Arthroscopic Rotator Cuff Repair With Mini-open Subpectoral Biceps Tenodesis

Nicholas I. Kennedy, M.D., George Sanchez, B.S., Sandeep Mannava, M.D., Ph.D., Márcio B. Ferrari, M.D., Salvatore J. Frangiamore, M.D., M.S., and CAPT Matthew T. Provencher, M.D., M.C., U.S.N.R.

Abstract: With a range of tear characteristics such as chronicity, degree of fatty atrophy, and number of tendons involved as well as varying patient-specific characteristics including age, injury mechanism, and expectations after treatment to consider, proper and successful treatment of a rotator cuff tear is multifactorial and, consequently, challenging. Although conservative management of a rotator cuff tear may be successful, a more severe tear with involvement of more tendons may warrant surgical intervention. Furthermore, additional pathology including biceps tendinopathy may result in greater patient morbidity and an even more complex treatment decision-making process and surgical technique. The purpose of this Technical Note is to describe our preferred surgical technique for the treatment of a rotator cuff tear involving 2 rotator cuff tendons in conjunction with a lesion of the long head of the biceps tendon.

Rotator cuff tears (RCTs) are common and limiting injuries of the shoulder[1] that result in pain, stiffness, weakness, and loss of proper range of motion. Although many patients can present as asymptomatic in the setting of an RCT, this condition can lead to a disabling and painful condition, especially in elderly patients.[1-3] Conservative treatment can be performed and has been associated with successful outcomes for RCTs.[2,3] Nevertheless, some patients, especially those with larger tears and concomitant pathology, may benefit from surgical treatment.[4-6]

Because of the cost of surgical management and comparable outcomes to conservative management in certain RCT cases, it is imperative to properly choose surgical candidates based on both their symptoms and ultimate functional goals. Surgical treatment is usually recommended for chronic symptomatic tears with previously failed conservative management and as a primary treatment option in young patients with high functional demands.[5,7] Several techniques have been described for the treatment of partial and total RCTs with similar outcomes.[8,9]

Aside from the patient's symptoms and postoperative demands as well as the condition of the rotator cuff, concomitant pathology must also factor into the ultimate treatment to be undertaken. Often seen in association with RCTs, tendinopathy of the long head of the biceps (LHB) is a limiting pathology reportedly seen in 30% to 69% of RCTs.[10,11] In particular, surgical treatment for biceps tendinopathy is advised in the setting of a medial tendon subluxation, partial thickness tears $\geq$25% to 50% in size of the tendon of the LHB, and/or failed conservative treatment.[12] The purpose of this Technical Note is to describe our preferred surgical technique for the treatment of an RCT involving 2 rotator cuff tendons in conjunction with a lesion of the LHB.

Surgical Technique

Preoperative Setup

We prefer and suggest the beach chair position when treating an RCT with a lesion of the LHB to complete an arthroscopic rotator cuff repair with subpectoral biceps tenodesis[13] (Video 1). We feel that this position allows

From the Steadman Philippon Research Institute (N.I.K., G.S., M.B.F., M.T.P.); and The Steadman Clinic (S.M., S.J.F., M.T.P.), Vail, Colorado, U.S.A.

The authors report the following potential conflicts of interest or sources of funding: M.T.P. is the consultant for Arthrex and JRF Ortho; has patent numbers (issued) 9226743, 20150164498, 20150150594, 20110040339; and receives publishing royalties from Arthrex and SLACK. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received March 26, 2017; accepted June 26, 2017.

Address correspondence to CAPT Matthew T. Provencher, M.D., M.C., U.S.N.R., Steadman Philippon Research Institute, 181 West Meadow Drive, Suite 1000, Vail, CO 81657, U.S.A. E-mail: mprovencher@thesteadmanclinic.com

2212-6287/17388

http://dx.doi.org/10.1016/j.eats.2017.06.036

for anatomic orientation of the torn rotator cuff and facilitates greater arm range of motion during the surgical case, thereby facilitating access to the LHB for eventual subpectoral biceps tenodesis. Before surgical intervention, many of our patients elect to undergo peripheral regional nerve blockade to aide in postoperative pain control.

After induction of general anesthesia, the patient, who is supine on a beach chair operating table, has his head secured and padded to the table using foam beach chair head restraint. The legs are slightly flexed at the knee with the use of a foam pad. Afterward, the bony prominences are well padded. Sequential compression devices are placed on bilateral lower extremities. Before raising the head of the patient's bed, blood pressure is checked and the patient is confirmed to be safe for elevation with anesthesia. Occasionally, the patient can suffer from hypotension, and a cerebrovascular incident is possible if the patient is raised to the beach chair position under general anesthesia.

The neck is then checked, with the patient in the upright position, to ensure that it remains in the neutral position. A safety strap secures the patient to the operative table. The nonoperative arm is held in the neutral position with an Allen Arm Positioner (Allen Medical Systems, Acton, MA) with care to ensure that the ulnar nerve is not compressed. The back of the beach chair table is then slid toward the contralateral side, clearing room for operative intervention. A "kidney rest" is tightened in order for the patient to remain secured to the operative table during the entirety of the procedure. The operative arm is then sterilely prepped and draped in a standard manner. We use a SPIDER2 (Smith & Nephew, Andover, MA) to hold the arm in position during arthroscopic and open surgery. Before incision, a surgical time-out is performed to confirm the correct patient, extremity, and surgical procedure.

Diagnostic Arthroscopy and Biceps Tenotomy

A standard posterior arthroscopic shoulder portal is made approximately 2 cm distal and 2 cm posterior to the posterior tip of the acromion. This portal is placed in line with the axillary crease and Neviaser portal soft spot. The arthroscope is introduced into the joint, and then under direct visualization, a 5-mm Arthrex cannula is used to establish an anterior mid-glenoid portal, which is in close proximity to the coracoid process, into the rotator interval. Pump pressure is typically around 40 mm Hg, and visualization is further aided by hypotensive anesthesia with a systolic blood pressure goal of 90 mm Hg.

A diagnostic arthroscopy of the joint is initially performed with particular attention paid to the status of the biceps tendon, joint synovium, glenohumeral ligaments, subscapularis and supraspinatus tendons, cartilage, and labrum. In our case example, synovitis is debrided with an arthroscopic shaver (Arthrex, Naples, FL) (Fig 1A). Then, further inspection reveals tenosynovitis and fraying of the LHB. The LHB is then tenotomized through the use of a combination of basket-style arthroscopic scissors and arthroscopic shaver (Fig 1B). Once the tenotomy is complete, a retraction of the biceps tendon is performed (Fig 1C). In this case example, tears of the supraspinatus and subscapularis tendons are identified. Once identified, a No. 1 polydioxanone stay suture (Ethicon, Somerville, NJ) is passed via a spinal needle.

Subacromial Decompression and Bursectomy With Associated Acromioplasty

After completion of the initial arthroscopy, the arthroscope is repositioned through the posterior portal into the subacromial space. We then establish a "50-yard line" style portal off the lateral border of the acromion. A thorough bursectomy is then performed using an arthroscopic shaver and a radiofrequency device (Arthrex) (Fig 2). We perform most of our bursectomy using the arthroscopic shaver, whereas the radiofrequency wand is mostly used for hemostasis. Bursal tissue in this space often appears bruised, thickened, and scarred in association with the RCT. We focus on both the subacromial space and lateral gutter to better visualize the tear. The tears are readily identified by the stay suture that was placed previously

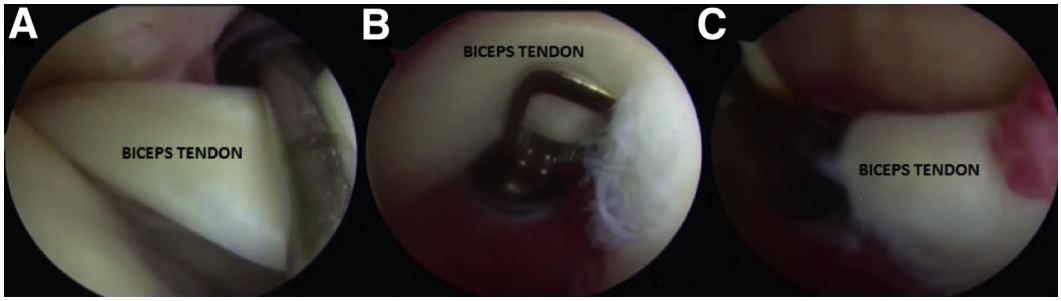

Fig 1. With the posterior portal as the viewing portal and the patient in the beach chair position, the biceps tendon in the left shoulder is evaluated using an arthroscopic probe (A). A combination of an arthroscopic basket and shaver is used to perform the tenotomy (B). Once the tenotomy is complete, a retraction of the biceps tendon is seen (C).

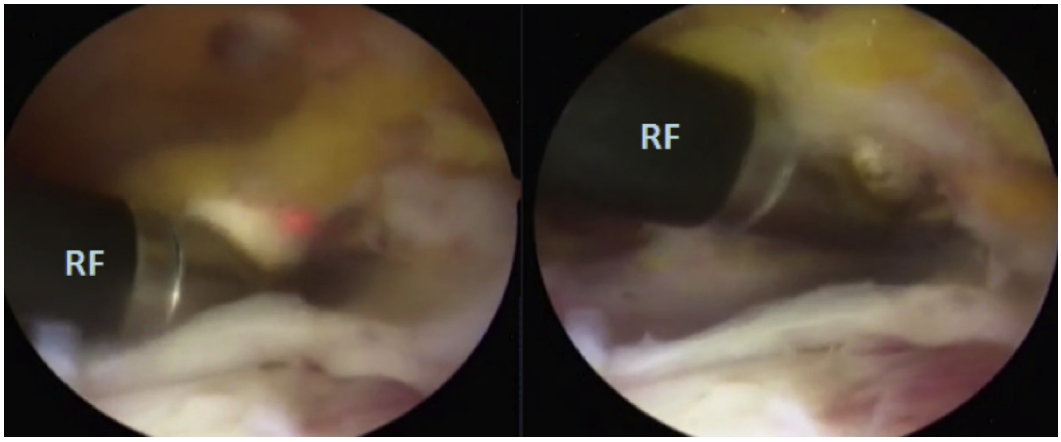

Fig 2. After the biceps tenotomy in the left shoulder, attention is turned to the subacromial space to complete the decompression. With the posterior portal as the viewing portal and the patient in the beach chair position, an arthroscopic shaver and a radiofrequency probe are used to perform the bursectomy. Once the bursectomy is complete, the rotator cuff tear pattern can be more easily evaluated. (RF, radiofrequency probe.)

while in the intra-articular glenohumeral joint. The tears are then sufficiently mobilized during the bursectomy with nearly a 360° release. At this point, it is crucial to identify tear type to plan for surgical repair of the tendons that is guided by the tear pattern.[14]

The subacromial decompression is then performed. The acromial spurring is addressed with an arthroscopic burr after soft tissue is cleared from the bone with the arthroscopic shaver. Concurrently, hemostasis is maintained with the radiofrequency device. Several millimeters of the spurring are resected allowing for more space to accommodate the supraspinatus tendon repair.

Arthroscopic Rotator Cuff Repair of the Subscapularis and Supraspinatus

In our case example, the tears of the subscapularis and supraspinatus are reconfirmed and evaluated to fully understand the tear pattern. Afterward, a FiberWire suture (Arthrex) is first passed through the torn subscapularis tendon using a FastPass Scorpion Suture Passer (Arthrex) through the anterior portal. After this, the footprint of the rotator cuff is prepared with an arthroscopic bone-cutting shaver (Arthrex) in shaver mode, radiofrequency wand, and rasp (Fig 3). A 4.75-mm SwiveLock Suture Anchor (Arthrex) is used. First, a Punch/Tap for the 4.75-mm SwiveLock (Arthrex) is used through the accessory portal to create the hole necessary for suture anchor insertion. Then, the anchor is loaded with the previously passed FiberWire suture. Afterward, the anchor is placed into the lesser tuberosity and then the repair is properly tensioned. A mallet may be used to appropriately insert the anchor to adequate depth. In this case example, the size of the tear found in the subscapularis tendon is small; therefore, 1 anchor is allowed for a sufficient repair. Once the repair is appropriately tensioned, the shoulder is taken through normal range of motion in internal and external rotation while the repair is arthroscopically visualized to ensure adequate fixation. Visualization of the subscapularis tear is sometimes aided by a 70° arthroscope.

Once the subscapularis tear has been repaired, the supraspinatus tear is re-evaluated. In this case example, the tear of the supraspinatus is identified as a "u-shaped" pattern that easily mobilizes back to the greater tuberosity footprint for anatomic repair. The arm is typically positioned to the side, in no more than 10° to 15° of abduction and neutral rotation. Similar to preparation before repair of the subscapularis, the supraspinatus footprint on the greater tuberosity is

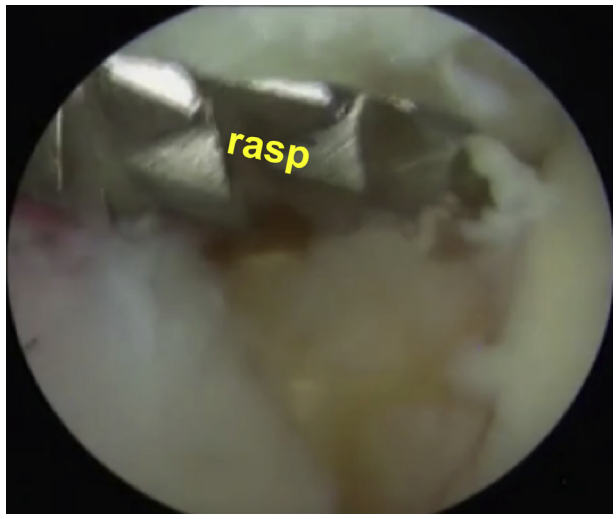

Fig 3. Using a combination of an arthroscopic shaver, rasp, and radiofrequency device, the bony bed surface is prepared for the reattachment of the rotator cuff tendon, laterally to the articular surface in the left shoulder with the posterior portal as the viewing portal and the patient in the beach chair position. The amount of bone prepared is guided by the extension and characteristics of the tear.

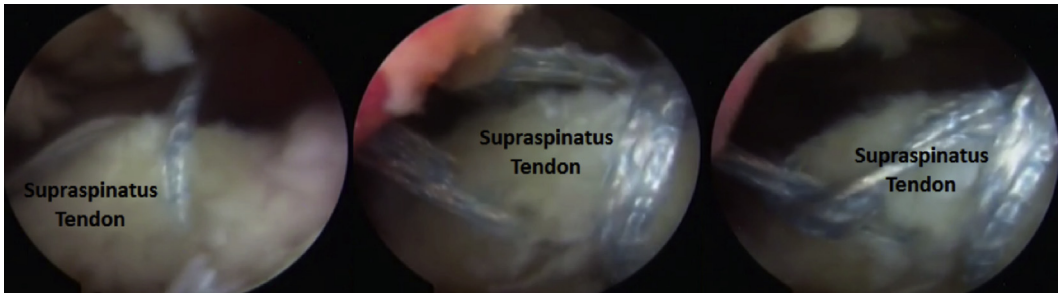

Fig 4. After bony bed preparation for reattachment of the rotator cuff in the left shoulder, the rotator cuff preparation is initiated with the posterior portal as the viewing portal and the patient in the beach chair position. Using a FiberWire suture, the tear in the supraspinatus tendon is sutured and then the ends of the sutures are retrieved through the arthroscopic portal.

prepared using an arthroscopic bone-cutting shaver in shaver mode to remove the residual torn tendon stump. Debridement is accomplished with the arthroscope in the posterior portal and with instrumentation through the lateral "50-yard line" portal. After the bony bed has been sufficiently prepared, the FiberWire suture is then passed through the torn tendon, whereas the FastPass Scorpion Suture Passer is used to retrieve the suture through the lateral portal. After passing the sutures in a horizontal mattress configuration, the free ends are retrieved (Fig 4).

Similar to the subscapularis tear repair, a 4.75-mm SwiveLock is used. This is accomplished by first punching a hole with the Punch/Tap for the 4.75-mm SwiveLock in the lateral aspect of the rotator cuff footprint under arthroscopic visualization. A separate accessory portal is often made to get an ideal angle for anchor insertion after first localizing the trajectory and placement of this anchor with a spinal needle. Then, the sutures that were previously passed through the tendon are retrieved and loaded into the 4.75-mm SwiveLock anchor (Fig 5). The anchor is then inserted through the accessory portal by first dunking the anchor approximately 25% into the previously established pilot hole and, afterward, pulling the sutures until they are taut. Again, a mallet may be used to insert the anchor into its proper place. In this case example, these steps are repeated for a second 4.75-mm SwiveLock anchor because of the size of the tear. In total, 3 anchors, 1 for the subscapularis and 2 for the supraspinatus, are used to reach an adequate repair.

Mini-open Subpectoral Biceps Tenodesis

Using a surgical pen, the path of the pectoralis major tendon is marked (Fig 6A). A small 2.5-cm incision is then made just inferior to the pectoralis major tendon, lateral to the axillary fold (Fig 6B). Hemostasis is achieved with bovie electrocautery while dissecting through the subcutaneous tissue. Metzenbaum scissors are then used to dissect through 2 layers of fascia. We are then able to readily identify the previously arthroscopically tenotomized LHB just medial to the pectoralis major tendon (Fig 7A). The tendon is then retracted from the joint (Fig 7B). Typically, the proximal extent of the tendon has significant synovitis and tearing, which is cleaned off and all adhesions are removed (Fig 7C). In most cases, this occurs in the proximal 4 to 5 cm of the tendon. The FiberWire suture is then whipstitched into the proximal end of the remaining tendon approximately 2 cm proximal to the muscle-tendon junction (Fig 8).

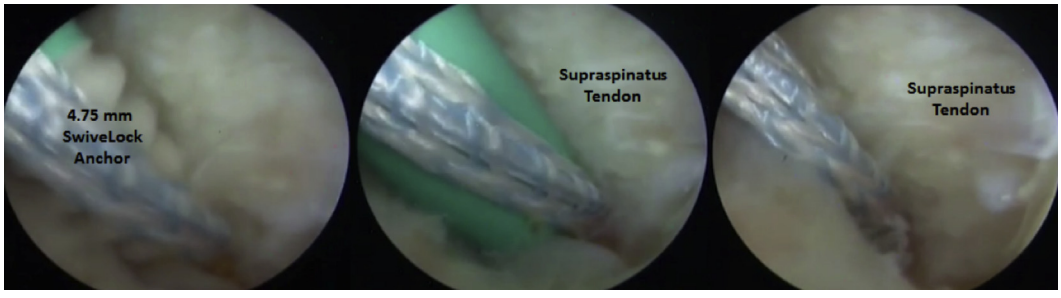

Fig 5. With the posterior portal as the viewing portal and the patient in the beach chair position, the sutures previously passed through the supraspinatus tendon in the left shoulder are retrieved and loaded into the knotless 4.75-mm SwiveLock anchor. The anchor is then inserted in the correct position. Afterward, the sutures are tensioned by initially dunking the anchor approximately one-fourth of the way into the previously established pilot hole. Then, the sutures are pulled until they are taut.

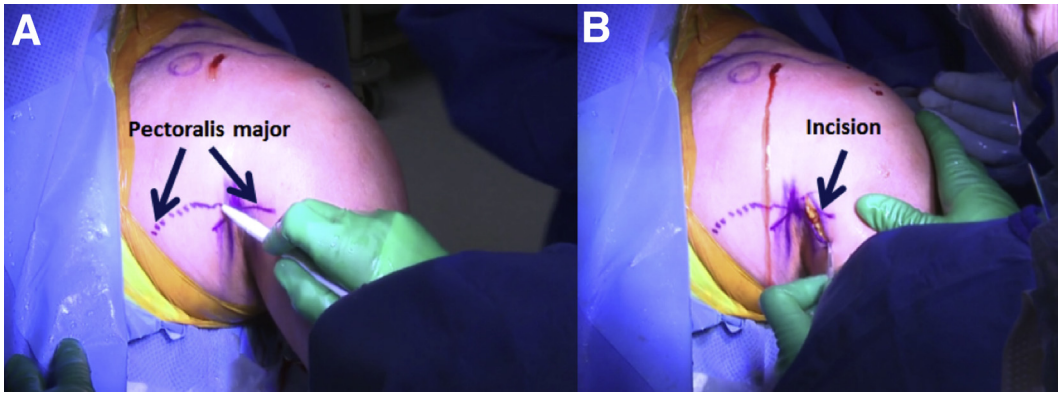

Fig 6. Once the arthroscopic portion of the procedure is complete, attention is turned to subpectoral biceps tenodesis through a mini-open approach in the left shoulder as the patient is in the beach chair position. Using a surgical pen, the path of the pectoralis major tendon is marked (A). A 2.5- to 3-cm incision is then made distally to the insertion of the pectoralis major tendon in the humeral shaft, lateral to the axillary fold (B).

The diseased tendon end is then resected. A 7 × 7 mm unicortical tunnel is then drilled over a guidewire in the biceps groove approximately 2 cm superior and proximal to the pectoralis major tendon insertion. Afterward, the biceps tendon is loaded into a 7 × 10 mm PEEK (polyether ether ketone) biceps tenodesis screw (Arthrex) by passing the whipstitched end through the eyelet and up the screw and screwdriver. The screw is then secured into the drilled tunnel (Fig 9). After screw insertion, the handle is removed to ensure that the screw is flush with the humeral cortex. Lastly, the screw is shuck once the repair is complete to ensure adequate fixation.

Closure

Copious irrigation of the subpectoral biceps tenodesis incision is then completed after completion of the tenodesis. A layered closure is performed with 2-0 monocryl and 3-0 monocryl subcuticular stitch, dermabond, and steristrips. The incisions are then dressed. Afterward, the shoulder is placed in an abduction sling. The pearls and pitfalls associated with this technique are listed in Table 1.

Postoperative Rehabilitation

For this particular repair, we advise a postoperative rehabilitation program lasting a total of 16 to 22 weeks. The initial 6 weeks should be centered on the goal of maintaining and protecting the repair. Therefore, the shoulder will be largely immobilized during this portion of the rehabilitation with no active range of motion and a restriction to only pendulum exercises and passive range of motion. At week 6, active range of motion is allowed with periscapular and stretching exercises. At week 10, early strengthening exercises including external and internal rotation with thera bands, elbow flexion and extension, and lateral raises are encouraged. During weeks 16 to 22, advanced strengthening exercises are suggested to capture the strength of the shoulder before injury. Moreover, self-capsular stretching is encouraged to maintain full range of motion. The return to sport is at the discretion of the patient.

Moreover, given the biceps tenodesis performed as part of this particular repair, the postoperative protocol should also consist of no active biceps activation of more than 10 lbs of lifting for the initial 6 weeks.

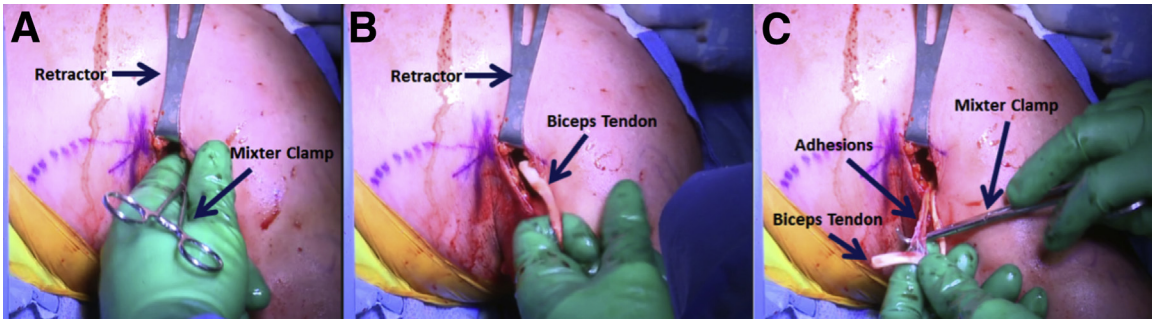

Fig 7. Once the incision distal to the pectoralis major tendon insertion in the humerus is made, blunt dissection is performed to identify the biceps tendon that was previously tenotomized in the left shoulder as the patient is in the beach chair position. Using a finger and mixter clamp, the tendon is identified (A) and retrieved (B), and then all adhesions are removed (C).

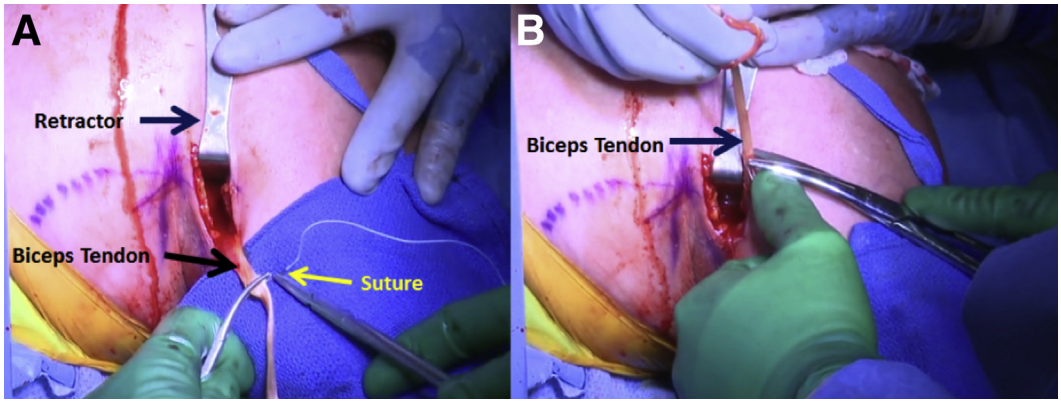

Fig 8. The biceps tendon in the left shoulder is released from all adhesions and secured using a hemostatic clamp 2 cm proximal to the muscle-tendon junction as the patient is in the beach chair position. While applying slight tension, the tendon is whip-stitched (A) with a FiberWire suture and then the part proximal to the hemostatic clamp is removed (B).

However, we encourage passive elbow range of motion in flexion, extension, and pronation, supination in the scapular plane of motion with low scapular engagement.

Discussion

RCTs with associated biceps tendinopathy are a common cause of debilitating shoulder pain that is challenging to treat due to the variety of factors in consideration. This Technical Note describes our preferred surgical technique for addressing this particular injury pattern. We recommend using this technique both in the setting of failed conservative management and in the acute setting with a symptomatic patient with high functional demand and high expectations after treatment.

There remains debate regarding the ideal treatment protocol, whether conservative or surgical, for RCTs. Many randomized control trials have shown that conservative management of rotator cuff repairs yields very similar objective outcomes when compared with surgical intervention.[2,3] With this in mind, conservative management is usually the primary treatment option, whereas surgical treatment is reserved for patients who have failed conservative management.

However, in a select subset of patients, such as those with significant physical symptoms, loss of range of motion,[15,16] high functional demand, or concomitant injury, surgery in the acute setting is appropriate. Tanaka et al.[15] showed that 4 specific factors affected outcomes after conservative treatment and the need for subsequent surgery: integrity of intramuscular supraspinatus tendon, supraspinatus muscle atrophy, impingement sign, and significantly decreased external rotation range of motion.

As previously stated, biceps tendinopathy is a common injury typically associated with RCTs. Surgical treatment is the preferred method when significant instability or pain is present, or when conservative management has failed. The 2 main categories of

Fig 9. After preparation of the biceps tendon in the left shoulder as the patient is in the beach chair position, the sutures are loaded in a 7 × 10 mm PEEK (polyether ether ketone) biceps tenodesis screw. Afterward, the screw is inserted into the previously drilled tunnel.

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
To ensure adequate interference fixation within bone and proper tensioning of the muscle-tendon unit, enough of the tendon must be secured before the fixation	Inadequate interference fixation may result from poor securement of the tendon for fixation
The arm is externally rotated approximately 10° while the drill is aimed directly anterior to posterior to ensure drilling and reaming in the center of the humerus	If the arm is improperly positioned during drilling, eccentric drilling may result and lead to inadequate fixation
A separate accessory portal can be made to get an ideal angle for anchor insertion after first localizing the trajectory and placement of this anchor with a spinal needle	
After subacromial decompression and bursectomy, it is crucial to identify tear type to plan for surgical repair of the tendons that is guided by the tear pattern	

treatment for biceps tendinopathy are tenodesis versus tenotomy. Numerous studies have been performed comparing the 2 procedures, and most have shown no clinically significant difference in subjective or objective outcomes.[17-21] Both options have been shown to be viable options for the treatment of tendinopathy. One advantage to tenotomy is a faster postoperative rehabilitation with an earlier return to sport compared with tenodesis. Tenodesis, on the other hand, usually results in inactivity for the initial 4 weeks after surgery with no active range of motion.[21] However, many studies have shown that tenodesis is superior to tenotomy in regard to cosmesis and ultimate tendon failure strength.[22-24] With this in mind, tenotomy may be a more favorable treatment option for an athlete or active patient looking for a quicker return to play or work; however, tenodesis may be preferable when long-term strength and stability are the top priority.

In conclusion, we recommend our described technique for the treatment of RCTs with associated biceps tendinopathy. We feel that our technique is easily replicable and ultimately leads to a resolution of symptoms regardless of the patient's particular functional demands. Nevertheless, further studies are needed to explore differences in long-term outcomes between different operative techniques, such as tenotomy versus tenodesis, performed concurrently with rotator cuff repair. These studies will further confirm the validity of the described technique.

References

1. Yamamoto A, Takagishi K, Osawa T, et al. Prevalence and risk factors of a rotator cuff tear in the general population. *J Shoulder Elbow Surg* 2010;19:116-120.
2. Itoi E. Surgical repair did not improve functional outcomes more than conservative treatment for degenerative rotator cuff tears. *J Bone Joint Surg Am* 2016;98:314.
3. Lambers Heerspink FO, van Raay JJ, Koorevaar RC, et al. Comparing surgical repair with conservative treatment for degenerative rotator cuff tears: A randomized controlled trial. *J Shoulder Elbow Surg* 2015;24:1274-1281.
4. Abdul-Wahab TA, Betancourt JP, Hassan F, et al. Initial treatment of complete rotator cuff tear and transition to surgical treatment: Systematic review of the evidence. *Muscles Ligaments Tendons J* 2016;6:35-47.
5. Schmidt CC, Morrey BF. Management of full-thickness rotator cuff tears: Appropriate use criteria. *J Shoulder Elbow Surg* 2015;24:1860-1867.
6. Economopoulos KJ, Brockmeier SF. Rotator cuff tears in overhead athletes. *Clin Sports Med* 2012;31:675-692.
7. Lorbach O. Controversies in the therapy of rotator cuff tears. Operative or nonoperative treatment, open or arthroscopic repair? *Orthopade* 2016;45:112-117 [in German].
8. Huisstede BM, Koes BW, Gebremariam L, Keijsers E, Verhaar JA. Current evidence for effectiveness of interventions to treat rotator cuff tears. *Man Ther* 2011;16:217-230.
9. Aleem AW, Brophy RH. Outcomes of rotator cuff surgery: What does the evidence tell us? *Clin Sports Med* 2012;31:665-674.
10. Kilicoglu O, Koyuncu O, Demirhan M, et al. Time-dependent changes in failure loads of 3 biceps tenodesis techniques: In vivo study in a sheep model. *Am J Sports Med* 2005;33:1536-1544.
11. Ozalay M, Akpinar S, Karaeminogullari O, et al. Mechanical strength of four different biceps tenodesis techniques. *Arthroscopy* 2005;21:992-998.
12. Levy DM, Meyer ZI, Campbell KA, Bach BR Jr. Subpectoral biceps tenodesis. *Am J Orthop (Belle Mead NJ)* 2016;45:68-74.
13. Mannava S, Jinnah AH, Plate JF, Stone AV, Tuohy CJ, Freehill MT. Basic shoulder arthroscopy: Beach chair patient positioning. *Arthrosc Tech* 2016;5:e731-e735.
14. Davidson J, Burkhart SS. The geometric classification of rotator cuff tears: A system linking tear pattern to treatment and prognosis. *Arthroscopy* 2010;26:417-424.
15. Tanaka M, Itoi E, Sato K, et al. Factors related to successful outcome of conservative treatment for rotator cuff tears. *Ups J Med Sci* 2010;115:193-200.
16. Itoi E, Tabata S. Conservative treatment of rotator cuff tears. *Clin Orthop Relat Res* 1992;275:165-173.
17. Kelly AM, Drakos MC, Fealy S, Taylor SA, O'Brien SJ. Arthroscopic release of the long head of the biceps tendon: Functional outcome and clinical results. *Am J Sports Med* 2005;33:208-213.

18. Wittstein JR, Queen R, Abbey A, Toth A, Moorman CT III. Isokinetic strength, endurance, and subjective outcomes after biceps tenotomy versus tenodesis: A postoperative study. *Am J Sports Med* 2011;39:857-865.
19. Wittstein J, Queen R, Abbey A, Moorman CT III. Isokinetic testing of biceps strength and endurance in dominant versus nondominant upper extremities. *J Shoulder Elbow Surg* 2010;19:874-877.
20. Osbahr DC, Diamond AB, Speer KP. The cosmetic appearance of the biceps muscle after long-head tenotomy versus tenodesis. *Arthroscopy* 2002;18:483-487.
21. Patel KV, Bravman J, Vidal A, Chrisman A, McCarty E. Biceps tenotomy versus tenodesis. *Clin Sports Med* 2016;35:93-111.
22. Slenker NR, Lawson K, Ciccotti MG, Dodson CC, Cohen SB. Biceps tenotomy versus tenodesis: Clinical outcomes. *Arthroscopy* 2012;28:576-582.
23. Hsu AR, Ghodadra NS, Provencher MT, Lewis PB, Bach BR. Biceps tenotomy versus tenodesis: A review of clinical outcomes and biomechanical results. *J Shoulder Elbow Surg* 2011;20:326-332.
24. Wolf RS, Zheng N, Weichel D. Long head biceps tenotomy versus tenodesis: A cadaveric biomechanical analysis. *Arthroscopy* 2005;21:182-185.