

Rotator Cuff Tear in a 13-Year-Old Baseball Player

A Case Report

Todd C. Battaglia,* MD, Michelle A. Barr,† MD, and David R. Diduch,*‡ MD

*From the *Department of Orthopaedic Surgery and the †Department of Musculoskeletal Radiology, University of Virginia Health Sciences Center, Charlottesville, Virginia*

Rotator cuff injuries are among the most common shoulder injuries seen in athletes. They occur mostly in baseball players and other athletes who frequently use the arm in overhead or throwing positions.^{5-7, 10, 11, 16, 18} Although juvenile and adolescent baseball players are also prone to shoulder injuries,^{12, 13, 19} tears of the rotator cuff are extremely uncommon in this age group.^{4, 12, 13} A review of the orthopaedic and sports medicine literature found no reports specific to rotator cuff injuries in adolescents. In addition, among the numerous studies focusing on treatment of rotator cuff injuries in young athletes, the youngest patient included in any report was 18 years old.^{2, 20} We describe the repair of a high-grade partial-thickness tear of the supraspinatus tendon that occurred in a 13-year-old baseball pitcher.

CASE REPORT

A 13-year-old, right-hand-dominant male athlete was seen for symptoms of right shoulder pain. He had been an active baseball pitcher until 20 months earlier, when he developed insidious onset of pain in the lateral and anterior shoulder. He continued to pitch regularly for 2 months despite increasing pain until one day, while in the act of pitching, he had the acute sensation of a “pop” in his shoulder accompanied by worse discomfort. He was unable to pitch after that time. He abstained from any strenuous athletics, including baseball, for 8 months after this acute injury, participated in multiple extended courses of rehabilitation and physical therapy, and intermittently used nonsteroidal antiinflammatory medicines with little improvement. He returned to baseball playing in other positions but remained unable to pitch, and he continued

to experience persistent pain in his shoulder with any overhead or throwing motions. He reported no other joint-related symptoms or significant medical problems. When interviewed about pitching frequency in the period preceding the acute injury, the patient stated that he often would pitch a full (six-inning) game, but he was not allowed to pitch consecutive games, which effectively limited his pitching to one to two games per week. He was unable to quantify his nongame pitching but stated that he also frequently pitched during practice, as well as at home with his father.

Shoulder range of motion was full and symmetric when compared with the uninjured side in forward flexion, abduction, and external rotation. Internal rotation was to T3 on the left side, but only to T8 on the involved right side. The patient had no evidence of abnormal shoulder instability in any plane bilaterally, nor any evidence of generalized ligamentous laxity. Neer’s and Hawkins’ impingement signs were positive. The patient reported pain with resisted external rotation on the right and was slightly weak with performance of this maneuver compared with that on the opposite side. There was also a positive supraspinatus stress test on the right.

Radiographs, including an outlet view, demonstrated no fracture or dislocation, open physes, and a relatively flat (type I) acromion. An MRI obtained 4 months earlier by another physician demonstrated an 8-mm area of high-grade abnormal signal in the rotator cuff within the supraspinatus tendon consistent with a near-complete partial rotator cuff tear. There was no evidence of cuff retraction. Because of the patient’s age and elapsed time since this MRI, a repeat scan was obtained to evaluate progression or healing of the lesion. The repeat MRI confirmed the presence of a high-grade, partial-thickness, bursal-surface tear of the supraspinatus tendon (Fig. 1). There was no evidence of healing when it was compared with the earlier study. There was also a longer, more hooked, *uncalcified* portion of the acromion with inflammation and thickening of the coracoacromial ligament at-

‡ Address correspondence and reprint requests to David R. Diduch, MD, Department of Orthopaedic Surgery, 400 Ray C. Hunt Drive, POB 800159, University of Virginia Health System, Charlottesville, VA 22908-0159.

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Figure 1. Turbo spin-echo fat-saturated T2-weighted coronal oblique MR arthrogram of the right shoulder demonstrating a bursal surface tear of the supraspinatus tendon (arrow) immediately adjacent to the coracoacromial ligament origin.

tachment at the acromial leading edge (Fig. 2). A subacromial injection of lidocaine completely relieved the patient's symptoms, indicating a positive impingement test.

Because of the failure of nonoperative treatment over 20 months, it was decided to proceed with arthroscopic repair of the cuff tear. During the examination under anesthesia and arthroscopy, there was no evidence of instability or a Bankart lesion. The articular surfaces and biceps tendon attachment were found to be normal. There was a small area of superficial undersurface fraying near the insertion of the supraspinatus tendon (Fig. 3A) that was debrided. The remainder of the cuff undersurface and insertion was intact. At the bursal surface, there was a 1-cm partial-thickness split in the supraspinatus tendon just medial to the insertion (Fig. 3B). In addition, a thickened coracoacromial ligament and prominent acromial leading edge were noted (Fig. 3C; after release of the coracoacromial ligament). This edge was not yet ossified, and, after release of the coracoacromial ligament, the cartilaginous acromial edge was resected with an arthroscopic bur until it was flush with the flat portion of the acromion to complete the subacromial decompression. Finally, the cuff tear was debrided and repaired with two side-to-side Panacryl sutures (Ethicon, Inc., Somerville, New Jersey) placed and tied arthroscopically (Fig. 3D).

Postoperatively, the patient's arm was placed in a sling for 3 weeks of passive shoulder motion only, followed by



Figure 2. Spin-echo T1-weighted image. The subacromial enthesophyte (arrow) located at the coracoacromial ligament attachment is more pronounced than normal.

slow advancement of active exercises. He regained full symmetric range of motion, had no pain, and began limited throwing by 3 months after surgery. He has since returned to full activity, including scholastic football and baseball, and remained without symptoms 9 months after surgery.

DISCUSSION

Adult baseball players, especially pitchers, are prone to injuries to the shoulder and surrounding structures, including glenohumeral instability, labral tears, acromioclavicular joint injuries, bicipital tendinitis, and, most commonly, rotator cuff tears.^{10,11,18} Adolescent baseball players, however, tend to experience shoulder pain due to other causes distinct to this age group, including proximal humeral physeal fracture, epiphyseolysis of the proximal humerus (Little League shoulder), and epiphyseal injuries of the distal clavicle.^{8,12,13,19} Tears of the rotator cuff are extremely rare in this age group.^{4,12,13} At any age, rotator cuff injury may occur as a result of 1) impingement, whether because of primary anatomic causes (outlet) or underlying instability (nonoutlet); 2) tensile overload; or 3) primary tendon degeneration.^{3,17,18,21} In young (20- to 40-year-old) athletes, rotator cuff injury is generally caused by acute or chronic overload, such as in throwing athletes, or as a result of a major traumatic episode, such as in contact sports. When impingement is present in this

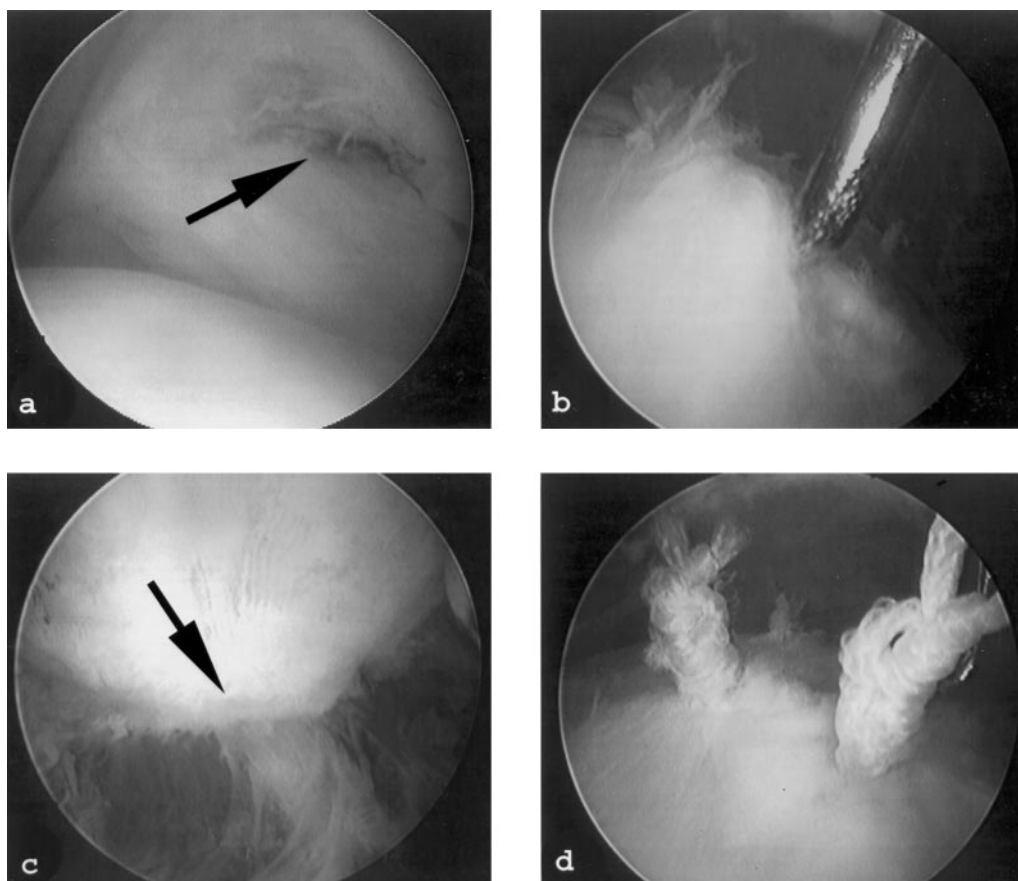


Figure 3. A, undersurface fraying of the supraspinatus tendon (arrow); B, bursal-surface high-grade partial-thickness tear of the supraspinatus tendon; C, prominent acromial leading edge (arrow) after release of the coracoacromial ligament; D, side-to-side suture repair of the cuff tear.

age group, it is often secondary to subtle or gross instability and less commonly due to primary acromial or outlet impingement.^{11, 13, 18, 20}

In this case, overexertion and chronic strain from pitching undoubtedly contributed to the injury. This boy pitched through progressive pain until experiencing an acute exacerbation and actual "pop." Published guidelines recommend limiting pitch counts for 9- to 18-year-old players in an effort to avoid overuse injuries.^{6, 14, 15} The American Sports Medicine Institute suggests that players in this age range pitch no more than two games per week, with the maximum number of pitches per game as follows: ages 8 to 10, 52 pitches; ages 11 to 12, 68 pitches; ages 13 to 14, 76 pitches; ages 15 to 16, 91 pitches; and ages 17 to 18, 106 pitches.¹⁴ Others suggest limits based on the number of innings pitched per week.⁶ A minimum number of rest days between games is also recommended, adjusted on the basis of the number of pitches thrown with each episode. Although it appears that adequate rest days may have been provided for this patient, each individual pitching episode likely exceeded the age-specific American Sports Medicine Institute pitch count recommendations. Assuming an average of five pitches thrown per batter,¹⁴ this pitcher undoubtedly threw at least 90 to 100 pitches

over the course of a six-inning game, and likely many more. His practice and recreational pitching added to this strain. It is also strongly recommended that no pitcher continue to throw when experiencing shoulder pain. The history of this patient suggests that he may have suffered a prodrome of rotator cuff tendinitis before the acute tear occurred. In this case, cessation of pitching at the onset of symptoms may have allowed recovery instead of progression to a true rotator cuff tear. Finally, the American Sports Medicine Institute also recommends limiting pitch type on the basis of age to reduce shoulder injury. Instruction in proper throwing mechanics should begin at an early age,^{1, 6, 9} and before age 10 only the fast ball and change-up are thought appropriate, whereas the curve ball, slider, knuckle ball, and screwball may be introduced with increasing age.¹⁴

Impingement may also have contributed to this rotator cuff injury. The results of the MRI and subacromial injection test, as well as the intraoperative findings, suggest that outlet impingement was occurring. In immature patients, radiographs may not demonstrate the true acromial anatomy and may mask a potential site of impingement. In this instance, although radiographs demonstrated a flat acromion, intraoperatively the nonossified acromial edge was

found to be prominent and the coracoacromial ligament thickened.

We believe that this case demonstrates a number of important points. First, although uncommon, rotator cuff tears should be included in the differential diagnosis of shoulder pain in very young athletes. In addition, outlet impingement may be present in this age group despite normal radiographic findings. Finally, published guidelines regarding pitching limits in this age group should be closely followed, and any child experiencing shoulder pain should cease throwing activities until symptoms have resolved.

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