



Acromion fracture associated with traumatic first time anterior shoulder dislocation: a case report



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Acromion fractures are uncommon injuries and account for approximately 8%–16% of all scapular fractures, which themselves account for only 1% of all fractures.^{7–8,10} Recently there has been an increase in the number of articles describing these fractures as a postoperative complication after reverse total shoulder arthroplasty.^{4,20} However, traumatic acromion fractures outside the setting of shoulder arthroplasty continue to be rarely described in the literature and are limited to case reports and small case series.^{7–8,18}

Given the rarity of these injuries, operative indications continue to be unclear. Although nondisplaced and minimally displaced fractures can be managed nonoperatively, they are at an increased risk of subsequent displacement, especially due to the inferior pull of the deltoid muscle. Displaced fractures that compromise shoulder function are generally managed with surgical fixation. A wide variety of operative techniques have been described in the literature including tension band wiring, Kirschner wire fixation, and screw and plate fixation.^{2,3,5,14,20}

Traumatic acromion fractures that are associated with concurrent pathology such as rotator cuff tears, coracoid fractures, and posterior shoulder dislocation have been described in the literature but are exceedingly rare.^{5,14,18} Here, we present a unique case of concurrent traumatic acromion fracture and bony Bankart lesion and subsequent glenohumeral subluxation. Surgical treatment involved arthroscopic capsulolabral repair as well as acromion open reduction and internal fixation (ORIF) with a dual-plate

construct using a 2.7 mm variable angle distal clavicle plate and a contoured 3.5 mm reconstruction plate (DePuy Synthes, Raynham, MA, USA). Patient consent was obtained for this case report.

Clinical history

A 46-year-old right hand–dominant male attorney was seen in the outpatient setting for a left shoulder injury after falling off his mountain bike at a reported 8–16 km/h. He struck the anterolateral aspect of his shoulder directly on a boulder. He reported hearing a popping sound and noted immediate pain and swelling of the shoulder. After initially being evaluated and discharged from a local emergency room, he was referred to our clinic for management recommendations.

On physical examination, there was significant tenderness to palpation at the lateral aspect of the shoulder, with limited active range of motion and strength compared to his uninjured shoulder. Initial 3-view radiographs of the left shoulder obtained in the emergency department demonstrated a minimally displaced fracture of acromion (Fig. 1) with a concentrically reduced glenohumeral joint. At the first outpatient visit, a computed tomography scan with 3-dimensional reconstruction was requested demonstrating a mildly displaced Levy Type IIC fracture of the acromion as well as a bony Bankart along the anteroinferior glenoid (Fig. 2, A–C).^{3,13}

The patient initially elected to proceed with nonoperative management with a shoulder immobilizer with the arm in abduction, with close radiographic follow-up. The patient was adherent with use of the shoulder immobilizer and there were no further traumatic events. Subsequent radiographs demonstrated further displacement of the acromion fracture as well as anterior glenohumeral subluxation (Fig. 3). A noncontrast magnetic

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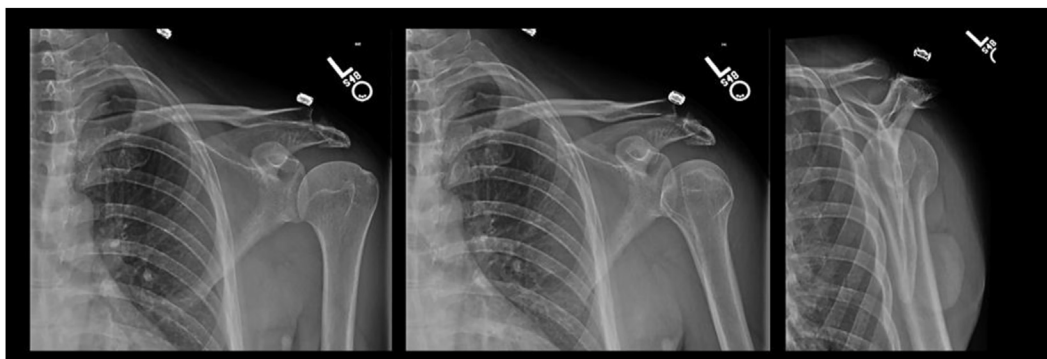


Figure 1 Three-view shoulder radiographs from initial injury demonstrating traumatic acromion fracture. MRI, magnetic resonance imaging.

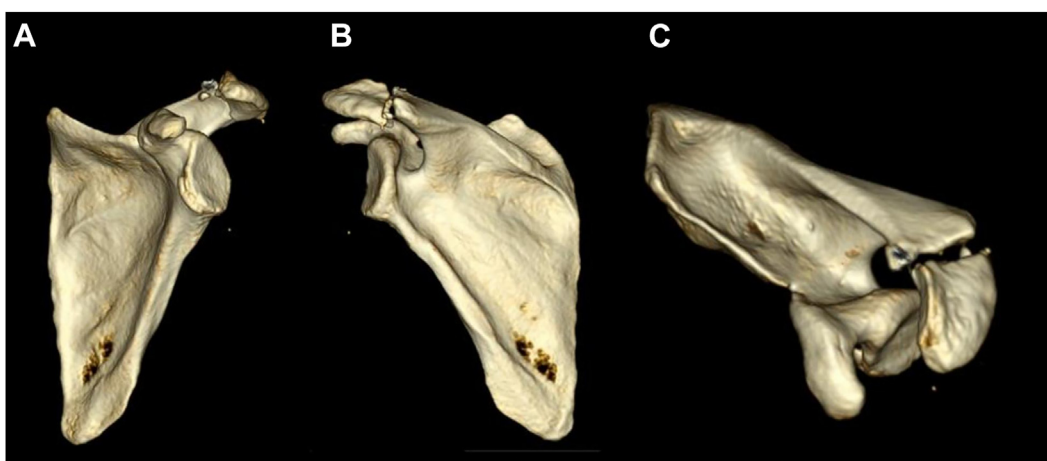


Figure 2 CT 3D reconstruction demonstrating (A) bony Bankart lesion and (B and C) displaced acromion fracture.



Figure 3 Four-view shoulder radiographs from clinic follow-up which demonstrate increased displacement of acromion fracture as well as anterior shoulder subluxation.

resonance imaging was obtained which showed a bony Bankart lesion with an associated labral tear (Fig. 4). Given these new findings, the decision was made to proceed with surgical intervention including left shoulder arthroscopic capsulolabral repair and acromion ORIF. The patient underwent surgical treatment 33 days after the initial injury.

Surgical procedure

Examination under anesthesia demonstrated limited range of motion and anterior dislocation of the left shoulder. There was grade 3 anterior instability and grade 1 posterior instability. The lateral acromion was clearly fractured and deformed. The patient

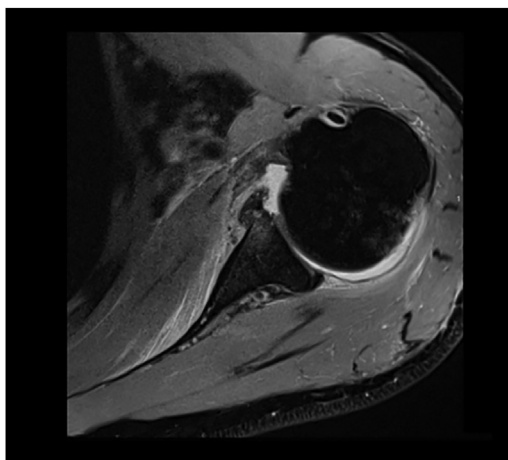


Figure 4 Noncontrast MRI of the injured shoulder demonstrating bony Bankart lesion. MRI, magnetic resonance imaging.

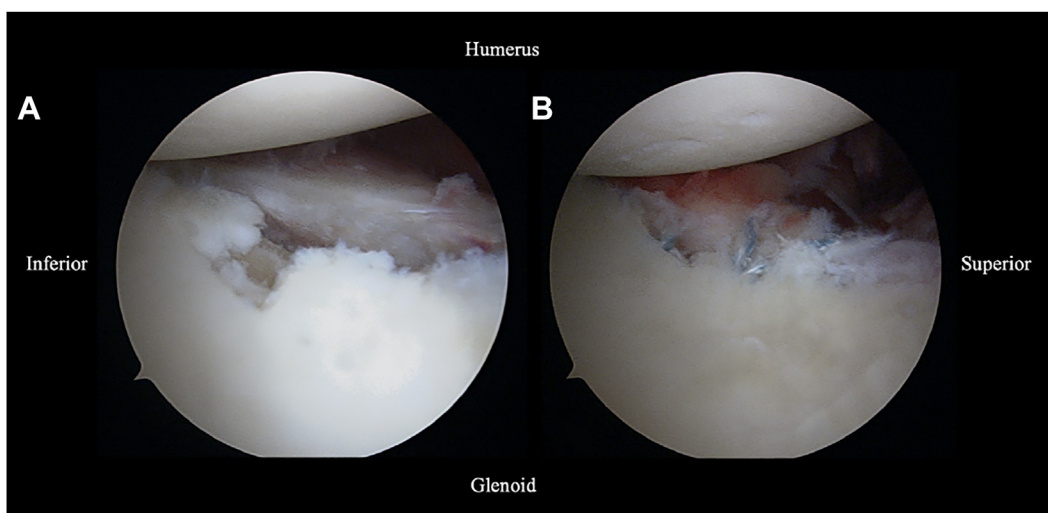


Figure 5 Arthroscopic images from the posterior viewing portal. (A) Anterior labral tear with a small cartilage defect identified along the anterior glenoid rim. (B) Anterior labral repair and capsulorrhaphy with the labrum up on the face of the glenoid covering the cartilage defect.

was positioned in the lateral decubitus position with 6.8 kg of suspended traction applied to the left upper extremity. The patient was prepped and draped in the usual sterile fashion.

Standard arthroscopic portals were established, and a diagnostic arthroscopy was performed demonstrating a displaced antero-inferior labral tear with bony fragment. The labral tissue and capsule were elevated off the anterior aspect of the glenoid and fixed with 4, knotless all-suture anchors (Arthrex, Naples, FL, USA) spread along the anterior glenoid rim (Fig. 5, A). After repair, traction was released and concentric reduction of the glenohumeral joint was confirmed when viewing from the anterior superior portal.

Following arthroscopic stabilization, attention was turned to acromion ORIF. A posterolateral incision was made over the scapular spine extending from medial to the fracture to lateral along the anterior one-third of the acromion laterally. Thick,

soft-tissue flaps were created and the trapezius and deltoid were exposed and subperiosteally elevated off the scapular spine. The fracture site was exposed, mobilized, irrigated, and débrided. Manipulation of the fracture was then performed, and a direct reduction was obtained. Two laterally based k-wires were used to provisionally hold the reduction. A 2.7 mm variable angle distal clavicle plate (DePuy Synthes, Raynham, MA, USA) was contoured to sit along the superior portion of the scapular spine extending to the acromion. A 7-hole 3.5 mm reconstruction plate (DePuy Synthes, Raynham, MA, USA) was contoured along the posterior and lateral aspect of the spine. The distal clavicle plate was fixed laterally with locking screws and the fracture was compressed through the plate. Medial locking screws were then placed for additional fixation. The 3.5 mm reconstruction plate was placed posteriorly (Figs. 6 and 7). Fluoroscopy was used to confirm anatomic reduction and appropriate fixation of

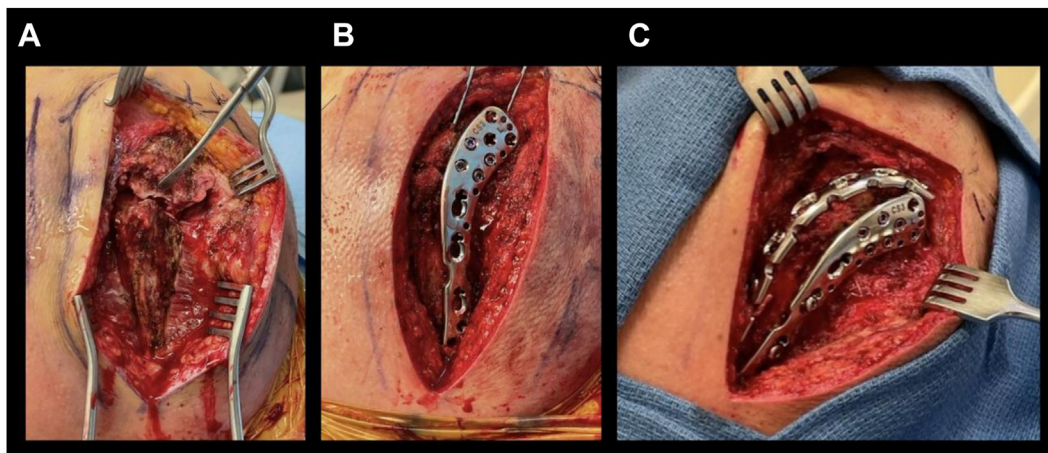


Figure 6 Intraoperative images demonstrating (A) acromion fracture, (B) fracture reduction and temporary fixation with 2 Kirshner wires and application of 2.7 mm variable angle distal clavicle plate, and (C) application contoured 3.5 mm reconstruction plate.



Figure 7 2.7 mm variable angle distal clavicle plate and contoured 3.5 mm reconstruction plates used for internal fixation.

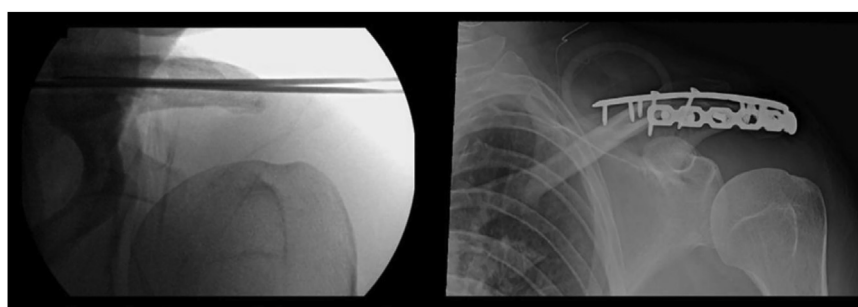


Figure 8 Intraoperative fluoroscopic image demonstrating fracture reduction and temporary fixation with 2 Kirshner wires and single-view postoperative radiograph demonstrating final fixation construct.

the acromion fracture as well as maintenance of the glenohumeral joint reduction. No bone graft was used. Single-view postoperative shoulder radiograph demonstrated anatomic reduction of acromion fracture and no hardware complications

(Fig. 8). Fig. 9 demonstrates the c-arm's positioning, such that the image intensifier is facing the patient anteriorly and the collimator is perpendicular to the patient's back. Fig. 10 is an example of the operating room layout.

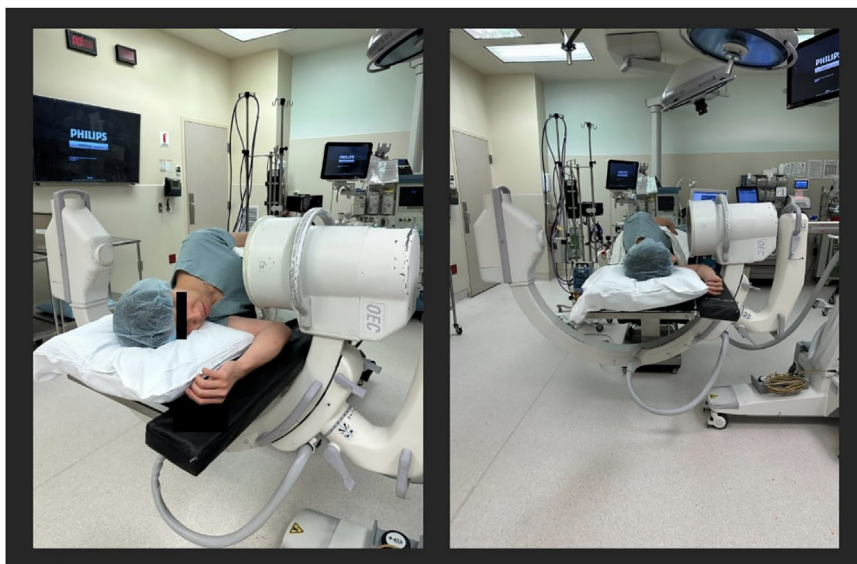


Figure 9 An example of patient positioning in reference to C-arm positioning.

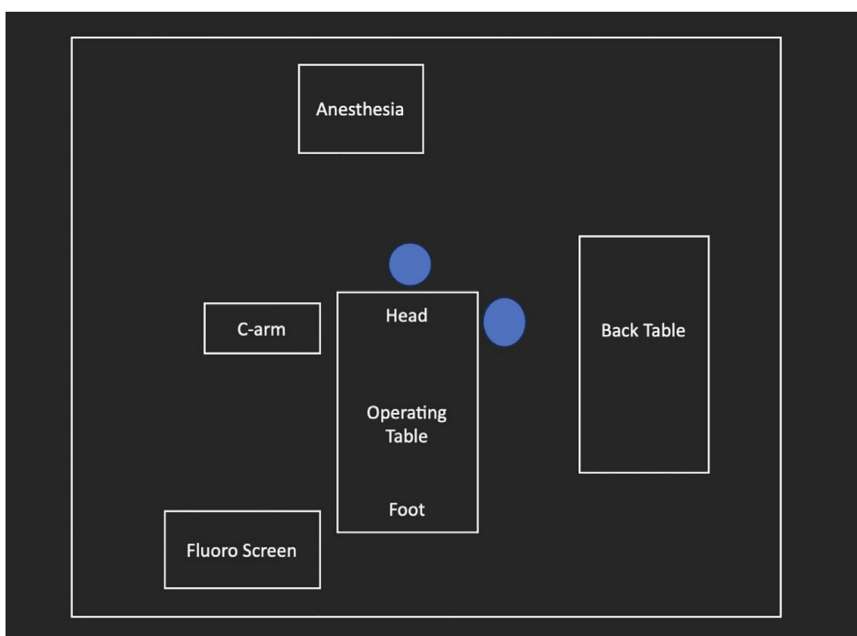


Figure 10 Recommended operating room layout for the acromion fracture fixation. Blue circles represent surgeons' positioning.

Postoperative care

Postoperative treatment involved immobilization of the shoulder with a shoulder immobilizer for 6 weeks. The patient followed-up at the 2-week, 1-month, 6-week, 2-month, 4-month, 6-month, and 1-year time points. There were no medical or surgical complications postoperatively, and the patient had no episodes of dislocations and his apprehension test at final follow-up was negative. It should be noted that at the initial

postoperative visit, the patient demonstrated mild deltoid atony and postoperative radiographs then demonstrated mild anterior subluxation of the glenohumeral joint. The patient began physical therapy around the 7-week mark with isometric scapular stabilizing exercises. Subsequently, the glenohumeral joint became concentrically reduced on follow-up X-ray. A gentle stretching/rehabilitation unit (Dynosplint, Severna Park, MD, USA) was ordered to help with shoulder motion at the 6-month mark. At his last visit, the patient had no pain and reported a



Figure 11 One-year postoperative left shoulder clinical images demonstrating asymptomatic posterior shoulder prominence from hardware.

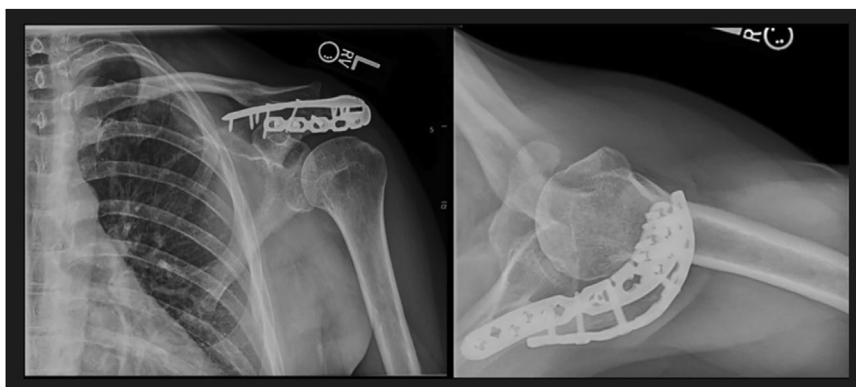


Figure 12 One-year postoperative left shoulder radiographs with anteroposterior and axillary views demonstrating healed acromial fracture, intact hardware, and normal glenohumeral alignment.

Single Assessment Numeric Evaluation score of 95. His injured shoulder range of motion was measured to be 160° of forward flexion, 160° of abduction, 80° of external rotation with shoulder adducted, and internal rotation to T7. Compared to the contralateral, uninjured shoulder, he lacked 10 degrees of flexion and abduction. He had symmetric strength at the supraspinatus, infraspinatus, teres minor, and subscapularis. Although there was prominence noted posteriorly from the hardware, the patient had no complaints and was overall very satisfied with his surgical result (Fig. 11). His left shoulder radiographs demonstrated healed acromial fracture, intact hardware, and normal glenohumeral alignment (Fig. 12).

Discussion

To the best of our knowledge, this is the first case of a traumatic acromion fracture associated with a glenohumeral dislocation. After a failure of initial nonoperative management, this pathology was successfully treated with an arthroscopic capsulolabral repair

and acromion ORIF. Robust acromion fixation was obtained with a dual-plate construct, using a 2.7 mm variable angle distal clavicle plate superiorly and a 3.5 mm contoured reconstruction plate laterally (DePuy Synthes, Raynham, MA, USA). At the 1-year follow-up, our patient has no pain and a self-reported Single Assessment Numeric Evaluation score of 95; he has also regained his baseline shoulder range of motion and strength.

In this case report, the patient opted to initially trial nonoperative management as his acromion was minimally displaced. Unfortunately, at his follow-up appointment, his acromion fracture displaced significantly, which led to the decision to proceed with surgical treatment. Ultimately, he underwent the above procedure 1 month after his initial surgery. Kim et al looked at 34 patients who underwent early vs. late fixation of posterolateral acromion fractures and found that only 44% of those who had a delay in treatment returned to preoperative levels of activity.⁹ Similarly, our patient had an early operative intervention and returned to his preoperative level of activity at the 1-year mark, suggesting that earlier intervention for displaced Levy Type II acromion fractures portend to better outcomes.

It is generally accepted that patients with displaced fractures, symptomatic nonunions, and those with associated injuries to the superior shoulder suspensory complex undergo anatomic reconstruction.^{7,10} There are a myriad of techniques reported for acromion fracture fixation including K-wire fixation, tension band wiring for peripheral lateral or anterior fracture, screw fixation, and plate techniques.^{2,6,7,8,12,15–17,19} Plating technique includes double plating, precontoured plating (both distal clavicle plates and acromion plates), and mesh osteosynthesis plating.^{1,11,18,21} The optimal fixation technique for displaced Levy Type II acromion fractures, whether associated with reverse shoulder arthroplasty or not, remains to be elucidated. We used a 2.7 mm variable angle distal clavicle plate and a contoured 3.5 mm reconstruction plate for our acromion fixation, which provided excellent fracture compression as well as robust time zero fixation. This construct is similar to what has been described in some other studies on acromion fixation techniques, and we also obtained acceptable postoperative outcomes in our patient.²¹

Traumatic acromion fractures with concomitant shoulder girdle injuries are rare clinical entities, and there are no other reports of these fractures in association with traumatic shoulder instability. Sims et al reported a case of an acromion fracture with a concomitant massive rotator cuff that underwent open repair prior to acromion ORIF.¹⁸ Because our patient had anterior subluxation of the humeral head, arthroscopic capsulolabral repair was performed immediately prior to acromion ORIF. We opted to perform the stabilization procedure first to decrease the risk of compromising the fixation with traction on the shoulder during the arthroscopic portion of the case.

Conclusion

This case report describes an acromion fracture associated with a traumatic anterior shoulder dislocation in an otherwise healthy individual. To our knowledge, we have not seen these injuries occur concomitantly. Close follow-up on patients with similar injury patterns to ensure that minimally displaced fractures do not displace leading to late subluxation. For those cases with displaced acromion fractures, arthroscopic capsulolabral repair and subsequent acromion ORIF can be successfully performed with excellent clinical results at the 1-year time point.

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