Biceps Tendonitis

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Pathology

Biceps tendonitis is defined as tenosynovitis of the long head of the biceps tendon. Biceps pathology has a wide range from acute tendonitis all the way to degenerative tendinopathy. The origin of the long head is the supraglenoid tubercle and superior labrum. From the origin, the tendon courses laterally into the intertubercular groove of the humerus and then courses down to the biceps muscle. The tendon is housed in the intertubercular or bicipital groove and is stabilized by the coracohumeral ligament, superior glenohumeral ligament, and rotator cuff muscles. These surrounding structures create a pulley-like course. The proximal portion of the tendon is at higher risk of abrasive wear and tear and injury. Overuse, anterior shoulder trauma, and concomitant rotator cuff injury can all contribute to biceps tendinopathy.

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What Is it?

The primary function of the biceps is elbow flexion and forearm supination. When the arm is externally rotated, it can also have a role in shoulder abduction.

Primary biceps tendonitis is less common compared to it being a secondary finding in shoulder pathology due to its close approximation with other structures around the shoulder joint. The biceps tendon sheath is associated with the glenohumeral synovium and, therefore, is found to be commonly affected by inflammation caused by shoulder impingement syndrome, rotator cuff pathology, superior labrum anterior-posterior (SLAP) lesion, osteoarthritis, subacromial bursitis, and acromioclavicular joint pathology [1]. A systematic review with a sample size of 599 within 5 included studies showed the percentage of associated lesions of long head of biceps tendon and supraspinatus tendon between 22% and 78.5% [2].

The innervation to the biceps tendon has not been classified; however, preliminary studies have shown that there is a network of sensory and sympathetic nerves that supply the tendon. These nerves disproportionally innervate the proximal part of the tendon toward the origin as well. It has also been proposed that substance P and calcitonin gene-related peptide are involved as neuromodulators for not only inflammation and pain but also tendon healing and regrowth [3].

The biceps tendon has blood supply from the anterior humeral circumflex artery. Cadaveric studies have proposed that the undersurface of the tendon within the bicipital groove of the humerus is a critical area of avascularity, which may contribute to increased risk of injury [4].

Clinical Presentation

Biceps tendonitis often can be preliminarily diagnosed with thorough history and physical exam. Patients with this condition will typically present with anterior shoulder pain which is exacerbated with shoulder flexion and overhead activity. The course is typi-

cally a progressive pain that is atraumatic in nature. Some patients may have radiating pain from the shoulder down the front of the arm. In addition, it is helpful to inquire about any patient history involving sports (baseball, volleyball, or other overhead activities) and physical labor in occupation.

As mentioned earlier, it is important to keep a broad differential diagnosis when suspecting biceps tendonitis given its common presentation as a secondary injury. For example, trauma and instability are typically not a primary cause of biceps pathology; however, trauma causing a SLAP tear with shoulder instability could result in biceps tendonitis. In addition, the practitioner should inquire if the patient has any associated neck pain as cervical radiculopathy should be ruled out.

There should be a high clinical suspicion for biceps tendonitis if the nature of the injury is traumatic and includes pain with abduction. The pain can be dull at rest, sharp with exacerbation with shoulder flexion, and typically not associated with neck pain.

Physical Exam

Due to a wide differential of shoulder pathologies, physical exam alone is difficult to diagnose biceps tendonitis in anterior shoulder pain. Typically, biceps tendonitis will have point tenderness at the anterior shoulder in the bicipital groove where the shoulder lies. It is important to find out which direction of shoulder movement exacerbates the pain and what range of motion the patient can do actively and passively. Establishing a baseline for range of motion evaluation is a good way to follow the progress of the patient as they undergo treatment. The unaffected shoulder should also be tested for comparison. On inspection, the gross deformity of budging of the biceps muscle is called a “Popeye sign” which is a finding in proximal biceps tendon rupture.

The special tests for biceps tendonitis are Yergason’s test and Speed’s test. Yergason’s test is when the patient’s shoulder is placed at their side, the elbow is flexed to 90 degrees, and the patient is instructed to supinate their forearm while resisted by the physician. Speed’s test is when the patient supinates their fore-

arm, extends their arm, and flexes the shoulder against resistance. Pain in the bicipital groove or radiating down the anterior arm is considered a positive test for biceps tendonitis. However, each test is not reliable if performed alone. In a study of 125 patients with ultrasound testing for confirmation, the sensitivity and specificity of Yergason's test were 32% and 78% and of Speed's test were 63% and 58%. The study did also show that combined Yergason's test and bicipital groove tenderness did show higher specificity (over 70%) compared to single tests [5].

Other special tests conducted were the empty can test which tests for rotator cuff injury and the Hook's test which tests for the integrity of the distal biceps tendon in the antecubital fossa. The Hook's test involves placing the patient's shoulder into abduction to 90 degrees, with flexion of the elbow and supination of the forearm. The examiner then tries to "hook" the distal biceps tendon. A positive test would be if the examiner is unable to palpate and hook the tendon, indicative of a distal biceps tendon tear.

Diagnostic Studies

Plain radiograph films are helpful for observing arthritic changes within the acromioclavicular and glenohumeral joint but are not diagnostic or revealing for biceps tendon pathology. The modalities for diagnosing biceps tendonitis include high-quality ultrasound, MRI, and magnetic resonance arthrography (MRA). MRI without contrast is often ordered; however, studies have shown that compared to the arthroscopic exam (the gold standard of biceps tendinopathy diagnosis), MRI is a poor imaging modality for ruling out tendinopathy. A study with 66 participants comparing non-contrast MRI to arthroscopic exam showed that the MRI had a sensitivity of 27.7% and specificity of 84.2% for partial long head biceps tears. In addition, although a non-contrast MRI can be helpful for surgical planning in shoulder pathology, a surgeon may be unaware of the biceps tendon pathology until directly visualized in surgery [6].

The superior imaging modality is MRA. MRA involves injection of contrast within the joint capsule, which helps to better visualize structures within the joint. A study with 42 patients with

confirmed surgical diagnosis of long head biceps pathology had MRAs reviewed by two separate radiologists and found overall high sensitivity and specificity for detecting abnormalities (tendinopathy and rupture). The reported sensitivity and specificity for observer 1 was 92% and 56% and observer 2 was 89% and 81% [7].

Ultrasound is a cost-effective imaging modality that can be quickly completed by an experienced musculoskeletal operator. Ultrasound is best utilized to visualize the extra-articular portion of the tendon, as it cannot visualize the tendon within the joint. The ultrasound is conducted to show the biceps tendon sitting within the bicipital groove (Figs. 3.1 and 3.2). In ultrasound diag-

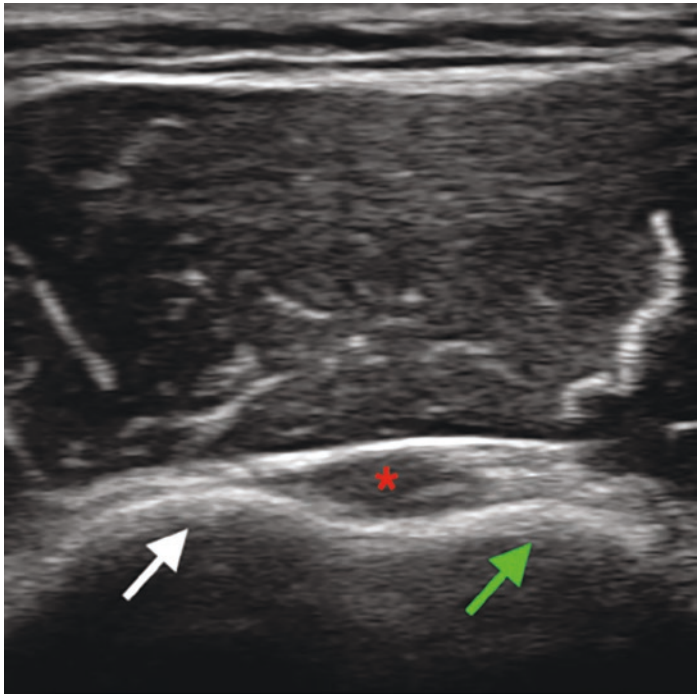

Fig. 3.1 Short-axis ultrasound image showing a normal biceps tendon (red *) sitting within the bicipital groove, which lies between the greater (green arrow) and the lesser tubercle (white arrow) of the humerus

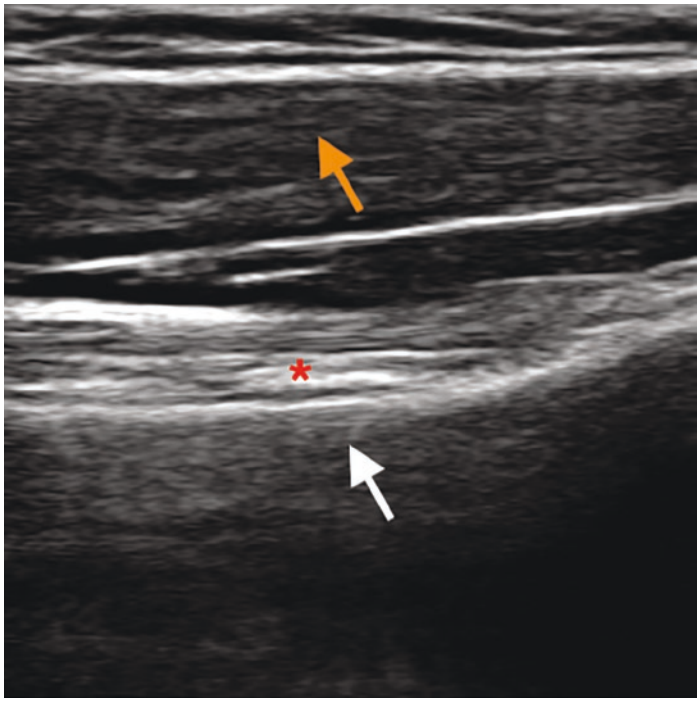

Fig. 3.2 Long-axis ultrasound image showing a normal biceps tendon (red *) running along the humerus (white arrow) and underneath the deltoid muscle (orange arrow)

nosis of tendinopathy, the structure will appear abnormally hypoechoic, and possibly partially thickened, and may have an effusion around the tent (Fig. 3.3). Doppler can be used to visualize active inflammation in the tendon sheath. Moderate tenosynovitis can be visualized as hyperechoic tissue around the tendon [8]. In a study comparing ultrasound to arthroscopy showed that ultrasound detected nearly all cases of tendon subluxation, dislocation, and complete ruptures but was poor at detecting partial ruptures [9]. Regarding tendinopathy specifically, ultrasound had a low sensitivity (0.22–1.00) and a high specificity

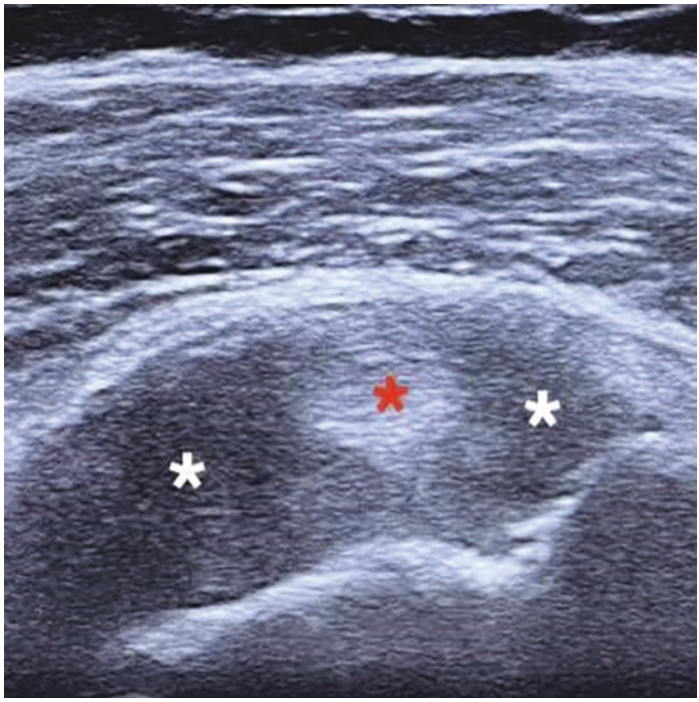

Fig. 3.3 Short-axis ultrasound image showing a large effusion (white *) around a biceps tendon (red *)

(0.88–1.00), which suggests that ultrasound may be a poor screening tool but a useful diagnostic tool [10].

In a nontraumatic presentation, without signs of contributing shoulder pathology, there typically is enough evidence clinically to diagnose biceps tendonitis from history and physical exam alone. If conservative treatment fails, to further diagnose or plan for injections, ultrasound can be considered after plain radiologic films to look for tears or effusion. MRI would be useful to determine the extent of his injury for possible surgical considerations and planning.

Treatment

Treatment is categorized as nonsurgical or surgical management. Once biceps tendonitis is clinically suspected or diagnosed with imaging, and conservative treatment should be started in the acute phase. This includes rest, specifically avoiding any exacerbating sports or activities, and nonsteroidal anti-inflammatory medications. Ice can be helpful to reduce inflammation. If the patient has improvement in pain with anti-inflammatory measures and rest, physical therapy should then be initiated to assist with ROM, strengthening of shoulder rotator cuff and girdle muscles surrounding the scapula.

If the pain severity persists despite oral medications, rest, or after 6–8 weeks of physical therapy, glenohumeral intra-articular or biceps tendon sheath injection can be administered [11]. Typically, a mixture of lidocaine and steroid is prepared as the lidocaine will provide an immediate pain-relieving component while the steroid will provide longer-lasting anti-inflammatory effects. Since the biceps tendon synovium is associated with the glenohumeral joint, an injection into the glenohumeral joint space can provide relief at the proximal biceps tendon (Nho 2010). Regarding accuracy, ultrasound-guided injections have been shown to have much higher successful injection rates (87%) compared to blind injections (27%) [4]. Injection of the biceps tendon involves the patient being supine with their arm externally rotated and hand supinated. The US transducer is placed perpendicular to the biceps tendon as it courses through the bicipital groove. The approach is then usually done in place from lateral to medial so that the needle can be visualized. Ideally, the best position for the needle is beneath the tendon to avoid injecting the subdeltoid bursa [12].

If tendonitis pain continues or worsens despite 6–8 weeks of conservative measures and steroid injections, the patient should be referred to orthopedics for surgical evaluation. Patients should also be referred for surgical evaluation if there are additional shoulder injuries, including tendon dislocation or subluxation, rotator cuff tears, or labral tears.

This chapter will not go into great depth of the surgical procedures offered; however, these options include biceps tenodesis and biceps tenotomy, which are considered to be simple and safe procedures, with high rates of patient satisfaction. Tenodesis involves cutting of the biceps tendon and reattaching it to the bicipital groove or transverse humeral ligament with sutures or screws. A tenotomy involves cutting the biceps tendon without reattaching it, allowing it to retract out of the shoulder joint [1, 13–15].

Return to Activities

Return to activity following a diagnosis of biceps tendonitis depends on a variety of factors. It is useful to consider whether the patient has undergone operative management or not. For a patient who does not undergo operative treatment, the patient is advised to return to the prior level of functional activity when s/he has full ROM and no pain or tenderness with a satisfactory clinical examination. Maintaining and continuing to improve upper extremity and core strengthening, flexibility, and neuromuscular drills are encouraged [16].

If the patient is an overhead athlete, another option for maintaining shoulder strength and flexibility is initiation of the Thrower's Ten program. This is a ten-step program that exercises all the major muscles necessary for throwing [16]. This includes the use of dumbbells, a chair, a table for support, a light resistance band tube, and a towel. There are various exercises performed including external and internal rotation at the waist and shoulders, abduction at the shoulder, press-ups, push-ups, and other exercises to strengthen and improve the overall power and endurance of the muscles surrounding the shoulder.

For patients undergoing operative management such as distal biceps repair, the average return to work timeline is just beyond 14 weeks. Averaged across all types of distal biceps repairs, a recent systematic review found that 89% of patients fully returned to work. This can be determined by a variety of meth-

ods by the clinician, such as achieving a passing score on the ASES (American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form) and SANE (Single Assessment Numeric Evaluation). The ASES assesses a patient's pain levels during a variety of tasks, and the SANE evaluates the patient's perception of his or her extremity functionality compared to pre-injury status [17].

Conclusion

Biceps tendonitis is overall a tenosynovitis of the shoulder that is observed less often as a primary injury but can commonly occur secondary injury with other shoulder pathology. History and physical exam alone can diagnose this condition, and MRA is the superior imaging choice, while ultrasound is the most cost-effective. Treatment includes conservative measures such as rest in the acute phase, anti-inflammatories, and ice. Physical therapy can be initiated following the acute phase, and if pain persists, a mixture of lidocaine and steroids can be administered. Orthopedic surgery referral can be recommended if these above interventions fail. Patients can generally return to activity when their pain has resolved, strength has been regained, and range of motion has improved.

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