

Single Portal Technique for Subscapularis Tendon Repair



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Abstract: The fast and steady development of arthroscopy techniques in the last couple of decades led to a drastic increase of arthroscopic rotator cuff repairs over the open procedure. Supraspinatus tears are the most common of all, but the subscapularis tendon tear is a more common injury than expected. Most of the time it presents as a partial tear or is associated with a subsequent rotator cuff tendon injury, especially the supraspinatus. Nowadays, the standard procedure to repair the subscapularis tendon is performed arthroscopically, even though a real superior result over the open repair it is yet to be reported. Ideally less operative time, less scarring, and postoperative pain would be the expected benefits, but no study has compared the long-term outcome of these 2 procedures yet. To maximize possible improvements, we would like to present an arthroscopic technique: a subscapularis tendon repair performed with the aid of an angled suture passer and using a single anterior working portal.

It is still unclear if arthroscopy has a superior role in clinical outcome and tendon healing in the case of a subscapularis tendon tear compared with the open procedure.¹ Only a few papers have investigated the results of arthroscopy on this type of injury so far, and, in addition, clinical outcomes, operative time, scarring, and postoperative pain should also be extensively investigated.

In 2003, Kim et al.² proved the introduction of arthroscopy to be not only a therapeutic tool but also an important diagnostic instrument for subscapularis tears. An isolated full-thickness subscapularis tendon tear is less common than other rotator cuff injuries, but in

recent clinical analysis involving more than 100 patients with rotator cuff injuries, 37% of them had either an isolated subscapularis tear or a subscapularis tear combined with other injuries.^{3,4} Because subscapularis tears are more commonly diagnosed than previously expected, it is desirable to find a suitable, easily applicable, and reproducible repair technique.

We demonstrate the repair of the subscapularis tendon through a single anterior portal, with the use of a ReelPass SutureLasso (Arthrex, Naples, FL).

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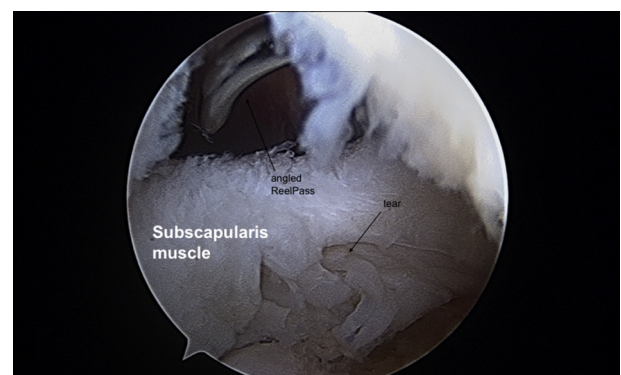


Fig 1. All the images from arthroscopy are performed in a right shoulder and viewed from the posterior portal. The tendon presents with a full-thickness tear marked by an arrow. In the background, the left-angled ReelPass is about to take a healthy bite of the tendon.

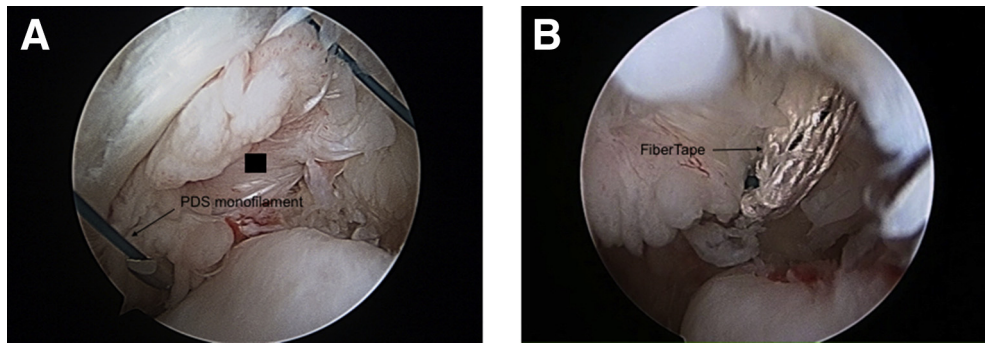


Fig 2. Right shoulder arthroscopy, viewing from the posterior portal. (A) A healthy bite of the tendon (marked with a square) is taken with the angled-suture passer inserted from the anterior portal. The PDS monofilament is abundantly uncoiled in the glenohumeral joint to be retrieved from the same anterior portal with the help of a ring grasper. (B) The center of the SutureTape, tied to the PDS monofilament, is being shuttled through the tendon and retrieved from the anterior portal to create a racking hitch stitch. (PDS, polydioxanone.)

Surgical Technique

Preoperative Evaluation

The diagnosis of a subscapularis tendon rupture consists of a detailed history, comprehensive physical examination, and complementary imaging studies.

A typical patient with subscapularis tendon rupture reports pain and swelling in the anterior part of the shoulder after a possible recent fall on an outstretched arm with possible anterior shoulder dislocation. There may be an associated lesion of other muscles in the rotator cuff. Patients will complain of decreased range of motion (ROM) and weakness with internal rotation of the arm that will be assessed during the physical examination.

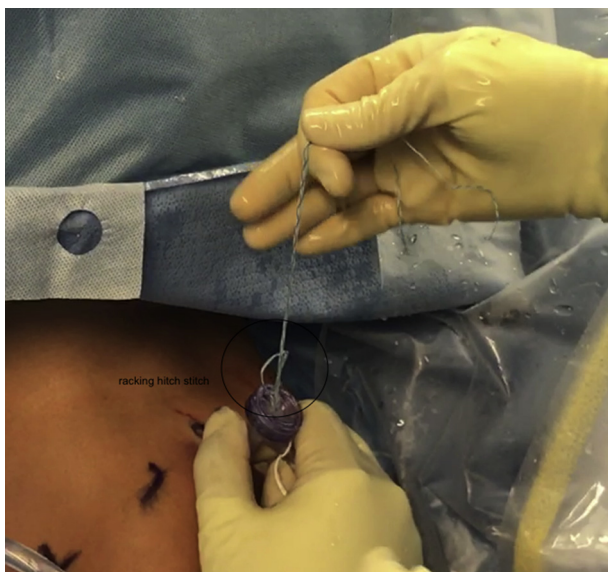


Fig 3. Picture from outside the right shoulder showing the racking hitch stitch (circled). The 2 limbs of the SutureTape fed through the looped end, and are about to be pulled and tension the stitch.

Inspection of both upper extremities is done during the physical examination, followed by palpation of the region of interest and evaluation of the ROM.

Special tests are used to assess more precisely subscapularis integrity: the lift-off test, the belly-press test, and the bear-hug test; all of them are most likely to be rated 2+. Ultrasound and magnetic resonance imaging are also helpful to confirm the diagnosis before possible surgical intervention.

Anesthesia and Positioning

The patient is placed supine on a beach-chair positioner, whereas an interscalene nerve block is placed in the upper extremity and general anesthesia is induced. An intraoperative examination should be performed under anesthesia to confirm our preoperative impression.

The patient is then placed in the beach-chair position with a well-padded head cushion. The operative site is

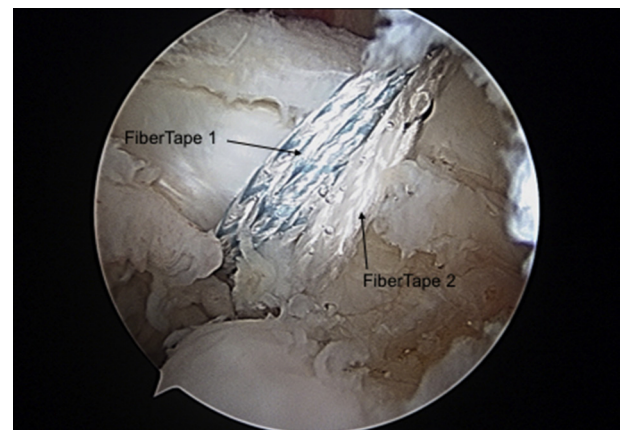


Fig 4. Arthroscopic picture of a right shoulder viewing from the posterior portal showing the 2 FiberTape used for the subscapularis tendon repair before the anchor placement and the final reduction.

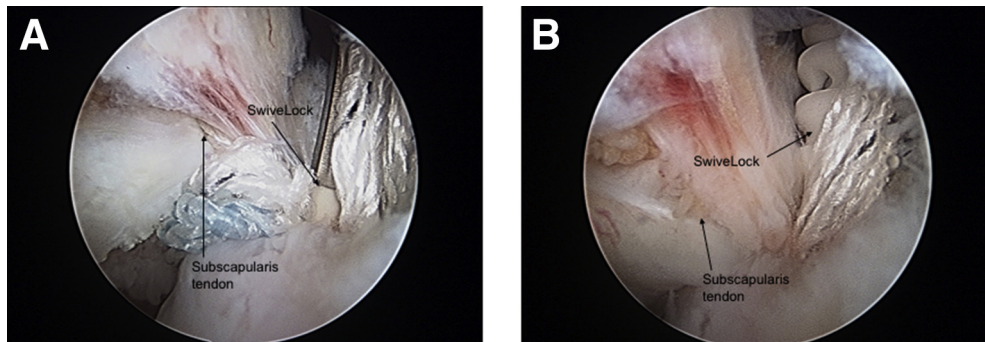


Fig 5. Arthroscopy image of a right shoulder from the posterior portal. (A) Both sutures are loaded on the same 4.75 SwiveLock marked by an arrow. The adequate reduction of the subscapularis tendon is achieved by tensioning each suture limb independently from outside the shoulder. Next the SwiveLock is dunked into a pilot hole previously punched on the humeral head. (B) The SwiveLock is being screwed in to secure a stable repair.

then sterilely prepped, draped, and a McConnell arm holder is used.

Portal Placement

A marking pen is used to highlight the anatomical landmarks of the shoulder. The posterior portal is made in the soft spot of the shoulder with an incision performed using a No. 11 blade. The glenohumeral joint is then entered using a blunt trocar with scope and sheath. A 30° 4.0-mm arthroscope is used to visualize the glenohumeral joint. A spinal needle is used to needle-localize the anterior portal under arthroscopic visualization. The anterior portal used is the classic anterior medial portal, made lateral to the coracoid process and anterior to the acromioclavicular joint. An 8-mm vertical incision is made followed by a switching stick, and then an 8.25 cannula is placed in the anterior portal (Arthrex). After standard diagnostic evaluation of the anatomic structures of the glenohumeral joint, attention is turned to the stabilization procedure.

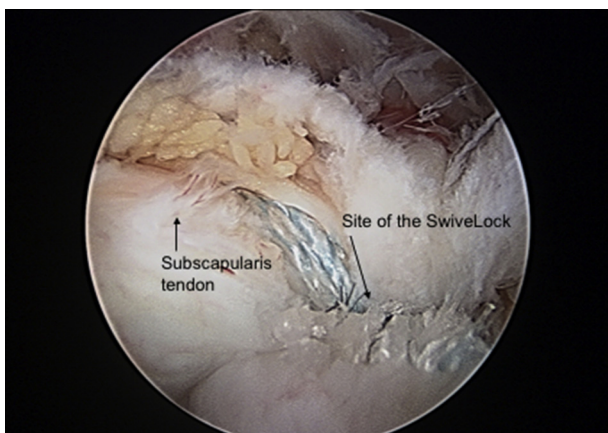


Fig 6. Final result of the subscapularis tendon repair using single row sutures and an angled suture passer in a right shoulder scope viewing from the posterior portal.

Subscapularis Tendon Repair

The patient presented here had a full-thickness tear of the superior portion of the subscapularis tendon (Fig 1). While viewing from the posterior portal, the footprint of the tendon must be cleaned off from debris and remodeled with an arthroscopic shaver to place the anchor.

A 45° angled ReelPass SutureLasso (Arthrex) is then introduced into the anterior working portal and used to take a healthy bite of the upper border of the torn subscapularis tendon; depending on the operative site, a left-angled will be used for a left shoulder and a right-angled for a right shoulder. The ReelPass has 10 yards of polydioxanone (PDS) monofilament that is abundantly uncoiled into the joint. The ReelPass is then withdrawn from the portal and the loose end of the PDS is retrieved from the same anterior portal with a ring grasper. The purpose of the PDS is to shuttle a FiberTape (Arthrex) through the subscapularis tendon (Fig 2). The FiberTape is then passed in a manner to create a racking hitch stitch. Specifically, the PDS monofilament is tied to the center of the tape; it is then pulled half way through the labrum so that the center of the tape creates a loop. The free ends of the FiberTape are passed through the looped end outside the shoulder (Fig 3) and tightly cinched down to create a

Table 1. Advantages and Disadvantages of the Single Portal Technique

Advantages

- Saves time to treat other associated conditions and avoid joint swelling
- Less invasive
- Knotless technique
- Shorter learning curve

Disadvantages

- Difficult to treat bigger tendon tears
- Late repairs with muscle atrophy, retraction, or fatty infiltration
- Possibility of entangled sutures with only 1 working portal

Table 2. Pearls and Pitfalls of the Single Portal and Suture Lasso Technique

Pearls	
•	Healthy bite of the subscapularis tendon with the ReelPass
•	Creation of a FiberTape loop to be shuttled in the tendon
•	Check the size of the tear to determine the number of sutures
•	Pilot hole drilled on the lesser tuberosity
•	Adequate suture tension while placing the anchor
Pitfalls	
•	Failure to get enough tendon with the suture lasso
•	Inadequate number of sutures for the relative tear size
•	Weak tensioning of the sutures during the anchor placement

racking hitch stitch. We use this first stitch as a tensioning device especially when following capacious, hard to place, bites with the suture lasso (Fig 4).

After the application of the sutures, a pilot hole is drilled on the lesser tuberosity (Video 1), medial to the bicipital groove, where the anchor will be placed.

In this case, the repair warranted only 2 sutures, so the next step is to load both FiberTapes on a single 4.75 SwiveLock (Arthrex). Each limb of the sutures is tensioned individually to ensure an appropriate reduction. The SwiveLock is malleted into the aperture of the hole and then screwed in to reduce the tendon down (Fig 5). When the SwiveLock is fully seated, all the sutures are cut with an arthroscopic suture cutter.

The result of the repair is probed at the end of the procedure to evaluate the repair and stability of the sutures (Fig 6).

Postoperative Care and Rehabilitation

The portal incisions are closed in a standard fashion and covered by an abundant dressing. The operative arm is then immediately placed into an immobilizer sling that will be used for the first 6 weeks after the surgery.

During the “early postoperative phase” (0-2 weeks), passive ROM of the operative shoulder is allowed to 120° of passive forward flexion and 30° of passive external rotation, whereas active ROM is allowed in the adjacent joints. Active elevation of the arm to lift an object is to be avoided during this time period. From weeks 2 to 6, the objective is to restore passive ROM and the sling is discontinued at the end of week 6. Active ROM exercises are started after week 6, and the average time to return to full activity is around 18 weeks after surgery.

Discussion

No difference in terms of outcome has been reported so far from the few articles the literature has provided on the difference between open and arthroscopic subscapularis tendon tear.⁵⁻⁸ At the same time, there is no study reporting the use of a single working portal

during arthroscopy and its long-term outcome. Minor scarring, reduced operative time, and postoperative pain could be the biggest improvements following this procedure. In addition, there may potentially be a reduced learning curve for this kind of technique: knotless and therefore less passages are required to secure the sutures and stabilize the lesion.

Less operative time also gives the possibility of treating associated injuries that usually come with the subscapularis tear, before fluids distend the joint and limit the visibility especially in the subacromial space.⁹

Given that a reduction in each of these aspects is associated with quicker return to work, further studies to confirm these results would be helpful in recommending arthroscopic over open repair.

Gilmer et al.⁹ performed a similar technique with the same SutureLasso and found that the main limitation is about the single-row repair especially with large or retracted tears (Table 1). In case of muscle retraction, muscle atrophy, or fatty infiltration, mostly due to a late repair, a double row repair would be more suitable, because it has the advantage to recreate a larger footprint.⁹ On the other hand, a double row repair requires accessory portals that are not contemplated in the technique described here.

The timing of a repair plays a fundamental role in the prognosis, probably as fundamental as the size of the tear, and both can possibly lead to re-rupture in the future. A late repair can present with muscle atrophy or retraction or fatty infiltration leading to a more complex, long, and possibly less successful procedure.⁶

There is no clear guideline on the ideal number of anchors to use, but Van der Zwaal et al.⁵ suggested that for every centimeter of subscapularis tendon tear 1 suture anchor should be placed. It is better to secure sutures separately, before the anchor placement, in case multiple FiberTapes are passed for the repair to avoid entangled sutures. In case multiple sutures are entangled, they can oppose the tensioning and reduction process when the SwiveLock is set in place, thus leading to a poorly reduced tendon and high chances failure of the tendon repair.⁵ Van Der Zwaal et al.⁵ also advocated for knotless sutures because of their easier application compared with knot tying and also because they are less time consuming; again, extra time can be used to treat associated injuries before soft tissues swell (Table 2). Finally, SutureTape is wider than normal FiberWire, and this option provides a stronger fixation and improved cut-through resistance with injured tissues.¹⁰ Given all the good features enumerated in Table 1 and the reproducibility of the technique, we would like to recommend this procedure as a reliable option for subscapularis tendon repair.

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