Technical Note

Subpectoral Biceps Tenodesis With Interference Screw Fixation

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Abstract: The proximal portion of the long head of the biceps is a recognized cause of anterior shoulder pain. This article presents a novel technique for tenodesing the proximal biceps tendon. The tendon is evaluated and tenodesed in the same anatomic position beneath the pectoralis tendon, and is removed entirely from the bicipital groove. The proximal portion of the long head of the biceps tendon is marked near its origin and lysed arthroscopically. The skin incision for the subpectoral open biceps tenodesis is made in the axilla exposing the inferior border of the pectoralis major muscle. The tendon is withdrawn from the joint and out of the incision. A Krackow or other type of interrupted tendon whipstitch is placed in the 10 to 15 mm of tendon proximal to the musculotendinous junction. A bone tunnel is created within the bicipital groove. The tendon/tenodesis driver complex is positioned to create a secure fit within the bone tunnel. Our current series includes 22 cases with short-term follow-up of 2 to 10 months. None of the repairs has pulled out and none of the patients reports persistent pain or loss of function. The subpectoral approach with interference screw fixation appears to be a promising, reproducible technique for tenodesing the biceps. **Key Words:** Biceps—Shoulder—Tenodesis—Interference screw—Tendinosis.

The proximal biceps tendon has long been a recognized source of shoulder pain. Gilcreest[1] first described tenodesis of the long head of the biceps to the coracoid process in 1926. Since then, a multitude of techniques have been described for biceps tenodesis. Previous investigations considered instability of the biceps tendon within the bicipital groove as the cause of pain and biceps tendinosis. Therefore, initial techniques were designed to secure the tendon within the groove.[2,3] Froimson and Oh[4] opposed these techniques, arguing that leaving a proximal remnant of the biceps tendon could interfere with joint motion and be a persistent source of shoulder pain. In 1974, they developed the first technique using an interosseous tunnel into which the knotted end of the biceps tendon could be secured. While this keyhole method showed superior clinical efficacy, it was tedious and time consuming. Looking for a simpler and faster technique, Boileau et al.[5] and Edwards and Walch[6] developed an interference screw fixation technique, securing the proximal biceps tendon within the bicipital groove after arthroscopic tenolysis.

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EVALUATION OF THE PROXIMAL BICEPS TENDON

The diagnosis of proximal biceps tendon disease is challenging because of frequently associated pathology and the proximity of the rotator cuff, acromioclavicular joint, superior labrum, and anterior capsule.

Subjectively, the pain is at the anteromedial aspect of the shoulder in the area of the intertubercular groove. This differs from pain resulting from rotator cuff disease or pathology of the subacromial space, which is often localized to the anterolateral or lateral aspect of the shoulder. The shoulder pain of biceps tendinosis is often exacerbated by overhead activities and may "radiate" down the anterior arm into the biceps muscle.

Physical examination most commonly reveals tenderness over the intertubercular groove of the humerus, found by palpating the anterior shoulder approximately 7 cm below the acromion with the arm internally rotated 10°.[7] In proximal biceps tendinosis, tenderness over the intertubercular groove should move laterally with external rotation of the arm as the groove rotates, a technique that helps distinguish it from many other causes of anterior shoulder pain. Provocative tests that help discern causes of anterior shoulder pain include an active compression test of the biceps tendon in the bicipital groove, Speed's test (biceps tension test), O'Brien's test, and Yergason's test.

SUBPECTORAL BICEPS TENDON TEST

Palpation of the biceps tendon under the proximal aspect of the pectoralis major tendon can also implicate the biceps tendon as part of the pathology. In this subpectoral biceps tendon test, the proximal biceps tendon is easily identified underneath the pectoralis tendon while the patient internally rotates against resistance. This maneuver may produce discomfort in a normal shoulder, so it is important to compare the side in question with the unaffected side. Pain greater on the affected side, which is alleviated by intra-articular injection of lidocaine, suggests pathology in the bicipital groove. Pain here can be associated with synovitis which, in our experience, may cause premature failure of the biceps tenodesis within the groove.

IMAGING STUDIES

Radiologic studies that may be used to support the diagnosis of proximal biceps tendinosis are plain radiographs, arthrograms, ultrasound, and magnetic resonance imaging (MRI). The groove view on plain radiograph reveals the depth and width of the bicipital groove.[8] Tendinosis or synovitis is suggested when an arthrogram shows a loss of contour or thickened tendon sheath. However, a negative arthrogram can be expected in more than 30% of all cases of proximal biceps pathology.[9]

Ultrasound is an inexpensive, noninvasive test that provides the advantage of dynamic correlation to clinical examination. Furthermore, an examination of the unaffected side is easily carried out. The bicipital groove is examined transversely first, then longitudinally, looking for effusions or swelling surrounding the proximal biceps tendon.[10-14] A limitation of shoulder ultrasound is that its accuracy is highly dependent on the technician. Thus, its use is recommended as a diagnostic tool only for the radiologist well versed in musculoskeletal sonography.

MRI allows visualization of the biceps tendon, bicipital groove, bony osteophytes, and any fluid collection. Although cost often limits its use, one study has reported MRI to be 98% sensitive and 89.5% specific for superior labral pathology.[15]

NONOPERATIVE MANAGEMENT

Initial nonoperative management relies on principles of treating tendinopathy: Begin with anti-inflammatory modalities such as nonsteroidal anti-inflammatory drugs and ice/cold packs on a consistent basis. Rest and avoidance of aggravating activities are also important. If initial management is unsuccessful, then steroid injections either intra-articularly or in the subacromial space may be used. Techniques such as deep friction massage, iontophoresis, and phonophoresis have been used, although response to these is inconsistent.[16,17]

During nonoperative management, be mindful of the potential underlying causes of biceps tendinosis. Anterior instability, impingement, and chronic rotator cuff tears, for example, require special attention. In such cases, techniques such as cuff strengthening exercises and range-of-motion activities should supplement the aforementioned modalities.

INDICATIONS FOR BICEPS TENODESIS

The decision to surgically treat biceps pathology is predicated on a clinical presentation of bicipital groove pain, provocative tests, and response to injection that implicate the biceps tendon as a significant source of pain and disability. Proximal biceps pathology is frequently associated with rotator cuff disease, and is infrequently an isolated entity.

Furthermore, significant proximal biceps pathology is confirmed by arthroscopic examination. Findings on arthroscopic examination may include biceps tendinosis occurring with or without concurrent rotator cuff problems, biceps tendinosis in association with supe-