

# Missed Rotator Cuff Tears in Polytraumatized Patients

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## Abstract

If not identified early, rotator cuff tears in polytraumatized patients can become debilitating. Traumatic rotator cuff tears are often massive, and generally retract over a short period of time. If a tear is missed or becomes irreparable, the consequences are profound, and can be devastating, especially to a younger, active person. In this article, we report 2 cases of initially untreated rotator cuff tears in polytraumatized patients and briefly review the literature.

If not identified early, rotator cuff tears in polytraumatized patients can become debilitating. Unfortunately, shoulder pain with negative radiographs tends to be disregarded in the evaluation of polytraumatized patients, especially patients presenting with other upper extremity fractures. Traumatic rotator cuff tears are often massive and, unlike degenerative tears, generally retract over a short period of time. It is important to detect these tears early, as there is a small window of opportunity for repair. If a tear is missed or becomes irreparable, the consequences are profound: pseudoparalysis, persistent pain, and rotator cuff tear arthropathy, among others.<sup>1</sup>

In this article, we report 2 cases of initially untreated rotator cuff tears in polytraumatized patients and briefly review the literature.

The patients provided written informed consent for print and electronic publication of these case reports.

## Case Series

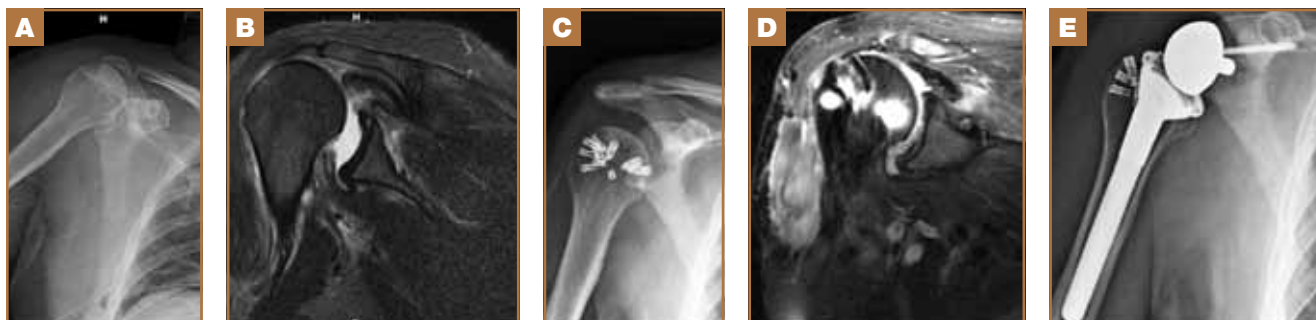
### Case 1

A healthy, right-hand dominant 51-year-old male truck driver was in a motorcycle accident and sustained numerous traumatic injuries, including abdominal, chest and extremity injuries, and fractures of the left-hand and left radius. At initial evaluation, he reported pain in the right shoulder. Radiographs (Figure 1A) were negative but suggested proximal humerus migration.

With fractures healed 3 months after injury, the patient was referred for persistent right shoulder pain and decreased range of motion (ROM). Examination revealed active forward flexion to 30° and abduction to 40°. Passive ROM demonstrated 90° of forward flexion and abduction. Subsequent magnetic resonance imaging (MRI) showed a massive 4-tendon rotator cuff tear retracted to the glenoid level and superior migration of the humeral head (Figure 1B).

Just more than 3 months after injury, open rotator cuff repair was performed using a double-row technique (Figure 1C).

**Figure 1.** Left radius fractures in 51-year-old man with right shoulder pain. (A) Right shoulder radiographs obtained because of pain are negative for fracture, but anteroposterior (AP) radiograph suggests proximal humerus migration. (B) Three months later, shoulder magnetic resonance imaging (MRI) shows massive rotator cuff tear. (C) AP radiograph after open rotator cuff repair. (D) Repeat postoperative MRI shows failed repair. (E) AP radiograph after reverse total shoulder arthroplasty (second inferior glenoid baseplate screw is not visible).



**Authors' Disclosure Statement:** The authors report no actual or potential conflict of interest in relation to this article.

The right upper extremity was maintained in a sling the first 8 weeks after surgery. ROM exercises were then allowed. By 4 months, full passive ROM had been regained, though active motion was significantly limited, and there was evidence of anterior superior escape. In addition, strength on rotator cuff strength testing was very poor. At 6 months, with the patient still having pain and demonstrating no improvement in strength, MRI was performed; it showed failure of the rotator cuff repair (**Figure 1D**). Despite a home program of deltoid-strengthening physical therapy, the pain and functional deficits persisted.

One year after injury, the patient elected to have operative treatment. He was offered options of hemiarthroplasty, glenohumeral fusion, and reverse total shoulder arthroplasty (TSA), and the advantages and disadvantages of each were discussed. He decided on reverse TSA (**Figure 1E**). Six months after this procedure, he could actively forward-flex to 145° and abduct to 135° and was back driving his truck.

## Case 2

A healthy, right-hand dominant 64-year-old male computer programmer was in a motor vehicle accident. He sustained a right humerus fracture, and ipsilateral radius and ulna fractures (**Figure 2A**), which were treated with open reduction and internal fixation (**Figure 2B**). He reported right shoulder pain during initial hospitalization, but no fractures were seen on the injury radiographs, and the pain was thought to be referred from the humerus fracture.

With fractures healed 4 months after fixation, and after a trial of physical therapy, the patient was referred for persistent right shoulder pain and decreased ROM. Examination revealed full passive ROM but also pseudoparalysis of the shoulder with only 10° of active forward flexion and abduction. The drop arm test and the hornblower sign were positive, and there was almost no strength to resisted rotator cuff testing. MRI showed a 3-tendon rotator cuff tear with significant retraction and proximal migration of the humeral head (**Figure 2C**).

When arthroscopic rotator cuff repair and mobilization were

attempted, the tear was found to be irreparable (**Figure 2D**). The patient then underwent bursectomy, with maintenance of the coracoacromial arch and debridement of the rotator cuff, and biceps tenotomy. After surgery, he began an anterior-deltoid-strengthening physical therapy program. Six months after surgery, he had persistent pain and significantly limited function. He could actively forward-flex to 60° and externally rotate 15°. Reverse TSA was then offered, but he deferred additional operative treatment.

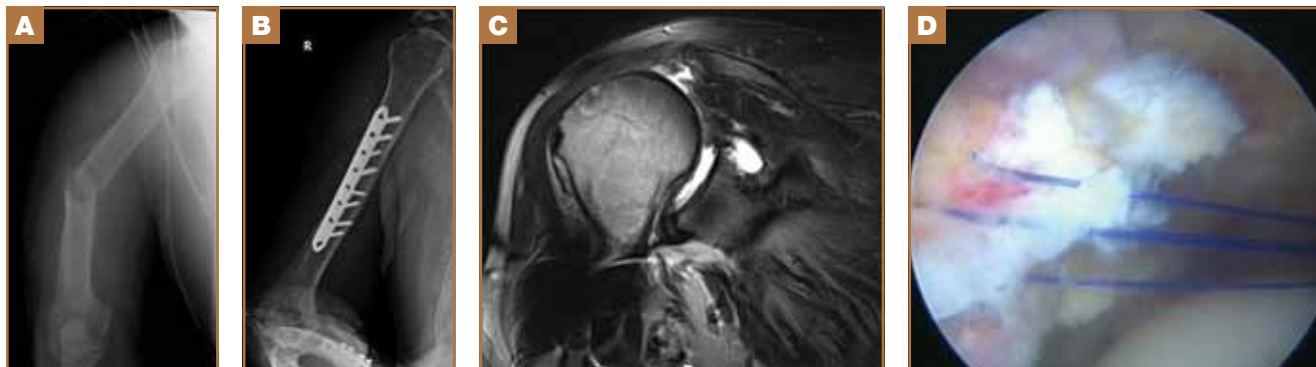
## Discussion

Reporting these cases can raise awareness of easily overlooked soft-tissue shoulder injuries in polytrauma patients. Specific examination of the polytrauma patient with shoulder pain on secondary or tertiary survey should include detailed assessment of the rotator cuff. Notably, polytrauma patients who have a glenohumeral dislocation should be carefully examined for concomitant rotator cuff tear.<sup>2,3</sup> In a recent study, more than 10% of patients who experienced high-energy trauma had a rotator cuff injury.<sup>3</sup> In awake patients, a rotator cuff tear can usually be diagnosed by examination alone; in obtunded or intubated patients, this may not be possible. In addition, in polytrauma patients, shoulder pain may be disregarded as pain related to other injuries or to generalized contusion from the injury mechanism. Instead, there should be a high index of suspicion for rotator cuff injuries in these patients. On inspection, there may be tenderness and evidence of ecchymosis and swelling of the anterior shoulder. Muscle atrophy can occur with an acute or chronic tear.<sup>4</sup>

Sorensen and colleagues<sup>5</sup> evaluated 104 patients (median age, 49 years) clinically and with ultrasonography a median of 13 days after acute soft-tissue shoulder trauma. Fifty-eight percent of these patients had a rotator cuff tear of some degree; in 32% of these cases, the injury was a full-thickness tear. Inability to perform active abduction above 90° correlated with acute rotator cuff injury in more than 50% of the patients; one-third of these patients had full-thickness tears.

In polytrauma patients with a rotator cuff tear, MRI should

**Figure 2.** (A) Anteroposterior (AP) radiograph shows right humerus fracture in 64-year-old man. (B) AP radiograph after humerus fracture fixation. (C) Four months later, magnetic resonance imaging shows massive rotator cuff tear. (D) Arthroscopic image of attempted rotator cuff mobilization.



be used to assess tear size, amount of tendon retraction, associated atrophy, and fatty infiltration. Patients with a large or massive tear, significant medial retraction, or fatty infiltration should be counseled regarding how these risk factors might affect their outcomes. The probability of successful healing after rotator cuff repair is drastically lower when there is more than 50% fatty infiltration and superior migration of the humeral head results in an acromiohumeral distance of less than 7 mm.<sup>6,7</sup>

Management of traumatic rotator cuff tears consists of early repair, medical status permitting. The goal is primary repair of the torn tendons to restore function to the extremity and prevent pseudoparalysis and rotator cuff tear arthropathy.<sup>4</sup> Sequelae of untreated rotator cuff tears include loss of musculotendinous elasticity, myotendinous retraction, fatty infiltration, superior migration of humeral head, and, ultimately, rotator cuff arthropathy.<sup>1</sup> Although small tears tend to remain small,<sup>8</sup> large tears increase in size and can become irreparable.<sup>9</sup> Fifty percent of full-thickness rotator cuff tears sustained by patients younger than 60 increase in size if treated nonoperatively.<sup>10</sup>

Two studies, comparing acute traumatic tears repaired less than 3 weeks after injury versus more than 3 weeks after injury, found that delayed diagnosis and treatment resulted in decreased shoulder ROM and function and, in more than 80% of cases, large or massive tears.<sup>11,12</sup>

Whenever possible, and even when reparability is in question, rotator cuff repair should be attempted. Open repair and arthroscopic repair have similar outcomes.<sup>13</sup> An open technique may be preferred when the procedure is being performed in conjunction with procedures not involving the shoulder, when the amount of time the patient can tolerate anesthesia is limited, or when operating room positioning prohibits an arthroscopic technique.

Should a rotator cuff tear be found irreparable at time of surgery, biceps tenotomy or tenodesis and subacromial decompression in the setting of a more chronic tear may be considered for pain relief.<sup>14</sup> Although short-term outcomes are good for relief of mechanical impingement pain, longer term outcomes have been mixed.<sup>15</sup> The coracoacromial ligament must be preserved to prevent anterosuperior escape of the humeral head.<sup>16</sup> For maintenance of the coracoacromial arch, the surgeon can consider performing debridement and tuberosity to reshape the greater tuberosity and allow it to smoothly articulate with the acromion.<sup>17,18</sup>

For chronic and irreparable symptomatic tears, functional outcomes are limited. Surgical options have drawbacks. In younger, active patients, tissue augmentation and/or a latissimus dorsi transfer may be indicated for posterosuperior rotator cuff deficiency, and a pectoralis major transfer is indicated for subscapularis deficiency. Although pain is relieved, functional gains are much less predictable.<sup>19-25</sup>

Shoulder arthroplasty is the most common treatment in elderly patients who remain symptomatic. For patients who can achieve 90° of forward elevation and have no evidence of anterosuperior escape, hemiarthroplasty is indicated; patients with pseudoparalysis are candidates for reverse TSA.<sup>26</sup> Although

good outcomes are generally reported, the complication rate for reverse TSA has been as high as 70%.<sup>27,28</sup> The rate may be even higher for younger, active patients. Conventional unconstrained TSA is contraindicated because of the high incidence of glenoid loosening.<sup>29</sup>

## Conclusion

Evaluation of polytraumatized patients with shoulder pain consists of radiographic imaging and thorough physical examination. When rotator cuff injury is suspected, the threshold for advanced imaging should be lowered. Full-thickness rotator cuff tears should be repaired as soon as possible. The consequences of late diagnosis and treatment can be considerable, and untreated tears can progress to rotator cuff tear arthropathy. The result is permanent disability and poorly tolerated functional deficits, which may have been avoided with timely treatment.

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## References

- Zingg PO, Jost B, Sukthankar A, Buhler M, Pfirrmann CW, Gerber C. Clinical and structural outcomes of nonoperative management of massive rotator cuff tears. *J Bone Joint Surg Am.* 2007;89(9):1928-1934.
- Rickert M, Loew M. Glenohumeral interposition of a torn rotator cuff in a young motorcyclist. *Arch Orthop Trauma Surg.* 2006;126(3):184-187.
- Robinson CM, Shur N, Sharpe T, Ray A, Murray IR. Injuries associated with traumatic anterior glenohumeral dislocations. *J Bone Joint Surg Am.* 2012;94(1):18-26.
- Nam D, Maak TG, Raphael BS, Kepler CK, Cross MB, Warren RF. Rotator cuff tear arthroplasty: evaluation, diagnosis, and treatment: AAOS exhibit selection. *J Bone Joint Surg Am.* 2012;94(6):e34.
- Sorensen AK, Bak K, Krarup AL, et al. Acute rotator cuff tear: do we miss the early diagnosis? A prospective study showing a high incidence of rotator cuff tears after shoulder trauma. *J Shoulder Elbow Surg.* 2007;16(2):174-180.
- Goutallier D, Postel JM, Gleyze P, Leguilloux P, Van Driessche S. Influence of cuff muscle fatty degeneration on anatomic and functional outcomes after simple suture of full-thickness tears. *J Shoulder Elbow Surg.* 2003;12(6):550-554.
- Gerber C, Wirth SH, Farshad M. Treatment options for massive rotator cuff tears. *J Shoulder Elbow Surg.* 2011;20(2 suppl):S20-S29.
- Yamaguchi K, Tetro AM, Blam O, Evanoff BA, Teefey SA, Middleton WD. Natural history of asymptomatic rotator cuff tears: a longitudinal analysis of asymptomatic tears detected sonographically. *J Shoulder Elbow Surg.* 2001;10(3):199-203.
- Mall NA, Kim HM, Keener JD, et al. Symptomatic progression of asymptomatic rotator cuff tears: a prospective study of clinical and sonographic variables. *J Bone Joint Surg Am.* 2010;92(16):2623-2633.
- Safran O, Schroeder J, Bloom R, Weil Y, Milgrom C. Natural history of nonoperatively treated symptomatic rotator cuff tears in patients 60 years old or younger. *Am J Sports Med.* 2011;39(4):710-714.
- Bassett RW, Cofield RH. Acute tears of the rotator cuff. The timing of surgical repair. *Clin Orthop.* 1983;(175):18-24.
- Hantes ME, Karidakis GK, Vlychou M, Varitimidis S, Dailiana Z, Malizos KN. A comparison of early versus delayed repair of traumatic rotator cuff

- tears. *Knee Surg Sports Traumatol Arthrosc.* 2011;19(10):1766-1770.
13. Warner JJ, Tetreault P, Lehtinen J, Zurakowski D. Arthroscopic versus mini-open rotator cuff repair: a cohort comparison study. *Arthroscopy.* 2005;21(3):328-332.
  14. Walch G, Edwards TB, Boulahia A, Nové-Josserand L, Neyton L, Szabo I. Arthroscopic tenotomy of the long head of the biceps in the treatment of rotator cuff tears: clinical and radiographic results of 307 cases. *J Shoulder Elbow Surg.* 2005;14(3):238-246.
  15. Gartsman GM. Massive, irreparable tears of the rotator cuff. Results of operative debridement and subacromial decompression. *J Bone Joint Surg Am.* 1997;79(5):715-721.
  16. Su WR, Budoff JE, Luo ZP. The effect of coracoacromial ligament excision and acromioplasty on superior and anterosuperior glenohumeral stability. *Arthroscopy.* 2009;25(1):13-18.
  17. Fenlin JM Jr, Chase JM, Rushton SA, Frieman BG. Tuberooplasty: creation of an acromioclavicular articulation—a treatment option for massive, irreparable rotator cuff tears. *J Shoulder Elbow Surg.* 2002;11(2):136-142.
  18. Scheibel M, Lichtenberg S, Habermeyer P. Reversed arthroscopic subacromial decompression for massive rotator cuff tears. *J Shoulder Elbow Surg.* 2004;13(3):272-278.
  19. Elhassan B, Ozbaydar M, Massimini D, Diller D, Higgins L, Warner JJ. Transfer of pectoralis major for the treatment of irreparable tears of subscapularis: does it work? *J Bone Joint Surg Br.* 2008;90(8):1059-1065.
  20. Warner JJ, Parsons IM 4th. Latissimus dorsi tendon transfer: a comparative analysis of primary and salvage reconstruction of massive, irreparable rotator cuff tears. *J Shoulder Elbow Surg.* 2001;10(6):514-521.
  21. Iannotti JP, Hennigan S, Herzog R, et al. Latissimus dorsi tendon transfer for irreparable posterolateral rotator cuff tears. Factors affecting outcome. *J Bone Joint Surg Am.* 2006;88(2):342-348.
  22. Degreef I, Debeer P, Van Herck B, Van Den Eeden E, Peers K, De Smet L. Treatment of irreparable rotator cuff tears by latissimus dorsi muscle transfer. *Acta Orthop Belg.* 2005;71(6):667-671.
  23. Irlenbusch U, Bracht M, Gansen HK, Lorenz U, Thiel J. Latissimus dorsi transfer for irreparable rotator cuff tears: a longitudinal study. *J Shoulder Elbow Surg.* 2008;17(4):527-534.
  24. Birmingham PM, Neviasser RJ. Outcome of latissimus dorsi transfer as a salvage procedure for failed rotator cuff repair with loss of elevation. *J Shoulder Elbow Surg.* 2008;17(6):871-874.
  25. Nové-Josserand L, Costa P, Liotard JP, Safar JF, Walch G, Zilber S. Results of latissimus dorsi tendon transfer for irreparable cuff tears. *Orthop Traumatol Surg Res.* 2009;95(2):108-113.
  26. Goldberg SS, Bell JE, Kim HJ, Bak SF, Levine WN, Bigliani LU. Hemiarthroplasty for the rotator cuff-deficient shoulder. *J Bone Joint Surg Am.* 2008;90(3):554-559.
  27. Affonso J, Nicholson GP, Frankle MA, et al. Complications of the reverse prosthesis: prevention and treatment. *Instr Course Lect.* 2012;61:157-168.
  28. Cheung E, Willis M, Walker M, Clark R, Frankle MA. Complications in reverse total shoulder arthroplasty. *J Am Acad Orthop Surg.* 2011;19(7):439-449.
  29. Nwakama AC, Cofield RH, Kavanagh BF, Loehr JF. Semiconstrained total shoulder arthroplasty for glenohumeral arthritis and massive rotator cuff tearing. *J Shoulder Elbow Surg.* 2000;9(4):302-307.

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