Technical Note

Arthroscopic Mobilization Techniques for Retracted Immobile Rotator Cuff Tears

Anthony J. Marois, M.D., and Larry D. Field, M.D.

Abstract: The treatment of massive, retracted rotator cuff tears remains a significant challenge to orthopaedic surgeons. While debridement and partial repair has been described as a viable option, surgeons seeking to perform a complete repair often must employ advanced mobilization techniques to lateralize retracted immobile rotator cuff tissue. Tears that appear irreparable often may be effectively mobilized with elements of capsular release, anterior interval slide, or posterior interval slide. When rotator cuff tissue is mobilized to the medial aspect of the anatomic footprint, a low-tension repair can be performed with good clinical outcomes.

Management of massive rotator cuff tears represents a considerable challenge to orthopaedic surgeons. Several treatment options exist for massive tears, including nonoperative care, debridement, partial repair, patch augmentation, superior capsular reconstruction, tendon transfers, and reverse total shoulder arthroplasty.[1] However, when possible, a complete arthroscopic rotator cuff repair that re-establishes native anatomy and biomechanics is preferred.[2] There are advanced techniques that can be employed to lateralize retracted immobile tears that are seemingly irreparable. These techniques, many of which have been previously described, include capsular release, anterior interval slide, and posterior interval slide.[3-5] This Technical Note presents the authors' techniques for mobilizing these complex tears.

Surgical Technique

Setup and Diagnostic Arthroscopy

After the induction of general anesthesia, the patient is placed in the beach-chair position, and an assessment of passive range of motion is performed. A standard posterior glenohumeral portal is established, and diagnostic arthroscopy is performed using a 30° arthroscope. After an anterior rotator interval portal is established, any intra-articular pathology is addressed, and the quality of the biceps tendon is assessed. In the setting of a massive tear, tenotomy or tenodesis of the biceps is deferred until the senior surgeon (L.D.F.) determines if the tear pattern would benefit from incorporation of the biceps in some potentially advantageous capacity such as biceps transposition using the "bio-superior capsular reconstruction" technique.[6]

Subacromial Assessment of Tear

The arthroscope is then repositioned into the subacromial space. A lateral portal is established under direct visualization, and a complete bursectomy is carefully performed. The camera is then moved to the lateral portal, and repairability of the rotator cuff is assessed utilizing the so-called 50-yard line view (Video 1, Fig 1), which allows a much-improved viewing perspective of the entire rotator cuff tear. An accessory posterolateral or anterolateral portal is then routinely established, and a grasper is introduced into the subacromial space. The torn rotator cuff tissue is manipulated to determine if the remaining tendon is lateralizable to the anatomic footprint (Fig 2). Often, multiple points and vectors of pull (anterior/posterior/lateral) must be assessed to determine if and where the tendon may be reducible and which rotator cuff tissue orientation will result in the lowest tension construct. If the tendon is not adequately reducible to the medial aspect of the anatomic footprint, additional strategies can be employed to increase tendon excursion.

From Mississippi Sports Medicine and Orthopaedic Center, Jackson, Mississippi, U.S.A.

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Address correspondence to Larry D. Field, M.D., Mississippi Sports Medicine and Orthopaedic Center, 1325 E Fortification St., Jackson, MS 39202, U.S.A. E-mail: Larry.Field@msmoc.com

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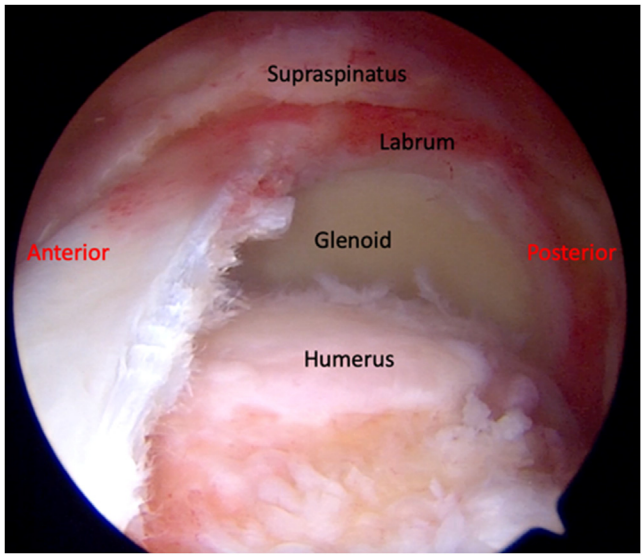

Fig 1. Arthroscopic view from the lateral portal of a left shoulder in the beach-chair position showing a massive, retracted supraspinatus tear.

Capsular Release

The first step, if the tendon is immobile and not easily lateralized, is to proceed with a capsular release. An arthroscopic soft tissue shaver (Dyonics; Smith & Nephew), introduced from an accessory lateral portal, is used to develop the plane between the undersurface of the torn rotator cuff and the glenoid to complete a 270° release (Fig 3). Care is taken to avoid iatrogenic injury suprascapular nerve by remaining within 1.5 cm of the glenoid rim. This technique typically can increase excursion up to 1 cm.

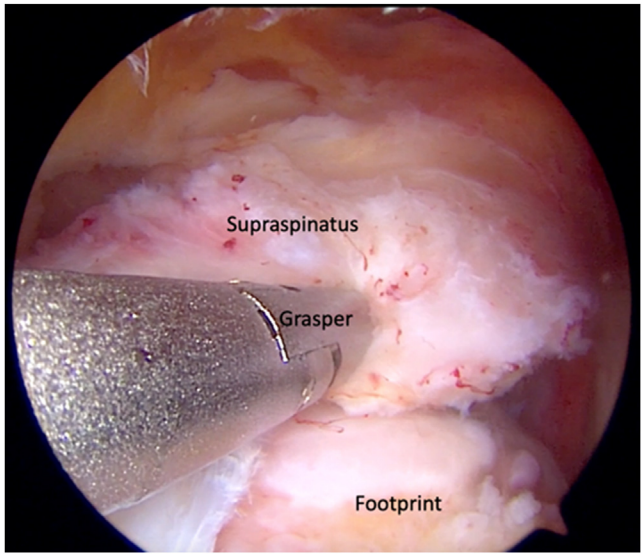

Fig 2. Arthroscopic view from the lateral portal of a left shoulder in the beach-chair position showing an arthroscopic grasper being used to test the mobility of torn rotator cuff tissue. In this instance, the tissue will not mobilize to the medial aspect of the anatomic footprint.

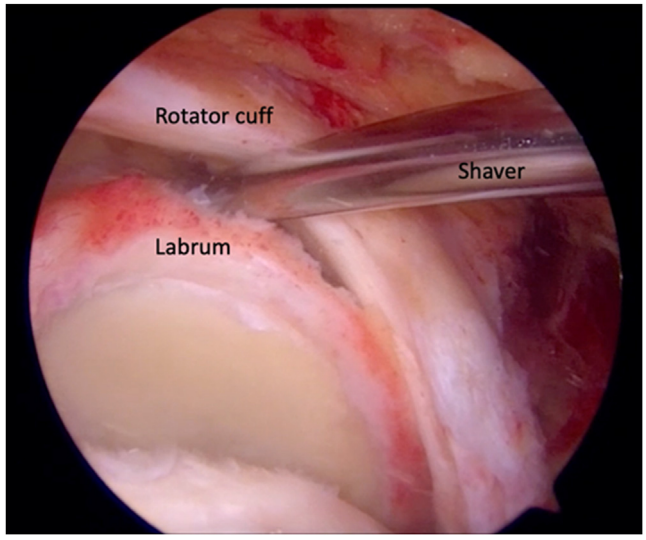

Fig 3. Arthroscopic view from the lateral portal of a left shoulder in the beach-chair position showing the technique using an arthroscopic shaver from an accessory lateral portal to release the capsule from the undersurface of the rotator cuff tendon.

Anterior Interval Slide

If the superior cuff requires further mobilization, then an anterior interval slide can be performed. An arthroscopic biter introduced into the subacromial space from the accessory anterolateral portal can be used to resect ligamentous and bursal connections from the anterior aspect of the supraspinatus tendon (Fig 4). The resection starts at the lateral free edge of the tear and extends to the base of the coracoid incising the contracted coracohumeral ligament. The biceps tendon

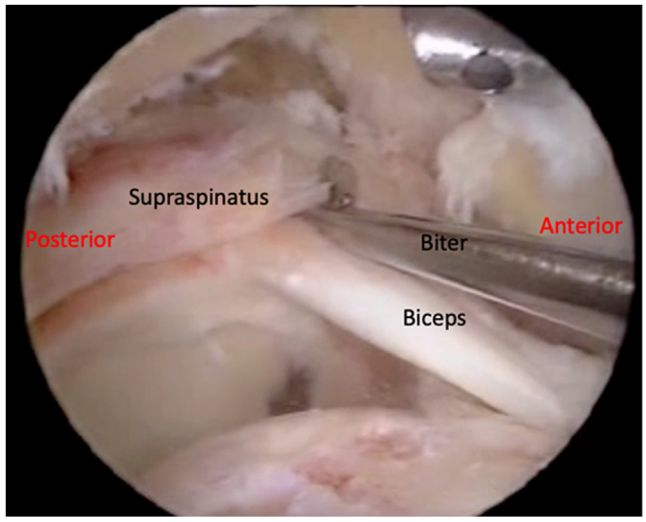

Fig 4. Arthroscopic view from the lateral portal of a right shoulder in the beach-chair position depicting the technique for an anterior interval slide using an arthroscopic biter from an accessory anterolateral portal.

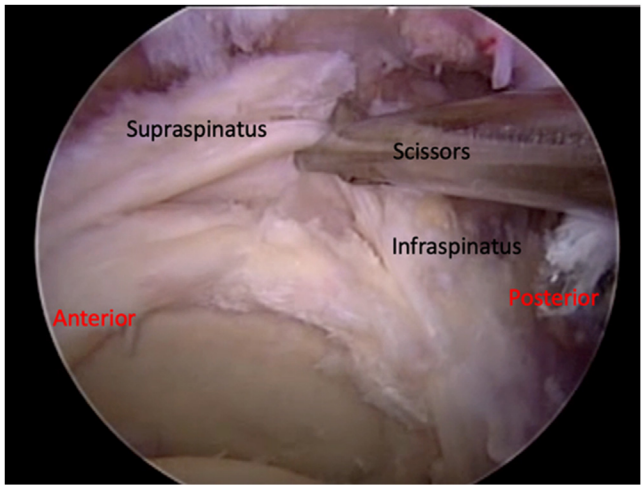

Fig 5. Arthroscopic view from the lateral portal of a left shoulder in the beach-chair position depicting the technique for a posterior interval slide using arthroscopic scissors from an accessory posterolateral portal.

attachment to the superior glenoid, if intact, can be used as a landmark for the anterior-most extent of the supraspinatus tendon. The anterior interval slide can effectively add another 1 to 2 cm of lateral excursion.

Posterior Interval Slide

If the posterior-superior cuff is not adequately reducible, a posterior interval slide can be performed to further improve tendon excursion. In this technique, an arthroscopic scissor is used to release the interval between the supraspinatus and infraspinatus (Fig 5). The release is started at the lateral free edge and carried in the direction of the scapular spine, taking care to avoid injury to the suprascapular nerve. The posterior interval slide can add another 1 to 2 cm of supraspinatus mobility and can significantly improve infraspinatus excursion as well.

Combination of Techniques and Repair

With the above techniques employed, a 4- to 5-cm tendon excursion can be created to assist with performing a low-tension repair. Our surgical techniques also frequently utilize medialization of the rotator cuff footprint to reduce tension and increase surface area of the healing surface.[7] We typically place 1 to 3 triple-loaded suture anchors into the greater tuberosity (Helicoil 5.5 mm; Smith & Nephew), pass sutures using a retrograde suture passer (IDEAL Suture Shuttle Grasper; DePuy), and tie knots (Fig 6). When biceps tenodesis is indicated and performed, the tenotomized biceps tendon is often incorporated into the repair construct by utilizing sutures from the most anteriorly placed anchor, thus augmenting the rotator cuff repair. In addition, a single lateral row anchor can sometimes be used to create a double-row construct to compress the rotator cuff tendon to the tuberosity (Fig 7). Postoperatively, patients are placed in an abduction sling immobilizer. Formal physical therapy is sometimes initiated after 1 week but is often delayed until 4 to 6 weeks after surgery if the tissue quality is poor or if the repair remains under relatively high tension despite the use of these mobilization techniques.

Discussion

It is possible to repair massive, retracted rotator cuff tears by using advanced mobilization techniques. This described arthroscopic approach with accompanying video utilizes multiple examples of retracted immobile rotator cuff tears that appear irreparable prior to mobilization efforts involving capsular release, anterior interval slide, and posterior interval slide. The techniques described demonstrate the steps necessary to achieve lateralization of the rotator cuff to the anatomic footprint to facilitate an effective, low-tension repair.

Several authors have previously described similar but varying techniques for mobilizing retracted tears.[3-5,8] The described techniques utilize reusable instruments (grasper, biter, scissors) and a disposable arthroscopic shaver that serves multiple purposes within the shoulder. The goal of the authors' method is not necessarily to lateralize the tendon for full footprint coverage of the anatomic footprint but to lateralize this tissue as possible so that it can be secured to a medialized footprint that results in a low-tension repair.

Prior studies have examined the effects of advanced mobilization techniques on repair tension, clinical outcomes, and retear/healing rates. Porschke et al.,[9] in a human cadaveric model, showed that an interval slide

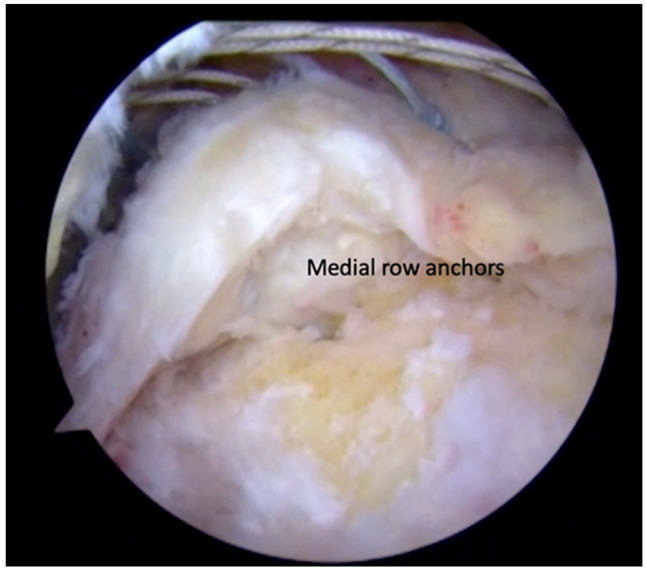

Fig 6. Arthroscopic view from the lateral portal depicting repaired rotator cuff tissue to the medial aspect of the anatomic footprint.

procedure significantly reduced tension during reduction by 47%, mostly due to anterior interval slide, without significant improvement with added posterior interval slide or capsular release. Clinically, Lo et al.[5] showed significant improvement in motion, strength, and outcome scores in 9 patients who underwent single or double interval slide for massive retracted tears. Berdusco et al.[10] showed similar improvement in strength and American Shoulder and Elbow Surgeons scores when interval slides were used in 11 patients but also found they had a high retear rate (55%) on magnetic resonance imaging follow-up.

High retear rates, despite improvement in clinical outcomes, have led some authors to advocate for partial repair in lieu of aggressive releases and slides to complete a repair fully. Kim et al.[11] found no significant differences in motion or outcome scores in those who had a complete repair with interval slides versus a partial repair despite a 91% retear rate in the complete repair group. This finding was similar to another study by Jeong et al.,[12] which showed 88% retear in the complete repair group and 85% in partial repairs. However, both studies demonstrated significant improvement in clinical outcomes.

The described techniques have the advantage of being relatively simple to perform, can be carried out without much added time or with increased cost, and result in the ability of surgeons to lateralize tendons that otherwise would be irreparable. Disadvantages include a somewhat increased risk of neurovascular injury when working medial to the glenoid and the potential that interval slides (particularly posterior) may devascularize the tendon (Table 1). Through the release of adhesions and mobilization of these retracted tendons to the greater tuberosity footprint, the illustrated techniques are designed to provide the patient with an improved chance at tendon healing. Also, medializing the anatomic footprint to reduce tension and increase surface area for healing and incorporating the biceps tendon into the repair construct are additional, supplemental techniques that may provide for increased opportunities for improved cuff healing. Further study on additional, adjunct procedures such as patch augmentation or balloon spacer placement may continue to add valuable and effective tools for rotator cuff repairs at high risk of retear.

Table 1. Advantages and Disadvantages of Arthroscopic Mobilization Techniques for Retracted, Immobile Rotator Cuff Tears

Technique Advantages
1. Yields adequate footprint coverage while achieving a relatively low-tension repair
2. Relatively simple arthroscopic methods utilized
3. Limited time requirements for execution of described techniques
4. No additional hardware requirements or additional costs generated
Technique Disadvantages
1. An increased risk of neurovascular injury when working medial to the glenoid
2. The potential of interval slides (particularly posterior) to devascularize the tendon

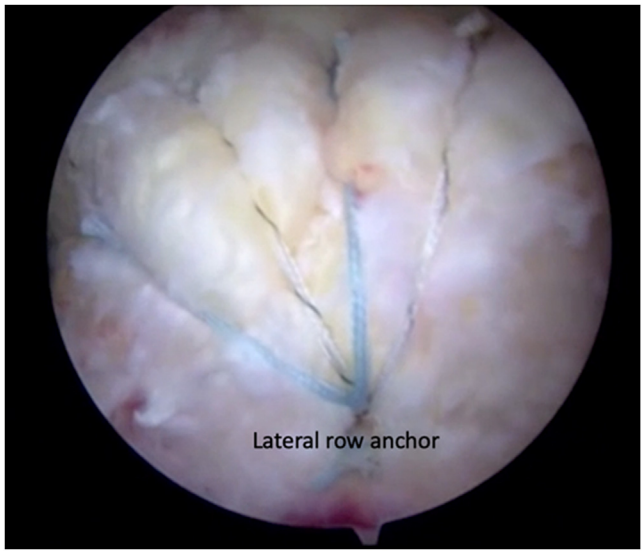

Fig 7. Arthroscopic view from the lateral portal depicting use of a single lateral row anchor to compress repaired rotator cuff tissue covering the anatomic footprint.

Disclosures

All authors (A.J.M., L.D.F.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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