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Operative Techniques in

Sports Medicine

Management of the Biceps Tendon ☆

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The long head of the biceps tendon (LHBT) is a common source of pathology in overhead athletes. The biceps-labrum complex is the combined anatomy of the LHBT and superior labrum, and it is imperative to understand this complex anatomical relationship for both diagnosis and management of these conditions. The etiology of LHBT pathology can be classified into the following 3 categories: inflammation, instability, and trauma. Although there are many physical examination tests for biceps tendon and superior labrum anterior to posterior lesions, many of these lack reproducible sensitivity or specificity to be clinically useful. Owing to the difficulty in diagnosing LHBT disorders, treatment should be guided by a combination of history and clinical examination findings as well as advanced imaging studies, including magnetic resonance imaging and ultrasound. Initial nonoperative treatment of LHBT pathology includes guided physical therapy, nonsteroidal anti-inflammatory medications, and corticosteroid injections. When nonoperative management fails, surgical treatment includes the following 3 common procedures: superior labrum anterior to posterior repair, biceps tenotomy, and biceps tenodesis. When treated appropriately, overhead athletes with LHBT pathology often experience excellent clinical outcomes.

KEYWORDS biceps tendonitis, overhead athletes, baseball, SLAP tear, biceps tenodesis

Introduction

The long head of the biceps tendon (LHBT) is a common source of pathology in overhead athletes and frequently coincides with superior labrum anterior to posterior (SLAP) tears in these patients. As discussed in the earlier article, SLAP tears are often managed with SLAP repair in overhead athletes, especially type II and IV SLAP tears.[1] However, type IV lesions can be managed with biceps tenodesis when significant biceps damage is encountered.[1] Because overhead athletes represent a special patient population with unique shoulder mechanics, management of these patients needs to take into account the loads that would be placed on the shoulder postoperatively, and the imperative need for return to sport, especially high-level athletes. It has been demonstrated that return to sport for overhead throwing athletes following SLAP repair is inconsistent,[2,3] highlighting the need for appropriate surgical indications, possible alterations in surgical technique or concomitant procedures, such as biceps tenodesis when indicated, to improve outcomes in these patients.

Biceps tenodesis has demonstrated excellent clinical outcomes for patients with primary LHBT pathology as well as for failed SLAP repairs.[4-6] Although there is a paucity of data regarding clinical outcomes of primary biceps tenodesis in overhead athletes with LHBT pathology, we have been using this technique for patients who present with symptoms localized to the bicipital groove with good results.[7] The goals of the present article are to review the anatomy of the biceps-labrum complex (BLC), the clinical evaluation of patients with LHBT pathology, advanced imaging modalities, and both

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nonoperative and operative treatment strategies for LHBT pathology in overhead athletes.

Anatomy and Function

The anatomy of the LHBT is complex and includes the tendon itself, the biceps stabilizing pulley, the superior labrum, and the glenoid. The term "biceps-labrum complex" (BLC) comprehensively incorporates the relevant anatomy and has the following 3 zones: the inside, the junction, and the bicipital tunnel.[8] The inside region includes the superior labrum and the LHBT anchor at the supraglenoid tubercle, whereas the junction includes the intra-articular LHBT and its stabilizing pulley. During standard glenohumeral arthroscopy, both the inside and junction components can be visualized and evaluated. Unfortunately, the bicipital tunnel is extra-articular and cannot be visualized during standard glenohumeral arthroscopy, and thus often possesses hidden lesions. This zone includes the LHBT beginning at the articular margin of the humeral head and extending to the subpectoral region, and encompasses the fibro-osseous tunnel that stabilizes the LHBT within the groove.[8,9]

Regarding BLC lesions, the thrower's shoulder deserves special attention given its unique mechanics. Pitchers and other overhead athletes have high clinical expectations, often with goals of returning to high-level competition, emphasizing the need for proper diagnosis and management in these patients. The baseball pitch is the fastest described human motion, often exceeding 7000°/s. This places tremendous force through the shoulder and can exceed 1000 N in professional pitchers.[10] Some believe that the etiology of BLC lesions in these athletes involves tension during the deceleration phase of throwing that can lead to both LHBT lesions as well as SLAP tears, or peel back during the late-cocking phase of throwing. These lesions may be exacerbated by the presence of associated anterior microinstability or glenohumeral internal rotation deficit (GIRD) and are often seen in combination with other shoulder pathology such as rotator cuff tears.[11-13]

The function of the LHBT is poorly understood and very controversial. It has been hypothesized to act as a humeral head depressor, as superior migration of the humeral head has been demonstrated by some authors after loss of the LHBT.[14,15] Some believe that the LHBT also acts as a dynamic anterior humeral head stabilizer. There is evidence in cadaveric studies that the contraction of the biceps decreases anterior translation in the position of anterior apprehension (abduction and external rotation), and detachment of the LHBT increases strain on the inferior glenohumeral ligament complex and also increases anterior-inferior translation.[16-19] An in vivo study also suggests a role of the LHBT as a dynamic stabilizer of the glenohumeral joint.[20]

The shoulder in the overhead athlete is under greater stress and has unique kinematics compared with the norm, and understanding the role of the biceps in these patients is essential to optimize their outcomes and return them to sport. Several studies have helped elucidate the role of the biceps in these athletes. During throwing in a healthy shoulder, the biceps appears to act predominantly as an elbow flexor, with moderate activity present in the cocking phase of throwing. This activity decreases in the acceleration phase, but biceps activity maximizes during the deceleration phase to control the elbow extension.[21,22] In athletes with a diagnosis of glenohumeral instability, electromyography has demonstrated increased biceps activity in these patients during arm acceleration, suggesting that these athletes attempt to recruit biceps contraction as a dynamic stabilizer in this setting.[21] However, more recent data suggest that the LHBT has little stabilizing function in vivo. Giphart et al demonstrated that in patients who underwent unilateral, open subpectoral biceps tenodesis (OBT), glenohumeral motion during simulated throwing and lifting did not differ between the tenodesed shoulder and the contralateral, normal shoulder.[23] These results are strengthened by multiple studies demonstrating no proximal migration, no glenohumeral instability, and good functional outcomes in patients after OBT.[24,25] Although these data suggest limited effect of biceps tenodesis on the overhead throwing motion, further clinical data reporting return to competitive throwing following tenodesis are required before more definitive recommendations can be made.

Physical Examination

The LHBT is densely innervated with pain fibers, making this structure a notorious pain generator.[26] In throwers, the etiology of LHBT lesions is believed to be repetitive microtrauma, although acute trauma is possible.[27] Distinguishing biceps tendon pain from other causes of pain in the shoulder can be challenging, as studies suggest that pain generators can be referred to multiple anatomical locations.[28] Overhead athletes with LHBT pain unfortunately often have coexisting pathology, such as subacromial impingement, rotator cuff tears, or SLAP lesions, which can confound the diagnosis and physical examination findings.[29,30] SLAP lesions can present with similar symptoms to LHB tendinitis, and SLAP lesions are notoriously difficult to diagnose using solely the physical examination. Thus, the surgeon should always consider various pathologic conditions in the differential diagnosis and should have a strong clinical suspicion for coexistent pathology, especially in the throwers shoulder. However, it is important to identify the LHBT as a source of pain in the preoperative setting, particularly if surgery is planned.

The physical examination should begin with a complete assessment of range of motion (ROM) and a thorough neurovascular examination, including strength testing of the supraspinatus and infraspinatus. Special attention should be paid to the subscapularis, of which lesions to the upper part of this tendon can be associated with biceps tendon lesions and LHBT instability. Special tests for the subscapularis include the belly-press test, the lift-off test, and the bear-hug test. The examination should also elucidate subacromial impingement symptoms and assessment for glenohumeral instability with apprehension tests, load and shift tests, and the presence of a sulcus sign. Although most overhead athletes would not present with frank instability, microinstability can present with isolated pain in these patients.[31] Careful attention should be paid to GIRD in the overhead athlete, which is associated with