

Arthroscopic Subscapularis Repair Using a Clever Hook and Lasso Loop Technique in the Beach Chair Position: A Simple and Reproducible Guide



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Abstract: Addressing subscapularis tendon pathology has garnered increased attention during shoulder arthroscopy in attempt to adequately restore glenohumeral force couples. The appropriate rebalancing of force couples of the rotator cuff musculature by repairing subscapularis tendon tears in patients with large rotator cuff tears has been shown to improve functional outcomes while decreasing retear rates. However, subscapularis tendon tears may be particularly challenging to diagnose and present a significant degree of technical difficulty with the description of multiple arthroscopic and open surgical techniques. In this comprehensive guide, we put forth a simple, concise, and reproducible arthroscopic technique using a Clever Hook and Lasso Loop stitch technique for repairing both high-grade partial and full-thickness tears of the subscapularis tendon.

Rotator cuff tears are commonly encountered in orthopaedic sports medicine and shoulder clinics, as they impose varying degrees of disability and pain. There remains a significant role for nonoperative management of chronic atraumatic degenerative rotator cuff tears and partial-thickness tears. However, operative intervention may be indicated when patients have failed nonoperative management or in younger patients presenting with acute traumatic full-thickness tears. Tears of the rotator cuff most commonly involve the supraspinatus and infraspinatus tendons, but more attention has recently shifted to include tears of the subscapularis tendon.¹ Sentinel work by Gerber and colleagues^{2,3} during the early 1990s renewed our focus on the importance of the subscapularis tendon

and its contribution to force couples about the glenohumeral joint.

The subscapularis is the largest of the rotator cuff tendons; therefore, disruption can lead to significant pain, disability and loss of function. Because it is an important internal rotator, adductor, and anterior stabilizer of the glenohumeral joint, failure to identify and subsequently repair a subscapularis tear may result in mismatch of the force couples of the shoulder. The incidence of subscapularis tears varies widely, with reports ranging from 2.1% to 10.5% in clinical studies and from 3% to 13% in cadaveric reports.⁴⁻⁸ However, an increased incidence of subscapularis tendon tears may be detected during careful arthroscopic examination, with prevalence rates ranging from 27% to 31.4%.⁹⁻¹³ This demonstrates the limitations of advanced imaging, with arthroscopy as the diagnostic gold standard. Tung et al.¹⁴ have further demonstrated the diagnostic accuracy of advanced imaging to be 31%. As an adjacent anatomic structure, the long head of the biceps tendon may also be involved in chronic tears via medial subluxation of the biceps tendon, with increased intrasubstance signal often identified on magnetic resonance imaging (MRI). Ultrasound may also play a role in the diagnosis of subscapularis pathology, with a recent systematic review demonstrating a diagnostic accuracy of 76%.¹⁵

For those in whom surgery is indicated, repair of both high-grade partial and full-thickness tears will provide restoration of vital glenohumeral force couples. The

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Table 1. Critical Steps

1. The patient is placed in the beach chair position using the Spider Arm Holder with the arm neutral, adducted, and without any internal or external rotation.
2. A posterior viewing portal is established, and the glenohumeral joint is evaluated to assess the biceps tendon and rotator cuff.
3. Once it has been established that the subscapularis needs to be repaired (high-grade partial or full thickness), which is often in conjunction with the biceps tendon, the anterior and anterosuperolateral (ASL) portals are established.
4. Anterior and ASL portals are established and triangulated using an 18-gauge spinal needle, as the position of the cannulas is critical to success.
5. The anterior portal is within the rotator interval in front of the biceps tendon and slightly medial to help improve trajectory of placing a metal anchor into the lesser tuberosity. An 8-mm threaded cannula is used in the anterior portal to allow for passage of instruments.
6. The ASL portal is established at the leading edge of the supraspinatus tendon. This will place it high and slightly anterior in the rotator interval. A 6-mm threaded cannula is placed via a switching stick.
7. To create the ASL portal, make a small capsulotomy with a no. 11 blade at the leading edge of the supraspinatus. This can be accomplished by advancing a no. 11 blade collinear to the spinal needle into the glenohumeral joint. Then, using a switching stick, followed by a 6-mm threaded cannula, atraumatic cannulation into the joint will be achieved for instrumentation.
8. If indicated, perform an all-arthroscopic knotless suprapectoral biceps tenodesis using 1.5-mm Labral Tape and a 2.9-mm PushLock Anchor. See technique by Saper and Li.¹⁷ Both the technique we described here for subscapularis tendon repair and the knotless suture lasso technique for suprapectoral biceps tenodesis use the same anterior and ASL working portals.
9. Next, to better define the subscapularis tear and evaluate its excursion, using an arthroscopic shaver and radiofrequency device, define the tendon and mobilize it from the surrounding capsule. An anterior interval release of scar tissue down to the coracoid base can assist in mobilization of the tendon (Video 1).
10. If the tendon is retracted, placing a traction stitch in the tendon can assist in mobilization. Using #2 braided suture, a suture loop is passed into the top of the subscapularis tendon using an Espresso passer and loop grasper (Fig 2). An 18-gauge spinal needle is inserted between the 2 anterior cannulas, in line with the subscapularis tendon. A small incision in the skin collinear with the spinal needle is made with a no. 11 blade to allow for passage of the traction suture out of the skin at the incision just made between the 2 cannulas.
11. Using the traction stitch, the tendon is further released to achieve full excursion to its footprint on the lesser tuberosity, to allow for a tension-free repair.
12. The arm is brought into maximal external rotation and 70° to 90° forward flexion to access the lesser tuberosity and allow for proper trajectory of the metal anchor into the lesser tuberosity via the anterior portal. The lesser tuberosity is then debrided and decorticated with a radiofrequency device and burr through the ASL portal before anchor insertion.
13. A triple-loaded 5.5-mm metal anchor is placed into the lesser tuberosity via the anterior portal at the subscapularis footprint. The arm is then returned to the neutral position with no flexion or rotation in preparation for the repair.
14. Take 1 limb of the #2 braided suture from the anchor out through the ASL portal. Use traction on the tendon, using either your traction stitch placed earlier or a loop grasper, through the ASL portal. Through the anterior portal, a 90° (Ideal Passer) is introduced into the joint and passed inferiorly in the tendon for the beginning of a vertical mattress suture. It is shuttled out through the ASL portal, and the #2 braided suture from the metal anchor is then shuttled through the tendon and out the anterior portal.
15. This process is repeated with the 90° to shuttle and pass another #2 braided suture from the metal anchor through the inferior tendon to create the vertical mattress suture (Fig 4A, B).
16. The lasso loop stitch is then created in the superior aspect of the tendon. Using the technique in step 14, one #2 suture from the metal anchor is shuttled through the superior tendon and becomes the post. The second limb of the #2 braided suture is passed into the ASL portal and docked into the subscapularis recess. A Clever Hook or straight penetrator is introduced through anterior portal and passed through the superior tendon and grabs the suture limb in the subscapularis recess. A loop is created, the Clever Hook or penetrator is placed in the loop, and the suture limb from the ASL portal is grasped and pulled out of the anterior portal, creating the lasso loop (Fig 5; Fig 6A, B; Video 1).
17. The suture can now be tied. Make sure the arm is in neutral position for proper tendon tensioning. The lasso loop is tied first to allow the post to slide and compress the tendon onto the lesser tuberosity. Four to 6 simple alternating half stitches are used to secure the knot.
18. The vertical mattress knot is tied second, resulting in a vertical mattress inferiorly and a lasso loop superiorly.
19. If desired, complete a double-row repair for additional reinforcement. The free ends of the suture (4 limbs) can be used via a knotless suture anchor fixation lateral to the previous metal anchor placement via the anterior portal.
20. Once the subscapularis tendon has been repaired, the supraspinatus or the infraspinatus rotator cuff tears can be addressed.
21. Postoperatively, the patient uses a sling and abduction pillow for 6 weeks. Physical therapy begins at 2 weeks with effusion control, pain control, and gentle range of motion, with a limitation on external rotation past neutral. Active range of motion and strengthening begin 2 to 3 months after surgery, with full recovery taking ~9 months to a year, depending on the patient, size of the tear, and concomitant pathology.

Lafosse classification may be used to guide surgical decision-making with regard to particular tear patterns and optimize the quality of fixation and patient outcomes.¹⁶ Traditionally, full-thickness subscapularis tendon tears were addressed via an open technique. With recent advancements in arthroscopic techniques, several authors have proposed repair of the subscapularis tendon arthroscopically. However, an all-arthroscopic technique may be technically challenging owing to difficulty with visualization and access to the subscapularis footprint on the lesser tuberosity. In this

article, we present a simple, concise and reproducible arthroscopic method to effectively repair the subscapularis tendon with use of both a Clever Hook (Depuy-Mitek Sports Medicine, Raynham, MA) and Lasso Loop stitch technique in the beach chair position.

Surgical Technique

Table 1 shows the critical steps of our procedure along with technical pearls. The Video shows the entire arthroscopic procedure. Table 2 shows the advantages

Table 2. Advantages and Disadvantages**Advantages**

1. This simplified procedure can be done with 2 anterior threaded portals, which allows for both addressing the biceps pathology and doing the subscapularis repair arthroscopically.
2. There is no need for switching between 30° and 70° arthroscopes, owing to arm positioning during arthroscopy and visualization.
3. The construct strength of the repair is improved by having the benefit of both hand-tying sutures in the subscapularis tendon, with both lasso loop and vertical mattress to compress the subscapularis tendon down to the lesser tuberosity. Additional double-row technique can be done with the residual 4 suture limbs via a knotless double-row repair for backup.
4. Use of the Spider Arm Holder and the beach chair position allows the surgeon to position the arm in forward flexion and external rotation, which improves the trajectory and angle for the placement of the suture anchors. Furthermore, maintaining arm position with the arm holder increases efficiency of suture passage, which will shorten procedure time.
5. This step-by-step guide demonstrates a simple technique to repair all subscapularis tendons via an arthroscopic technique. This will be reproducible by all arthroscopic surgeons.

Disadvantages

1. All-arthroscopic subscapularis repairs can be difficult, and if visualization of the lesser tuberosity and subscapularis is not achieved, you may require a 70° scope or an accessory portal.
2. Adding both a biceps tenodesis and subscapularis repair to a traditional rotator cuff repair will add time and therefore swelling of the soft tissues and shoulder.
3. Extensive tears and retracted tears that do not regain excursion with dissection may require conversion to an open or mini-open procedure.
4. Bleeding can become an issue when dissecting around the subscapularis tendon. Careful and thoughtful dissection with use of traction on the subscapularis tendon can reduce this issue.
5. This procedure may be difficult if you use the lateral decubitus position for rotator cuff repairs, because of the inability to flex and externally rotate the arm without either an assistant or removing traction.

and disadvantages, and [Table 3](#) shows the pearls and pitfalls of this technique.

Arthroscopic Setup and Preparation

The senior surgeon's (X.L.) preference for this arthroscopic procedure is to use the beach-chair position with an assisted arm holder (Spider Arm Holder; Smith & Nephew, Memphis, TN). This allows for the appropriate humeral head positioning to provide improved visualization and access to the lesser tuberosity ([Fig 1](#)). The lateral decubitus position can be used with appropriate assistance; however, forward flexion and external rotation, to appropriately expose the lesser tuberosity, may prove difficult in that position.

A standard posterior viewing portal is made and a 30° scope is inserted into the glenohumeral joint. After diagnostic arthroscopy and confirmation of subscapularis pathology, anterior and anterosuperolateral (ASL) working portals are established with insertion of threaded cannulas (8 mm for anterior portal and 6 mm for ASL portal) ([Fig 1](#)). The anterior portal is placed within the rotator interval and slightly medial to help improve the trajectory for placing the metal anchor to the lesser tuberosity. The ASL portal should be placed high and slightly anterior in the rotator interval adjacent to the leading edge of the supraspinatus tendon. A no. 11 blade is used to make arthroscopic incisions, followed by the insertion of 2 threaded cannulas into the glenohumeral joint. It is essential to place a larger (8-mm) threaded cannula in the anterior portal to allow passage of the arthroscopic instruments. When making the ASL portal, a no. 11 blade is advanced collinear to the spinal needle, resulting in a capsulotomy just anterior to the leading edge of the supraspinatus tendon, ensuring easy passage of the cannula.

Both threaded cannulas are passed into the glenohumeral joint via a switching stick.

Addressing Associated Pathology

Biceps pathology is addressed first, as it is commonly seen with both acute and chronic subscapularis tears. Saper and Li¹⁷ previously described an all-arthroscopic knotless suture lasso technique for suprapectoral biceps tenodesis. This technique allows for both biceps and subscapularis pathology to be addressed through the same 2 portals anteriorly. The subscapularis tendon is then repaired arthroscopically, with the supraspinatus or infraspinatus tendon tears addressed last.

Mobilization of the Subscapularis Tendon Tear

The next step is to better define the subscapularis tear. Using an arthroscopic shaver and radiofrequency device, the subscapularis tendon is defined and provisionally mobilized from the surrounding capsule. A careful and comprehensive arthroscopic anterior interval release of the scar tissue down to the coracoid base can assist in mobilizing the subscapularis tendon ([Video 1](#)). If the tendon is significantly retracted, a lasso loop traction stitch is placed into the superior border of the subscapularis tendon ([Fig 2, A–D](#)). Using a #2 braided suture loaded midway onto the EXPRESSEW II (Depuy-Mitek Sports Medicine) suture passer, the suture loop is passed into the top of the subscapularis tendon ([Fig 2A](#)). Then a loop or ring grasper is used to grab the 2 suture limbs through the loop, creating a lasso loop construct ([Fig 2B](#)). Next, an 18-gauge spinal needle is passed anteriorly between the 2 threaded cannulas into the glenohumeral joint, in line with the subscapularis tendon ([Fig 2C](#)). Using a no. 11 blade, a small incision is made to create a portal to allow for

Table 3. Pearls and Pitfalls

Pearls

1. Beach chair position with mechanical arm holder (Spider Arm Holder) facilitate appropriate positioning of the arm for evaluation and management of the subscapularis tendon while increasing efficiency and decreasing operating time.
2. The arm position for evaluation and defining the tear is a flexed shoulder with internal rotation and posterior-directed force to visualize the subscapularis tendon and footprint.
3. A lasso loop traction stitch in the subscapularis tendon can be placed to allow for traction and facilitate release of scar tissues. These sutures can be brought out of an accessory portal anteriorly.
4. An anterior interval release to the base of the coracoid can also aid in subscapularis excursion to its anatomic footprint on the lesser tuberosity.
5. The arm position for anchor placement from the anterior portal into the lesser tuberosity is in maximum external rotation and 70° to 90° flexion. This is best done with the Spider arm holder.
6. The arm position for suturing and repair of the subscapularis tendon is in neutral position and no flexion.
7. Suture configuration is a vertical mattress below and lasso loop above.
8. A 90° passer is used from the anterior portal to shuttle #2 suture through the inferior tendon to create the vertical mattress suture.
9. A 90° passer is used to pass the post stitch for the lasso loop, followed by the use of either a Clever Hook or a straight penetrator to create the lasso loop superiorly in the tendon.
10. The superior lasso loop is always tied first to allow for the post to slide and the tendon to be compressed down to the lesser tuberosity.
11. The vertical mattress suture is tied second to reinforce the repair.
12. A double-row repair can be achieved using the 4 suture limbs with a swivel lock anchor lateral to the metal anchor, for primary fixation to reinforce the repair.

Pitfalls

1. An extensive tear may require accessory viewing portals or the use of a 70° arthroscope.
2. This technique may be difficult to reproduce in the lateral decubitus position because of the inability to bring the arm into appropriate positions necessary for visualization and anchor placement.
3. If the arm is not brought into the appropriate positions described in this technique for visualization and fixation, then the proper tensioning of the tendon on the lesser tuberosity will not be achieved, and repairing the subscapularis arthroscopically may not be possible.
4. Anterior and anterosuperolateral (ASL) cannulas placed incorrectly may cause increased difficulty with the procedure.
5. Extensive release of the subscapularis tendon for full excursion can cause bleeding.
6. With the technical difficulty of doing a biceps tenodesis, subscapularis repair, and rotator cuff repair, the time of the procedure can cause increased tissue or shoulder swelling, which needs to be recognized; pump pressures need to be monitored and changed for varying conditions in the shoulder.
7. If swelling, bleeding, or difficulty visualizing the repair prevent progress arthroscopically, the procedure can be converted to an open one using the same technique of a vertical mattress inferiorly and a lasso loop superiorly in the tendon. This also can be reinforced with a lateral swivel lock anchor for a double-row repair.

passage of the #2 FiberWire (Arthrex, Naples, FL) traction suture so that the traction stitch is out of the 2 threaded cannulas and in line with the subscapularis tendon. Once traction is applied with the lasso loop traction stitch, the subscapularis tendon is further released anteriorly, posteriorly, and superiorly to achieve full excursion to its footprint on the lesser tuberosity (Fig 2D).

Anchor Placement to the Lesser Tuberosity

Proper access to the lesser tuberosity is improved by bringing the arm into maximal external rotation and 70° to 90° forward flexion (Fig 3A). This maneuver allows for proper trajectory for metal anchor placement into the lesser tuberosity via the anterior portal. Using an arthroscopic radiofrequency device and burr, the lesser tuberosity is debrided and decorticated via the ASL portal. A shaver is then introduced into the ASL portal to clean up any remaining debris. A triple-loaded 5.5-mm metal anchor (Arthrex) is then placed in the lesser tuberosity (Fig 3B) via the anterior portal (8-mm threaded cannula) at the subscapularis footprint. The arm is returned to the neutral position with no flexion and no rotation in preparation for arthroscopic repair.

Arthroscopic Subscapularis Repair: Lasso Loop Stitch Technique Using a Clever Hook

Arthroscopic subscapularis repair is done using a vertical mattress suture configuration inferiorly in the tendon and a lasso loop stitch technique superiorly. The vertical mattress stitches are placed first, with the #2 braided suture from the metal anchor shuttled into the ASL portal; traction of the subscapularis tendon is accomplished with either the traction stitch or a loop grasper via the ASL portal, using a 90° passer (Ideal Passer; DePuy-Mitek Sports Medicine) from the anterior portal to penetrate the subscapularis tendon inferiorly. A metal loop shuttling suture is then passed through the tendon and retrieved into the ASL portal (Fig 4A, B). The #2 braided suture is shuttled across the tendon via this metal loop shuttling suture, into the anterior portal. This step is repeated with the other end of the #2 braided suture to create the vertical mattress configuration inferiorly in the tendon.

The lasso loop stitch is then created at the superior aspect of the subscapularis tendon. Using the same step above, 1 suture from the metal anchor is passed into the tendon. This limb will act as the post. The second suture limb is passed through the ASL portal and docked into

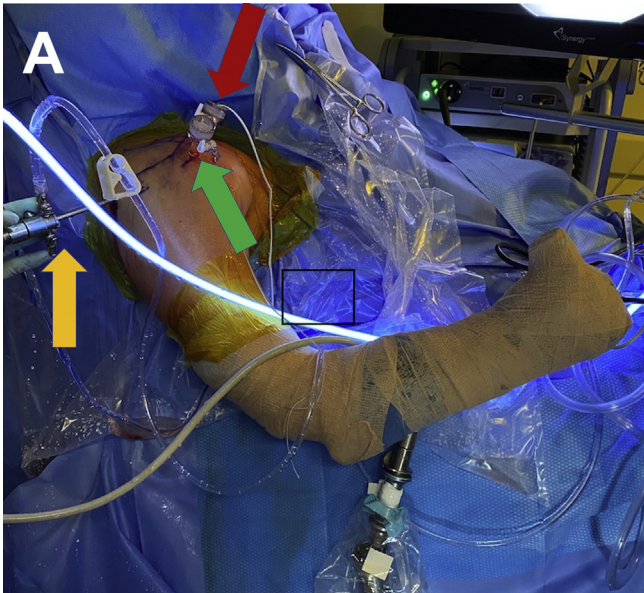


Fig 1. Intraoperative image of the right shoulder in the beach chair position with the right arm in the Spider arm holder. A 30° arthroscope is inserted into the right glenohumeral joint via the posterior viewing portal (orange arrow). Two threaded cannulas are placed anteriorly: the 8-mm cannula for the anterior portal (red arrow) and the 6-mm cannula at the anterosuperior lateral (ASL) portal (green arrow). The right arm is in neutral position with no flexion and no rotation.

the subscapularis recess (Fig 5A). Traction or tensioning of the subscapularis tendon is provided via the traction stitch or loop/ring grasper. A Clever Hook (Depuy-Mitek Sports Medicine) or straight penetrator (Arthrex) is inserted into the anterior portal to penetrate the top of the subscapularis tendon and grab the suture limb docked in the subscapularis recess (Fig 5B; Video 1). A loop is created, and the Clever Hook is placed into the loop to retrieve the suture limb from the ASL portal to create the lasso loop (Fig 5C, D). The lasso loop stitch is seen in Fig 6A and B. All of the other sutures are taken out of the anterior portal to the ASL portal. Pulling on the post suture limb, the lasso loop is tightened, thus reducing the subscapularis tendon to the footprint (Fig 7A). Four to 6 simple alternating half stitches are used to secure the knot. The lasso loop is always tied first to allow the post to slide down. The vertical mattress knot is tied second with alternating half hitches. The final suture construct will consist of a vertical mattress inferiorly and a lasso loop superiorly.

Securing the Subscapularis Tendon

Always tie the knots in the subscapularis tendon with the arm in the neutral position for proper tensioning. This will allow the arthroscopic knots on the anterior aspect of the tendon to compress the tendon to the lesser tuberosity. The final construct is checked at this time with an arthroscopic probe. If additional

reinforcement is needed, the free ends of the suture (4 limbs) will then be used in a double-row construct via knotless suture anchor fixation lateral to the previous anchor placement via the anterior portal (Fig 7B). The final integrity of the repair is then assessed arthroscopically while ranging the arm (Fig 7C, D). After the arthroscopic subscapularis repair is complete, the supraspinatus or infraspinatus rotator cuff tear is addressed.

Postoperative Care

A sling with an abduction pillow is used postoperatively for 6 weeks. Physical therapy can begin at 2 weeks with limitations to external rotation. Patients may progress to active range of motion and strengthening at 2 to 3 months. Full recovery can typically be expected in 9 to 12 months, depending on the patient, size of the tear, and associated pathology.

Discussion

The preservation of force couples about the glenohumeral joint is of primary importance when addressing rotator cuff pathology. As such, we advocate repair of both high-grade partial and full-thickness subscapularis tears in isolation or in combination with supraspinatus and infraspinatus tears. The presence of subscapularis pathology is more common than historically realized, with studies suggesting subscapularis tear prevalence being >25% in patients undergoing arthroscopic evaluation for rotator cuff tears.⁹ Additionally, in a retrospective evaluation of 236 patients undergoing arthroscopic intervention for rotator cuff pathology, Naraihsman et al.¹² reported a 31.4% prevalence of concomitant tears of the subscapularis and a 6.4% prevalence of isolated tears. Therefore, there has been a precipitous increase in the focus on subscapularis tear management. As such, Ticker and Burkhart¹⁸ suggested that repair of the subscapularis tendon may allow for increased ease of repair of concomitant posterosuperior rotator cuff tears by reducing resting tension at the anterior aspect of the supraspinatus tendon. Furthermore, in evaluation of muscle activation in patients with rotator cuff pathology, Kelly et al.¹⁹ demonstrated that asymptomatic patients with rotator cuff tears tend to experience increased activation of the subscapularis tendon, suggesting an imbalance in glenohumeral force couples. In patients with massive irreparable rotator cuff tears, Yoon et al.²⁰ reported a decreased need for surgery in the presence of an intact subscapularis tendon, thus highlighting the importance of an intact subscapularis.

Isolated disruption of the subscapularis may contribute to decreased quality of life in patients with otherwise intact superior and posterior force couples. As such, numerous studies have demonstrated and reported on improved clinical outcomes after arthroscopic

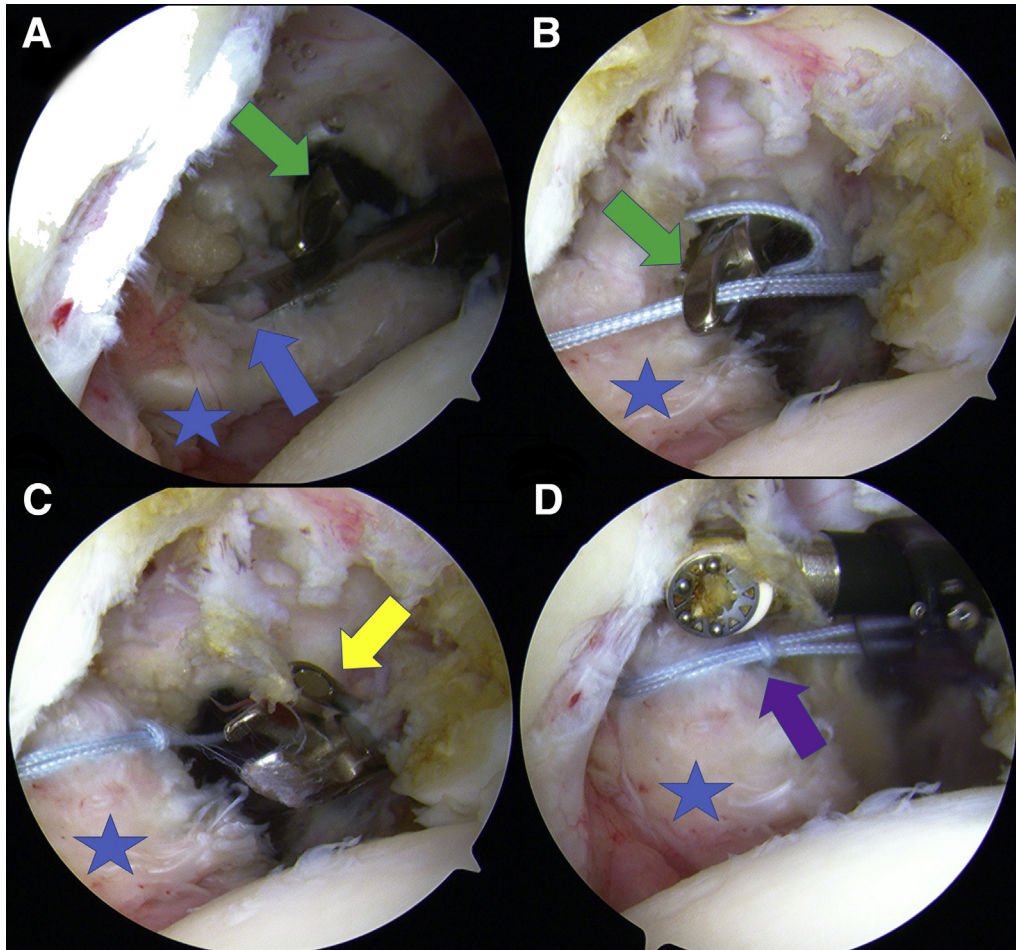


Fig 2. Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope via the posterior portal. (A) Using an Expresso (blue arrow) with a #2 braided suture at the midpoint, a loop is passed across the top of the subscapularis tendon (star). The loop or ring grasper (green arrow) is docked in the anterior portal. (B) The ring grasper (green arrow) is placed into the loop, and the 2 suture limbs are passed into the loop and out of the anterior portal to create the lasso loop traction stitch. (C) A spinal needle is used to localize the anterior accessory portal. Using the ring grasper, the lasso loop traction stitch is taken off the anterior portal via the anterior accessory portal. (D) The final lasso loop stitch (purple arrow) is seen here, and the subscapularis tendon (star) is mobilized with scar tissue release.

repair of isolated subscapularis tendon tears.^{16,21-24} With a minimum 2-year follow up of 23 isolated subscapularis repairs, Lafosse et al.²⁵ demonstrated a significant improvement in self-assessed shoulder function

as well as University of California, Los Angeles (16.4 to 30.9 points) and weighted Constant (48.6% to 75.2%) scores. Additionally, Denard et al.²⁶ reported improvements in American Shoulder and Elbow Surgeons

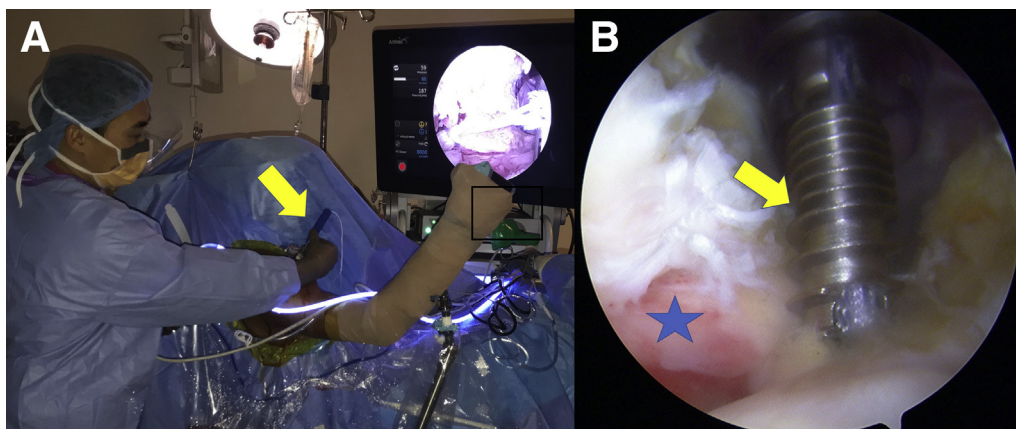
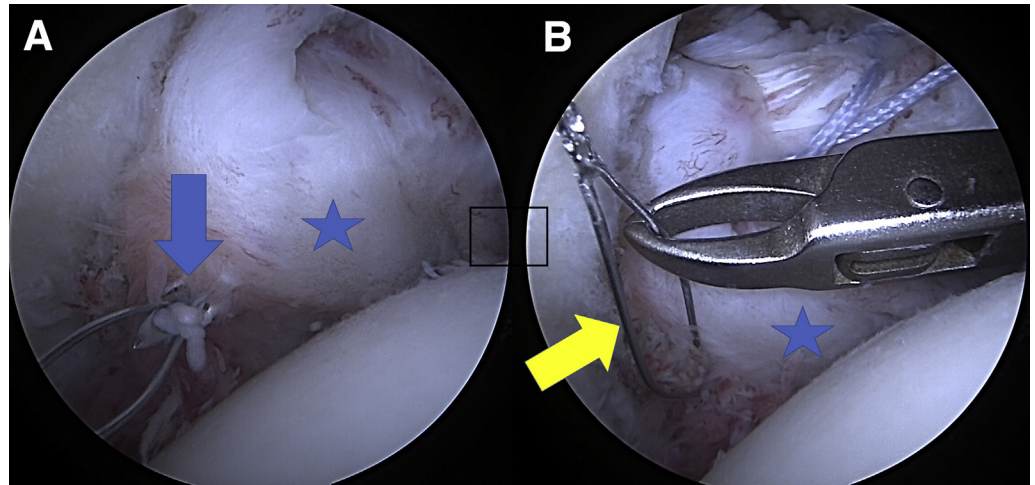


Fig 3. (A) Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope via the posterior portal with the right arm in a Spider arm holder in 70° to 80° forward flexion and maximum external rotation to help expose the lesser tuberosity. The metal anchor is placed into the lesser tuberosity via the anterior portal (arrow). (B) Viewing posterior with a 30° arthroscope in the right shoulder, the metal anchor (arrow) is placed via direct arthroscopic visualization.

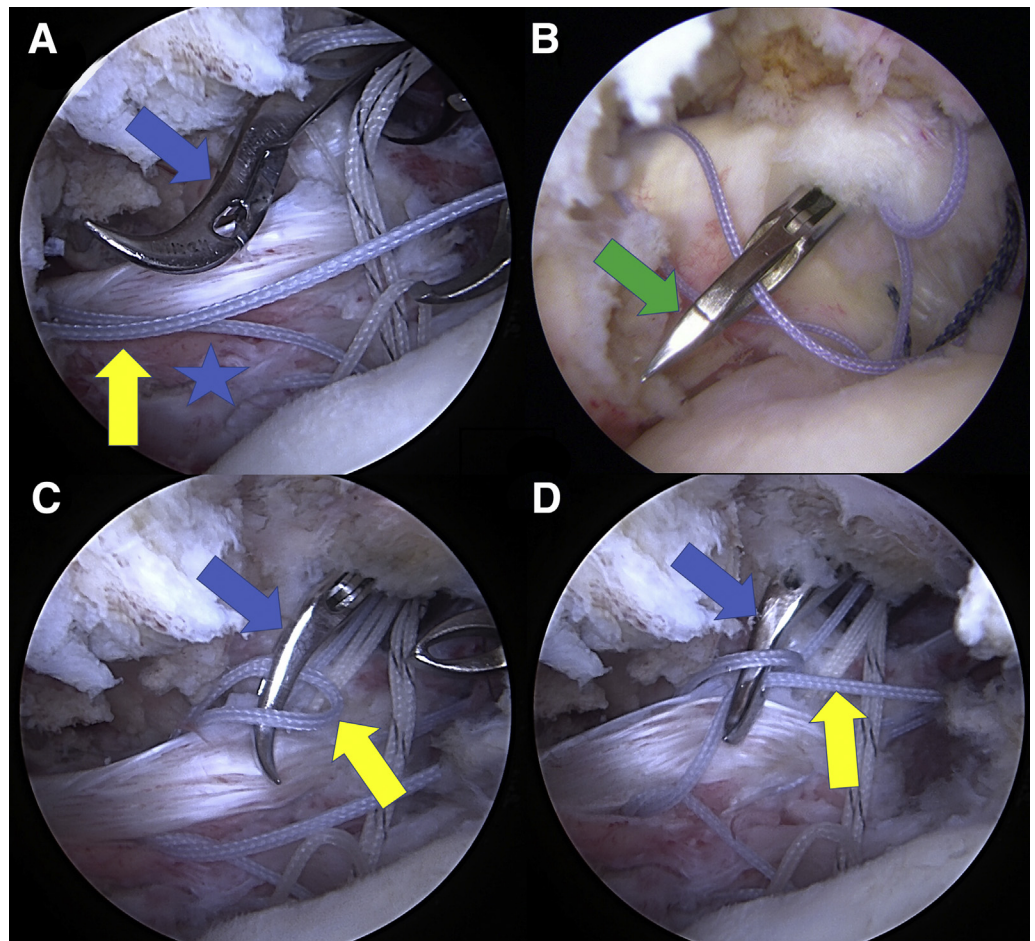
Fig 4. Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope from the posterior portal. (A) 90° passer with a metal loop suture shuttling device (blue arrow) is passed into the subscapularis tendon (star). (B) A ring grasper is used via the anterosuperior lateral (ASL) portal to retrieve the metal loop passer (yellow arrow) to help shuttle the #2 braided suture across the subscapularis tendon (star). The same step is repeated with the other limb of the suture to create the vertical mattress configuration.



(ASES) scores from 40.8 to 88.5 in evaluation of a consecutive series of 79 patients having undergone isolated subscapularis repair. The authors further

reported that 83.3% experienced good to excellent outcomes, with 92.4% returning to normal activities of daily living.²⁶ However, Monroe et al.²⁷ reported that in

Fig 5. Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope from the posterior portal. (A) One limb of the #2 suture (yellow arrow) from the metal anchor is taken out of the anterosuperior lateral (ASL) portal and docked into the subscapularis recess (yellow arrow) with a ring grasper. The Clever Hook (Depuy-Mitek Sports Medicine) is placed in the anterior portal (blue arrow). (B) The subscapularis tendon is penetrated with either the Clever Hook or a straight penetrator (green arrow), and the suture in the subscapularis recess is retrieved to create a loop. (C) The Clever Hook (blue arrow) or penetrator (yellow arrow) is placed into the loop (yellow arrow), and the same suture limb from the ASL portal is retrieved. (D) The suture is passed into the loop (yellow arrow) and into the anterior portal to create the lasso loop stitch. Clever Hook is seen here with the blue arrow.



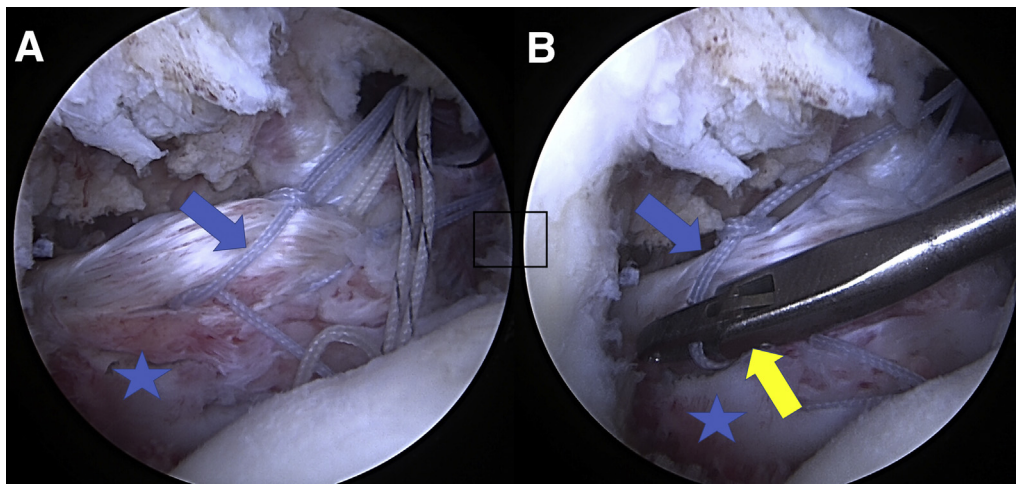


Fig 6. Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope from the posterior portal. (A) Final lasso loop construct is seen with the blue arrow. Subscapularis tendon is seen with the star. (B) If the loop is too lateral, a ring grasper (yellow arrow) is inserted via the anterosuperior lateral (ASL) portal to position the lasso loop (blue arrow) medial and on top of the subscapularis tendon (star).

the subset of patients with associated supra- and infraspinatus tendon tears and poor infraspinatus muscle quality or severe fatty infiltration, arthroscopic subscapularis repair had worse patient-reported outcomes than in patients with good infraspinatus muscle

quality and no fatty infiltration. Thus, it is important to preoperatively evaluate infraspinatus muscle quality and amount of fatty infiltration in patients undergoing arthroscopic subscapularis repair to help predict future outcomes.

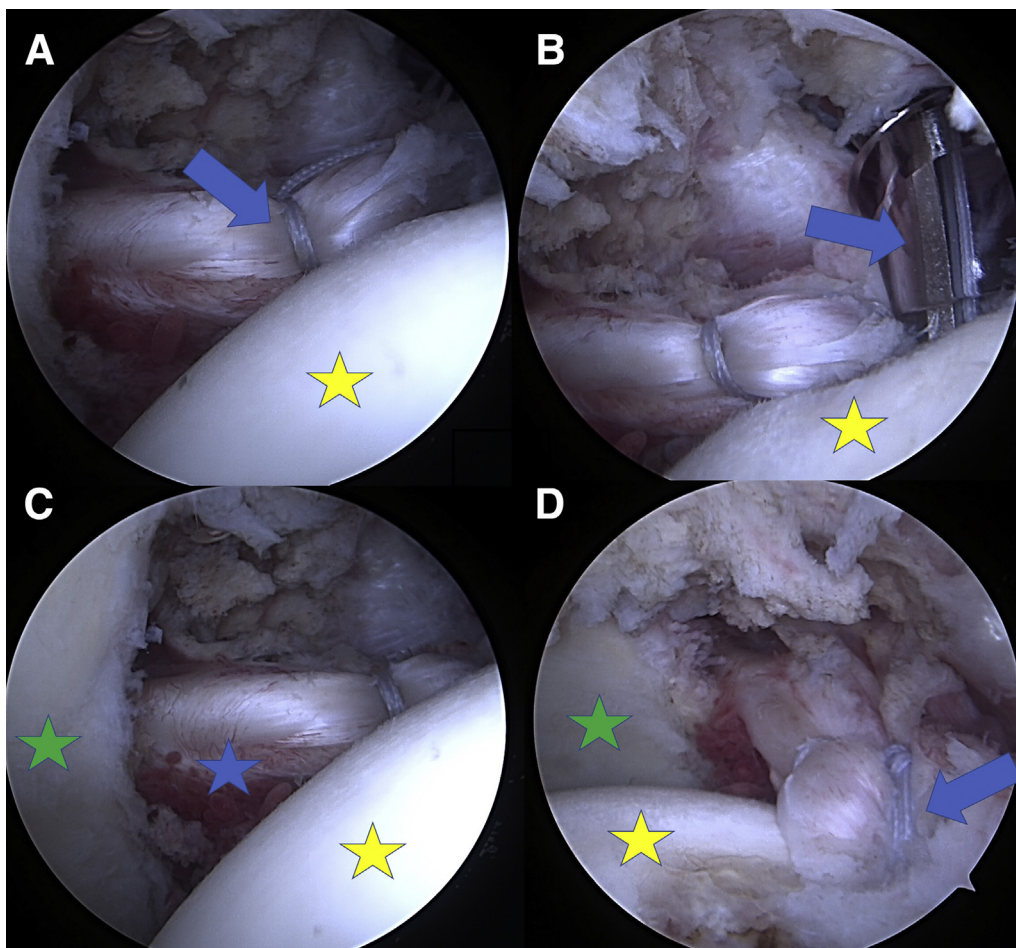


Fig 7. Intraoperative arthroscopic image of the right shoulder viewing with a 30° arthroscope from the posterior portal. Humeral head is marked with a yellow star, and the glenoid is marked with a green star. (A) The top of the subscapularis tendon is tied down with the lasso loop stitch (arrow), and the vertical mattress stitch is tied down using alternating half hitches. (B) A double-row construct can also be done with the residual 4 suture limbs and using a lateral row anchor (arrow) to the humeral head (star). (C) The final arthroscopic subscapularis repair is seen here. (D) 30° scope viewing from the anterosuperior lateral (ASL) portal on the right shoulder shows the final arthroscopic repair using a double-row technique (arrow).

Similarly, retear rates after repair of massive rotator cuff tears appears to be more common in patients who have a concomitant subscapularis tear, demonstrating the crucial biomechanical role of the anterior force couple provided by the subscapularis tendon. In evaluation of 122 consecutive patients having undergone massive rotator cuff repair, Lee et al.²⁸ demonstrated a significantly increased incidence of retears of the arthroscopically repaired supraspinatus and infraspinatus tendon in patients with unrepaired concomitant subscapularis tears involving more than one-third of the superior portion of the tendon. Furthermore, Boileau et al.²⁹ identified an associated subscapularis tear as a risk factor for retear in evaluation of 65 consecutive shoulders having undergone repair of full-thickness supraspinatus tears. In addition, Kim et al.³⁰ demonstrated improved clinical outcome scores with arthroscopic repair of isolated subscapularis tendon tears in patients with irreparable massive rotator cuff tears, with changes in ASES scores from 35.9 preoperatively to 76.0 postoperatively. Monroe et al.³¹ evaluated 145 shoulders with subscapularis tears and found that most of these were partial tears associated with supra- or infraspinatus tendon tears (44%), and isolated full-thickness subscapularis tendon tears comprised only 5.9% of the patient population. The authors also found significant improvements in pain and patient-reported outcomes for majority of patients after arthroscopic subscapularis repair.³¹ Outcomes were also similar despite subscapularis tear size or concurrent supra- or infraspinatus tendon tears.³¹

Thus, it is essential that a high-grade partial or full-thickness subscapularis tendon tear be appropriately addressed and repaired in isolation or in the presence of an associated full-thickness supraspinatus or infraspinatus tendon tear. Evidence from the literature shows that this management strategy will improve patient outcomes and decrease retear rates via proper recreation of the force couples of the shoulder.

In conclusion, a comprehensive body of literature supports repair of subscapularis tendon tears in isolation or in association with concomitant rotator cuff tears, with surgical arthroscopic repair yielding excellent functional and clinical outcomes with low failure rates.

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