Open Subpectoral Biceps Tenodesis: Reliable Treatment for All Biceps Tendon Pathology

Patrick Kane, MD; Philip Hsaio, BS; Bradford Tucker, MD; Kevin B. Freedman, MD, MSCE

Abstract: Long head of the biceps (LHB) tendon pathology is a common cause of pain in the shoulder. Pathology encountered includes biceps tendon tears and tendinitis, biceps anchor or superior labral tears, and biceps subluxation or instability. Current surgical treatment options for LHB disorders include tenotomy and tenodesis. Tenodesis prevents cosmetic deformity and biceps cramping with activity. Open subpectoral tenodesis anatomically restores the length-tension relationship of the biceps muscle and removes all diseased biceps from the bicipital groove. The authors present their technique of open subpectoral tenodesis, which demonstrates a high success rate with consistent pain relief and dependable fixation. [Orthopedics. 2015; 38(1):37-41.]

Although the function of the long head of the biceps (LHB) tendon is controversial, the LHB tendon has long been recognized as a potential cause of pain in the shoulder. Patients with LHB tendon disorders typically present with anterior shoulder pain in the bicipital groove. Biceps tendon disorders are frequently associated with other shoulder pathology, such as glenohumeral arthritis and rotator cuff tears. Several physical examination maneuvers, such as Speed’s, Yergason’s, and O’Brien’s tests, have been developed to isolate LHB tendon pathology. However, several level I and level II studies have questioned their accuracy. Advanced imaging or visualization during shoulder arthroscopy confirms the diagnosis of LHB disease. Failure to treat biceps pathology while addressing associated shoulder disorders can lead to persistent shoulder pain following surgery.

The current surgical treatment options for LHB pathology include tenotomy (release) vs tenodesis (reattachment). Some systematic reviews have shown no difference between these 2 techniques, while other studies have shown increased biceps pain and cramping, cosmetic deformity, and patient dissatisfaction with tenotomy. As a result, younger, high-demand patients are usually treated with tenodesis. There are several potential reattachment sites for the biceps tendon, including the lesser tuberosity, coracoid, bicipital groove, short head of the biceps, pectoralis major tendon, and subpectoral bone tunnels. The optimal location for LHB tenodesis remains controversial.

Currently, no level I or II studies exist comparing tenodesis above, within, or below the bicipital groove. However, there are several advantages to subpectoral biceps tenodesis. First, subpectoral tenodesis can reliably restore the anatomic length-tension relationship of the biceps muscle by placing the musculotendinous junction of the biceps at the inferior border of the pectoralis major tendon. Other techniques can have difficulty determining the appropriate tension to the remaining biceps tendon. In addition, the subpectoral location removes the entire diseased segment of biceps, whereas techniques at or above the bicipital groove can leave a segment of biceps within the groove that leads to continued shoulder pain. Tenodesis can be achieved through a variety of fixation methods, including interference screw, suture fixation, anchors, bone...
subpectoral tenodesis with bone tunnels and suture fixation. This method provides reliable pain relief with anatomic fixation, has minimal implant-associated costs, and can treat all biceps pathology.

Materials and Methods

Patients with LHB tendon disorders undergoing shoulder arthroscopy and open subpectoral biceps tenodesis performed by the senior author (K.B.F.) between 2005 and 2012 were eligible for inclusion in this study. Patients who were seen at a minimum of 1-year follow-up were included. Patients lost to follow-up before 1 year were excluded. All patients were diagnosed with LHB tendon disease, based on preoperative evaluation and findings during shoulder arthroscopy. The primary indication for shoulder arthroscopy was rotator cuff repair, and tenodesis was performed at the conclusion of the operation. An approximately 2- to 3-cm skin incision centered over the pectoralis major tendon is made within the axillary fold. A Hohmann retractor can be placed directly through the pectoralis major tendon to retract the tendon lateral to the bicipital groove. The LHB tendon is then delivered from the groove and a locking Krackow stitch is placed at the musculotendinous junction with a #2 Orthocord suture (DePuy Mitek, Raynham, Massachusetts) (Figure 3). Excess biceps tendon is excised after this stitch is completed, leaving 1 to 2 cm of tendon remaining from the musculotendinous junction (Figure 4). The bicipital groove is exposed with electrocautery and a 2.4-mm guide pin is placed just superior to the inferior margin of the pectoralis tendon. A 7.5-mm acorn reamer is placed over the guide pin and used to make a unicortical central drill hole (Figure 5). The 2.4-mm drill pin is again used to make 2 accessory holes distal to the previously placed central hole. When completed,
an equilateral triangle is made among the 3 drill holes with approximately 1 cm separating each hole (Figure 6). A short straight blade from the Spectrum Suture Passer (CONMED, Largo, Florida) is then used to place a passing O-PDS suture (Ethicon, Somerville, New Jersey) from the accessory drill hole to the central hole. A crochet hook from the rotator cuff repair tray is used to retrieve the PDS suture from the central drill hole. After the first PDS suture is retrieved, the process is repeated with the other accessory hole (Figure 7). A simple loop is then made in each PDS suture to shuttle the #2 Orthocord suture through the central hole and out the accessory holes on each side of the bicipital groove (Figure 8). The sutures are tensioned and the biceps tendon is docked in the central hole within the intramedullary canal in the bicipital groove (Figure 9). The 2 suture limbs are then tied on the lateral side of the tendon to prevent tendon strangulation (Figure 10). The musculotendinous junction of the LHB can be seen directly beneath the inferior border of the pectoralis tendon, providing anatomic fixation (Figure 11). The fascia is left open, the wound is irrigated, the subcutaneous tissue is closed with a 2-0 Vicryl suture (Ethicon), and the skin is closed with a running Monocryl suture (Ethicon).

Postoperatively, the patient is placed in a standard sling. Patients have no restriction in elbow motion following surgery. Elbow flexion is limited to 5 lb for the first 6 weeks, and then advanced as tolerated.

RESULTS
One hundred two patients with an average age of 53.8 years underwent open subpectoral biceps tenodesis performed by the senior author (K.B.F.) between 2005 and 2012. The indications for shoulder arthroscopy are listed in Table 1. Concomitant procedures at the time of tenodesis are listed in Table 2. Ninety-eight percent of patients (100 of 102)
satisfaction with surgery. One patient reported persistent bicipital groove pain, and 1 patient developed an infection of the biceps tenodesis site that required irrigation and debridement. One patient experienced loss of fixation with resultant biceps deformity, but reported no pain and was satisfied with his results. Five patients reported pain from recurrent rotator cuff tear, 3 patients reported pain from recurrent impingement requiring subacromial injection, and 1 patient developed postoperative stiffness from a concomitant labral repair that required arthroscopic capsular release. No humerus fractures occurred.

**DISCUSSION**

The open subpectoral biceps tenodesis technique described here provides the treating orthopedic surgeon with a valuable method for managing all biceps tendon pathology. A low complication rate and high rates of patient satisfaction and pain relief were found with this technique. As previously mentioned, no level I or II studies exist comparing tenodesis above, within, or below the bicipital groove. However, subpectoral tenodesis completely removes the tendon from the bicipital groove, where pathology frequently extends, and eliminates pain from residual stenosis or from tenosynovitis from remaining, inflamed synovium. Several studies report reliable symptom relief, maintenance of the anatomic length-tension relationship, and a low incidence of failure with subpectoral tenodesis. One study showed a higher revision rate for tenodesis within the biceps groove compared with distal fixation (12% vs 2.7%).

Additionally, previously reported rates of success and return to work or play for arthroscopic repair of Type II SLAP lesions have varied greatly (22% to 75%). One study showed higher rates of satisfaction and return to work or play for tenodesis compared with repair. The results from the current study support the use of subpectoral tenodesis for the management of these lesions as well. Finally, when compared with other fixation methods, suture tenodesis using the technique described here is associated with minimal additional implant costs and uses readily available instrumentation. Bone tunnel and suture fixation vs the interference screw technique differ in cost by more than $400 (Table 3).

**CONCLUSION**

Open subpectoral biceps tenodesis represents a reliable surgical technique for treating all LHB tendon disorders, including biceps tendonitis and tears, subluxation, and Type II SLAP tears. This particular technique provides predictable pain relief and high success rates, has minimal implant-associated costs, and has demonstrated a low rate of complications.

**REFERENCES**


3. Holthy R, Razmjou H. Accuracy of the Speed’s and Yergason’s tests in detecting biceps pathology and SLAP lesions.


