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Mini-Open Subpectoral Biceps Tenodesis With an All-Suture Anchor

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The long head of the biceps tendon can be a source of pain in a variety of shoulder pathogies such as including biceps tenosynovitis, type II SLAP tears, partial long head of the biceps tears, and long head of the biceps subluxations or dislocations among others. When nonoperative management has failed and surgical management is indicated, the long head of the biceps can be treated with either tenotomy or tenodesis. Although tenotomy is reliably effective, tenodesis is often preferred as it helps prevent complications such as cramping, fatigue, and supination and elbow flexion weakness. Several biceps tenodesis techniques have been described including suprapectoral vs subpectoral, open vs arthroscopic and a variety of fixation methods have been used including a biotenodesis screw, cortical button, bone bridge, and suture anchor. This article describes the technique for a mini-open, subpectoral on-lay biceps tenodesis using an all-suture anchor double loaded with suture tape. We prefer this method as it provides effective fixation with minimal tendon slippage and minimizes the risk of complication.

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Introduction

Treatment for shoulder pathology involving the long head of the biceps (LHB) can include debridement, tenotomy, arthroscopic biceps tenodesis, or open biceps tenodesis. Surgical treatment of the LHB is indicated for patients who failed nonoperative management for conditions including biceps tenosynovitis, type II SLAP lesions, partial LHB tendon tears, and subluxations or dislocations of the LHB, and can also be considered certain patients with rotator cuff pathology and glenohumeral degenerative joint disease. When the decision is made to surgically release the biceps tendon, the option exists to decide between tenodesis and simple tenotomy. Although tenotomy has been found to reliably relieve pain, tenodesis is typically preferred as it helps avoid Popeye deformity of the biceps muscle, maintains the length-tension relationship, and preserves elbow flexion and supination strength.[1] Additionally, tenotomy may be associated with poor functional result, cramping, and fatigue in 19%-38% of patients.[2,3] In our practice, tenotomy is generally reserved for patients at elevated risk of infection, those who are unable to comply with the postoperative rehabilitation required of biceps tenodesis, and those in whom cosmetic appearance of a Popeye deformity is not a concern. Biceps tenodesis can be performed with a variety of techniques including proximal vs distal, open vs arthroscopic, and with a variety of methods of fixation including a biotenodesis screw, cortical button, bone bridge, or suture anchor. We prefer a mini-open, distal subpectoral biceps tenodesis technique due to reduced incidence of residual pain and stiffness.[4] This is accompanied by reliable clinical outcomes and low complication rate.[5,6] Here we present the senior author's (B.J.C.) preferred method for biceps tenodesis, which is a mini-open, subpectoral on-lay technique using a double loaded all-suture anchor with broad suture tape to maximize suture-tendon biomechanics and prevent slippage while allowing insertion into a small outer diameter (1.7 mm) drill hole that reduces the risks for postoperative complications.

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Figure 1 Patient positioning. Right shoulder prepared for open biceps tenodesis with the patient reclined in the beach chair position. The right arm is abducted 20°-30° and a 3 cm vertical incision is planned (solid marking pen line) superiorly at the border at the junction of the pectoralis major and anterior deltoid. Dotted marking pen line indicates the inferior border of the pectoralis major. (Color version of the figure available online.)

Patient Positioning and Surgical Preparation

Preoperatively, an interscalene nerve block is administered and the patient is placed under conscious sedation. An examination under anesthesia is performed to assess for passive range of motion and instability. The patient is then placed the beach chair position to prepare for diagnostic arthroscopy (Fig. 1). A posterior portal is first established, 2 cm inferior and 1 cm medial to the posterolateral acromion. Using direct visualization from the posterior portal and guidance with a spinal needle, a standard anterior portal is established through the rotator interval 1 cm lateral to the coracoid.

Surgical Technique

Once the posterior and anterior portals are established, a standard diagnostic arthroscopy is performed to evaluate for pathology of the glenoid, humeral head, labrum, rotator cuff, and biceps tendon. After diagnostic arthroscopy while viewing through the posterior portal, the long head of the biceps is incised at its junction with the superior labrum using an arthroscopic basket through the anterior portal. If needed, an arthroscopic shaver (Torpedo; Arthrex, Naples, FL) is used to gently remove any residual biceps tendon from the superior labrum.

At the completion of shoulder arthroscopy, during which any pathology including the labrum and rotator cuff are addressed, the head of the bed is reclined an additional 20°. The arm is then slightly externally rotated and abducted. The inferior border of the pectoralis major is palpated and a 3-cm vertical incision is made from this inferior border headed distally just lateral to the axillary crease (Fig. 1). Blunt finger dissection or with a Metzenbaum scissors is used for the subcutaneous tissue and to enter the fascia just inferior to the pectoralis major and lateral to the short head of the biceps. Blunt dissection is used to develop the subpectoral plane in the direction of the humerus and the LHB tendon is palpated in the bicipital groove adjacent to the pectoralis major tendon edge. A small pointed Hohmann retractor is then placed under the pectoralis major lateral to the biceps tendon entering just lateral to the pectoralis major tendon insertion. A Chandler retractor is gently placed against the medial aspect of the humerus, staying adjacent to the bone avoiding the neurovascular structures lying medially, particularly the musculocutaneous nerve (Fig. 2). An Army-Navy retractor can be used superiorly or inferiorly as needed for visualization. The LHB tendon that was previously released during the arthroscopic portion of the procedure can be retrieved either using a finger or curved hemostat (Fig. 3).

After retrieving the long head of the biceps, electrocautery is used to decorticate a 1.5 cm × 1.5 cm area in the subpectoral region at the distal aspect of the bicipital groove. At the desired site for fixation, an osteotome and a mallet are used to gently "fish-scale" the humeral cortex to enhance healing of the tenodesis and to help prevent guide migration (Fig. 4A). A straight drill guide is then placed at the desired location of the biceps tenodesis at the superior part of the prepared region of the distal biceps groove. Using the drill guide, a unicortical 1.7 mm hole is drilled (Fig. 4B). The position of the drill guide is maintained and a double loaded all-suture soft anchor (Biceps FiberTak Anchor; Arthrex, Inc, Naples, FL) is then gently impacted into the drill hole (Fig. 5). The sutures are gently tensioned to ensure anchor fixation. Each suture is passed through the LHB tendon with running, reinforced sutures over a 2 cm zone of the biceps tendon in a location that normalizes the tendon tension and typically about 1 cm proximal to the musculotendinous junction (Fig. 5). The opposite ends of both sutures that were not passed through the tendon are then pulled tightly to reduce the biceps tendon to the bone. The sutures are tied using the unpassed ends as posts to firmly fixate the biceps tendon to the prepared humeral surface. The remaining proximal tendon and excess suture are excised and the skin incision is closed with Monocryl suture and Dermabond (Ethicon, Somerville, NJ) (Fig. 6).

Figure 2 Soft tissue dissection. Right shoulder vertical incision with a pointed Hohmann retractor placed laterally under the deltoid, a Chandler retractor medially, and an Army-Navy retractor inferiorly to enhance visibility. The subcutaneous tissue and fascia is dissected to view the long head of the biceps tendon. (Color version of the figure available online.)