

Case Report

Subscapularis Tears in Our Younger Athletes

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Citation: Sutton KM (2017) Subscapularis Tears in Our Younger Athletes. Sports Injr Med 01: 111. DOI: 10.29011/2576-9596.100011

Received Date: 9 April, 2017; **Accepted Date:** 1 May, 2017; **Published Date:** 8 May, 2017

Abstract

Background: Subscapularis tendon tears are rare in the pediatric population due to the presence of the growing physis. Historically, the use of arthroscopic subscapularis repair has only been described in the adult population.

Hypothesis: The use of arthroscopy in the repair of subscapularis tendon tears in the skeletally immature population is a promising alternative to open repair.

Study design: Case report.

Methods: Two pediatric, skeletally immature patients were identified with complete subscapularis tendon tears resulting from athletic participation. Extent of rotator cuff pathology was evaluated through physical examination, X-rays, Magnetic Resonance Imaging (MRI), and diagnostic arthroscopy. Two different suture anchor systems were utilized for repair of the tendon tear in Case 1 and Case 2: Mitek Helix BR (DePuy Mitek, Raynham, MA) and Peek Bio-Corkscrew (Arthrex, Naples, FL), respectively. Immediate adequacy of repair was confirmed through intraoperative range of motion evaluation. Postoperative recovery included relative immobilization and graded physical therapy exercises. Surgical outcome was gauged at three months postoperative with active range of motion evaluation and thorough clinical evaluation; followed by evaluation of return to sport after 1 year postoperatively.

Results: The patient in Case 1 presented with an isolated one-centimeter retraction of the entire subscapularis tendon from the insertion. Pertinent positives on clinical exam were anterior shoulder pain, positive belly-press test, positive lift-off test, and internal rotation to vertebra T10. At ten weeks following repair, the patient denied pain and limitation; and, clinical evaluation revealed negative lift-off and belly-press test with internal rotation to vertebra T7. The patient in Case 2 presented with a subscapularis tendon tear with an associated non-displaced avulsion fracture of the proximal humerus. The subscapularis tendon tear retracted approximately two-centimeters from the avulsed fragment. At twelve weeks following arthroscopic repair, the patient denied pain and limitation; and, clinical evaluation revealed no instability, negative belly-press test and internal rotation to vertebra T12. Both patients returned to a pre-injury level of athletic performance following arthroscopic repair.

Conclusion: We present the cases for two reasons: first, because subscapularis tendon tears are rare in the pediatric population, and second, to describe the technique and outcome of arthroscopic repair of subscapularis tears in this specific population. In this report, we successfully described two arthroscopic surgical techniques to repair a rare pediatric injury and the postoperative outcomes that allowed early return to play.

Keywords: Arthroscopy; Pediatric; Rotator Cuff; Subscapularis

Introduction

Burkhart, et al. first described arthroscopic repair of tears

of the subscapularis tendon in 2002 [1]. Prior to advances in arthroscopy, allowing greater access to the anterior rotator cuff, the standard of care for subscapularis tears was open repair. Historically, there has been an association between subscapular tendon tears and other rotator cuff pathology, specifically supraspinatus

and infraspinatus tears. In fact, isolated subscapularis tendon tears are quite infrequent, occurring in approximately 3.0% to 4.9% of all arthroscopic rotator cuff repairs [2,3].

Most rotator cuff tears occur in adults. Pediatric rotator cuff tears are estimated to account for 1.0% of all rotator cuff tears [4]. When pediatric shoulder injuries occur, they are often the result of pathology other than rotator cuff tears: physeal disruption, proximal humerus fractures, or injury to the supporting soft tissue of the shoulder such as the labrum [5]. The low incidence of pediatric rotator cuff tears can be attributed to the presence of an open growth plate and relatively strong cuff tendon.

As a result of the rarity of this injury, we report the cases of two pediatric patients who presented with shoulder pain after sustaining traumatic injuries in sports participation. Subsequent clinical and radiological workup revealed isolated subscapularis tendon ruptures. We discuss the management, arthroscopic technique, and rehabilitation protocol used which led to optimal outcomes for both patients.

Case 1

The first case presented is that of a 14-year-old, skeletally immature boy who sustained a left shoulder injury playing football. As he fell to the ground, another player landed on his left shoulder resulting in forceful abduction and external rotation. There was no dislocation. Pertinent clinical exam findings included anterior shoulder pain, positive lift-off test, and a positive belly-press test. There were no impingement nor apprehension signs. Range of motion on exam revealed forward flexion from 0 to 130-degrees in the scapular plane, abduction 0 to 90-degrees, external rotation 0 to 45-degrees, and internal rotation to vertebra T10. Despite appropriate physical therapy with range of motion and strengthening exercises, the patient continued to report pain and weakness affecting the shoulder. A MRI arthrogram was performed revealing a subscapularis tear with 1 centimeter of tendon retraction from its insertion (Figure 1) and the long head of the biceps tendon positioned anatomically in the bicipital groove. No other shoulder pathology was demonstrated.

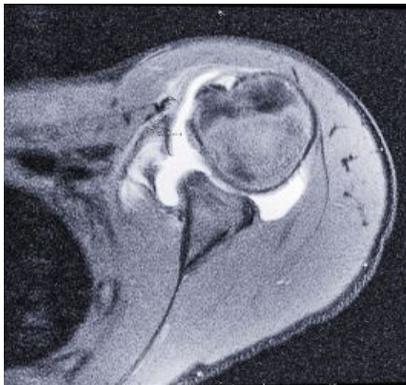


Figure 1: Case 1. MRI, Axial T1, Showing Isolated Subscapularis Tendon Tear of the Left Shoulder Measuring 13.4-Mm.

Arthroscopic repair of the subscapularis tendon injury was performed six weeks after the presenting injury. Beach chair position and the Spider arm positioner (Smith and Nephew) were utilized to facilitate extremity manipulation. Diagnostic arthroscopy of the left shoulder confirmed an isolated subscapularis tendon rupture (Figure 2) using the posterolateral portal. The long head of the biceps tendon was left intact. The anterior portal was positioned slightly medial to the acromioclavicular joint using a 6.5-mm trocar; and, the accessory anterolateral portal was created at the anterolateral corner of the acromion using a 5.5-mm trocar.



Figure 2: Case 1. Diagnostic Arthroscopy Confirming Isolated Left Subscapularis Tendon Tear.

A traction suture was placed into the tendon and brought out laterally. The footprint and sub coracoid space were debrided with a 4.5-mm shaver. A release of the tendon was performed allowing the tendon to rest on the footprint. A double-loaded Mitek Helix BR anchor (DePuy Mitek, Raynham, MA) was introduced into the lesser tuberosity. The sutures were brought through the tendon using horizontal mattress technique. The tendon was reduced to the lesser tuberosity with appropriate tension (Figure 3). Adequacy of fixation was confirmed as the shoulder was brought through a full range of motion, including internal and external rotation.



Figure 3: Case 1. Arthroscopic repair of left subscapularis tendon tear with double-loaded Mitek Helix BR anchor (Depuy Mitek, Raynham, MA).

Postoperative physical therapy was approached in a graded fashion: first, pendulum exercises for two weeks; second, passive and active assisted range of motion with restricted external rotation at two weeks; and third, active range of motion exercises at six weeks. At three months, the patient reported neither pain nor

limitation. His subjective shoulder value at that time was 95%. Range of motion on examination revealed forward flexion 0 to 170-degrees, external rotation 0 to 50-degrees, and internal rotation to vertebra T7. Lift-off and belly-press test were negative. The patient returned to contact sports one month later, including football. At one-year follow-up, he was participating in all of his pre-injury athletic activities at full capacity.

Case 2

The second case presented is that of a 12-year-old skeletally immature athlete who injured his right shoulder during a lacrosse game. Clinical and radiographic evaluation revealed a non-displaced right proximal humerus fracture with an associated subscapularis tendon rupture (Figure 4).



Figure 4: Case 2. MRI (Axial, T2 Fat-Suppressed) Showing Right Subscapularis Tendon Tear with Non-Displaced Avulsion Fracture of the Lesser Tubercle.

Arthroscopic repair of the shoulder pathology was performed in beach chair position and using the Spider arm positioner to facilitate extremity manipulation. Diagnostic arthroscopy of the affected shoulder revealed no other pathology within the glenohumeral joint. The sub coracoid space was debrided to allow for adequate visualization of the subscapularis tendon. Significant scar tissue was noted at the insertion of the subscapularis tendon. Further debridement of the tendon revealed that the ruptured tendon had retracted infero-medially approximately two centimeters; and, the inferior portion of the tendon was partially intact. The long head of the biceps tendon was positioned anatomically in the bicipital groove. Two anterior portals were placed in the rotator interval. A double-loaded 4.5-mm Peek Bio-Corkscrew suture anchor (Arthrex, Naples, FL) was placed at the inferior aspect of the subscapularis footprint on the lesser tuberosity. The ruptured tendon was anchored with horizontal mattress technique. A second Peek Bio-Corkscrew anchor was placed at the superior portion of the subscapularis footprint on the lesser tuberosity. Sutures were passed in simple fashion to anchor the ruptured tendon. The long head of the biceps tendon was left intact. Direct arthroscopic visualization and intra-operative fluoroscopy were used to confirm adequacy of repair, proper placement of suture anchors, and reduction of the fracture site. The patient was immobilized in a sling for one week postoperatively.

Postoperative physical therapy started at one week with passive protected range of motion with limited external rotation. Active range of motion began one month postoperative. Range of motion on examination at ten weeks postoperative revealed forward flexion 0 to 170-degrees, external rotation 0 to 70-degrees, and internal rotation to vertebra T12. No instability was apparent and belly-press test was negative. At one-year follow-up, the patient returned to all pre-injury athletic activities, including lacrosse.

Discussion

Shoulder injuries in pediatric athletes are not uncommon; and, injuries are often the result of trauma or overuse. However, rotator cuff injuries are not common in the pediatric population. The subset of rotator cuff injuries presented in this report, subscapularis tendon tears, are infrequent and represent approximately 2% to 7% of all rotator cuff tears [6].

Pediatric rotator cuff tears in the skeletally immature child are rare due to the presence of the growing physis. Under mechanisms that would result in adult rotator cuff tears, it is the physis that is more likely to fail instead of the surrounding soft tissue support due to mismatches in strength and elasticity [7,8]. Furthermore, when pediatric rotator cuff injuries occur, it is often accompanied by an avulsion fracture at the osseous insertion. Therefore, a diagnosis of an isolated subscapularis injury without bone avulsion may be missed without a history of anterior dislocation or adequate radiographic evaluation [9].

In 2002, Burkhart described a technique for arthroscopic repair of subscapularis tendon tears in adults [1]. There are few reports of arthroscopic repair of subscapularis tendon tears in the pediatric population. Kreuz, et al. found that the best prognosis in the adult population with subscapularis tendon tears with or without concomitant supraspinatus tears was with early repair [10]. Garrigues, et al. arrived at a similar conclusion in the pediatric population [11]. Thus, early diagnosis and treatment is paramount to ensure long-term functional recovery.

Historically, shoulder arthroscopy was difficult in the pediatric and adolescent population due to larger equipment and poor long-term data [12]. However, advances in the field of arthroscopy have created an alternative to open rotator cuff repair in the skeletally immature. In the skeletally immature athlete, arthroscopy can result in more rapid return to pre-injury performance, and thus, earlier return to play [13]. It is important to note that arthroscopy in this age population can be more challenging due to the smaller space with and using arthroscopic equipment sized for the adult population. Also, in this age group, it is important to consider leaving the long head of the biceps tendon intact to allow for maintenance of dynamic stabilization of the shoulder. Typically, in the adult population, a subscapularis repair would include a biceps tenodesis or tenotomy as the long head of the biceps tendon is usually subluxed [14].

We presented two cases of arthroscopic repair of subscapularis tendon tears in the skeletally immature patient for two reasons: first, because subscapularis tendon tears are rare in the pediatric population, and second, to describe the technique and outcome of arthroscopic repair of subscapularis tears. Prompt work-up with thorough clinical exam and radiographic evaluation, to include MRI, allowed early diagnosis and surgical intervention. As noted in our paper, not all skeletally immature subscapularis injuries are association with bony findings on radiographs. Arthroscopic repair was chosen to avoid the associated complications of open repair: scar formation, adhesions, and greater post-operative pain. Following repair, both patients returned to their pre-injury level of play free from pain or limitation. In the appropriate pediatric patient with subscapularis tendon tear, arthroscopic repair is a promising alternative to open rotator cuff repair.

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