

Arthroscopic Repair of an Isolated Subscapularis Tendon Rupture in an Adolescent Patient



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Abstract: Arthroscopic repair of an isolated subscapularis tendon rupture has been previously described in the adult population; however, the technique has yet to be described in a pediatric patient. In this Technical Note, we describe an arthroscopic repair of an isolated subscapularis tendon rupture with concomitant mini-open suprapectoral biceps tenodesis in an adolescent patient. Standard anterior and posterior portals are established with an accessory portal in the anterosuperior angle of the acromion. A 0-PDS suture is used to pass strands of suture tape through the inferolateral and superolateral aspects of the subscapularis tendon. Suture tape is passed through a suture anchor and the accessory portal and is fixated at the junction of the inferior one-third and superior two-thirds of the subscapularis tendon footprint and at the junction of the superior one-third and inferior two-thirds of the subscapularis tendon footprint. Following subscapularis tendon fixation, biceps tenodesis is performed through either a mini-open subpectoral or arthroscopic suprapectoral approach. This described technique allows for full visualization of the subscapularis tendon and lesser tuberosity. Additionally, this technique allows for accurate placement of suture anchors to maximize footprint coverage and appropriate graft tensioning.

Rotator cuff tears are a common shoulder pathology that occur in approximately 20% of the general population and result in pain, weakness, stiffness, and loss of range of motion.^{1,2} Despite the frequency of these injuries, the subscapularis is rarely involved. Cadaveric studies have shown that full-thickness subscapularis tears occur in between 3% and 13% of patients, with a higher incidence of partial subscapularis tendon tears.³ Large clinical studies on patients with symptomatic rotator cuff tears identified the subscapularis tendon as the pathologic tendon in 6.4% to 28% of cases as confirmed by arthroscopic examination.^{4,5} This discrepancy in the reported incidence of subscapularis tears can likely be attributed to the heterogeneity in clinical presentation.

Since the subscapularis is the only anteriorly located rotator cuff muscle, different vectors of force typically cause injury as compared with the rest of the rotator cuff. Isolated subscapularis tears can occur following forced external rotation or extension of a partially abducted arm. A subscapularis lesion in the pediatric population is a rare injury and is often associated with an avulsion fracture of the lesser tubercle. In more rare instances, an isolated subscapularis tendon tear can be seen in this population.^{6,7} Management typically entails surgical intervention through arthroscopic repair, which has been shown to obtain satisfactory functional and patient-reported clinical outcomes, as well as reduced pain levels.⁸⁻¹⁰

The technique of arthroscopic repair of the subscapularis tendon has been previously reported in adult populations. In this Technical Note, we describe the primary repair of a full subscapularis tendon rupture in an adolescent patient.

Technique

Imaging and Indications

Indications for a subscapularis tendon repair include acute full-thickness tendon tear as confirmed by noncontrast magnetic resonance imaging, in the absence of significant glenohumeral arthritis that would indicate reverse total shoulder arthroplasty in older patients. Younger patients may have the capacity to heal partial-thickness rotator cuff tears. Thus, it is

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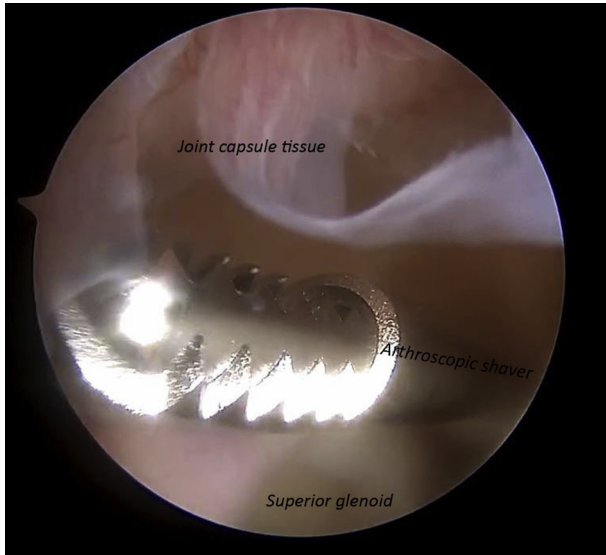


Fig 1. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. The joint capsule, labrum, rotator cuff, and joint capsule are debrided with an arthroscopic shaver.

possible that early detection with focused physical therapy can prevent the progression of a partial injury rather than early surgical intervention.¹¹ Clinical exam may reveal increased range of motion on passive external rotation, weakness on internal rotation, and a positive belly-press test or lift-off test.¹²

Positioning and Diagnostic Arthroscopy

With the patient in the upright beach chair position, the arm is placed in 0° forward flexion and 20°

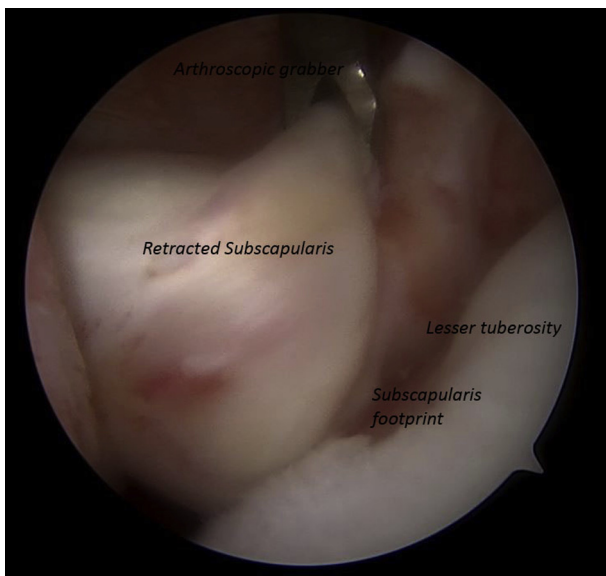


Fig 2. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. The retracted subscapularis is reapproximated to its insertion on the lesser tuberosity of the humerus.

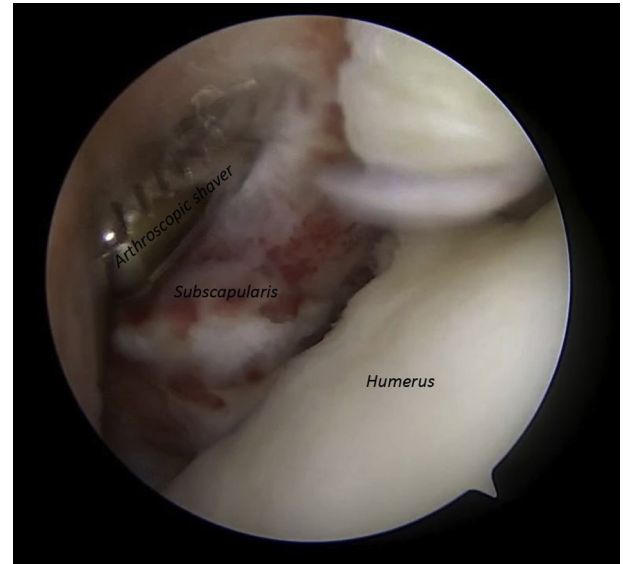


Fig 3. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. An arthroscopic shaver is used again to debride and free the subscapularis to allow for lateral mobilization.

abduction. Standard anterior and posterior portals as well as an accessory portal in the anterosuperior angle of the acromion are created. Diagnostic arthroscopy is



Fig 4. Right shoulder in the beach chair position. View of the placement of an 8-mm cannula placed in the accessory anterior superolateral portal and an 8-mm PassPort cannula placed in the anterior portal.

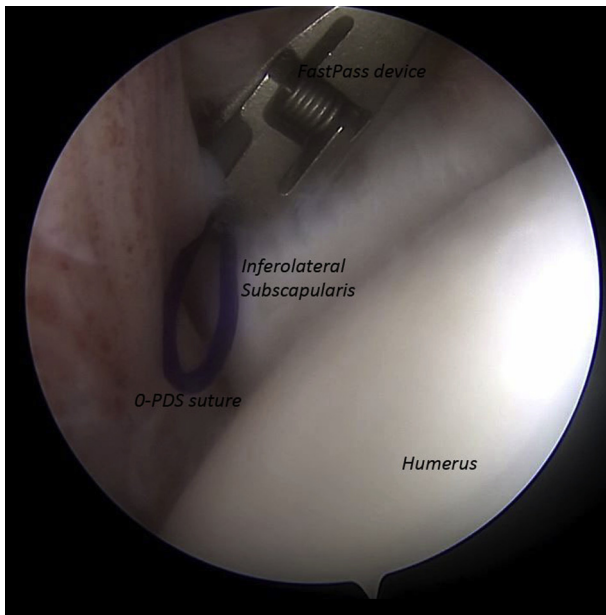


Fig 5. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. The FastPass device is passed through the anterior portal to place a 0-PDS suture through the inferior one-third and superior two-thirds of the lateral subscapularis tendon, to facilitate subsequent passage of labral tape through the subscapularis tendon.

performed through the posterior viewing portal in order to confirm the pathology.

Primary Repair of a Full-Thickness Subscapularis Tear

An arthroscopic shaver is passed into the glenohumeral joint through an anterior portal, and all damaged tissue along the rotator cuff, joint capsule, and

labrum is debrided with a shaver and electrocautery wand (Fig 1). Once the damaged tissue is debrided and removed from the joint space, the subscapularis tear can be visualized (Video 1). The superior glenohumeral ligament and coracohumeral ligament may still be attached to the superolateral aspect of the subscapularis tendon; if possible, this tissue may be preserved during the repair.

A subscapularis tendon rupture is often medially retracted into the glenohumeral joint (Fig 2) and is typically associated with injury or medial instability of the long head of the biceps tendon (LHBT), secondary to disruption of its sling. If so, arthroscopic scissors can be passed through the anterior portal to release the LHBT to facilitate subsequent biceps tenodesis, as shown in Video 1. This is preferred over biceps tenotomy in younger patients as it has the advantages of maintaining a length-tension relationship, which may reduce spasms of the bicep muscle,¹³ preserve supination strength, and avoid a “Popeye” deformity.

Following release of the LHBT, attention is turned to the subscapularis tendon. An arthroscopic shaver and cautery wand are passed through the anterior portal to debride the inferior and lateral aspects of the retracted subscapularis tendon (Fig 3). In the provided video, an 8-mm cannula is placed in the anterior superolateral (accessory) portal, and an 8-mm PassPort cannula (Arthrex, Naples, FL; Fig 4) is placed into the glenohumeral space through the anterior portal. An arthroscopic shaver is passed through the anterior superolateral portal to debride the footprint on the cortical surface of the lesser tuberosity.

As seen in the video, a FastPass device (Arthrex) is then used to pass a 0-PDS suture through the inferolateral aspect of the subscapularis tendon (Fig 5).

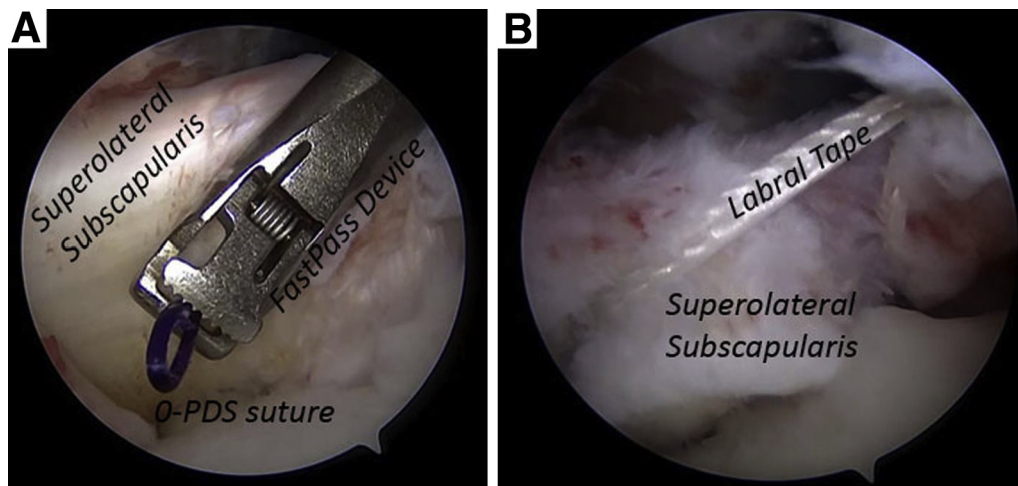


Fig 6. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. (A) The FastPass device is passed through the anterior portal to place a 0-PDS suture through the superior one-third and inferior two-thirds of the lateral subscapularis tendon. (B) The 0-PDS suture was tied to the labral tape to facilitate passage through the subscapularis tendon.

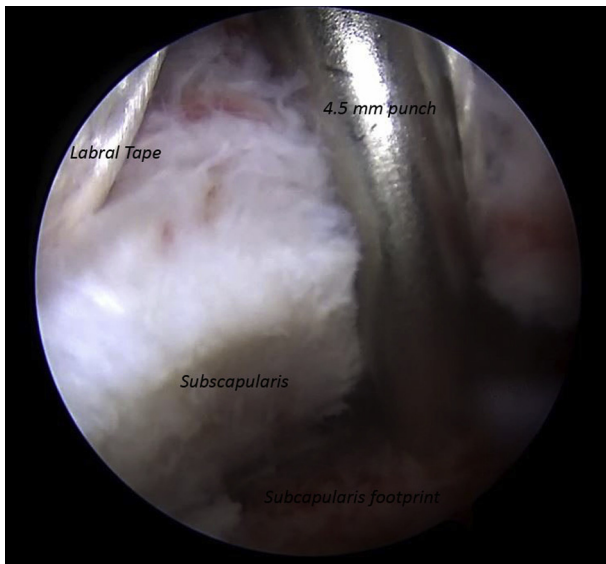


Fig 7. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. A 4.5-mm punch is passed through the anterior portal to create a bone socket at the inferior one-third and superior two-thirds of the subscapularis footprint.

The 0-PDS suture is then used to shuttle a labral tape suture through the subscapularis tendon. This process is then repeated for a more superior pass of labral tape (Fig 6). A suture grabber is then passed through the anterior portal and pulls both strands of the suture tape through the anterior portal, allowing for tensioning and elevation of the subscapularis tendon. This permits exposure and visualization of the footprint on the lesser tuberosity.

A 4.5-mm punch is passed through the anterior portal and is tapped 15 mm into the cortical bone at the junction of the inferior one-third and superior

two-thirds at the subscapularis footprint (Fig 7). As shown in the provided video, the inferior labral tape is then implanted with a 4.75-mm PEEK Swivelock screw (Fig 8). Similarly, an additional 4.75-mm PEEK Swivelock screw is used to fix the superior labral tape at the junction of the superior one-third and inferior two-thirds of the subscapularis footprint.

After stable fixation is achieved, all fibrillated and degenerative tissue that remains is debrided with an arthroscopic shaver and cautery wand. The patient's arm is cycled through internal and external rotation, and the arthroscope is used to visualize stabilization of the repaired subscapularis tendon construct (Fig 9). At this point, biceps tenodesis is performed through either a mini-open subpectoral or arthroscopic suprapectoral approach. Postoperatively, the shoulder is placed in an abduction pillow and sling.

Discussion

The described technique of arthroscopic subscapularis tendon repair is performed most frequently in adult patients. However, this technique is also appropriate for restoring anatomy and function to adolescent patients. Isolated rotator cuff injuries in the pediatric and adolescent populations are rare and are more likely to involve bony injuries due to the lack of degeneration of the rotator cuff tendons as well as the presence of an open physis in pediatric patients.¹¹ As such, cases of complete tendon avulsion of the tendon without fracture or residual tendon remaining on the lesser tuberosity in pediatric patients have not been reported.

The literature currently includes several techniques and variations for the repair of isolated subscapularis tears in adult patients. Since this is such a rare injury, especially in the pediatric population, it is difficult to study the difference in outcomes comparing these

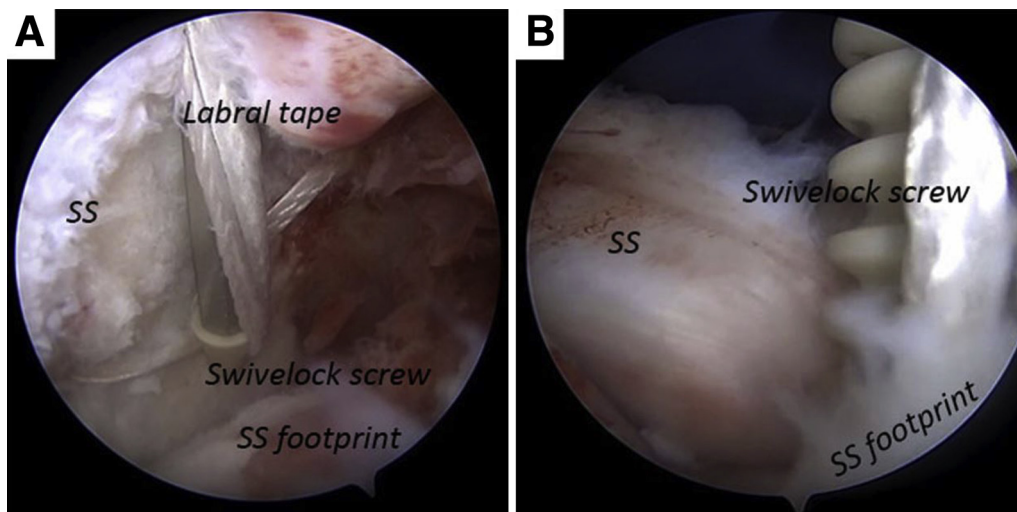


Fig 8. Right shoulder in the beach chair position. Arthroscopic view of the glenohumeral joint space from the posterior portal. (A) Both limbs of the labral tape are threaded through a Swivelock screw. (B) The Swivelock screw is implanted into the bone socket previously created on the subscapularis footprint. (SS, subscapularis.)

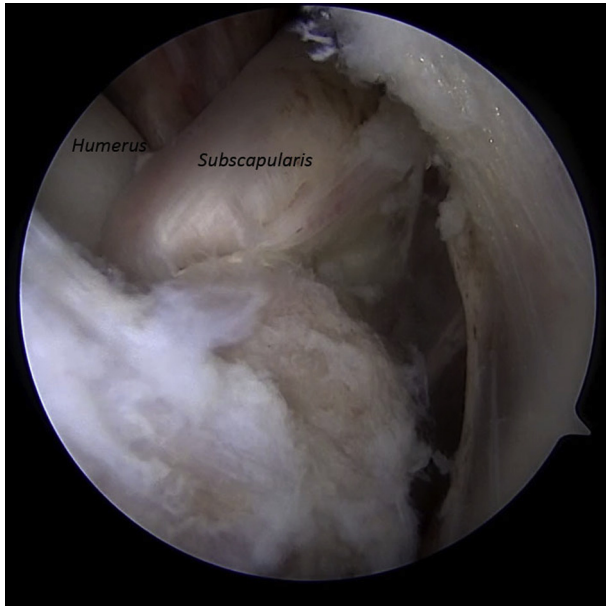


Fig 9. Right shoulder in the beach chair position. Arthroscopic view of the stabilized repair of the subscapularis to its anatomic insertion on lesser tuberosity of the humerus.

techniques. In this described technique, if adequate cortical purchase is not achieved, patients are susceptible to failure. Another risk of this procedure is overzealous debridement of the fibrillated subscapularis tissue that may lead to overtensioning of the subscapularis tendon, which may cause reduced range of motion and strength postoperatively. Lastly, passing the suture through the lateral aspect of the tendon that is too close to the tendon margin may predispose to failure. In this Technical Note, we describe a safe and effective way to surgically address an isolated complete rupture of the subscapularis tendon in an adolescent patient.

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