

Arthroscopic Repair of Rare Transtendinous Rotator Cuff Tear: Utilizing Established Portals and a Posterior Superior Accessory Portal



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Abstract: There is a high incidence of rotator cuff injuries in the adult population, and there are well-described techniques for the most common types. Full-thickness transtendon rotator cuff tears are an uncommon injury, and there is limited literature on the appropriate treatment. These rare injuries are important to recognize due to the risk of repair failure using traditional techniques. Simply anchoring the medial portion of the tendon to the anatomic footprint after debriding the lateral tendon risks overtensioning the tendon. Previous techniques share the problem of poor visualization and difficulty passing sutures from standard portals. This technique uses 2 portals, the well-described Neviasser portal and a posterior superior accessory portal. Through these 2 portals, the goal is to increase visualization, increase ease of passing sutures, and avoid debridement of intact tendon.

Rotator cuff tears are a significant problem with many different types and treatment options. Most of these tears occur at the tendon-bone junction, with few occurring at the musculotendinous junction. Walcott et al.¹ recently reported on a rare full-thickness transtendon rotator cuff tear, with at least 1 cm of tendon attached laterally to the intact footprint. In a 3-year span, 9/502 (1.79%) patients were identified having transtendinous rotator cuff tears. A traumatic fall onto an abducted arm was the cause of injury in all patients included in the study. There have been studies examining intratendinous partial-thickness tears of the supraspinatus by Clavert et al.² and Park et al.³ Cohen et al.⁴ studied rotator cuff tears in athletes and noted 1 intrasubstance partial-thickness tear during a 7-season span. However, full-thickness transtendon tears were not observed in these studies.

Transtendon tears with significant lateral tendon on the footprint require special care to not alter the length-tension relationship of the supraspinatus. Simply debriding the lateral portion of a transtendon tear followed by directly attaching the medial portion to the footprint risks significant overtensioning. This has been a proposed reason for early failure and lack of healing.⁵

Walcott et al.¹ repaired the first injury with a mini-open technique before moving on to an arthroscopic repair for the subsequent injuries. A more recent Technical Note by Kelly and Field⁶ provided more descriptive instructions for arthroscopic repair of a medial transtendon rotator cuff tear. These previous arthroscopic techniques both used standard portals to place a suture anchor into the anatomic footprint followed by side-to-side repair of the medial and lateral components of the tendon.

This technique uses a well-described Neviasser portal in addition to a posterior superior accessory portal (PSAP). These views are intended to increase visualization of the anatomic footprint and provide better angles and access within the joint space.

Surgical Technique

Surgical Indications

A 56-year-old female presented with right shoulder pain and weakness following traumatic fall onto an abducted arm. The magnetic resonance image demonstrated a transtendinous full-thickness tear of the supraspinatus with significant lateral tendon still

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Table 1. Pearls and Pitfalls of the Surgical Technique

Pearls	Pitfalls
<ul style="list-style-type: none"> • Spinal needle localization for optimal portal placement. • Camera movement among portals to optimize view during the case. • Alter abduction of the shoulder to improve anchor placement. 	<ul style="list-style-type: none"> • Inadvertent portal placement minimizes access to the footprint. • Poor visualization may risk malreduction of the tear pattern. • Malreduction of the tear pattern may lead to increased tension and poor healing.

attached to the anatomic footprint on the greater tuberosity. There was minimal degenerative arthropathy and chondromalacia. Given the acute injury and evidence from clinical exam and imaging, the patient was indicated for transtendon repair of the rotator cuff ([Table 1](#), [Video 1](#)).

Patient Positioning and Anesthesia

The procedure is done under general anesthesia with the patient in lateral decubitus position. The bony prominences should be well padded including a pillow under the peroneal nerve and an axillary roll. Examine the shoulder for instability with anterior superior, anterior middle, and anterior inferior load and shift, as well as posteriorly.

Diagnostic Arthroscopy

Establish a midposterior glenoid portal and an anterior rotator interval portal. The glenohumeral joint can be viewed from the articular side to identify intra-articular pathology. The senior author's (S.T.) case showed a tear across the supraspinatus tendon with a

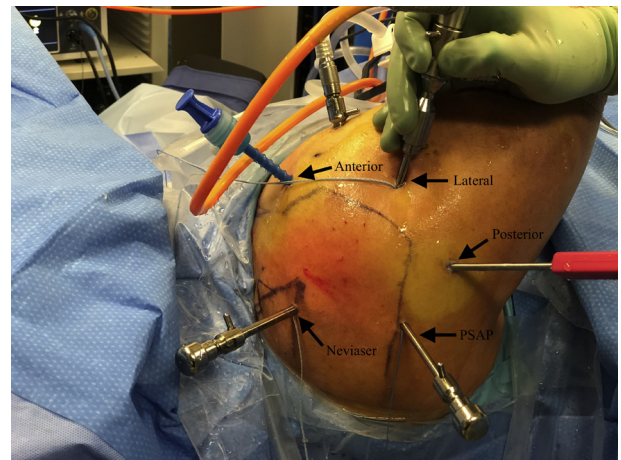


Fig 2. Right shoulder image showing locations of the portals used in the procedure. The posterior superior accessory portal is used to increase visualization and avoid debridement and damage to intact rotator cuff tendon posteriorly and laterally. (PSAP, posterior superior accessory portal; Neviaser, Neviaser portal.)

large tuft of lateral tendon attached to the greater tuberosity and an articular portion of the capsule torn off the undersurface of the supraspinatus ([Fig 1](#)). Bicep and other rotator cuff pathology may need to be repaired before transtendon repair. Type 2 and 3 acromion may need to be converted to type 1 for adequate room in the joint space.

Surgical Technique

It may be difficult to visualize the 4 to 5 mm of exposed medial footprint. A PSAP can be made off the

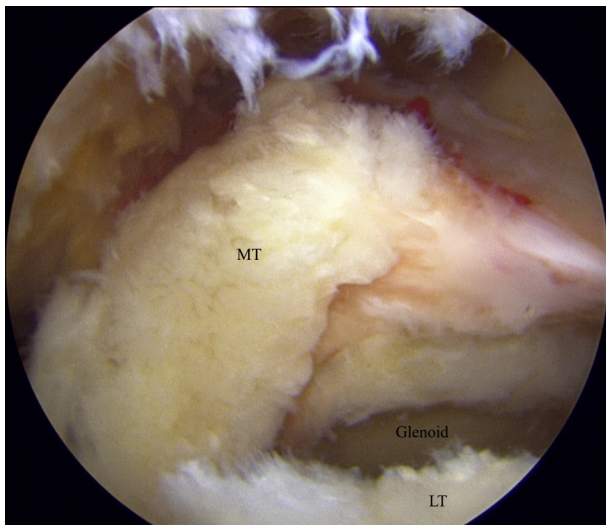


Fig 1. Right shoulder arthroscopic view of the subacromial space from the lateral portal showing a complete transtendinous rotator cuff tear. Note significant lateral tendon attached to the greater tuberosity. (MT, medial tendon; LT, lateral tendon.)

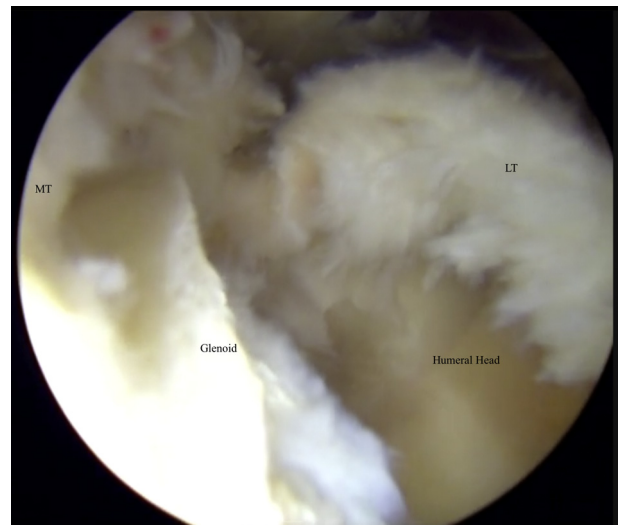


Fig 3. Right shoulder arthroscopic view of the subacromial space from the posterior superior accessory portal showing a complete transtendinous rotator cuff tear. Note significant lateral tendon attached to the greater tuberosity. (MT, medial tendon, LT, lateral tendon.)

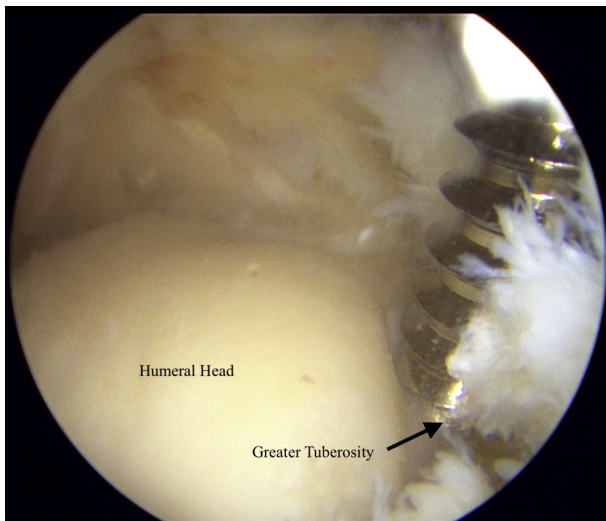


Fig 4. Right shoulder arthroscopic view of the subacromial space from the posterior superior accessory portal. This view shows the location of the 5.5 Healicoil Regenesorb anchor (Smith & Nephew) being placed through the Neviaser portal into the medial portion of the greater tuberosity. These portals allow for a perpendicular angle into the greater tuberosity under direct visualization.

back side of the acromion medial to the posterolateral edge of the acromion, just off the bone (Fig 2). This gives a posterior superior visualization of the supraspinatus and infraspinatus tendon attaching to the greater tuberosity from medial to lateral (Fig 3). Use the PSAP for viewing the joint space with the arm hyper-adducted. Use the Neviaser portal to place a 5.5 Healicoil Regenesorb anchor (Smith & Nephew, Andover,

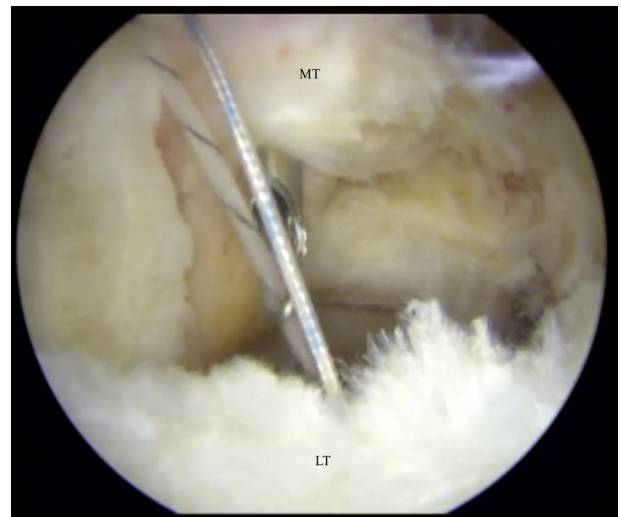


Fig 6. Right shoulder arthroscopic view of the subacromial space from the lateral portal. A retrograde suture passer is passed through the Neviaser portal to pull suture through the medial portion of the tendon. (MT, medial tendon; LT, lateral tendon.)

MA) just lateral to the articular edge of the humeral head in the greater tuberosity (Fig 4). The combination of the PSAP and Neviaser portal allows a perpendicular angle to insert the anchor under direct visualization. This was otherwise difficult to see without debriding lateral tissue due to intact rotator cuff, laterally and posteriorly.

Use the PSAP to visualize the joint space and use a retrograde pink retriever device to grab and pass 3 sutures anteriorly, middle and posteriorly through the lateral tendon attached to the footprint (Fig 5). Switch

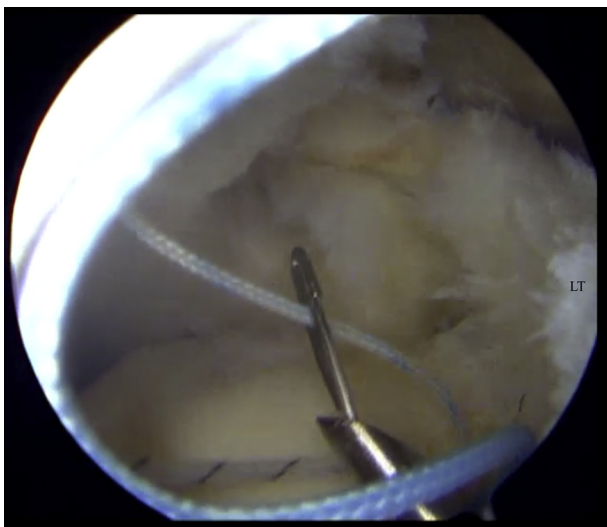


Fig 5. Right shoulder arthroscopic view of the subacromial space from the posterior superior accessory portal. A retrograde suture passer is passed through the lateral portal to pull suture through the lateral portion of the tendon. (LT, lateral tendon.)

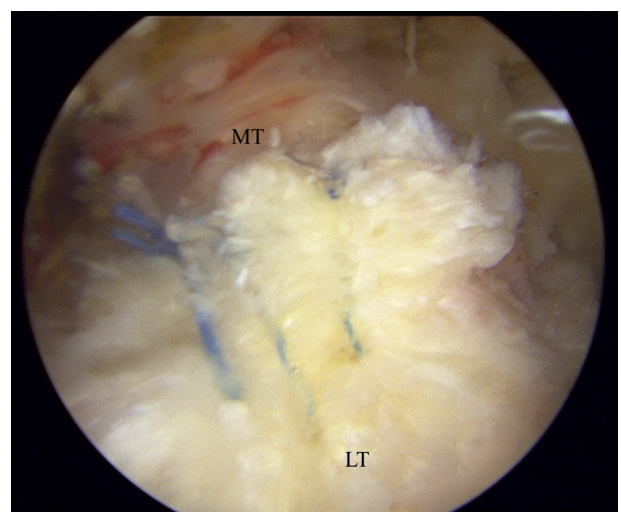


Fig 7. Right shoulder arthroscopic view of the subacromial space from the lateral portal showing a repaired trans-tendinous rotator cuff tear. The sutures were tied in a side-to-side fashion. A fourth suture was passed to reinforce the repair. (MT, medial tendon; LT, lateral tendon.)

Table 2. Advantages and Disadvantages of the Surgical Technique

Advantages	Disadvantages
<ul style="list-style-type: none"> • Perpendicular pass of anchors. • Improved visualization of transtendon tear. • Better anatomic reduction of the tendon. 	<ul style="list-style-type: none"> • Working with unfamiliar portals may lead to inadvertent placement and visualization. • Surgeon may not be accustomed to using a retrograde suture passer.

the camera to the lateral portal and use the posterior portal and Neviaser portal to pass retrograde sutures through the medial portion of the tendon anteriorly, middle, and posteriorly (Fig 6).

These sutures are tied side-to-side to reapproximate medial and lateral aspects of the tendon for an anatomic reduction. An additional no. 2 UltraBraid (Smith & Nephew) can be passed in a side-to-side fashion from lateral to medial using the Neviaser portal, as the senior author did in this case (Fig 7).

Postoperative Rehabilitation

An abduction sling should be used at all times for the first 4 weeks except when showering and under guidance of a physical therapist. Passive range of motion as the patient tolerates is allowed at this time. At 4 weeks, discontinue sling immobilization and start gentle passive stretching. Begin active-assisted and active range of motion at 6 weeks and strengthening exercises at 8 weeks.

Discussion

Full-thickness transtendon rotator cuffs are uncommon and have been reported as being due to a traumatic fall onto an abducted arm. Walcott et al.¹ recently found the incidence to be 1.97% or 9/502 patients in a 3-year span.¹ These acute full-thickness transtendon tears are unique and important to recognize due to the complications associated with traditional repair. Simple debridement of the lateral tendon attached to the anatomic footprint and then repair of the medial tendon to the anatomic footprint risks over-tensioning the tendon. This change in the length-tension relationship has previously been linked to repair failure.⁵ This proposed technique reduces this risk by repairing the medial tendon to the laterally intact tendon.

Walcott et al.¹ reported outcomes in 7 patients who underwent side-to-side repair of full-thickness transtendon rotator cuff tear with at least 1 cm of intact lateral cuff attached to the anatomic footprint. All

patients showed improvements in postoperative strength and function with an average follow-up of 41.5 months. Walcott, et al.¹ and Kelly and Field⁶ both used arthroscopic repairs for traumatic full-thickness transtendon rotator cuff tears to maintain the length-tension relationship. These previous arthroscopic techniques used standard portals for anchor placement followed by side-to-side repair of the medial and lateral components of the tendon.^{1,6}

There is a distinct set of advantages and disadvantages with this technique (Table 2). While working with unfamiliar portals, careful planning is necessary to avoid inadvertent portal placement. Although previous techniques have the advantage of working with familiar portals, they have problems with poor visualization and difficulty suturing through standard portals. This technique uses the well-described Neviaser portal to more easily place anchors into the anatomic footprint at a perpendicular angle and to help pass sutures within the joint space. The PSAP is used as a viewing portal to keep the anatomic footprint under direct visualization. Through these 2 portals, the goal is to increase visualization, increase ease of passing sutures, and avoid debridement of intact tendon.

Acknowledgments

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References

1. Walcott ME, Daniels SD, Sinz NJ, Field LD, Higgins LD. Traumatic full-thickness transtendinous rotator cuff tears: A case series. *J Shoulder Elbow Surg* 2017;26:62-67.
2. Clavert P, Coniat YL, Kempf JF, Walch G. Intratendinous rupture of the supraspinatus: Anatomy and functional results of 24 operative cases. *Eur J Orthop Surg Traumatol* 2016;26:133-138.
3. Park SE, Panchal K, Jeong JJ. Intratendinous rotator cuff tears: Prevalence and clinical and radiological outcomes of arthroscopically confirmed intratendinous tears at midterm follow-up. *Am J Sports Med* 2015;43:415-422.
4. Cohen SB, Towers JD, Bradley JP. Rotator cuff contusions of the shoulder in professional football players: Epidemiology and magnetic resonance imaging findings. *Am J Sports Med* 2007;35:442-447.
5. Meyer D, Wieser K, Farshad M, Gerber C. Retraction of supraspinatus muscle and tendon as predictors of success of rotator cuff repair. *Am J Sports Med* 2012;40:2242-2247.
6. Kelly BJ, Field LD. Arthroscopic repair of medial transtendinous rotator cuff tears. *Arthrosc Tech* 2017;6:2217-2221.