Case report

Isolated subscapularis rupture in an adolescent – Arthroscopic repair and outcome – Case study

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A R T I C L E  I N F O

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1. Introduction

Subscapularis injuries in adolescents are a rarity, leading to frequent misdiagnosis on routine examination as cuff contusions or brachial plexus neuropraxias,\(^2\) more commonly known as "stingers" or "burners". In an acute setting, the severity of pain can often limit accurate examination and diagnosis. However, the potential for injury progression to a possible irreparable state highlights the importance of initially excluding rotator cuff tears in all adolescents. We hereby present a case of an adolescent male who sustained a traumatic rupture of his subscapularis tendon and discuss our management.

2. Case report

A 13-year-old boy sustained an injury to his right, dominant shoulder whilst playing rugby. He played football in the academy of a Premier League professional soccer club and county level rugby union. He was tackled running forward, falling heavily onto his fully abducted externally rotated right arm. He had immediate severe pain and was unable to continue playing. He sustained an anterior shoulder dislocation, which was relocated by a physiotherapist at the time of injury. Following two weeks of physiotherapy, a more significant injury was suspected and he was referred to the senior author.

On examination there was tenderness anteriorly. He achieved active flexion to 150° and abduction to 70°, with further movement limited by pain. He demonstrated external rotation to 50° with discomfort. There was possible anterior translation of the glenohumeral joint in 30° of external rotation. He had marked anterior apprehension of his shoulder at 80° abduction and 20° external rotation. Additionally, the patient had a positive belly press sign and bear hug test indicating involvement of the subscapularis. There did not appear to be any supraspinatus, infraspinatus or teres minor weakness and there was no bony injury. An Ultrasound scan revealed a large subscapularis tendon rupture.

A Magnetic Resonance (MR) Arthrogram confirmed the rupture of the subscapularis tendon with 3 cm of medial retraction (Fig. 1). There was no labral tear or Hill–Sachs lesion seen on the MR Arthrogram.

It was decided to perform an arthroscopy and reattachment of the subscapularis tendon. This was undertaken four weeks after the injury. The patient was positioned in the beach chair position under general anaesthesia. The shoulder was positioned using an arm holder (Allen). The optimal position for the repair was 70° flexion, neutral rotation and abduction.

The arthroscope was initially inserted into the glenohumeral joint posteriorly. One anterolateral and two anteromedial portals were used for instrumentation, created using an outside-in technique.

Arthroscopic inspection revealed a full thickness tear of the subscapularis tendon (Fig. 2). The tear was significant in size (3 cm medial retraction). There was an avulsion of the tendon from the lesser tuberosity. The tendon was thick and of good quality. The synovium was moderately proliferated throughout and the rotator interval was inflamed. There was no other injury seen.

The arthroscope was moved to the anterolateral portal for the repair (Fig. 3) and an additional anteromedial portal was created for instrumentation and anchor insertion. The tendon was mobilised and controlled with a traction suture (Fig. 4). In preparation of repair, the lesser tuberosity was freshened. The tendon was fixed to its original insertion using two 5.5 mm triple loaded suture anchors (Twiflex PK, Smith and Nephew), using a combination of mattress and simple sutures (Fig. 5). Following the repair the safe range of movement was assessed by moving the shoulder into abduction and external rotation, whilst observing the tension of the repair. The ‘safe zone’ was determined to be abduction to 70°, forward elevation to 140° and external rotation to 20°.

Postoperatively the patient was placed in a shoulder immobiliser for 3 weeks and underwent physiotherapy. Rehabilitation began with active assisted flexion and external rotation in the ‘safe zone’ as tolerated for 3 weeks, progressing to a fuller active range of movements to improve scapula and glenohumeral stability, as per our standard protocol.\(^3\) He was able to easily exceed the safe zone under supervision of his therapist without any discomfort after one...
week post-operatively and at 3 weeks he had almost full flexion, abduction to 90°, with only 20° of external rotation. At 6 weeks he was pain free and had regained full range of movement, with MRC grade 5 subscapularis strength on resistance testing. He returned to rugby skills training at 7 weeks and contact training by 10 weeks. He returned to soccer at 10 weeks. He played his first rugby game 12 weeks after surgery. At 14 months after surgery he was completely asymptomatic and playing county level rugby.

3. Discussion

Rotator cuff tears are a rare in adolescents, accounting for less than 1% of all tears.5,8 Their infrequent incidence is a result of a higher tissue strength, elasticity and resilience in youth,6,11 rationalising their regular misdiagnosis. The high prevalence of such tears amongst the middle-aged and elderly populations is due to degenerative changes of the rotator cuff that begin at 40 years.1 Subsequently, this means that with increasing age a reduced impact force is required to sustain such injury.1 Thus it is apparent that high energy trauma is necessary to cause rotator cuff tears in adolescents and supports the emerging association between this pattern of injury secondary to trauma experienced in competitive sports, particularly in those involving throwing.

In adolescents it is common for a rotator cuff tear to be accompanied with an avulsion fracture, as the cartilage and bony physis are weaker than the muscles and are therefore more likely to give.6,11 However, in our case we present an isolated rupture of subscapularis with no other accompanying tears or fractures; an added rarity to an already infrequent injury.4

On presentation, patients show a reduced range of movement with pain on passive movement. Such pain is often a major limitation for diagnosis on clinical examination alone and should warrant imaging to exclude rotator cuff tears in acute shoulder injuries in adolescents.

Tarkin et al.11 reported three cases of rotator cuff injuries where abnormalities were not found on the initial radiographs, but repeat images at a later time revealed calcifications adjacent to the affected tendon.11 However, previously reported cases have demonstrated avulsion fractures of the lesser tuberosity on plain axillary view radiographs.11 Therefore X-ray imaging is a useful
tool but not necessarily diagnostic. In our case no radiographs were taken and the tear was confirmed by an MR Arthrogram. Computer Tomography (CT) has been used in past cases in the literature but it is not as sensitive as Magnetic Resonance Imaging (MRI) in detecting full thickness cuff tears. Ultrasound scanning is also a useful diagnostic tool.

Several treatment methods have been discussed in the literature. Sugalski et al. presented a case of an adolescent baseball player who sustained an isolated subscapularis rupture with an avulsion of the lesser tuberosity. The injury was treated non-operatively, with rest followed by physiotherapy, and the outcome was successful. However, Browning et al. stated that full thickness rotator cuff tears are best managed by surgical methods in order to achieve full pre-injury function. The optimal time of surgery should be within three months of injury, to minimise the complications of scar tissue formation and atrophy.

Lehmann et al. and Polousky et al. each reported two cases of traumatic subscapularis injuries in adolescents that were repaired in open surgery, with three of the four patients having accompanying avulsion fractures. Another report presented two cases of subscapularis tears with avulsion fractures in young ice hockey players, where diagnostic arthroscopy was performed but open repair was the final management. Heyworth et al. recently presented three cases of isolated subscapularis ruptures with avulsion fractures, where the definitive treatment was arthroscopic repair and in each case this management was effective. In previous case studies, adolescents who have sustained traumatic tendon ruptures have been managed in a similar way to adults and factors such as open growth plates in adolescents did not alter the management. In our case diagnostic arthroscopy with arthroscopic cuff repair was performed with a successful outcome.

Open repair has been shown as an effective treatment method but there are disadvantages compared to arthroscopic repair. It is a more invasive procedure leading to greater postoperative pain and longer rehabilitation, accompanied with a larger scar. Arthroscopic repair can result in rapid progression to full function and symptomatic relief, meaning a short-term return to play in young athletes. However, successful arthroscopy requires an experienced surgeon to overcome a technically difficult operation.

Rotator cuff tears must be considered in the differential following an acute shoulder trauma in adolescents where radiographs are normal and movement is restricted by pain. MRI, MR Arthrogram and Ultrasound scanning can all confirm the diagnosis. We recommend arthroscopic repair of full thickness subscapularis tears with avulsion fractures in adolescents, followed by safe and supervised rehabilitation to achieve early full shoulder function and pain free activity.

References