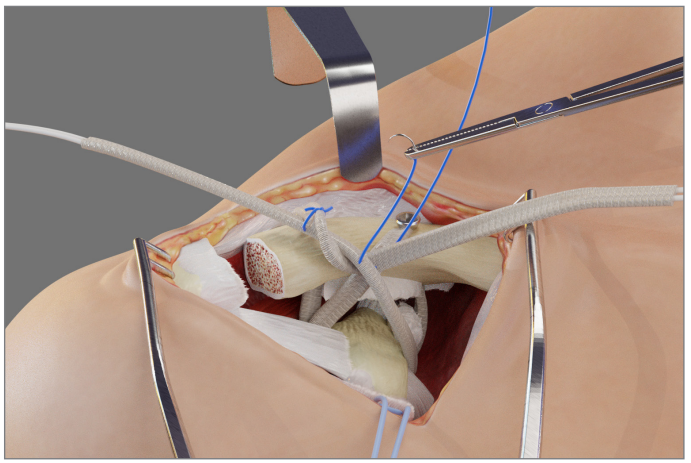


An additional figure-of-8 loop around the coracoid appears to improve the horizontal stability, reduce tension on the interference screws and reduce the stress under the coracoid.

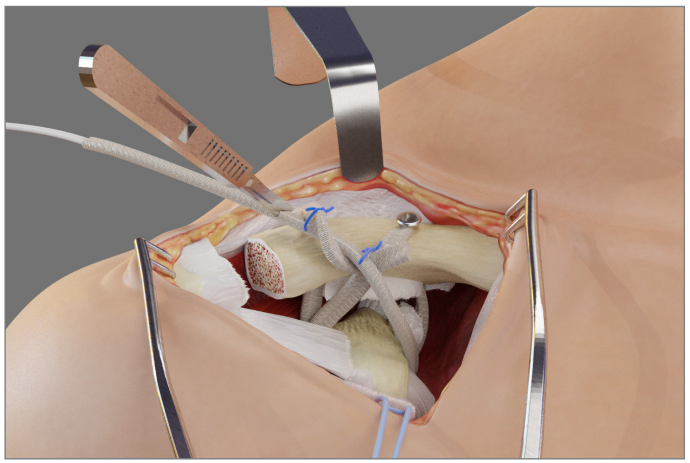
The lateral limb of the No. 2 stay suture is tied to the medial limb of the LARS™ ligament and then pulled under the coracoid.



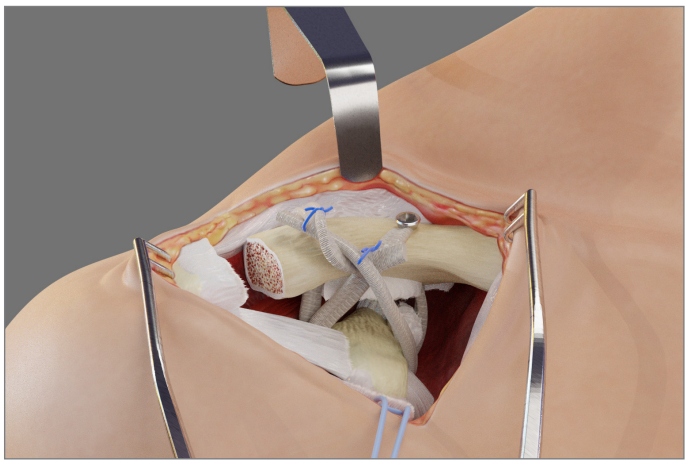
23. The two free LARS™ ligament limbs are tied together



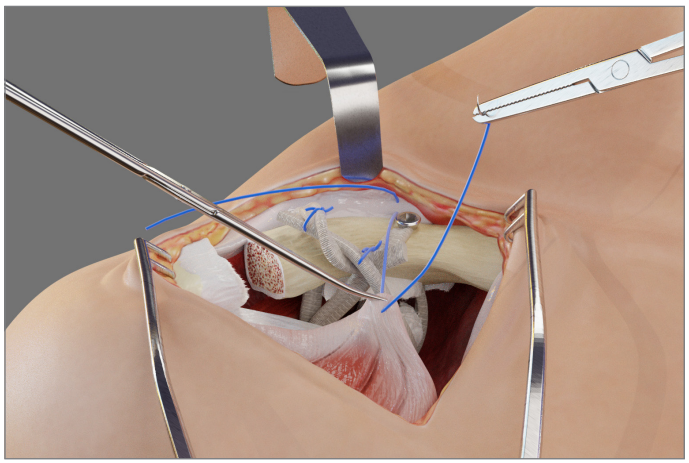
24. They are fixed with a high strength No. 2 suture.



25. Excess LARS™ ligament limbs are cut.



26. The AC joint reconstruction is now complete.



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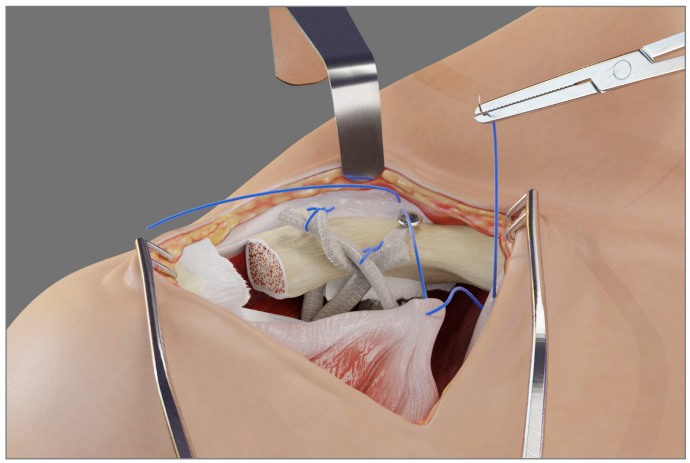

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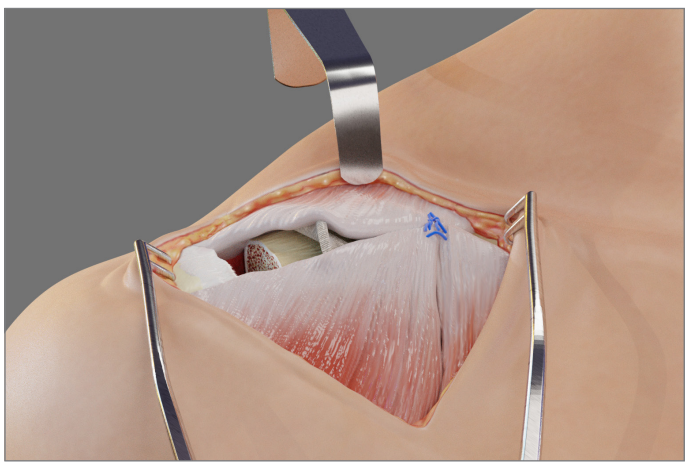
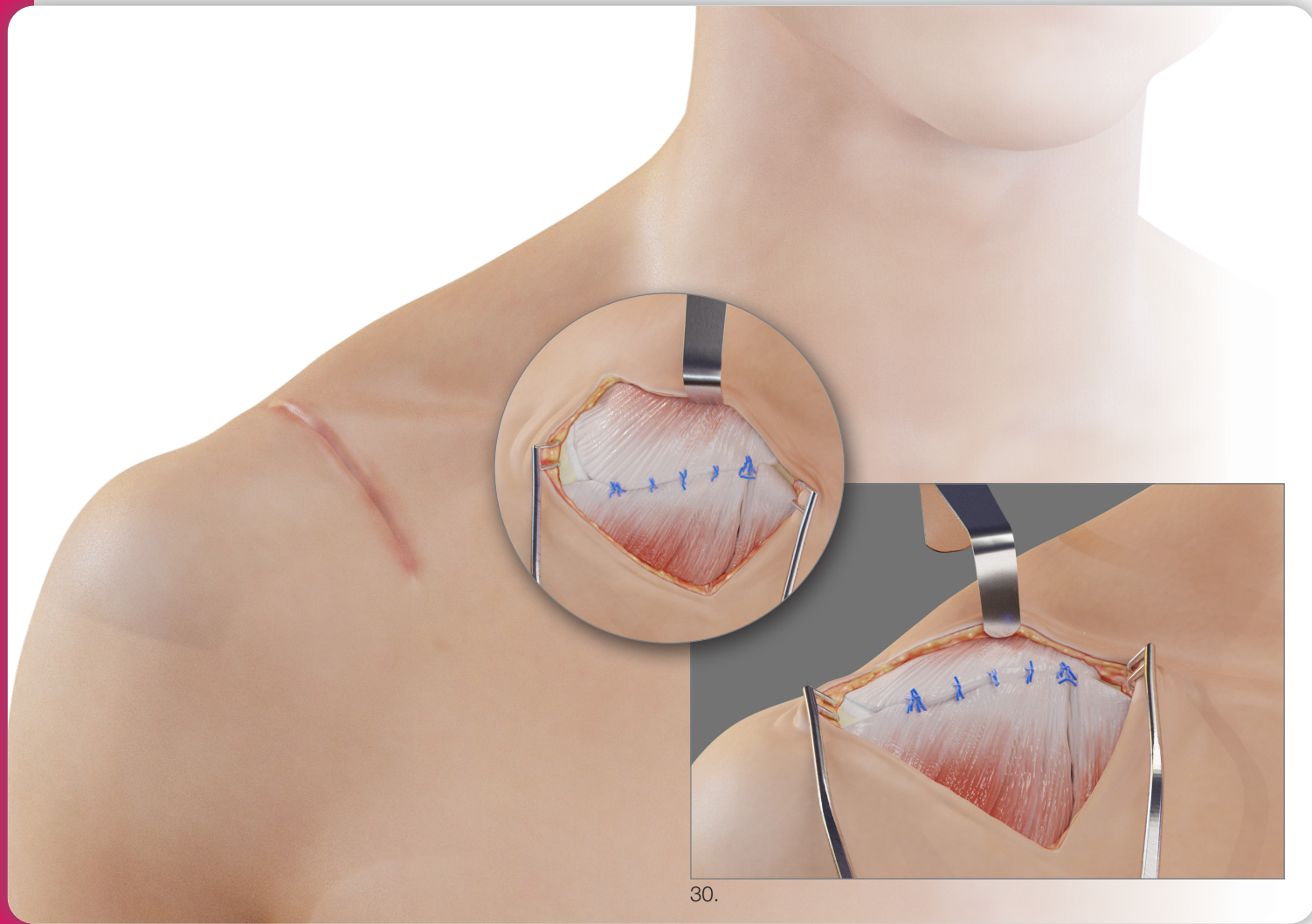


29.

The deltoid flap is closed to the edges of pectoralis major and trapezius.

The deltoid and trapezius are closed tightly over the clavicle and the AC joint. Where there is redundancy a double-breast closure is used to ensure a dynamic reinforcement of the construct.

Tips:
If needed, an additional AC joint reconstruction to improve horizontal stability should be performed before closure of the delto-trapezial fascia. The cut LARS™ ligament ends can be used for this through additional drill holes in the acromion and lateral clavicle.



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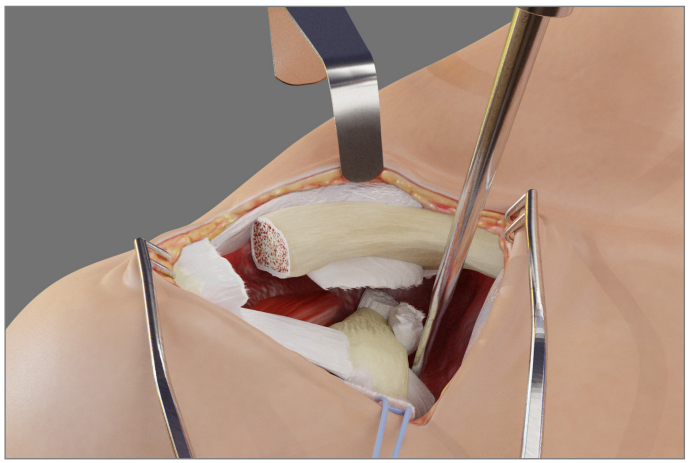


7a.

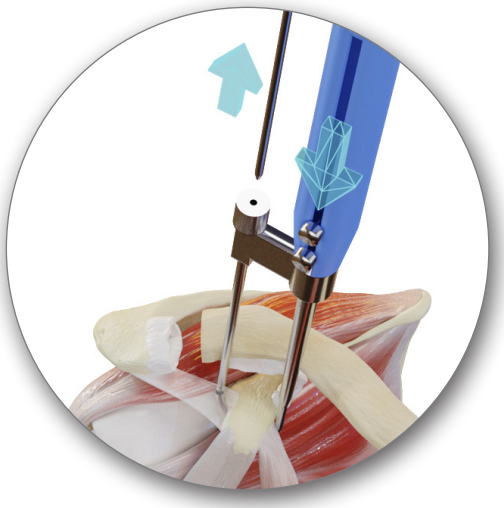
7b.

7c.

Cannulated top hat technique

Insert the guide's hook under the coracoid from the medial border to the lateral border.

Set up the wire-passer cannula. Tap the drift several times to get the top of the hook free from the fibrous tissue which may be interposed.



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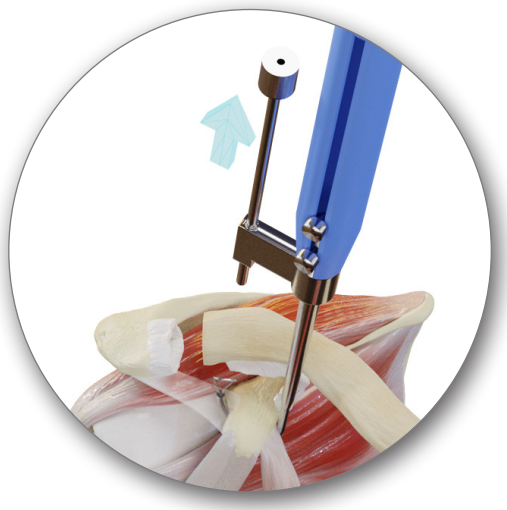
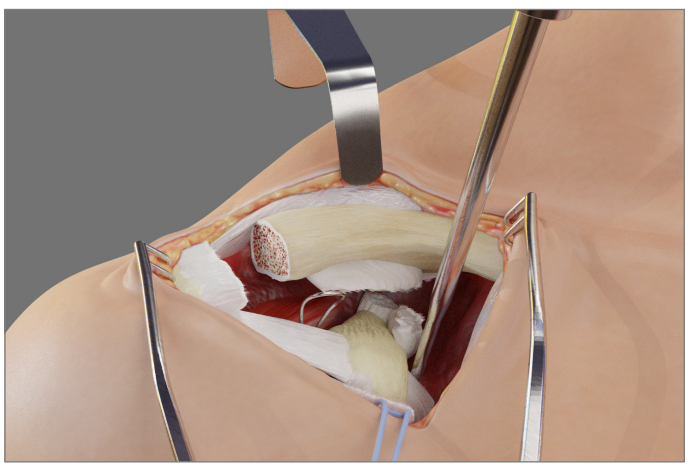


7e.



7f.

Remove the drift and lower the cursor.

Take out the wire-passer cannula. The wire loop should appear at the level of the anterior border of the clavicle.

Ordering information

LARS™ acromioclavicular ligament
104.115 LAC 20 Ligament
104.116 LAC 30 Ligament

LARS™ blunt thread interference screws
104.470 Ligament Screw 4.7 x 15mm
104.515 Ligament Screw 5.2 x 15mm
104.520 Ligament Screw 5.2 x 20mm
104.530 Ligament Screw 5.2 x 30mm

LARS™ ACJ Instrument set
104.207 K-Wire Ø2 x 150mm Blunt ends (single use)
204.001 Screwdriver - ATVS35
204.008 Wire Loop - U014011 (single use)
204.022 Guide - B24000
204.022.001 Pusher Wire Loop (single use)
204.023 Drift - D03002
204.024 Wire Passer Canula - D03001
204.025 Drill Bit Ø4.5 x 150mm - U01101
204.026 Drill Bit Ø3.5 x 150mm - U01110
204.066 Drilling Guide - D03003

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