TECHNICAL NOTE

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Superior Capsular Reconstruction Technique for Massive Rotator Cuff Tear With Arthroscopic Transfer and Augmentation of Long Head of Biceps Brachii Tendon—The Biobridge Technique

Vrgoč Goran, M.D.,[1,2]* Matolić Grgur, M.D.,[2] Bajramović Dubravko, M.D.,[3] and Brkić Iva, M.D.[4]

Abstract: Massive irreparable rotator cuff tears remain a major surgical challenge, often leading to pain, functional loss, and superior humeral migration. Superior capsular reconstruction has emerged as a technique to restore superior stability. Autologous augmentation using the long head of the biceps brachii tendon offers a cost-effective, biologically viable option, avoiding graft harvest and morbidity. We describe an all-arthroscopic technique of superior capsular reconstruction with long head of the biceps brachii tendon transposition and augmentation called Biobridge technique. The method involves careful tendon mobilization, release of the transverse humeral ligament, long head of the biceps brachii tendon fixation at the supraspinatus footprint, and reinforcement using a lasso-loop and shoelace configuration, completed with a double-row repair. This construct provides superior restraint and improved footprint coverage while maintaining vascularized autologous tissue. Biomechanical and clinical studies suggest this technique improves pain, motion, and acromiohumeral distance while lowering retear risk in appropriately selected patients. This article describes the step-by-step surgical approach, indications, and rationale for the Biobridge technique, highlighting its potential as a reproducible and biologically sound alternative to graft-based reconstructions.

Arthroscopy Techniques. 2026;00:e70085

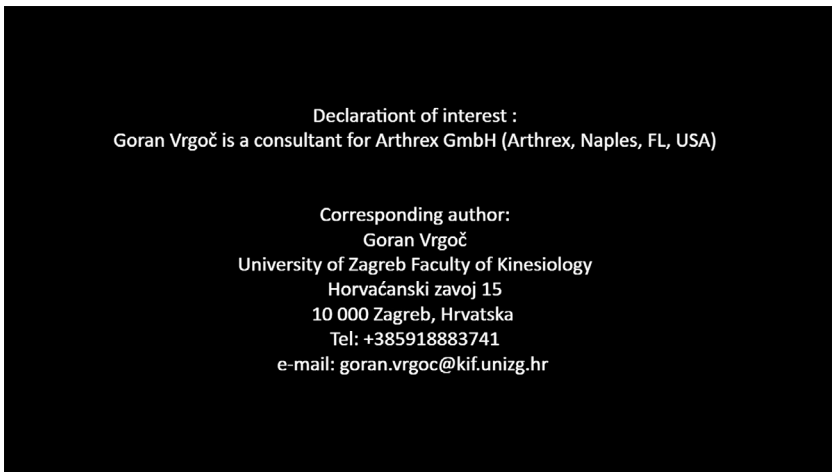
Chronic massive rotator cuff tears (MRCT) represent a major problem both for patients and surgeons (Figure 1). This condition can progress to rotator cuff tear arthropathy if not treated. Patients have significant decrease in the range of motion (ROM), and pain interferes with their daily activities and sleep. There are many solutions for surgical treatment of MRCT but none are ideal. In the literature, there are many different techniques for surgical treatment of MRCT such as complete or partial repair, arthroscopic debridement with a biceps tenotomy or tenodesis, patch augmentation, tendon transfer, superior capsular reconstruction (SCR), reverse total shoulder arthroplasty, and subacromial balloon spacer placement.[1,2] However, there is still no clear consensus on the most effective technique, as outcomes can vary based on patient-specific factors such as age, tear size, tissue quality, and functional demands. All chronic MRCT are difficult to repair because of the size of rotator cuff tendon retraction and muscle atrophy.[1] Arthroscopic SCR is increasingly emerging as one of the key surgical solutions for chronic MRCT. According to the Delphi consensus study, massive rotator cuff tear is defined as retraction

From the [1]Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia; [2]Department of Orthopaedic Surgery, Clinical Hospital "Sveti Duh", Zagreb, Croatia; [3]Department of Radiology, Clinical Hospital "Sveti Duh", Zagreb, Croatia; [4]Department of head, neck and ENT, Clinical Hospital "Sveti Duh", Zagreb, Croatia.

*Address correspondence to Vrgoč Goran, M.D., University of Zagreb Faculty of Kinesiology, Horvacanski zavoj 15, 10000 Zagreb, Hrvatska.
E-mail: goran.vrgoc@kif.unizg.hr

Received October 7, 2025; Accepted November 29, 2025.

View this article online at wileyonlinelibrary.com. DOI: 10.1002/atn2.70085



VIDEO 1 We introduce an arthroscope into the glenohumeral joint through the posterior portal for diagnostic arthroscopy. Then, we evaluate the mobility of the tendon remnant with a grasper. Arthroscopic release of the tendon remnant is done with an ablation device. Using the device we move maximally medially and below and above the tendon remnant so we can achieve better lateral mobilization. Next step is to cut the transverse humeral ligament to release the long head of the biceps brachii tendon from the bicipital groove. With a grasper we transfer the long head of the biceps brachii tendon to a new position on the supraspinatus footprint on the greater tuberosity. Corkscrew anchor loaded with FibreWire and TigerWire suture is implanted in the supraspinatus footprint. With the lasso-loop technique we stabilize the long head of the biceps brachii tendon. With the sliding mechanism of the anchor, we bring the tendon at our planned location after the lasso-loop suture is placed. When the tendon is on our target location, we lock and fixate it with half stitches. After the transposition, size of the massive rotator cuff tear is decreased and the long head of the biceps brachii tendon is now at the place of the supraspinatus tendon. We do not cut the long head of the biceps brachii tendon and the connection to the superior part of the glenoid is preserved. Next, a Scorpion device is loaded with FiberWire or FiberTape for the reconstruction of the far medial part of the massive rotator cuff tear. The goal is to connect posterior remnant of the supraspinatus tendon and the long head of the biceps brachii tendon in a stable construct. Far medial reconstruction is done with the shoelace side-to-side technique with FiberTape to avoid additional tensioning on the construct with anchors on the humeral head. Then, we implant the next CorkScrew anchor at the supraspinatus footprint. The second anchor is implanted approximately 1 cm from the first anchor. Scorpion device is loaded with sutures from the anchor and we position our sutures in a side-to-side configuration connecting the remnant of the supraspinatus and infraspinatus tendon and the long head of the biceps. With these sutures we reconstruct the lateral part of the massive rotator cuff tear. With the sutures from the second anchor we have connected the posterior part of the supraspinatus and infraspinatus tendon with the long head of the biceps brachii tendon in a single row side-to-side manner. After completely closing the massive rotator cuff tear into a stable construct, FiberTape sutures from the medial sutures construct and sutures from the lateral row are loaded in the SwiveLock anchor for a double row fixation. Video content can be viewed at https://doi.org/10.1002/atn2.70085.

of tendon(s) to the glenoid rim in either the coronal or axial plane and/or a tear with ≥67% of the greater tuberosity exposed measured in the sagittal plane.[3]

The aim of this technical note is to describe an arthroscopic variant for arthroscopic SCR of chronic massive rotator cuff tears with long head biceps brachii tendon augmentation without tenotomy called the Biobridge technique.

SURGICAL TECHNIQUE

The patient is placed in a beach chair position. The procedure is performed under general anesthesia after antibiotic prophylaxis. After induction of general anesthesia, the surgical draping is done and the injured arm is placed in an extension holder in 30° of forward flexion. The arm is then connected with 3 kg of traction (Figure 2) and the arthroscope is introduced into the glenohumeral joint through the posterior portal for diagnostic arthroscopy. After visualization of the glenohumeral pathology under direct visualization, we open the posterolateral viewing portal and transfer the arthroscope into in the subacromial space. Then, we open the anterolateral working portal for the subacromial space (Figure 3). With a radiofrequency ablation device, we release the deltoid fascia and clean the subacromial bursa with arthroscopic shaver. Once there is a clear view of the MRCT

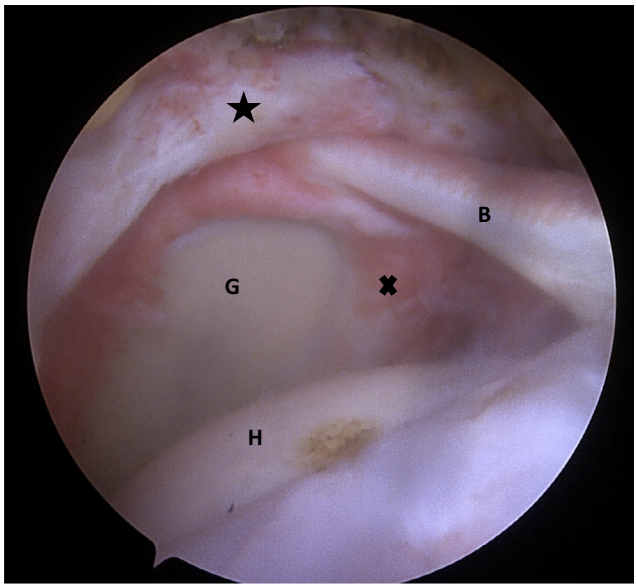


FIGURE 1 Posterolateral viewing portal. Right shoulder. Massive rotator cuff tear (star—supraspinatus remnant, B—long head of biceps brachii tendon, H—humeral head, G—glenoid, X—anterior labrum).

and adequate space for arthroscopic reconstruction, we can proceed with the technique (Table 1). First, we need

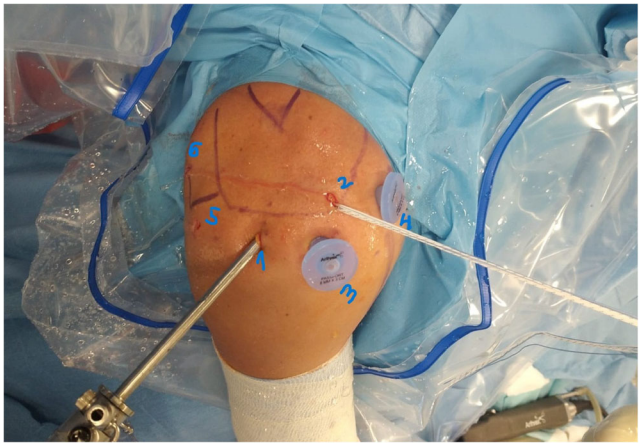


FIGURE 3 Shoulder arthroscopy. Right shoulder. 1—lateral portal for viewing (with arthroscope), 2—working portal for anchor placement, 3—anterolateral portal with PassPort Button cannula, 4—anterior portal with PassPort Button cannula, 5—posterolateral portal, 6—posterior portal.

to refresh the edges of MRCT with a arthroscopic shaver and arthroscopic biters. We evaluate the mobility of the tendon remnant with arthroscopic grasper. Arthroscopic release of the tendon remnant is done with a radiofrequency ablation device. Using the ablation device, we

FIGURE 2 Beach chair position for shoulder arthroscopy. Right arm is placed in extension holder in 30° of forward flexion (black arrow—connection to extension device).

TABLE 1 Surgical Steps, Pearls, and Pitfalls of SCR With LHBT

Surgical Step	Pearls	Pitfalls
Arthroscopic visualization of massive rotator cuff tear	Cleaning the edges of the rupture with arthroscopic shaver and the biters	Bleeding during visualization makes orientation and assessment of the rupture size difficult
Mobilization of rotator cuff tendon	Release the tendon superiorly and inferiorly with a soft tissue radiofrequency ablation device.	Without good soft tissue release SCR is difficult to perform
Ligament transverse humerale (Brodie ligament) release	The quickest way is to cut it with a 11 size blade or biters under direct visualization to release LHBT	With an ablation device you often hit a small blood vessel
Transposition of the long head of biceps brachii tendon	Static transposition of the LHBT with lasso-loop suture from the titanium anchor for positioning and fixating	In older people biocomposite anchors can be more challenging to fixate
Suturing rotator cuff remnant for LHBT	First we put far medial suture with shoelace technique and FiberTape	Do not use a suture from anchors because it creates a lot of tension on tendons and can cut the tendon
Suturing rotator cuff remnant for LHBT	Lateral sutures are from anchor in side-to-side manner	
Acromioplasty	Additional biological effect with bone bleeding and increase of acromiohumeral distance	Be careful not to abrade too much of the acromion

LHBT, long head of the biceps tendon; SCR, superior capsular reconstruction.

move maximally medially and below and above the tendon remnant so we can achieve better lateral mobilization (Figure 4). With an arthroscopic shaver, we abrade supraspinatus footprint from soft tissue and prepare it for anchor placement. The next step is to cut the transverse humeral ligament to release long head of biceps brachii tendon (LHBT) from bicipital groove. With a grasper we transfer the LHBT to a new position on the supraspinatus footprint on greater tuberosity. A Corkscrew anchor (Arthrex, Naples, FL, USA) loaded with FiberWire and TigerWire suture is implanted in the supraspinatus footprint. Using the lasso-loop technique described by Lafosse[4], we stabilize the LHBT (Figure 5). With the

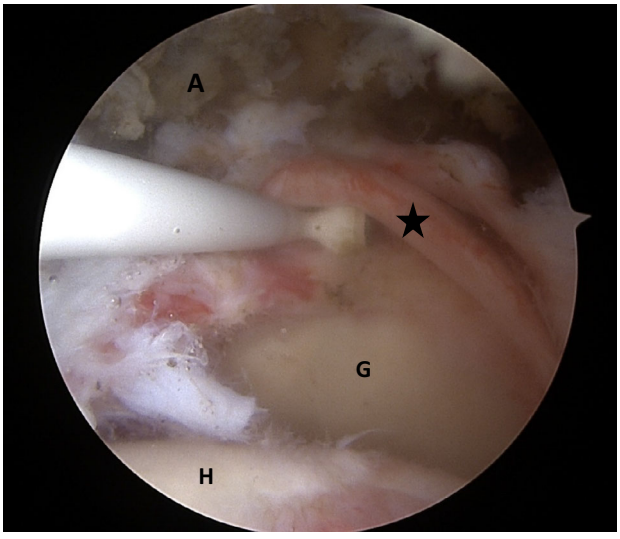


FIGURE 4 M.supraspinatus remnant release with radiofrequency ablation device in lateral portal (star—m.supraspinatus remnant, G—glenoid, A—acromion, H—humeral head). Right shoulder. Beach chair position.

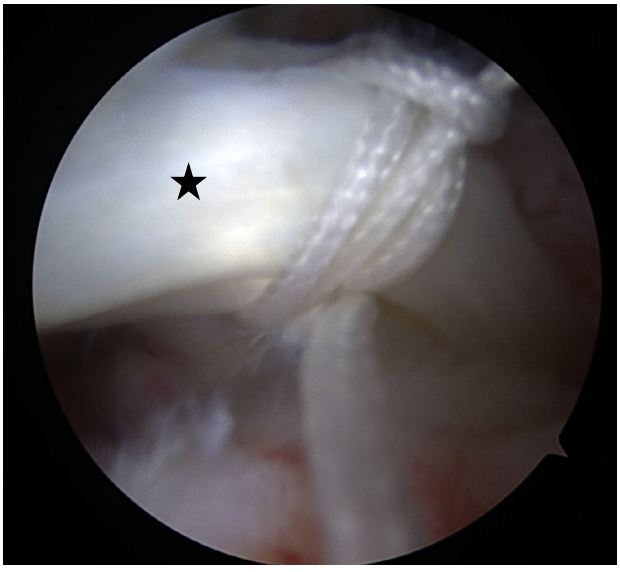


FIGURE 5 Lasso-loop stitch applied on long head of biceps brachii tendon for transposition and tenodesis (star—long head of biceps brachii tendon). Viewing from posterolateral portal in beach chair position.

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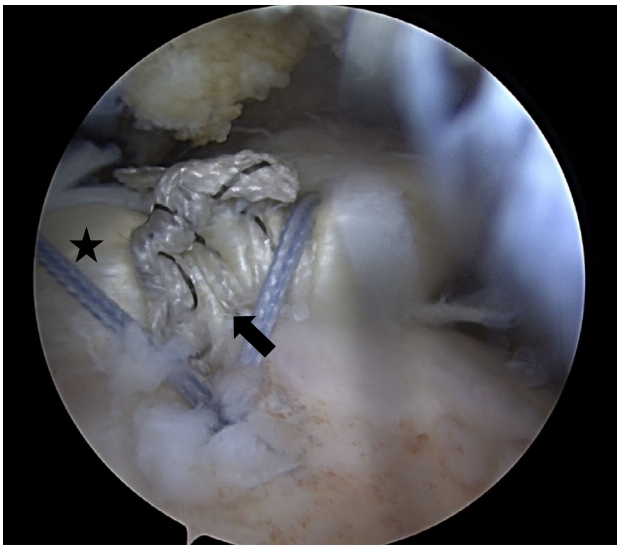

FIGURE 6 Long head of biceps brachii tendon transposition and final fixation (arrow—lasso-loop final construct, star—long head of biceps brachii tendon). Viewing from posterolateral portal in beach chair position.

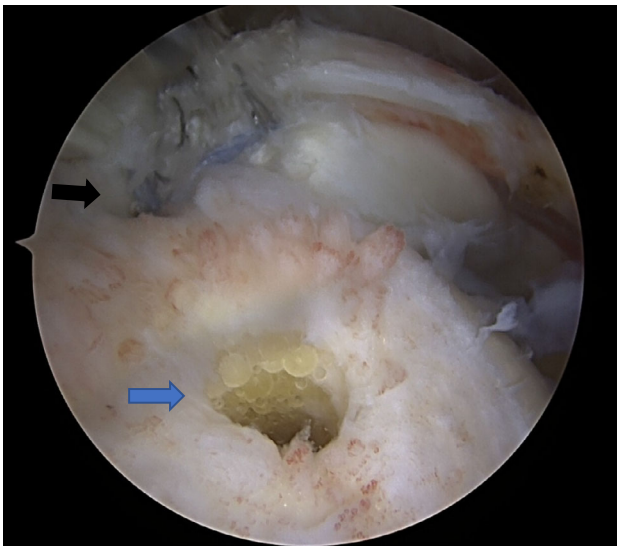

FIGURE 8 Position of 2 medial row anchors for MRCT reconstruction (black arrow—first anchor, blue arrow—second anchor). Viewing from posterolateral portal in beach chair position. (MRCT, massive rotator cuff tears.)

sliding mechanism of the anchor, we bring the LHBT to our planned location after the lasso-loop suture is placed. When LHBT is on the target location, we lock and fixate the LHBT with half stitches (Figure 6). After LHBT transposition, the size of the MRCT is decreased and the LHBT is now at the place of the supraspinatus tendon. We do not cut the LHBT and connection to the superior part of the glenoid is preserved. A Scorpion device (Arthrex, Naples, FL, USA) is loaded with FiberTape (Arthrex, Naples, FL, USA) for reconstruction of the far medial part of the MRCT. The goal is to connect posterior remnant of the musculus supraspinatus (m.SSP) tendon and the LHBT in a stabile construct. Far medial reconstruction is done with the shoelace side-to-side technique described by Suzuki et al.[5] with FiberTape to avoid additional tensioning on construct with anchors on the humeral head

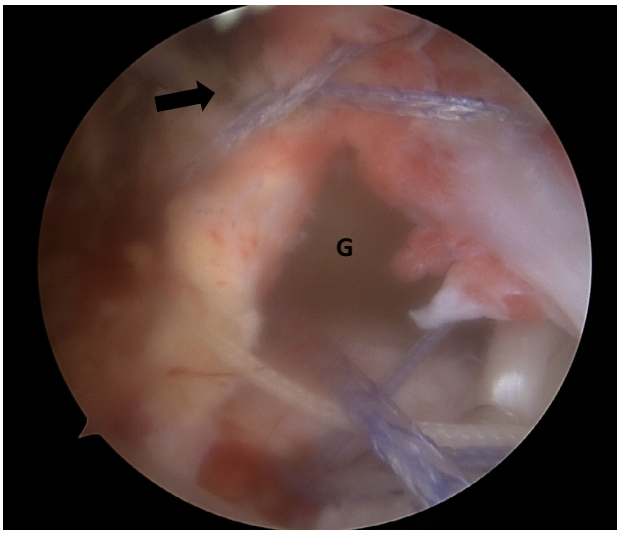

FIGURE 7 Reconstruction of medial part of MRCT with shoelace technique and FiberTape (arrow—closed medial part of the rupture with shoelace technique and FiberTape, G—glenoid). Viewing from lateral portal in beach chair position. (MRCT, massive rotator cuff tears.)

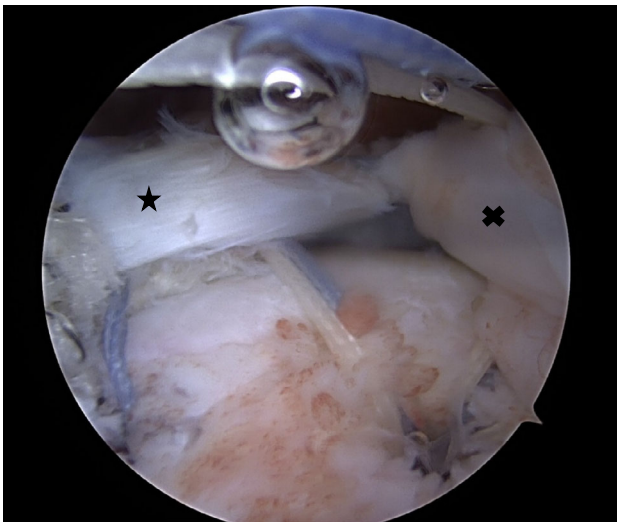

FIGURE 9 Starting reconstruction of lateral part of MRCT connecting m.infraspinatus tendon and LHBT (star—long head of biceps brachii tendon, X—m.infraspinatus tendon). Viewing from lateral portal in beach chair position. (LHBT, long head of the biceps tendon; MRCT, massive rotator cuff tears.)

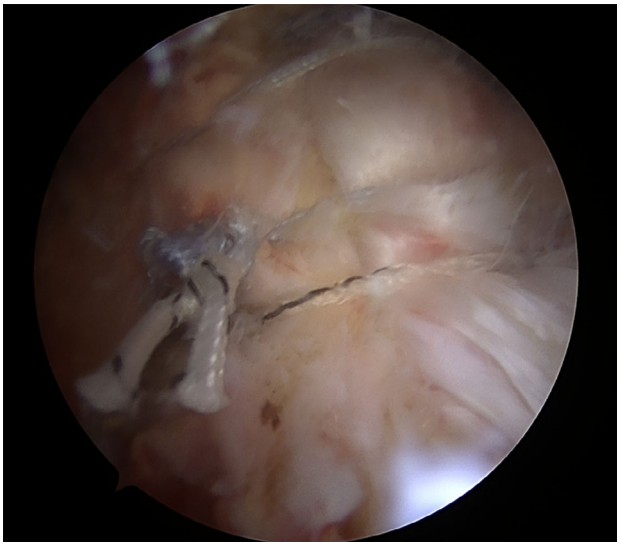

FIGURE 10 Side-to-side reconstruction of lateral row MRCT. Viewing from the lateral portal in beach chair position. (MRCT, massive rotator cuff tears.)

(Figure 7). Then, we implant the next anchor CorkScrew biocomposite Triple Play anchor (Arthrex, Naples, FL, USA) at the supraspinatus footprint. The second anchor is implanted approximately 1 cm from the first anchor (Figure 8). A Scorpion device is loaded with sutures from the second anchor and we position our sutures in a side-to-side configuration connecting the remnant of the posterior part of the m.SSP tendon or/and musculus infraspinatus tendon and the LHBT (Figure 9). With these sutures we reconstruct the lateral part of the MRCT with the LHBT. The distance between the rotator cuff tendon and the LHBT is smaller after LHBT transposition. With the sutures from a second anchor, we connect the posterior part of the m.SSP tendon or/and musculus infraspinatus tendon with the LHBT in a single row side-to-side manner. Tendons are perforated laterally with a straight BirdBeak (Arthrex, Naples, FL, USA) arthroscopic instrument for passing sutures from anchor. After suture passing, sliding knots are used to connect and fixate the rotator cuff tear. The MRCT is reconstructed in margin convergence manner (Figure 10). After completely closing the MRCT with LHBT stabile construct, FiberTape sutures from the medial suture construct and sutures from lateral row are loaded in a 4.75 mm SwiveLock anchor (Arthrex, Naples, FL, USA) for double row construct. The SwiveLock anchor is placed in the greater tuberosity after it was debrided of soft tissues and bone surface abraded with an arthroscopic shaver (Video 1).

TABLE 2 Indications and Contraindications for the SCR With LHBT

Indications	Contraindications
Massive rotator cuff tears	Goutallier gr.IV fatty infiltration
Patte gr.III m.SSP	Ruptured LHBT
Intact or reparable subscapularis	Patte gr.III m.SSP and m.ISP
Hamada ≤2 arthritis	≤3 mm acromiohumeral distance
Intact LHBT	Uncorrectable stiffness
Failed conservative treatment	

LHBT, long head of the biceps tendon; m.ISP, musculus infraspinatus; m.SSP, musculus supraspinatus; SCR, superior capsular reconstruction.

TABLE 3 Advantages and Disadvantages of Arthroscopic SCR with LHBT

Advantages	Disadvantages
• Postponing reverse shoulder arthroplasty • Significantly cheaper method • Technically less demanding method • Depression effect of the LHBT on humeral head • Increasing acromiohumeral distance • Shorter surgical time • Decreases repair tension • No need for open surgery • No need for allografts • No need for additional anchors on glenoid • No donor site morbidity	• Required healthy LHBT • Difficult to reconstruct in neglected cases • Residual LHBT soreness • Longer rehabilitation process • Weaker muscle strength after rehabilitation • Experienced arthroscopic surgeon is necessary

LHBT, long head of the biceps tendon; SCR, superior capsular reconstruction.

Indications

Symptomatic MRCT (supraspinatus ± infraspinatus), intact or reparable subscapularis, Hamada ≤2 arthritis, and failed conservative treatment. LHBT must be intact and of sufficient caliber (Table 2).

Contraindications

Advanced cuff tear arthropathy, irreparable subscapularis, absent/degenerate LHBT, infection, or uncorrectable stiffness (Table 2).

Postoperative Course

Patients are managed with "one-day surgery setting" during their stay at our hospital. After surgery, patients are placed in a shoulder abduction sling for 6 weeks. Pendulum exercises begin 10 days after surgery. Passive and active-assisted ROM exercises begin at 4 weeks postoperatively. Strengthening exercises are gradually introduced 10 to 12 weeks postoperatively, depending on pain, ROM, and overall recovery.

DISCUSSION

SCR with LHBT transfer and augmentation without tenotomy (the Biobridge technique) for chronic massive rotator cuff rupture is minimally invasive, cost-effective, safe, and an excellent option for effective surgical treatment. Using this arthroscopic surgical technique, we can avoid or postpone superior humeral head migration, reduce pain, improve ROM, and enhance muscle strength.[1] The only drawback of this SCR method is the need for preserved intra-articular and extra-articular LHBT. If the LHBT is ruptured or significantly damaged, SCR with LHBT augmentation cannot be performed. However, in such cases SCR can be done arthroscopically with the use of different structural and biological augmentation but the surgery costs and the complexity of the procedure increase.[1] The LHBT transposition procedure allows us to compensate ruptured and retracted tendon in the service of successful MRCT reconstruction. In a study from 2022, rerouting of the biceps tendon for SCR to treat irreparable rotator cuff tear was done in a rabbit model. Results showed that biceps tendon remodeled and healed in a new bicipital groove after surgical rerouting. Also, reconstructed superior capsule with rerouted biceps tendon in a rabbit model resulted in greater biomechanical strength than the native superior capsular.[6] By translating humeral head inferiorly, we will achieve larger acromiohumeral distance.[7] With increased acromiohumeral distance, we can improve glenohumeral ROM and protect reconstructed superior capsule. The rotator cuff crescentic cable is damaged in a MRCT which can lead to loss of force transmission and loss of joint stability.[8] To avoid consequences of losing dynamic stabilization, pseudoparalysis, and rotator cuff arthropathy, it is necessary to reconstruct a MRCT. A meta-analysis from 2024, compared 456 patients with large to massive rotator cuff tears treated with conventional rotator cuff reconstruction and with SCR with LHBT. Results showed significant decrease in superior translation of proximal humerus, improvement in postoperative ROM, increase in postoperative acromiohumeral distance, and decrease in retear rates in patients with SCR with LHBT.[9] Retear rates in patients who underwent arthroscopic SCR with LHBT augmentation at 1-year follow-up were 5.6% according to Chiang et al., and those patients who had retear had satisfactory clinical results.[10] This Biobridge arthroscopic SCR technique may be a potential solution for MRCT when tendon retraction reaches glenoid rim and there is lack of tendon tissue for successful arthroscopic reconstruction of the rotator cuff tear (Table 3). One of the key benefits of MRCT reconstruction with LHBT augmentation and tenodesis is preventing superior humeral migration, decreasing pain, increasing ROM, and decreasing deltoid forces needed for shoulder abduction.

The Biobridge technique integrates 3 principles: restoring superior stability, biologic augmentation with LHBT, and strong fixation with modern suture configurations.

All-arthroscopic SCR with LHBT augmentation is feasible, cost-effective, and biologically favorable. Careful patient selection and secure technique optimizes results. High-quality trials are needed to confirm its role alongside graft-based SCR.

DISCLOSURES

The author (V.G.) declares the following financial interests/personal relationships which may be considered as potential competing interests: V.G. reports Consulting fees from Arthrex GmbH. The other authors (M.G., B.D., B.I.) declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

1. McClatchy SG, Parsell DE, Hobgood ER, Field LD. Augmentation of massive rotator cuff repairs using biceps transposition without tenotomy improves clinical and patient-reported outcomes: The biological superior capsular reconstruction technique. *Arthroscopy.* 2024;40:47-54.
2. Di Benedetto P, Mancuso F, Tosolini L, Buttironi MM, Beltrame A, Causero A. Treatment options for massive rotator cuff tears: A narrative review. *Acta Biomed.* 2021;92:e2021026.
3. Schumaier A, Kovacevic D, Schmidt C, et al. Defining massive rotator cuff tears: A Delphi consensus study. *J Shoulder Elbow Surg.* 2020;29:674-680.
4. Lafosse L, Van Raebroeckx A, Brzoska R. A new technique to improve tissue grip: "The lasso-loop stitch." *Arthroscopy.* 2006;22:1246.e1-e3.
5. Suzuki H, Chang A, Kumagae H, Shimizu Y, Sakai A, Uchida S. Arthroscopic shoelace side-to-side repair technique using UltraTape for the treatment of longitudinal midsubstance rotator cuff tears. *Arthrosc Tech.* 2017;6:e1845-e1850.
6. Xu J, Li Y, Zhang X, et al. The biomechanical and histological processes of rerouting biceps to treat chronic irreparable

rotator cuff tears in a rabbit model. *Am J Sports Med.* 2022; 50:347-361.

7. Berthold DP, Muench LN, Dyrna F, et al. Comparison of different fixation techniques of the long head of the biceps tendon in superior capsule reconstruction for irreparable posterosuperior rotator cuff tears: A dynamic biomechanical evaluation. *Am J Sports Med.* 2021;49:305-313.
8. Cheppalli NS, Purudappa PP, Metikala S, Goel A, Singla A, Sambandam S. Using biceps tendon autograft as a patch in the treatment of massive irreparable rotator cuff tears improves patient-reported outcome scores: A systematic review. *Arthrosc Sports Med Rehabil.* 2023;5:e529-e536.
9. Shin KH, Jang IT, Han SB. Outcomes of superior capsular reconstruction using the long head of the biceps tendon in large to massive rotator cuff tears: A meta-analysis and systematic review. *J Clin Med.* 2024;13:1052.
10. Chiang CH, Shaw L, Chih WH, et al. Modified superior capsule reconstruction using the long head of the biceps tendon as reinforcement to rotator cuff repair lowers retear rate in large to massive reparable rotator cuff tears. *Arthroscopy.* 2021;37:2420-2431.