

[Orthopaedics]

Massive Rotator Cuff Tear in an Adolescent Athlete: A Case Report

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Full-thickness rotator cuff tears in the young athlete are a rare injury. These injuries typically result from an acute traumatic event in a contact athlete, as opposed to overuse injuries more commonly seen in throwing athletes. Acute tears may be initially overlooked, with the symptoms attributed to other, more common causes, such as cuff contusion or brachial plexus neuropraxia (“stinger” or “burner”). If undiagnosed, the tear may progress to an irreparable state at the time of eventual diagnosis. Therefore, rotator cuff tear must be included in the differential for acute shoulder injuries in the young athlete. This article presents a case of an adolescent athlete with a traumatic, massive rotator cuff tear that was diagnosed and managed promptly with excellent outcome.

Keywords: rotator cuff tear; adolescent; athlete

Rotator cuff injuries are commonly attributed to repetitive overuse in the overhead throwing athlete in association with internal impingement and SLAP (superior labral anterior posterior) lesions.^{2,3} These tears tend to be articular sided and of partial thickness in nature.⁶ Acute traumatic injuries are much less common in this population¹¹ and often result in contusions of the rotator cuff, as opposed to discrete tears.⁷ However, when full-thickness tears do present in the young population, they are typically the result of acute trauma instead of overuse.¹¹ Despite the rarity, this injury should not be overlooked and must remain in the differential of shoulder injuries in the young athlete, including such entities as SLAP tears, “stingers”/“burners,” cuff contusions, and deltoid contusions. Contact athletes in particular may initially present with something similar to a “dead arm syndrome” with transient loss of use of the involved upper extremity.¹² If dismissed as a brachial plexus neuropraxia (stinger or burner), the rotator cuff tear may progress. Dead arm syndrome is often attributed to internal impingement and SLAP tears as well.^{5,6} Cuff contusions are also common in contact athletes and present with acute short-term loss of rotator cuff function.⁷ It has been our experience that traumatic rotator cuff tears progress more rapidly to the point of irreparability than do degenerative lesions in older patient populations. Timely diagnosis is therefore crucial.

CASE REPORT

A 16-year-old right-hand-dominant high school quarterback sustained injury to the left shoulder while attempting to score a touchdown. The left upper extremity was outstretched overhead, with the ball, as the patient dove into the end zone. As the patient landed, he was tackled from behind by another player, with direct contact to the posterior aspect of the left shoulder. The patient had immediate severe pain in the left shoulder and was unable to continue play. He was evaluated locally the following day owing to continued pain and inability to elevate the upper extremity. Radiographs revealed posterior humeral subluxation but no fracture. An magnetic resonance imaging (MRI) scan was ordered, and he was referred to our institution for further evaluation and management.

Our initial evaluation, 4 days postinjury, revealed a guarded posture and diffuse tenderness throughout the shoulder. Although passive range of motion was unrestricted (though with significant discomfort), the patient displayed limited active range of motion of the shoulder. Rotator cuff strength testing revealed 2/5 strength on shoulder abduction (supraspinatus) and external rotation (infraspinatus) with a positive lift-off test (subscapularis). Instability evaluation was limited, secondary to patient discomfort and guarding; however, no discrete anterior instability was documented with load and shift or with

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abduction and external rotation. The humeral head was resting posterior but in a reduced position. Increased translation and pain were present with a posterior load and shift, but the shoulder was not able to be dislocated. Sulcus sign was negative. The patient was neurovascularly intact.

The MRI revealed marked posterior subluxation of the humeral head with a large accumulation of edema and hemorrhage in the glenohumeral joint. The MRI also revealed complete, full-thickness tears of the supraspinatus and infraspinatus tendons from their insertions; a complete, full-thickness tear of the subscapularis with medial subluxation of the long head of the biceps tendon; and a probable full-thickness tear of the teres minor tendon (Figure 1).

The patient was subsequently taken to the operating room 7 days postinjury. Given the 4-tendon involvement, an open-cuff repair was planned; however, arthroscopy was recommended to first assess the labrum and biceps tendon. An arthroscopic evaluation was therefore performed and so demonstrated the marked hemorrhage and edema in the glenohumeral joint (Figure 2). The extensive injury to the rotator cuff was confirmed, as was instability of the biceps tendon. Remarkably, the glenoid labrum was found to be intact throughout its perimeter with no posterior labral disruption. A debridement of the tendon edges and hemorrhage was completed, the biceps released, and the arthroscope removed in preparation for the open approach. The arthroscopic portion of the case was kept brief to prevent excessive swelling from hampering the open repair.

A combined anterior and posterior approach was selected owing to concern that a single extended approach may not allow complete access to the extremes of the rotator cuff for repair. The posterior approach was first performed. A longitudinal incision was created overlying the deltoid and centered on the posterior glenohumeral joint. The posterior arthroscopic portal was incorporated into the incision. The deltoid fascia was incised, and upon splitting the deltoid fibers, the posterior humeral articular surface was in direct visualization, confirming a complete avulsion of the infraspinatus tendon and disruption of the posterior capsule (Figure 3). Involvement of the teres minor was also documented. Two bioabsorbable anchors with a total of 4 suture sets passed in horizontal mattress configuration were used to accomplish a repair of the infraspinatus and upper teres minor tendons.

A deltopectoral approach was then performed. Upon development of the interval, it was readily evident that the subscapularis tendon had completely avulsed off of its insertion onto the lesser tuberosity and the biceps tendon had subluxed medially out of the bicipital groove. During superior retraction, access to the supraspinatus was achieved and the full-thickness tear was easily identified. A total of 3 additional double-loaded bioabsorbable anchors were placed to repair the supraspinatus and subscapularis. With each anchor, both sets of sutures were passed in horizontal mattress configuration. In all, 5 anchors and 10 suture sets were used to complete the rotator cuff repair. The excellent tendon quality and mobility and strong repair resulted in confidence with a single-row repair. A second row was not deemed to be necessary. A biceps tenodesis was also performed

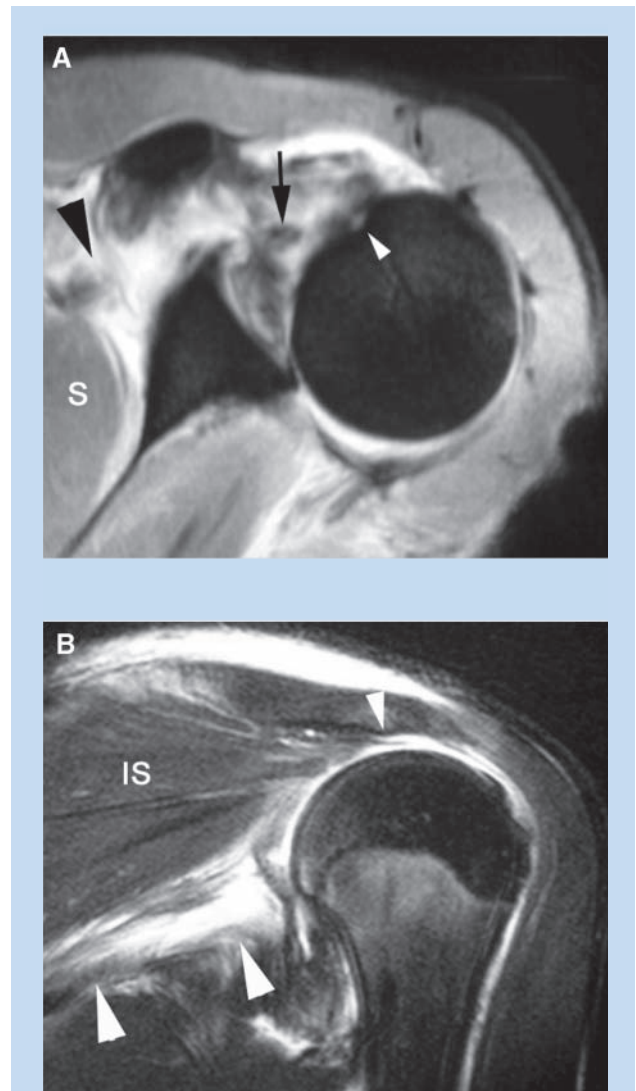
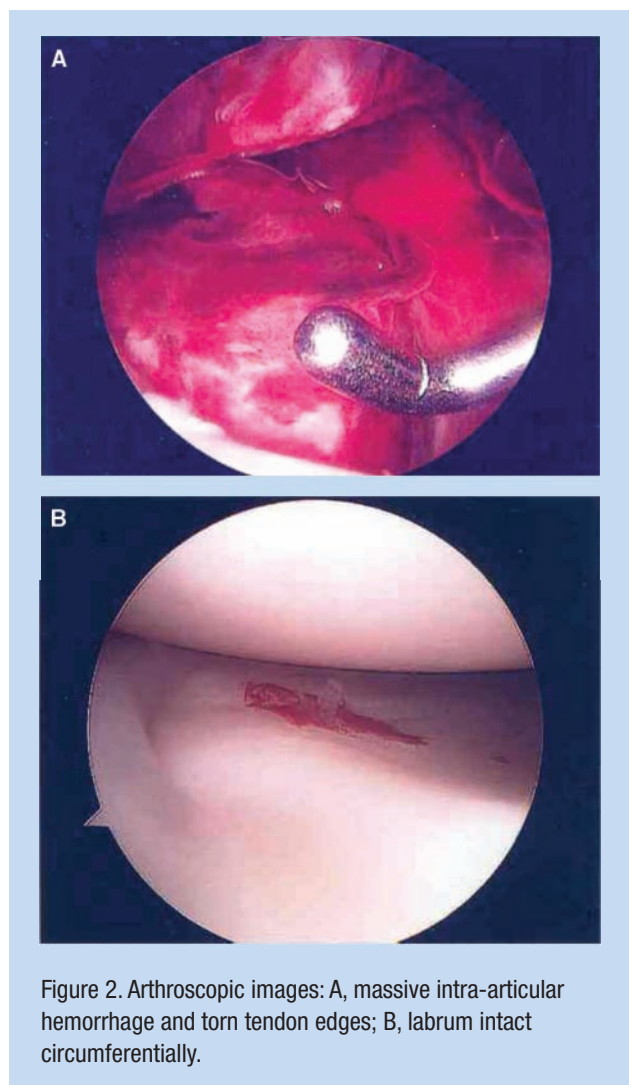


Figure 1. Preoperative MRI: A, gradient echo T2-weighted axial image (S = subscapularis muscle). The humeral head is severely subluxed posteriorly. The subscapularis tendon is completely torn and retracted (large black arrowhead). The long head of the biceps tendon (black arrow) is dislocated medially, out of the bicipital groove (small white arrowhead). Extensive, amorphous low-signal tissue in the anterior joint is compatible with hemorrhage. B, fat-saturated T2 oblique coronal image (IS = infraspinatus muscle). The infraspinatus tendon is completely torn and retracted (small white arrowhead). There is also complete rupture of the teres minor with extensive fluid and hemorrhage in its expected position (large white arrowheads).

through the anterior approach with the use of a bioabsorbable tenodesis screw. All wounds were thoroughly irrigated and closed. The patient was placed into an external rotation sling with the arm in neutral.

At 2-week follow-up, sutures were removed and the patient was continued in the external rotation sling. Elbow range of



motion and pendulum exercises were initiated. At 4-week follow-up, radiographs revealed a concentric reduction of the glenohumeral joint. Physical therapy was initiated for passive range of motion. At 8-week follow-up, the patient continued to show improvement but reported involvement in a motor vehicle accident 2 weeks beforehand (6 weeks following surgery) with transient increase in shoulder pain. Range of motion revealed forward flexion to 120° and external rotation to 20°. Due to the recent trauma, a repeat MRI was ordered. The MRI, eventually performed nearly 3 months postsurgery, revealed a concentrically reduced glenohumeral joint with no evidence of persistent or recurrent rotator cuff tear (Figure 4). Clinical follow-up at this time demonstrated continued improvements in motion with active forward flexion to 140° and external rotation comparable to the contralateral side at 60°. No instability was evident on clinical exam and the patient was without apprehension. At the last clinical follow-up, 5 months following surgery, the patient demonstrated 170°

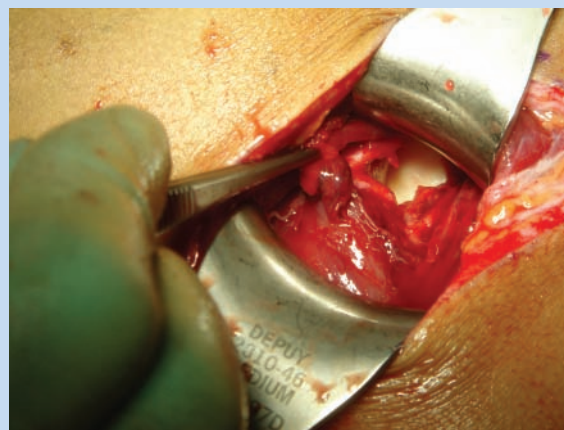


Figure 3. Posterior approach. Upon reflecting the deltoid, the articular surface of the humeral head and torn infraspinatus tendon are visualized.

of active forward flexion and abduction, external and internal rotation comparable to the contralateral side, and an intact rotator cuff throughout to strength testing. At 6 months, the patient had returned to baseball with no recurrent symptoms, and 1 year following injury he has returned to football without complaint.

DISCUSSION

Few reports of traumatic rotator cuff tears in adolescent and young adult patients exist in the literature. One case report of an intercollegiate football player with a high-grade partial thickness supraspinatus tear was reported after an axial load to the involved shoulder with impaction of the humeral head into the undersurface of the acromion.⁸ The patient was treated with arthroscopic evaluation followed by open rotator cuff repair and acromioplasty. The athlete returned to full activity following a structured 4-month, 7-phase rehabilitation program.

In 1996, Blevins et al reported on 10 contact athletes with traumatic rotator cuff injuries.⁴ All were the result of a direct blow to the shoulder while participating in football. Patients were aged 24 to 36 years old. There were 3 full-thickness tears, 5 partial-thickness tears, and 2 cuff contusions. All underwent operative intervention and 9 of 10 returned to football. The authors reported that internal injury within the rotator cuff and bleeding within the subacromial space (a cuff contusion) can lead to scar formation that results in an acute impingement process. They concluded that arthroscopic evaluation should be considered in contact athletes with shoulder pain and weakness after a direct blow to the shoulder if there is lack of improvement with a cuff rehabilitation program.

Another study reported the incidence of rotator cuff tears in adolescents as 0.8% (3 of 379 tears).¹⁰ Of the 3 patients, only 1 had a full-thickness ("pinhole size") tear in the supraspinatus. The remaining 2 were articular-sided partial-thickness tears. All 3 patients developed the cuff lesion as a result of traumatic injury. The authors concluded that rotator cuff tears in the

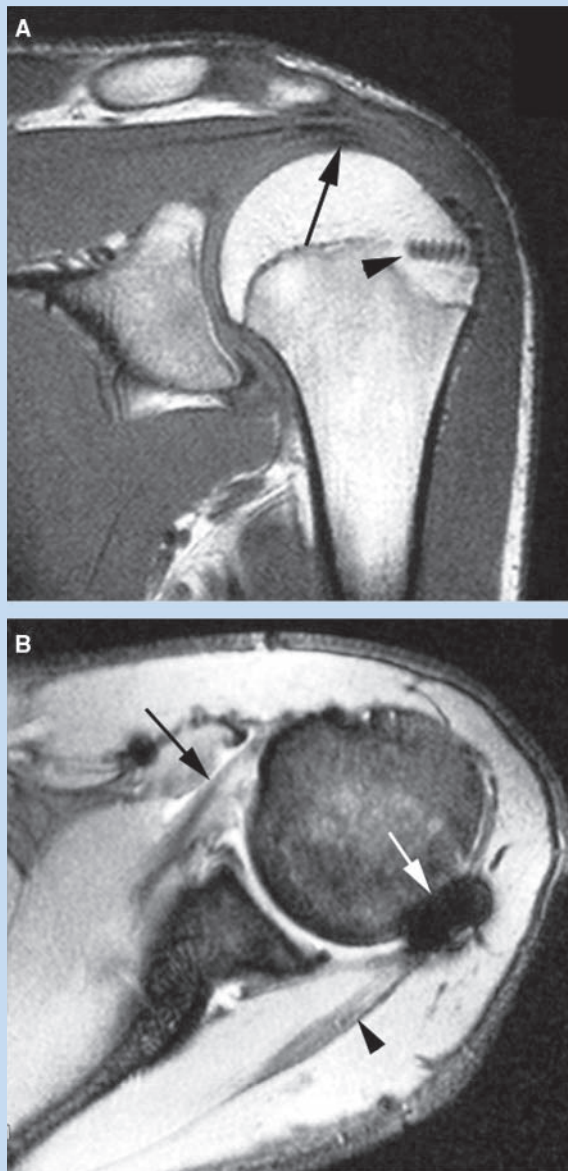


Figure 4. Postoperative MRI: A, T1-weighted oblique coronal image. Artifact from an anchor is present within the greater tuberosity (arrowhead). Note the intact supraspinatus tendon (arrow). B, gradient echo T2-weighted axial image. The subscapularis (black arrow) and infraspinatus (arrowhead) tendons are intact after repair (white arrow = artifact from anchor).

young patient are associated with extrinsic factors, such as traumatic stress applications, as opposed to rotator cuff degeneration.

These studies highlight the concept that rotator cuff tears can occur in the young athletic population and must be considered in the evaluation to not be overlooked on initial presentation.

Hulstyn and Fadale reported on the multifactorial nature of rotator cuff tears in an athletic population.⁹ Three mechanisms

were proposed, including intrinsic tendon disease associated with repetitive overuse and microtrauma, extrinsic tendon (outlet) impingement as described by Neer,¹³ and intra-articular impingement (internal impingement). Each of these proposed mechanisms may contribute to rotator cuff pathology in the athletic population.

Traumatic cuff tears may be more prevalent in the setting of high-energy glenohumeral dislocations, as was likely the case in the patient presented above. Although not specifically reported by the patient and although the labrum was intact, dislocation was likely, given the marked posterior subluxation of the humeral head on radiographs and MRI. Disruption of the posterior capsule was evident on MRI and the posterior approach, although it was not specifically addressed. While rotator cuff tear in association with dislocation is most common in adults >40 years of age, the association must not be dismissed in the young patient as well. Even fewer reports of cuff tears exist in association with posterior dislocations, making the diagnosis even more elusive.¹⁵

Traumatic cuff tears are rare in the young athletic population. Contusions and partial thickness tears of the rotator cuff are more commonly documented in the literature.^{1,7,14} Despite this, full-thickness tears must be considered in the evaluation of a young patient with a traumatic shoulder injury. Early identification and expedient management are crucial. These injuries may initially be dismissed as brachial plexus neuropraxias or cuff contusions, particularly in the football population. If overlooked, the rotator cuff tear is likely to progress and may become irreparable by the time of diagnosis. Rotator cuff repairs have been shown to produce excellent results in patients younger than 40 years of age and to return patients to preinjury level of function.¹¹ We believe that this case report highlights the possibility of massive cuff tear in the young athletic population to help prevent misdiagnosis and mismanagement of this potentially devastating injury. When this injury is recognized and treated appropriately, good outcomes and return to sport can be achieved, as demonstrated in this patient.

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