

Single Medial-Row Anchor With Biceps Tenodesis in a Transosseous Double-Row Construct for Massive Rotator Cuff Tear



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Abstract: Massive rotator cuff tears are a common issue for patients and can be challenging to manage surgically. While the literature has shown that repair construct can affect the outcome of a rotator cuff repair, and the double-row repair is typically favored over the single-row repair for larger rotator cuff tears, the double-row repair also has some shortcomings. These shortcomings are related to the increased technical difficulty of the procedure, as well as increased costs due to the increased number of anchors used. Both of these factors also lead to an increase in the amount of time spent in the operating room as well. This study describes a surgical technique to help mitigate this shortcoming of the double-row repair by using a single medial-row anchor in our double-row construct for repair of a massive rotator cuff tear.

Massive rotator cuff tears are a common issue treated by orthopaedists.¹ Defined as a rotator cuff tear involving 2 or more tendons or tear size >3 cm, these tears are known to be bad actors for patients. Arthroscopic repair has shown increasingly positive results through the years in being able to provide patients with relief of symptoms.² Various factors have been identified that place patients at risk of retear following rotator cuff repair, including tear size, repair construct, patient age, and tendon quality.³ While patient age, tear size, and tendon quality are not modifiable, the repair construct is controlled by the surgeon. The ability of securing the tendon to bone has been the focus of many studies trying to identify the best construct. The double-row, transosseous equivalent construct has shown improved biomechanical strength over that of the

single-row repair,⁴ but also has its downsides as well. The procedure can be technically demanding and require increased time in the operative suite to address the tear. In addition, as the tear size grows, surgeons are more likely to use more implants to address the tear, which leads to increased costs.⁵ In this Technical Note, we describe a technique for repair of a massive rotator cuff tear using a transosseous equivalent, double-row construct with a single medial-row anchor, 5 free FiberTape sutures, and 2 preloaded FiberWire sutures.

Indications and Contraindications

Patients are indicated for the following procedure who have been found to have a rotator cuff tear and have not responded to nonoperative management. Contraindications to the procedure are if the patient also has a concurrent subscapularis tear, or if the rotator cuff tear is considered irreparable.

Patient Setup

The patient is positioned in the beach-chair position (Fig 1), with care taken to properly secure the head in a neutral position. The operative extremity is prepped and draped in the normal standard fashion. Use of an arm holder is also implemented to aid arm positioning throughout the procedure.

Arthroscopic Procedure (With Video Illustration)

A narrated video with demonstration of the surgical technique described in this section can be reviewed

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Fig 1. The standard beach-chair position for a right shoulder arthroscopic procedure used by the senior author.

([Video 1](#)). Standard posterior, anterolateral, and posterolateral portals are used ([Fig 2](#)). The posterior portal is established first and can be used to enter the glenohumeral joint for the diagnostic portion of the arthroscopic procedure. For some massive rotator cuff tears, entering the subacromial space primarily may be sufficient, as adequate visualization of the glenohumeral joint is possible from the subacromial space given the size of the rotator cuff tear. The anterolateral portal is established with use of a spinal needle under direct visualization. The motorized shaver is then introduced to perform a bursectomy, followed by an electrocautery device to remove bursa from the undersurface of the acromion. The motorized shaver is then again used to perform an acromioplasty to complete the subacromial decompression portion of the procedure.

Attention is then turned to the rotator cuff tear. With use of the shaver, the tear is defined and any adhesions superiorly and inferiorly to the cuff tissue are removed. Care is taken, at this point, to note the tear characteristics and to plan for placement of the single medial-row anchor based upon what vector the tissue needs to be pulled to be reduced. Switching between lateral and posterior portals may be necessary to ensure the rotator cuff tissue has been adequately freed from bursal tissue. The footprint of the rotator cuff is then prepared with use of the shaver to expose bleeding bone.

Under direct visualization, a spinal needle is used to establish a posterolateral portal to the subacromial space. The camera is moved to view from this portal and a cannula is placed into the anterolateral portal. Using an arthroscopic grasper or grasping suture passer device, the reduction of the rotator cuff tissue is evaluated and location for the single medial-row anchor is planned ([Fig 3](#)). If necessary, anterior marginal convergence sutures can be used to help bring the posteriorly retracted rotator cuff more anterior ([Fig 4](#)). These will also help to reinforce the passed suture tapes from the medial-row anchor. An accessory anterior portal is made with use of a spinal needle in a trajectory that will allow for placement of the medial-row anchor ([Fig 5](#)). An awl is used to prepare a bone tunnel for a double loaded 5.5-mm SwiveLock anchor (Arthrex, Naples, FL) additionally loaded with 5 free FiberTape sutures. The single medial-row anchor is then placed ([Fig 6](#)).

The FiberTape sutures from the anchor are then passed through the rotator cuff tissue in spaced bites with use of the Scorpion suture passer (Arthrex) ([Fig](#)

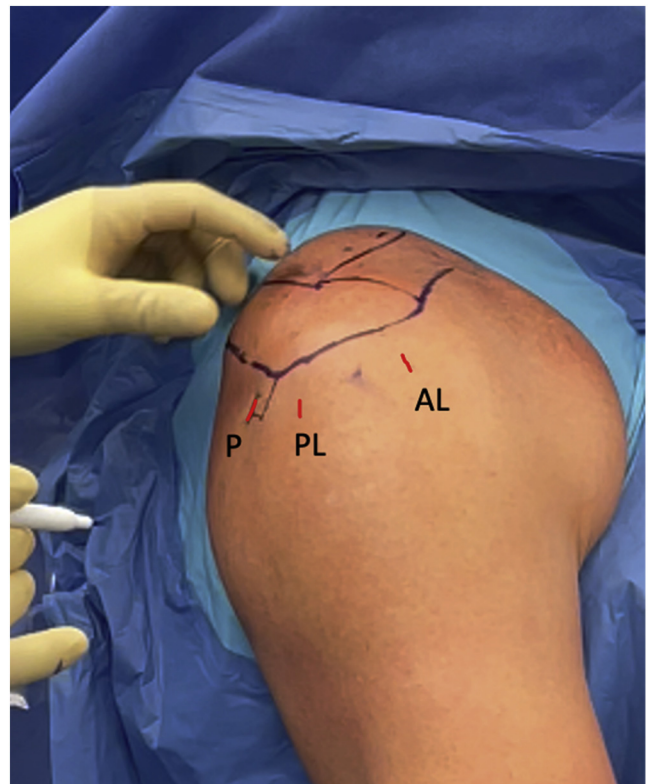


Fig 2. The location of arthroscopy portals used during the procedure for a right shoulder in the beach chair position. The posterior (P), posterolateral (PL), and anterolateral (AL) are demonstrated. The location of an additional anterior portal will vary depending on the best location for trajectory to place the medial-row anchor. This portal will also be used for suture management as well.

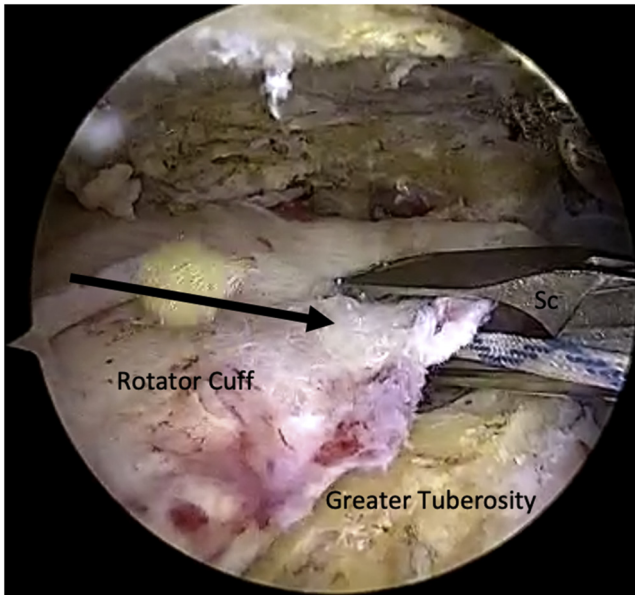


Fig 3. The arthroscopic view of the subacromial space from the posterior viewing portal of a right shoulder in the beach chair position. The Scorpion suture passer (Sc) (Arthrex) is used as a grasper to ensure that the rotator cuff is mobile and able to be reduced anatomically to the greater tuberosity. The vector of reduction is demonstrated by the black arrow.

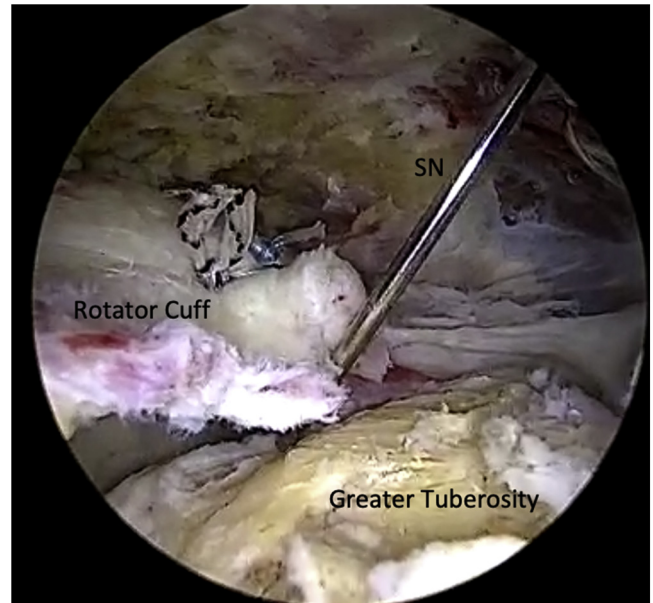


Fig 5. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach chair position. A spinal needle (SN) is introduced in an appropriate trajectory to place a single medial-row anchor in line with the vector needed to reduce the rotator cuff to the greater tuberosity.

7). For massive rotator cuff tears, in which the single medial-row anchor can be placed anteriorly in the rotator cuff footprint just posterior to the biceps groove, the preloaded FiberWire sutures are used to incorporate

the biceps tendon into the repair after it is freed from the biceps groove (Fig 8). The senior author has used this technique to help reinforce the repair and

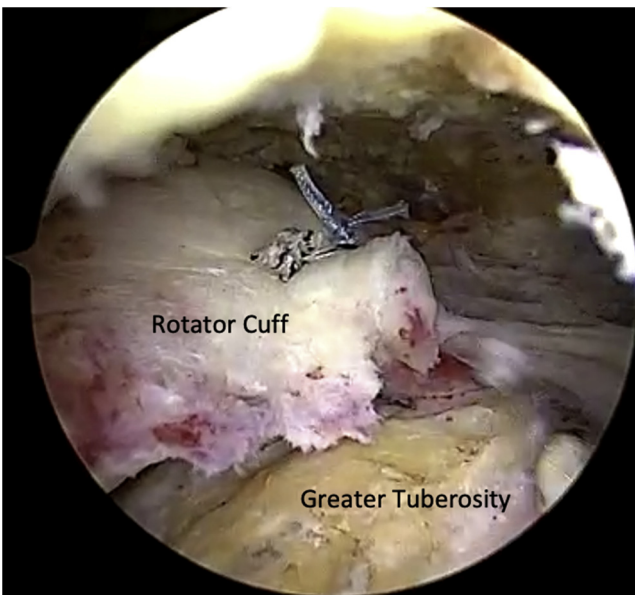


Fig 4. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach-chair position. Marginal convergence of the anterior rotator cuff tendon helps to translate the posteriorly retracted rotator cuff tissue anteriorly with 2 simple stitches of FiberTape sutures.

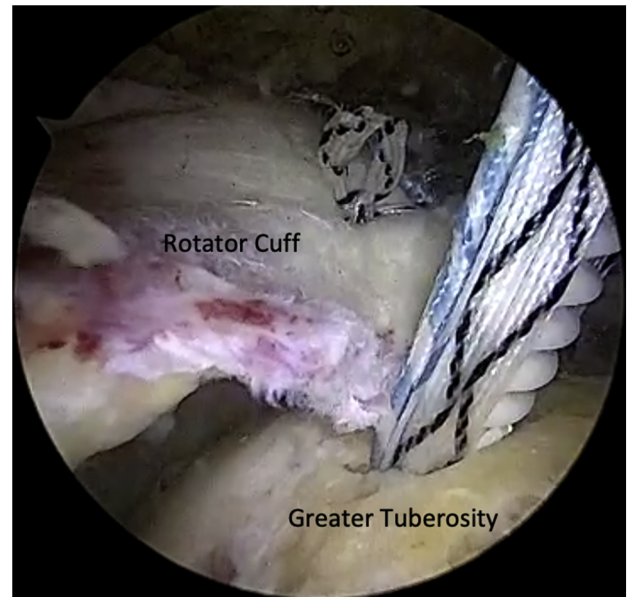


Fig 6. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach chair position. A 5.5-mm SwiveLock anchor (Arthrex) preloaded with 2 FiberWire sutures and then additionally loaded with 5 free FiberTape sutures, is advanced into the bone tunnel.

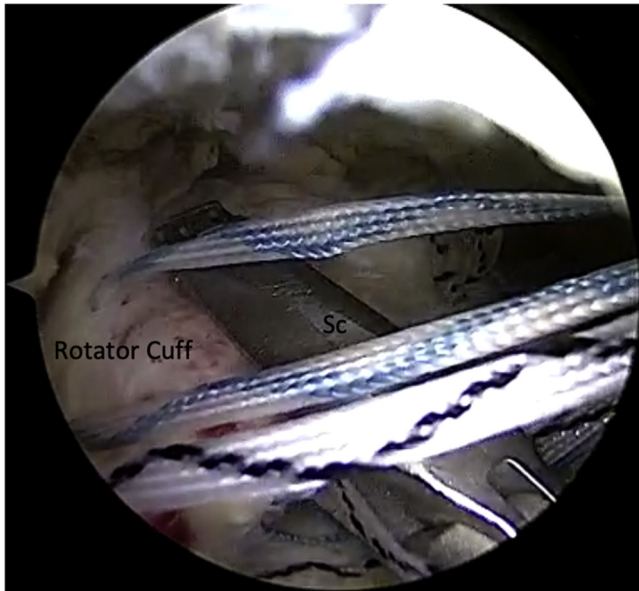


Fig 7. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach chair position. The FiberTape sutures are passed sequentially from posterior to anterior with use of the Scorpion (Sc) suture passer (Arthrex).

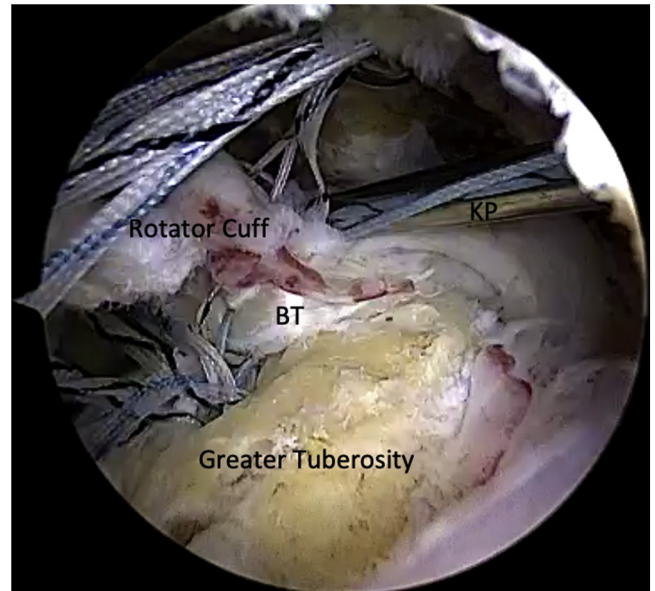


Fig 9. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach chair position. The FiberWire sutures are tied arthroscopically with use of an arthroscopic knot pusher (KP) and the biceps tendon (BT) is reduced to the greater tuberosity.

help further restrain superior migration of the humeral head for patients with massive rotator cuff tears. The preloaded FiberWire sutures are tied arthroscopically to tension the biceps tendon to the footprint of the rotator

cuff (Fig 9). Finally, all of the FiberTape sutures are docked in 2 lateral-row SwiveLock anchors (Arthrex). The tapes are placed into anterior or posterior lateral row anchors in alternating fashion to form a crossing

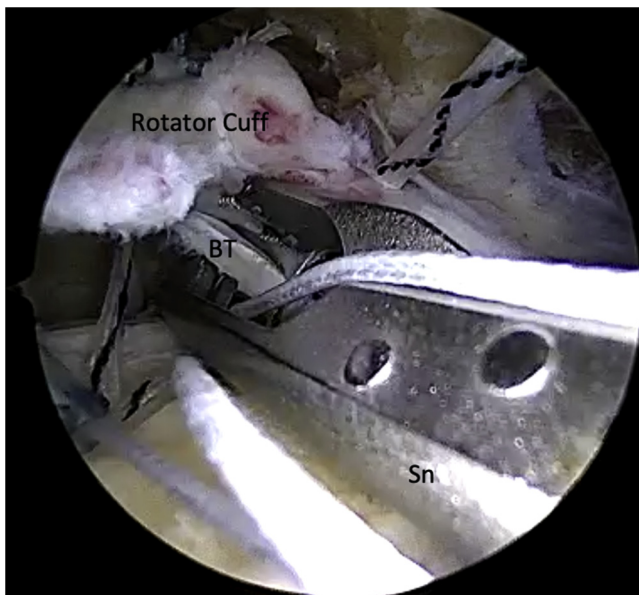


Fig 8. The arthroscopic view of the subacromial space from the posterolateral viewing portal of a right shoulder in the beach-chair position. The Scorpion (Sn) suture passer (Arthrex) is used to pass the FiberWire suture through the biceps tendon (BT) and then through the anterior margin of the rotator cuff.

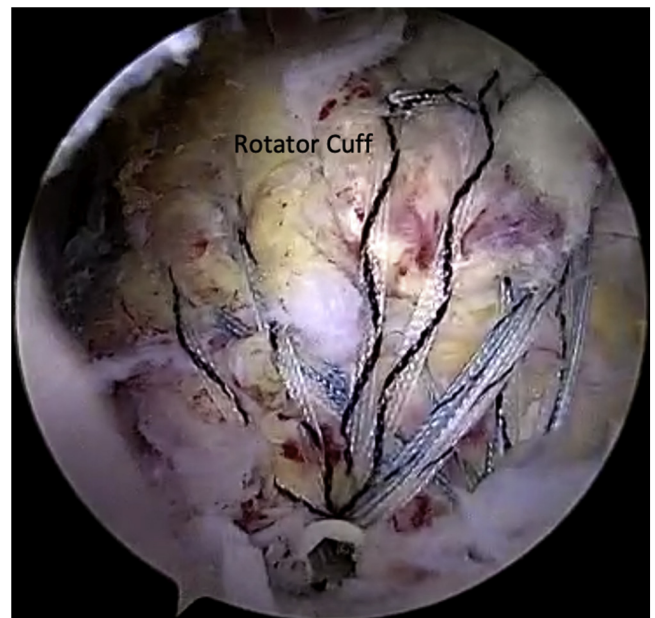


Fig 10. The arthroscopic view of the subacromial space from the anterolateral viewing portal of a right shoulder in the beach-chair position. Final construct after anchoring alternating tapes to an anterior lateral-row anchor, followed by anchoring the remaining tapes to a posterior lateral-row anchor.

Table 1. Postoperative Rehabilitation Protocol Used Following Rotator Cuff Repair

Postoperative Interval	Rehabilitation
0 to 6 weeks	Gentle PROM exercises, 1-lb weight-lifting restriction
6 weeks to 3 months	Addition of AROM exercises, 1-lb weight-lifting restriction
>3 months	Addition of gentle strengthening exercises, initiate weight-bearing with operative extremity

AROM, active range of motion; PROM, passive range of motion.

tape construct and to compress the rotator cuff tissue into the rotator cuff footprint (Fig 10).

The arthroscopic portals are then closed with nylon suture and sterile dressings are placed. The patient is placed into a sling with an abduction pillow, and a standard postoperative rehabilitation protocol is followed as described in Table 1.

Discussion

Massive rotator cuff tears make up to 40% of all rotator cuff tears.¹ They are more likely to be significantly debilitating to patients and historically were thought to have universally poor outcomes following repair, although more recent literature has shown promising results.² The principles of the rotator cuff repair are described by Azar et al.⁶ and describe the importance of the subacromial decompression, maintaining the deltoid origin, mobilizing torn tendons potentially with an interval slide, repairing the tendon to bone, and following a supervised and staged rehab protocol. These steps have likely led to improved outcomes for these massive rotator cuff tears. The ability of securing the tendon to bone has been the focus of many studies trying to identify the best construct. The double-row, transosseous-equivalent construct has shown improved biomechanical strength over that of the single-row repair,⁴ but the double-row repair has added cost of more anchors, increases operating room time, and is more technically demanding.⁵ Recent systematic reviews and metaanalysis of biomechanical literature have shown that factors positively influencing the strength of a repair are the number of sutures used in a

repair, use of larger diameter sutures, and use of mattress stitches.⁷ We believe the aforementioned technique addresses some of the shortcomings of the double-row repair while incorporating all 3 components found in this review to positively influence the strength of the repair.

Of course, any surgical technique has its own set of advantages and disadvantages. For this technique, the pearls and pitfalls are summarized in Table 2. Advantages of this procedure are that fewer implants are used, thus decreasing the cost of the procedure. In addition, the time needed to repair even massive rotator cuff tears is reduced by simplifying the steps of the procedure. The senior author has reduced the time needed to repair complete tears of 2 or more rotator cuff tendons to about 30 minutes on average. We believe this specific technique is less technically demanding and can result in reduced operating room time compared with other standard double-row techniques. Potential disadvantages of the procedure are concerns of decreased contact pressure to the footprint or potential for malreduction of the rotator cuff tendon, given that there is only 1 medial-row anchor in the construct. While this may be a concern, proper placement of the medial-row anchor in the center of the vector that is required to reduce the rotator cuff tear to its footprint, along with proper spread of the lateral row anchors, we believe, mitigates these concerns. It should be noted that if the vector of reduction needed for the rotator cuff tendon is more posterior on the greater tuberosity, the bone is generally not as dense in this location and can result in medial anchor pull-out. Generally, this vector of reduction is not common in most massive rotator cuff tears, and placing the medial-row anchor more anteriorly on the greater tuberosity results in adequate reduction of the rotator cuff tendon and placement of the medial-row anchor in more dense bone resulting in less pull-out. In addition, there may be some concerns over postoperative stiffness with incorporating the biceps tendon into the repair, but there is increasing data of other techniques incorporating the biceps into various repairs with good results.⁸ In the senior authors practice, postoperative stiffness has not been observed in patients who have had the

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Using a simple suture placed anteriorly in the rotator cuff can help pull the posteriorly retracted rotator cuff tissue anteriorly to improve visualization before	If the vector of reduction required for the rotator cuff is more posterior, typically the bone is softer in this location. It can result in pullout of the medial anchor and failure of the construct.
An anterior interval slide can be used to allow the cuff to reduce closer to the footprint	If a Lafosse grade 4 or 5 subscapularis tear is present, then repair of the subscapularis must be performed as well.
Placing the posterior arthroscopic portal more lateral and superior than a standard posterior arthroscopic portal can improve visualization.	

Table 3. Advantages and Disadvantages

Advantages	Disadvantages
Lower cost of procedure	Biceps tendon incorporation can theoretically lead to increased stiffness postoperatively
Reduction in procedure time	Medial-row fixation is dependent on a single anchor
Incorporating the biceps tendon results in more resistance to superior humeral head migration	

biceps tendon incorporated into the repair compared to patients who have undergone the standard “loop and tack” biceps tenodesis technique where the biceps has been released from its origin. The advantages and disadvantages of the technique are summarized in [Table 3](#).

Due to technical efficiency of the proposed procedure, and ability to still maintain a strong biomechanical construct, we believe that a single anchor medial-row construct to be a promising technique in the repair of even massive rotator cuff tendon tears.

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