Traumatic rotator cuff tears in patients younger than 25 years are rare events, with few reports in the literature. When compared with the more mature shoulder, the young, healthy supraspinatus tendon is a robust tendon that is able to absorb a significant amount of energy before tendon failure. Therefore, the diagnosis of a rotator cuff tear can be often overlooked in this population due to the patient's age. This is a report of traumatic supraspinatus repairs in patients younger than 25 years. Nine patients younger than 25 years were identified with a posttraumatic supraspinatus tear as visualized during routine diagnostic shoulder arthroscopy. These 9 patients represented 0.33% of all rotator cuff repairs during a 9-year period. Average patient age was 19.1 years (±3.7 years; range, 13 to 25 years). Magnetic resonance imaging failed to diagnose a rotator cuff tear in 50% of the patients. Mean delay from injury to surgery was 6.6 months. All tears were arthroscopically repaired. Concomitant anterior instability pathology was demonstrated among 66.7% of the patients. No complications were reported. At latest follow-up, all patients reported minimal to no shoulder pain and were tolerating strenuous work, activities, and sports without significant complaints. Even with advanced imaging, the diagnosis of a rotator cuff tear can often be missed in this patient population. Although clinical outcomes can be good, care must be taken to broaden the diagnostic differential in young patients with posttraumatic shoulder pain. [Orthopedics. 2015; 38(7):e631-e634.]
Traumatic supraspinatus tears in patients younger than 25 years are rare events, with few reports in the literature. Posttraumatic shoulder pain in this patient population is routinely attributed to instability or fracture, and the diagnosis of a rotator cuff tear can often be overlooked due to the patient’s age. When compared with the more mature shoulder, the young, healthy supraspinatus tendon is a robust tendon that is able to absorb a significant amount of energy before tendon failure. The weakest structural link in the shoulder in this patient population is often bone as opposed to tendon. As a result, shoulder trauma in younger patients likely results in more fractures than supraspinatus tears.

This study reports the presentation and clinical course of patients younger than 25 years with traumatic supraspinatus repairs. The authors hypothesized that the preoperative diagnosis of a supraspinatus tear can often be missed in this patient population but that successful outcomes can be achieved with operative repair once identified.

**Materials and Methods**

A retrospective review was performed of all patients of the 3 senior surgeons (C.R.N., J.S.N., R.H.B.) with the procedural code of arthroscopic and open rotator cuff repairs (CPT 29827, 23410, 23412) between January 1, 2003, and February 15, 2012. All patients younger than 25 years at the time of surgery were identified. Medical records were reviewed to confirm the diagnosis of a traumatic rotator cuff tear from the operative report and intraoperative arthroscopic photographs.

Inclusion criteria were patient age younger than 25 years, rotator cuff tear necessitating repair, and shoulder pain induced by a single traumatic episode. Exclusion criteria were patient age 25 years and older, subscapularis tears, greater tuberosity fractures, lesser tuberosity fractures, lack of rotator cuff tear, no known trauma, injury to the contralateral limb that would not allow a control examination relative to the operative shoulder, and insufficient follow-up.

The chart was further reviewed to document mechanism of injury, delay from injury to surgical repair, and official magnetic resonance imaging (MRI) report diagnosis. The operative report and intraoperative arthroscopic photographs were reviewed. Postoperative physical examination data relative to the contralateral uninjured extremity included passive range of motion, active range of motion, and strength. Patient satisfaction was also reviewed.

**Results**

Nine patients younger than 25 years were identified with a posttraumatic full-thickness or high-grade partial-thickness supraspinatus tear visualized during routine diagnostic shoulder arthroscopy. Average patient age was 19.1 years (±3.7 years; range, 13 to 25 years); 67.7% (6 of 9) of the patients were women. These 9 patients represent 0.33% (9 of 2727) of all rotator cuff repairs performed by the senior authors during a 9-year period. Six subscapularis repairs were identified during the same time period and were excluded from the study.

Magnetic resonance imaging was obtained for 8 of 9 patients. One patient was unable to obtain MRI due to an indwelling spinal cord stimulator that was placed due to complex regional pain syndrome of her lower extremities from a prior trauma. Of the remaining 8 patients, the official MRI report from a board-certified radiologist was consistent with the arthroscopic diagnosis of a rotator cuff tear in 50% of patients. The diagnoses of the incorrectly read MRI included Bankart lesion, humeral avulsion of the glenohumeral ligaments lesion, and superior labral anteroposterior tear.

A single, traumatic event occurred prior to the onset of shoulder pain in all patients. Average time from injury to surgery was 6.6 months (±4.4 months). Mechanism of injury varied, including snow skiing, softball, baseball, volleyball, motor vehicle crash, gymnastics, flag football, and a fall on ice.

Of all patients, 44.4% (n=4) displayed arthroscopic evidence of a full-thickness supraspinatus tear. The remaining 55.6% (n=5) had a high-grade (>50%) partial-thickness supraspinatus tear. All tears were consistent with an anterior supraspinatus tear in close proximity to the bicipital sling. No tears consistent with internal impingement, such as posterior partial-thickness supraspinatus or infraspinatus tears with associated posterior labral wear, were noted in any patients. In addition, no patients displayed arthroscopic evidence of intra-articular biceps tendonitis or instability.

A single-row arthroscopic rotator cuff repair with suture anchor fixation was performed in all patients (Figure). In patients with a high-grade partial-thickness tear, the remnant rotator cuff was sharply removed from the greater tuberosity and then appropriately repaired. Of all patients, 66.7% (6 of 9) demonstrated concomitant anterior instability pathology, which included 3 Bankart repairs, 2 anterior capsular plications, and 1 thermal capsulorrhaphy. The primary indication for surgery was a supraspinatus tear in 3 patients and instability/labral pathology in 6.

Preoperatively, all 9 patients reported shoulder pain at extremes of motion and resisted forward elevation. Four patients exhibited 4/5 strength with shoulder abduction, and 1 patient had 4/5 strength with resisted external rotation. No patients exhibited an external rotation lag sign or weakness with the belly press maneuver. Seven patients reported apprehension in maximum abduction and external rotation.

All patients followed a standard postoperative rotator cuff repair protocol with a graded formal physical therapy regimen. No complications were reported. At latest follow-up (range, 4-30 months), all pa-
tients reported minimal to no shoulder pain and were tolerating strenuous work, activities, and sports without significant complaints. All patients demonstrated nearly symmetrical active and passive range of motion with normal strength compared with the contralateral side. For the patients with associated instability repairs, none demonstrated repeat instability episodes or apprehension. All patients remained satisfied with their functional outcomes.

**Discussion**

Due to the rarity of rotator cuff tears in younger patients, full-thickness rotator cuff tears can be often misdiagnosed as a more common shoulder pathology in this age group, such as shoulder instability or “impingement.” Shoulder weakness in this population could easily be attributed to a rotator cuff contusion or brachial plexus neuropaxia. Although patients younger than 25 years comprised less than 1% of rotator cuff repairs at the authors’ practice, it is still important to recognize that the pathology does exist. More than 50% of the patients in the study were misdiagnosed by the radiologist, the surgeon, or both.

This finding supports the hypothesis that the clinical and MRI preoperative diagnosis of a rotator cuff tear can often be missed in this patient population. This could likely lead to a delay in the appropriate treatment, with associated pain and disability due to that delay. In addition, this study likely underestimates the prevalence of supraspinatus tears in young patients because only those with surgically repaired pathology were able to be identified.

Although this is the largest reported series of full-thickness supraspinatus repairs in patients younger than 25 years, several other cases are reported in the literature. The youngest reports are 12- and 13-year-old patients with partial-thickness tears. Tarkin et al reported a 12-year-old patient with a partial-thickness supraspinatus tear and a 14-year-old patient with a supraspinatus tear “that contained bony fragments” at the time of arthroscopy. Weiss et al reported 6 adolescent athletes with rotator cuff tears or tuberosity fractures, but only 1 of these patients had a supraspinatus tear. Turman et al documented a traumatic 4-tendon rotator cuff tear in a 16-year-old high school quarterback. Rickert and Loew and Schoenfeld and Lippitt reported traumatic rotator cuff tears with associated dislocations after high-energy motor vehicle trauma in patients in their early 20s who underwent an open repair.

Itoi and Tabata reported 3 patients 15 to 19 years old with traumatic supraspinatus tears. All were high-grade partial-thickness tears with the exception of a “pinhole-size” full-thickness component in 1 patient. Adolescent rotator cuff tears represented 0.8% of all rotator cuff tears referred to their institution during a 9-year period. This is greater than the 0.33% incidence of arthroscopically diagnosed rotator cuff tears in patients in the current study.

In the current series, the outcomes of full-thickness rotator cuff repairs in young patients were good. All patients regained full strength and range of motion in the early postoperative period. All patients remained satisfied with their functional outcomes. Several studies report rotator cuff repairs in young patients, but most of these studies define young as younger than 40 or 50 years. The results of the majority of these studies demonstrate excellent results as well.

Increasing age has been shown to negatively affect rotator cuff tendon healing after repair. Although a healed repair results in improved strength when compared with a repair that does not heal, surprisingly the healing rate does not affect patients’ pain relief or satisfaction. In addition, rotator cuff pathology is often an age-related degenerative process. In the current study, the population’s extreme youth relative to most other rotator cuff repair outcome studies should demonstrate better surgical results due to patient biology that is more amendable to healing.

**Figure:** A large supraspinatus tear of the right shoulder is arthroscopically visualized through a posterior viewing portal in a 21-year-old patient in the lateral position 1.5 months after a motor vehicle crash (A). A single-row arthroscopic rotator cuff repair with suture anchor fixation was subsequently performed (B). Completed repair visualized from the lateral portal (C).

Rotator cuff tears in young, overhead-throwing athletes is a well-described pathologic sequela of internal impingement. Internal impingement of the shoulder is repetitive contact of the greater tuberosity with the posterosuperior aspect of the glenoid with the arm in an abducted, externally rotated position. This leads to posterior partial-thickness supra- or infraspinatus tears with associated posteri or labral lesions.

However, internal impingement represents a different clinical entity that is
distinct from the patients described in this report. The onset of shoulder pain in this young patient population occurred im-
mEDIATELY after a single, traumatic event. This contrasts internal impingement, which is a
chronic overuse phenomenon. In addition, all tears were consistent with anterior sup-
raspinatus tears. No patients displayed evidence of posterior partial-thickness supra-
or infraspinatus tears with associ-
ated posterior labral pathology, as seen with internal impingement of throwing
athletes. Although anterosuperior internal
impingement of the shoulder has been described, its etiology is thought to be
from biceps instability and lesions of the bicipital pulley. This is also an overuse
phenomenon usually seen in middle-aged
patients. The posttraumatic rotator cuff
tears in this patient population represent a
different clinical entity than anterosuper-
ior internal impingement.

The limitations of this study are the
small number of patients, lack of control
group, and limited follow-up. However, the rarity of traumatic rotator cuff tears in young patients limits the study size. A
control group of nonoperatively treated
patients would be optimal, but this study
demonstrates the inaccuracy in the clin-
cal and radiographic diagnosis of rota-
tor cuff tears in this patient population.

This series highlights that this rare en-
tity is likely an underappreciated cause of posttraumatic shoulder pain in young
patients.

**CONCLUSION**

This is the largest reported series of traumatic supraspinatus repairs in pa-
tients younger than 25 years. Even with
advanced imaging, the diagnosis of a rota-
tor cuff tear can often be missed in this
patient population. Although clinical out-
comes can be good, care must be taken
to broaden the diagnostic differential in
young patients with posttraumatic shoul-
der pain.

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