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Research Paper Review

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Diagnosis of Long Head of Biceps Pathology

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ABSTRACT

INTRODUCTION: *Previous reviews have described the limitations of examination and diagnosis of the LHBT through various modalities. The purpose of this review is to summarise the current tools available for LHBT diagnosis, assess their effectiveness and discuss emerging techniques to improve diagnostic accuracy. Directions for future study are described to improve preoperative planning and intraoperative detection of LHBT pathology.*

METHODS*: This article was a narrative review. As such, no study methodology was outlined.*

CONCLUSION*: At this point, no single method of detecting pathology has been identified. The authors of this review suggest a combination of clinical judgement, history and physical examination, preoperative imaging studies, and intraoperative examination as the preferred algorithm for the diagnosis of LHBT lesions. Physical examination should emphasize the active compression test, palpation of the biceps groove, and standard orthopedic tests such as Speed's and Yergason's.*

ANALYSIS

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Background Information

Diagnosis of long head of the biceps tendon (LHBT) pathology is challenging. The history often includes vague and inconsistent complaints (1) and physical testing is often unreliable in isolation, while lacking sensitivity and specificity even when used in combination (2). Ultrasound (US) has shown 100% specificity in detecting dislocation and rupture of the LHBT. However, these are less common conditions and US is less useful for detecting more common problems such as partial thickness tearing (3). The utility of US can also be limited by technician skill. MRI is even less useful, with non-enhanced MRI only showing a sensitivity of 27% and specificity of 84% for lesions of the LHBT (5). Individuals with shoulder pathology often subsequently undergo glenohumeral arthroscopy. However, this has been shown to only detect 67% of the LHBT pathology found on open examination and to underestimate pathology in 56% of cases (7).

This review examined emerging technologies and how they are improving the quality of existing technologies to provide a better understanding and more complete diagnostic capabilities of the LHBT complex.

Summary

History**:**

LHBT pathology most commonly presents with anterior shoulder pain on exertion, described as pain on the anteromedial shoulder with radiation toward the distal muscle belly or deltoid origin. Often there is no specific history of trauma but there may be a history of repetitive overhead activity (8).

LHBT lesion descriptions are often divided into three zones: intra-articular, junctional, and within the biceps groove. However, the clinical presentation does not reliably correlate with the zone affected by pathology. LHBT lesions are commonly associated with other shoulder pathologies and the concomitant pain from other intra- or extra-articular sources may confound the presentation.

In cases of bicep tendon subluxation or rupture, there can be a discrete pop heard or felt, or with subluxations, a clicking or snapping which can be reproduced with specific activities or arm positions (9). Both are commonly associated with traumatic or degenerative changes in the rotator cuff. SLAP lesions commonly present with a history of repetitive overhead activity and poorly defined posterior shoulder pain in the area of the posterior deltoid and rotator cuff. The pain is exacerbated with activity and improves with rest and patients often complain of being unable to sleep on the affected side, reach behind their back, or perform overhead presses when weightlifting.

Physical Examination

The most common tests for the LHBT include Speed's test (sensitivity = 32-90%, specificity = 13.8-85%), Yergason's (sensitivity = 14-75%, specificity = 78-89%), and direct palpation of the bicipital groove (sensitivity = 53-57%, specificity = 54-74%) (10). O'Brien's test is also commonly used, although it is more commonly identified as a test for SLAP lesions. When used for LHBT lesions it has a sensitivity of 38-68% and specificity of 46-61% (10). The upper cut test is less commonly used and has a sensitivity of 73% and specificity of 78% (11).

Arrigoni et al. (12) describe an additional test, the biceps resisted flexion test. In this test, the patient is seated, arm at their side with the elbow flexed to 90 degrees. The patient maintains maximum resisted flexion for 5 seconds while their strength is measured with a digital dynamometer. Patients with LHBT lesions showed significantly lower strength and the test has a reported sensitivity of 60% and specificity of 88%. The test has the advantage of having an objective numeric scale but also the disadvantage of requiring additional equipment and not being able to determine the location of the lesion.

Taylor et al. (13) suggest a "3-pack" examination including the active compression test, throwing test, and bicipital tunnel palpation. The throwing test involves abducting the shoulder to 90 degrees in maximal external rotation with the elbow flexed to 90 degrees to mimic the late cocking phase of throwing. The patient steps forward with the opposite leg, while moving the arm into the early acceleration phase while the examiner provides resistance to the motion at the level of the wrist. This combination was found to be 73% sensitive and 46-79% specific.

Advanced Imaging

Radiographs:

A standard shoulder series can be useful for diagnosing and/or excluding other bony pathologies, but have not been shown to be useful in the diagnosis of LHBT pathology.

Ultrasound:

US has been shown to have up to 100% specificity and 96% sensitivity in diagnosing biceps tendon dislocation or subluxation, but is less useful for diagnosing tears, especially partial tears (3). As well, it has not been shown to be effective in diagnosing intra-articular pathology due to the surrounding bony anatomy and limitations of the probe (4). Hsiao et al. (4) have suggested a technique for dynamic evaluation of the LHBT insertion at the superior labrum, utilizing a low-frequency curvilinear probe along with specific arm positioning and maneuvers, which may improve the diagnostic power of US for LHBT along its entire course. However, its effectiveness when compared to other techniques has not been studied.

Advantages to the use of US include lower cost when compared to other forms of advanced imaging, the fact that it is non-invasive, and the ability to perform the test in the office. The main disadvantage is the extent to which its usefulness is dependent on the skill of the technician.

Magnetic resonance imaging (MRI):

MRI has also been shown to incompletely evaluate the LHBT, showing a sensitivity of 77% for intra-articular lesions, 43% for junctional lesions, and 50% for bicipital tunnel lesions (14). When gadolinium contrast is added, magnetic resonance arthrogram (MRA) shows an increased ability to detect SLAP lesions (16), however, no additional benefit is seen over non-contrast MRI for more distal lesions. As well, comparisons of 3D and 2D MRA have shown them to be equally effective for detecting SLAP lesions and labral pathology, with 3D MRA having shorter imaging times (6).

Despite the limitations of MRI, some other features detectable on MRI have been shown to be highly indicative of LHBT pathology, with the presence of cystic changes on or around the lesser tuberosity strongly associated with LHBT and subscapularis tears (17). As well, MRI has shown 100% sensitivity in the diagnosis of subluxation or dislocation of the LHBT (15).

Arthroscopy:

Arthroscopy is commonly used as the gold standard in studies of LHBT diagnosis. However, it too has its limitations. Gilmer et al. (7) compared arthroscopy to open observation in patients undergoing biceps tenodesis and found that arthroscopy only evaluated 32% of the biceps tendon, and only identified 67% of pathology found on open examination. This calls the use of arthroscopy as the gold standard into question. However, while open examination may be the most accurate, it is also the most invasive.

Saithna et al. (18) have suggested an alternative technique for a direct biceps tenoscopy that may allow for a complete assessment of the LHBT all the way to the subpectoral terminus without requiring open examination. This technique, while not detailed in the review, allowed for a mean length of 104 mm of the tendon to be visualized compared to 33mm with standard glenhumeral arthroscopy.

CLINICAL APPLICATION & CONCLUSIONS

While some advances in diagnostic modalities have been made, it is still common for subtle pathologies of the LHBT, such as partial tearing or fraying, to be underestimated. At this point, no single method of detecting pathology has been identified. The authors of this review suggest a combination of clinical judgement, history and physical examination, preoperative imaging studies, and intraoperative examination as the preferred algorithm for the diagnosis of LHBT lesions. Physical examination should emphasize the active compression test, palpation of the biceps groove, and standard orthopedic tests such as Speed's and Yergason's. *EDITOR'S NOTE: as with many body regions or structural injuries, clinicians should aim for a combination of positive (or negative) orthopedic tests when attempting to accurately rule a condition in or out.*

The primary treatment suggested for all forms of LHBT pathology is tenodesis and tenotomy. These treatments have been shown to have a relatively low complication rate and generally positive reported outcomes. However, there is some concern about possible overtreatment. (*NOTE: This paper was clearly aimed at surgeons, therefore, no non-surgical treatment options were discussed.*).

Further research is clearly needed. The authors suggest a prospective, cross-sectional study of pain location, radiation, and aggravating/relieving factors in patients with shoulder pain that is ultimately diagnosed as LHBT pathology in order to further characterize this patient population. As well, a better understanding of the relevance of the exact pathology should be a bigger priority than developing a better method of visualizing the entire tendon. We need further guidance on how injury location and characteristics may guide treatment selection. At this time, there is not a lot of literature to direct the application of manual or conservative treatment for LHBT conditions.

STUDY METHODS

This article was a narrative review. As such, no study methodology was outlined..

STUDY STRENGTHS/WEAKNESSES

Strengths:

- These authors provided comprehensive summary of the state of the (mainly surgical) literature on evaluation of LHBT pathology.

Weaknesses:

- The article was written from a surgical standpoint. Therefore, no information was provided on non-surgical methods of treatment which may be beneficial in cases of LHBT injury.

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Additional References:

1. Bedi A, Allen AA. Superior labral lesions anterior to posterior-evaluation and arthroscopic management. Clin Sports Med 2008; 27: 607-630.

2. Cook C, Beaty S, Kissenberth MJ, et al. Diagnostic accuracy of five orthopedic clinical tests for diagnosis of superior labrum anterior posterior (SLAP) lesions. J Shoulder Elbow Surg 2012; 21: 13-22.
3. Armstrong A, Teefey SA, Wu T, et al. The efficacy of ultrasound in the diagnosis of long head of the biceps tendon pathology. J Shoulder Elbow Surg 2006; 15: 7-11.
4. Hsiao MY, Hung CY, Chang KV, et al. Dynamic Ultrasonography of the Intra-Articular Long Head Biceps Tendon and Superior Labrum. Am J Phys Med Rehabil 2016; 95: e183-184.
5. Dubrow SA, Streit JJ, Shishani Y, et al. Diagnostic accuracy in detecting tears in the proximal biceps tendon using standard nonenhancing shoulder MRI. Open Access J Sports Med 2014; 5: 81-87.
6. Jung JY, Yoon YC, Choi SH, et al. Three-dimensional isotrophic shoulder MR arthrography: comparison with two-dimensional MR arthrography for the diagnosis of labral lesions at 3.0 T. Radiology 2009; 250:498-505.
7. Gilmer BB, DeMers AM, Guerrero D, et al. Arthroscopic versus open comparison of long head of biceps tendon visualization and pathology in patients requiring tenodesis. Arthroscopy 2015; 31: 29-34.
8. Nho SJ, Strauss EJ, Lenart BA, et al. Long head of the biceps tendinopathy: diagnosis and management. J Am Acad Orthop Surg 2010; 18:645–56.
9. Nho SJ, Frank RM, Reiff SN, et al. Arthroscopic repair of anterosuperior rotator cufftears combined with open biceps tenodesis. Arthroscopy 2010; 26:1667–74.
10. Hegedus EJ, Goode AP, Cook CE, et al. Which physical examination tests provide clinicians with the most value when examining the shoulder? Update of a systematic review with meta-analysis of individual tests. Br J Sports Med 2012; 46:964–78.
11. Ben Kibler W, Sciascia AD, Hester P, et al. Clinical utility of traditional and new testsin the diagnosis of biceps tendon injuries and superior labrum anterior and posteriorlesions in the shoulder. Am J Sports Med 2009; 37: 1840–7.
12. Arrigoni P, Ragone V, D'Ambrosi R, et al. Improving the accuracy of the preoperativediagnosis of long head of the biceps pathology: the biceps resisted flexion test. Joints 2014; 2: 54–8.
13. Taylor SA, Newman AM, Dawson C, et al. The "3-Pack" Examination Is Critical for Comprehensive Evaluation of the Biceps-Labrum Complex and the Bicipital Tunnel: A Prospective Study. Arthroscopy 2017; 33: 28–38.
14. Taylor SA, Newman AM, Nguyen J, et al. Magnetic resonance Imaging Currently fails to fully evaluate the Biceps-Labrum complex and Bicipital tunnel. Arthroscopy 2016; 32: 238–44.
15. Razmjou H, Fournier-Gosselin S, Christakis M, et al. Accuracy of magnetic resonance imaging in detecting biceps pathology in patients with rotator cuff disorders:comparison with arthroscopy. J Shoulder Elbow Surg 2016; 25: 38–44.
16. De Maeseneer M, Boulet C, Pouliart N, et al. Assessment of the long head of the biceps tendon of the shoulder with 3T magnetic resonance arthrography and CT arthrography. Eur J Radiol 2012; 81: 934–9.

17. Celikyay F, Yuksekkaya R, Deniz C, et al. Locations of lesser tuberosity cysts and their association with subscapularis, Supraspinatus, and long head of the biceps tendon disorders. Acta Radiol 2015; 56: 1494–500.
18. Saithna A, Longo A, Leiter J, et al. Shoulder arthroscopy does not adequately visualize pathology of the Long Head of Biceps Tendon. Orthop J Sports Med 2016; 4: 1–6.