Arthroscopic Biceps Tenodesis With Interference Screw Fixation: A Technique Video

Brian Forsythe,*† MD, Vahram Gamsarian,† BE, Harsh H. Patel,‡ BA, Elyse Berlinberg,§ BS, Alec Warrier,† BS, Haseeb Goheer,‖ BS, Vikranth Mirle,† BS, Lashmanan Sivasundaram,† MD, and Christopher M. Brusalis,† MD
Investigation performed at Midwest Orthopaedics at Rush, Chicago, Illinois, USA

Background: Management of long head of the biceps tendon (LHBT) pathology is accomplished through a biceps tenotomy or tenodesis. While both modalities provide beneficial outcomes, a biceps tenodesis may confer improved cosmesis, functional outcomes, and decreased muscle cramping postoperatively. Many procedural considerations are undertaken prior to a tenodesis, such as the surgical approach and fixation device. While similar clinical outcomes are achieved between an open subpectoral and arthroscopic suprapectoral biceps tenodesis (ASPBT) with interference screw (IS) fixation, the latter technique offers a minimally invasive modality.

Indications: The primary indications for an ASPBT include superior labrum anterior posterior (SLAP) tears, LHBT tears, biceps instability, bicipital tunnel disease, biceps pulley lesions, and biceps tenosynovitis. Contraindications to the arthroscopic approach include a distal lesion of the biceps tendon below the pectoralis major tendon (PMT). The IS may be used to create a biomechanically stiffer construct.

Technique Description: With the arthroscope in the lateral portal, the distal aspect of the bicipital groove proximal to the superior border of the PMT is identified and opened. The LHBT is subsequently mobilized and released. An anterosuperolateral portal is localized with a spinal needle positioned perpendicular to the bicipital tunnel, 1.5 cm proximal to the superior border of the PMT. The biceps is then removed *ex vivo* and whip-stitches are sewn beginning 1 cm proximal to the myotendinous junction of the LHBT. After firmly associating the LHBT with the tip of the IS, a guidewire is placed 1.5 cm superior to the superior border of the PMT, perpendicular to the humerus, and a reamer is used to prepare a 6-, 7-, or 8-mm diameter socket. The tendon is inserted through the accessory portal into the tunnel, followed by screw fixation. Suture tails are tied with 5 alternating half hitches, each secured via an arthroscopic knot pusher.

Results: ASPBT with IS fixation provides significant pain relief, improves range of motion (ROM), and enhances quality of life.

Discussion: ASPBT with IS fixation provides significant improvements in patient-reported and functional outcomes and thus can be an acceptable treatment for LHBT pathology.

Patient Consent Disclosure Statement: The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

Keywords: arthroscopic; biceps tenodesis; interference screw; long head of the biceps tendon; shoulder arthroscopy

VIDEO TRANSCRIPT

The following video describes our surgical technique for the performance of an arthroscopic biceps tenodesis using interference screw (IS) fixation in the treatment of proximal biceps tendon pathology.

We have no relevant disclosures.

BACKGROUND

We will begin with a background on the treatment of long head biceps tendon pathology, followed by a case presentation, where we will discuss preoperative planning as well as the arthroscopic technique. The video will then conclude with postoperative management, return-to-sport guidelines, followed by a review of clinical outcomes.

Long head of the biceps tendon (LHBT) pathology remains a common generator of anterior shoulder pain, which is often treated with a tenodesis procedure.[10] Biceps tendinosis is the most common etiological source, resulting from wear and tear in the bicipital groove or joint space. When nonoperative treatment measures, such as activity modification,

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nonsteroidal anti-inflammatory drugs (NSAIDs), or physical therapy fail, surgical intervention may be considered. While both a biceps tenotomy or tenodesis are feasible treatment options, tenodesis has become more common, with evidence suggesting it results in improved cosmesis, functional outcomes, and decreased biceps muscle cramping.[11]

When performing a biceps tenodesis, certain technical factors should be taken into consideration. While arthroscopic and open surgical approaches are each performed commonly, an arthroscopic technique is less-invasive and provides better cosmesis. However, arthroscopic techniques may be more technically challenging. A recent randomized trial of 85 patients demonstrated that an arthroscopic biceps tenodesis resulted in equivalent clinical outcomes at 2-year follow-up.[4]

The technique for biceps tenodesis varies also in fixation strategy. A single-suture all-suture anchor has recently been popularized as a less-intrusive fixation option. Alternatively, an IS provides a biomechanically stiffer construct; however, it confers greater violation of the humeral cortex. A recent radiosterometric analysis of 94 patients who underwent biceps tenodesis fixed with either an IS or all-suture anchor demonstrated less tendon migration in cases with IS fixation. However, clinical outcomes between cohorts did not differ at 2 years postoperatively. Our technique describes an arthroscopic suprapectoral biceps tenodesis (ASPBT) with an interference fixation, yielding a biomechanically stiff construct.

Our patient is a 46-year-old right hand-dominant male who presented for the evaluation and management of anterolateral right shoulder pain in the absence of antecedent trauma or prior shoulder surgery. The pain had been ongoing for the past 7 months. He endorsed difficulty with lifting and overhead activities. The patient denied use of any pain control medication and had pain despite 3 months of focused physical therapy. Of note, he did receive an intra-articular shoulder injection from an outside provider, which yielded only minimal improvement. His pain was rated a 7 out of 10 and reported having 75% of normal function in his right shoulder.

On physical examination, he achieved 165° of forward flexion, 50° of external rotation, and internal rotation to L3. The patient had + 1 tenderness to palpation along the greater tuberosity, bicipital groove, posterior joint line, and acromioclavicular joint. Functional testing demonstrated a positive Neer's and Hawkins, and O'Brien's test. He also demonstrated pain with valgus shear. Examination of the rotator cuff strength revealed 5-/5 supraspinatus and infraspinatus strength.

Anteroposterior and axillary radiographs reveal well-preserved glenohumeral joint space, with no evidence of fracture, foreign body, or soft-tissue injury. Coronal and axial T2-weighted imaging revealed an intact long head biceps tendon with diffuse glenoid labral tearing. The rotator cuff appeared intact.

INDICATIONS

Primary indications for an arthroscopic biceps tenodesis include superior labrum anterior posterior (SLAP) tears, LHBT tears, biceps instability, bicipital tunnel disease, biceps pulley lesions, and biceps tenosynovitis. Contraindications to the arthroscopic approach include a distal lesion of the biceps tendon below the pectoralis major tendon.[2]

TECHNIQUE DESCRIPTION

For this procedure, the patient is placed in the beach-chair position with the arm in 45° of abduction, forward flexion, and slight external rotation of 10° to 20°.[6] A standard posterior portal is created, and the procedure begins with a diagnostic arthroscopy. Concomitant intra-articular pathology, such as labral fraying, is addressed. The biceps tendon is carefully inspected to confirm pathology. Prior to detaching the bicep anchor from the superior labrum, a spinal needle is used to pierce the tendon to prevent it from retracting following detachment. This needle also helps localize the tendon in the subacromial space.

We then proceed to the subacromial space, and perform a careful bursectomy. An anterolateral portal is created, and using the previously placed spinal needle as a reference landmark, the transverse humeral ligament is unroofed and biceps tendon is extracted into the subacromial space. Next, a curved hemostat is used to extract the tendon out from the anterolateral portal. To ensure adequate excursion of biceps tendon for subsequent suture passage, the arm is placed in slight forward flexion with the elbow at 30° of flexion. An army navy retractor is used to retract the skin to allow improved access to the biceps tendon. A high-strength, nonabsorbable suture is then passed through the tendon in a standard Whipstitch configuration.

Excess biceps tendon is then resected. Following this, we expose the bicipital groove using a combination of shaver

*Address correspondence to Brian Forsythe, MD, Midwest Orthopaedics at Rush, 1611 W. Harrison St., Ste 360, Chicago, IL 60621, USA (email: forsythe.research@rushortho.com).
†Midwest Orthopaedics at Rush, Chicago, Illinois, USA.
‡Rutgers New Jersey Medical School, Newark, New Jersey, USA.
§NYU Grossman School of Medicine, New York City, New York, USA.
‖Virginia Tech Carilion School of Medicine, Roanoke, Virginia, USA.
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and electrocautery. A 7-mm socket is drilled for a 6.25 mm IS. The sutured biceps tendon is then loaded onto the anchor, and implanted in the bicipital groove. For additional fixation, the suture from the anchor is then tied to the whip-stitched suture limbs. Final inspection of the construct confirms appropriate length, tension, and rigidity of fixation.

RESULTS AND DISCUSSION

Complication rates following an ASPBT range from 1.0% to 9.1%.[3,5,8,9] A Popeye deformity is one complication that can be minimized by paying careful attention to the length and tension of the biceps during fixation. In addition, the risk of a humeral fracture is present and may be exacerbated using the interference technique.[9] Following tenodesis, the construct is also susceptible to failure; however, interference fixation has consistently been shown in biomechanical studies to be stiffer.[7,9] To reduce groove pain, related to stenosis, we routinely release zone 2 arthroscopically, which is also our preferred tenodesis location.

Our tips for this procedure include operating early, ideally within 6 months of symptom onset, as longer durations have been shown to reduce the likelihood of achieving clinically significant outcomes after surgery. Furthermore, patient positioning should be optimized with 20° to 30° of elbow flexion, as this prevents over-tensioning of the biceps muscle tendon unit. Finally, passage of the LHBT through the opening of an army-navy retractor can facilitate compression of the soft tissue and improve access for whip-stitching of the tendon.

We start a 4-phase rehabilitation postoperatively for our patients. Phase 1 involves wearing a sling at all times in the first 2 weeks except during therapy and home exercises. Passive range of motion (ROM) is also allowed during this period. Phase 2 involves progressing toward achieving full active ROM and active supination. Phase 3 consists of strengthening exercises and resisted supination. The final phase involves advanced strengthening exercises, by week 16.

Overall, patients should return to sports and work on an individualized basis. While literature assessing return to sport after arthroscopic biceps tenodesis is scarce, a separate investigation performed at our institution assessing outcomes between the arthroscopic and open techniques found that most individuals without concurrent rotator cuff repair returned to sport at 4 months. Those with a rotator cuff repair returned to sport at approximately 6 months. Regarding return to work, a case series of 50 patients undergoing arthroscopic suprapectoral onlay biceps tenodesis found that 71.1% returned at an average of 4.6 months. Light-duty workers returned to work at a significantly greater rate and in less time than heavy-duty workers.[1]

In a prospective, randomized trial investigating arthroscopic suprapectoral versus open subpectoral biceps tenodesis at mid-term follow-up, there were no significant differences in American Shoulder and Elbow Surgeons (ASES), Constant, or Single Assessment Numeric Evaluation (SANE) scores at a minimum 2-years follow-up. No Popeye deformities were noted in either the arthroscopic or open group, with no revisions of the biceps tenodesis in either group.[4] In a recent radiostereometric analysis, biceps tenodesis performed via screw interference fixation had 5-fold less migration than did tenodesis performed via a single, all-suture fixation construct at 1 week postoperatively. At 3 months postoperatively, the screw interference construct continued to have 3-fold less migration. These data suggest that screw interference fixation provides greater security for biceps tenodesis than an all-suture anchor with a single suture.

In conclusion, ASPBT with IS fixation is a simple, reproducible technique applicable for the treatment of symptomatic LHBT pathology. The procedure results in significant improvements in patient-reported outcomes, ROM, and strength, with a low overall complication rate.

Here are our references.

Thank you for your attention.

ORCID iDs

Brian Forsythe https://orcid.org/0000-0003-1665-5872
Vahram Gamsarian https://orcid.org/0000-0003-2091-2341
Elyse Berlinberg https://orcid.org/0000-0001-5308-1383
Haseeb Goheer https://orcid.org/0000-0003-4004-0202
Vikranth Mirle https://orcid.org/0000-0003-3283-183X
Lashmanan Sivasundaram https://orcid.org/0000-0002-0727-2100

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