

Complex Scapulothoracic Disruption Managed with Scapular Dual Column Plating and Acromion Tension Band Osteosynthesis: A Radiological and Functional Success Story

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Learning Point of the Article:

In rare and complex scapulothoracic disruptions involving both scapular and acromial fractures, a multistructural approach using dual-column scapular plating and acromial tension band osteosynthesis can achieve excellent anatomical restoration and functional outcomes.

Abstract

Introduction: Scapulothoracic disruptions with associated scapular and acromial fractures are extremely rare and complex injuries, with limited guidance available in the current literature regarding their combined surgical management. These injuries can severely impair shoulder stability and function, necessitating anatomical reconstruction to restore biomechanics.

Case Report: We present the case of a 43-year-old male who sustained a high-energy trauma resulting in a type 1 scapulothoracic disruption (Zelle's classification), including fractures of the scapular body, lateral border, and acromion process. Surgical intervention involved dual-column reconstruction plate fixation of the scapula and tension band osteosynthesis for the acromion. Postoperative rehabilitation led to excellent radiological union and full functional recovery, with return to all activities by 4 months.

Conclusion: This case highlights the importance of anatomical fixation in restoring both scapulothoracic and glenohumeral mechanics. Dual-column plating provided stable scapular reconstruction, while acromial fixation ensured deltoid reattachment and preservation of shoulder abduction. The combined approach yielded a favorable clinical outcome in a rare injury pattern and was successfully delivered free of cost under a government-funded healthcare scheme. Biomechanically sound surgical constructs and guided post-operative rehabilitation are a key to optimal recovery in such complex injuries.

Keywords: Scapular fractures, shoulder injuries, acromial fractures, tension band wiring, shoulder girdle injuries.

Introduction

Scapulothoracic disruptions are severe injuries usually resulting from high-energy trauma. They may involve the scapular body, spine, lateral border, and acromion and are often associated with chest wall or clavicular injuries. These injuries compromise shoulder mechanics and require stable reconstruction to prevent chronic dysfunction.

While isolated scapular plating and acromial fixation have been described individually, there is limited documentation of cases managed with both dual-column scapular plating and acromion tension band wiring in the same setting. To the best of our knowledge, this is the only case report presenting such a scenario demonstrating excellent radiographic and functional results following comprehensive surgical intervention.

Author's Photo Gallery



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Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2025.v15.i08.5914>

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Submitted: 19/05/2025; Review: 09/06/2025; Accepted: July 2025; Published: August 2025

DOI: <https://doi.org/10.13107/jocr.2025.v15.i08.5914>

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Figure 1: Pre-operative imaging and clinical presentation of a complex scapular injury; the anteroposterior (AP) shoulder radiograph and three-dimensional computed tomography scans of the left scapula demonstrate a comminuted fracture involving the infraspinous fossa, scapular spine, lateral border, and acromion process. These indicate a high-energy scapulothoracic disruption. Also shown is a clinical photograph of the posterior shoulder region with a lacerated wound that was primarily closed using silk sutures at a peripheral health center before referral. The combination of osseous fragmentation and soft tissue compromise highlights the severity of the injury and the need for advanced surgical intervention.

Case Report

A 43-year-old right-hand-dominant male was brought to our institute following a high-velocity road traffic accident. Initial evaluation revealed extensive scapulothoracic injury with

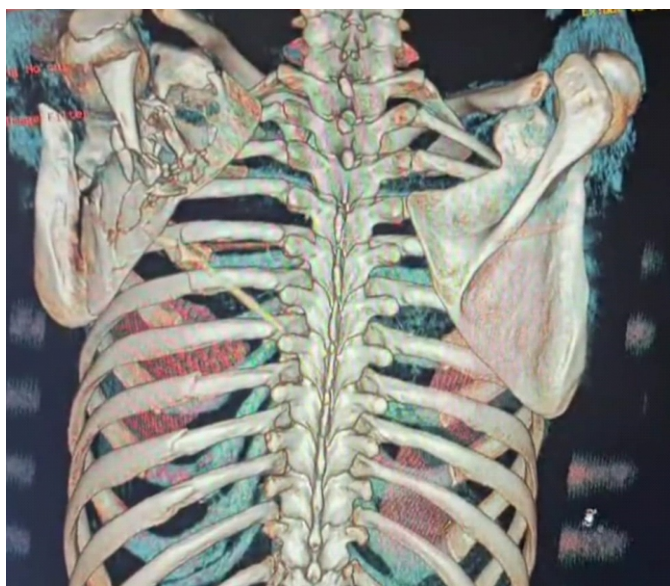


Figure 2: Three-dimensional computed tomography reconstruction of the left shoulder girdle demonstrating a lateral displacement of the scapula exceeding 2 cm from its normal anatomical position, consistent with scapulothoracic dissociation; the scan reveals gross disruption of the scapular architecture, including loss of anatomical continuity and orientation of the scapular body, spine, and acromion. This degree of displacement is indicative of high-energy trauma and is often associated with concurrent injuries to the clavicle, rib cage, and surrounding musculature. The imaging underscores the severity and complexity of the injury, aiding in pre-operative planning for surgical stabilization.

displaced fractures of the left (non-dominant side) scapular body, lateral column, and acromion process (Fig. 1) without any vascular or neurological deficits (Type 1, Zelle et al. [1]). Computed tomography scans confirmed significant disruption of the scapular architecture with lateral displacement of more than 2 cm and shortening, as well as fracture of the acromion (Fig. 2).

Informed consent was taken from the patient and his relatives, following which he underwent surgical stabilization. Through the Judet approach, after elevating the infraspinatus muscle from the infraspinous fossa and retracting it laterally, the posterior aspect of the scapula was exposed in its entirety. After securing the suprascapular nerve and artery at the spinoglenoid notch, anatomical reduction of the scapular body and lateral column was achieved and fixed with 3.5

mm reconstruction plates in a dual-column configuration (Fig. 3). The acromion fracture was separately addressed through superior scapular approach. Tension band wiring was done using two 2 mm Kirschner wires and a 1.5 mm stainless steel wire wound in a figure-of-eight fashion to achieve compression and restore the deltoid insertion (Fig. 4).

Post-operative rehabilitation included early passive motion followed by active-assisted range of motion at 4 weeks. At 4 months, the patient demonstrated active shoulder abduction up to 120° (Fig. 5), minimal pain (Visual Analogue Scale 1/10), and radiographic evidence of fracture union (Fig. 6). The University of California, Los Angeles Shoulder Score following a questionnaire was found to be 34/35 and the Constant–Murley score was 95/100, again confirming an excellent outcome [2,3].

Discussion

Scapular plating is commonly indicated in cases of medial/lateral column disruption, >25 mm displacement, or angulation >45° [4,5]. Acromial fractures are typically treated conservatively but may require tension band wiring or plating when displaced or impeding shoulder motion [6-8].

To the best of our knowledge, no reports exist describing the combined use of dual-column plating and acromial fixation in the same patient. Goss introduced the concept of the superior shoulder suspensory complex (SSSC) and emphasized the need for restoration of all its components to prevent instability [9,10]. This case supports this biomechanical principle by treating both the lateral scapular border and acromion, which

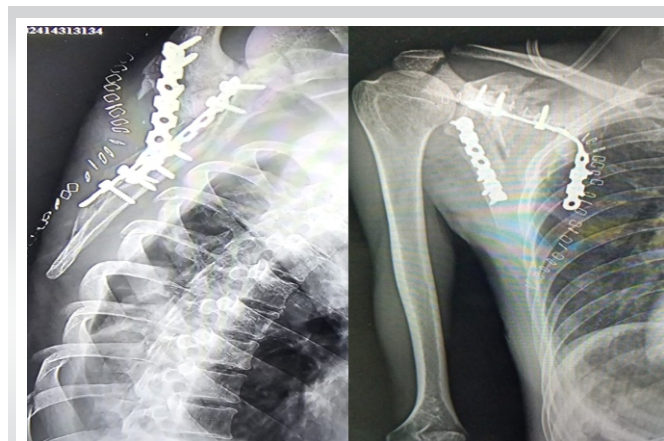


Figure 3: Immediate post-operative anteroposterior (right) and scapular Y-view (left) radiographs of the left shoulder following the first surgical procedure; the images show dual-column reconstruction of the scapula with plate fixation of both the medial and lateral columns. Restoration of scapular alignment and structural integrity is evident, reflecting the initial phase of surgical stabilization in the management of complex scapulothoracic disruption.

are integral to the SSSC [Table 1].

Jain et al. reported good outcomes using tension band wiring in isolated acromion fractures [11], while Herrera et al. found dual-column scapular fixation yielded better functional recovery compared to single-plate constructs in complex fractures [12].

Qalib et al. reported good outcome in a displaced acromion fracture treated with three cannulated cancellous screws perpendicular to the fracture [13]. Hollensteiner et al. concluded that double plating approach with two locking plate constructs bore good results in Levy type III acromion fractures [14]. Bauer et al. reported a durable result after double plating of entire scapular spine and acromion with concurrent reverse shoulder arthroplasty in a case of rotator cuff arthropathy with scapular spine fracture [15]. Hsiue et al. demonstrated an excellent outcome of dual plating of the acromion along with

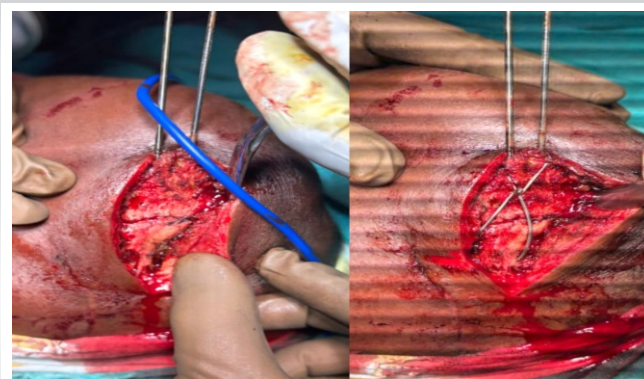


Figure 4: Intraoperative images demonstrating anatomical reduction of the acromion fracture; the fracture fragments are accurately realigned and temporarily stabilized using two parallel 2.0 mm Kirschner wires (K-wires). A 1.5 mm stainless steel wire is applied in a figure-of-eight configuration around the K-wires to achieve tension band osteosynthesis. This construct provides dynamic compression across the fracture site, enhancing stability and promoting union in the anatomically complex region of the acromion.

arthroscopic capsulolabral repair in a patient with an acromion fracture with first-time anterior shoulder dislocation. A 2.7 mm variable angle distal clavicle plate was used along the superior aspect of scapular spine up to the acromion and a 3.5 mm reconstruction plate was placed posteriorly in their report [16]. However, concurrent fixation of scapular body, lateral border, and acromion has not been extensively documented, making this case noteworthy in the field of complex trauma.

Successful shoulder function depends on the integrity of the scapular body, lateral border, acromion, and surrounding musculature. Disruption of multiple components, as seen in this case, requires an individualized surgical strategy aimed at restoring anatomy and biomechanics.

The dual-column scapular plating ensured proper restoration of the scapular contour and glenoid alignment, while acromial fixation maintained deltoid lever arm function. The



Figure 5: Clinical photographs showing active left shoulder abduction up to 120° (left), well-healed surgical site without scar-related complications (middle), active internal rotation of the shoulder in extension indicating progressive functional recovery, and satisfactory rehabilitation outcome, considering this was his non-dominant arm.



Figure 6: Four-month post-operative evaluation following surgical management of complex scapular fracture; left: Scapular Y-view radiograph; right: anteroposterior radiograph showing stable fixation with dual-column scapular plating and acromial tension band wiring alongside signs of fracture healing.

Study (year)	Number of cases	Fixation methods	Functional outcome
Goss (1993)	2	Case 1: Tension-band wiring of the acromion only	Both cases united well; no quantified score reported; outcomes noted as functionally satisfactory
		Case 2: Plate for acromion, tension-band for clavicle, K-wire for coracoid (recommended screw instead)	
Yao et al. (2020)	22 patients (7 triple, 1 quadruple, 14 double disruptions)	ORIF tailored to site: plates for clavicle/scapula, cannulated screw for coracoid, AC stabilization as needed	Union in all cases UCLA score: 15 excellent, 5 good, 2 poor ? 91% good/excellent
Sonkusale et al. (2024)	18 cases (unstable floating shoulders – double disruptions)	ORIF of both clavicle and scapula (locking plate, precontoured scapula plate)	Herscovici score: 72.2% excellent/good
			ASES score: 61% scored 50–100
Jones et al. (reported in 2024)	15 cases (12 triple, 3 quadruple disruptions)	14 scapular neck fractures, 8 clavicle, 10 acromion, 10 coracoid; all treated operatively as per location	Functional outcomes not numerically specified in abstract; surgical series shows high union rates
UCLA: University of California, Los Angeles, ORIF: Open reduction and internal fixation			

Table 1: Summary table of SSSC studies.

combination prevented scapular winging and shoulder weakness – common complications in scapulothoracic injuries. Rehabilitation played a critical role in achieving excellent outcomes, considering this was the patient's non-dominant arm, emphasizing the importance of early mobilization post-stabilization.

Conclusion

This case demonstrates that a comprehensive surgical approach combining scapular dual-column plating and acromion tension band osteosynthesis can lead to excellent radiological union and functional recovery in patients with complex scapulothoracic disruption. Surgeons should consider early and anatomical reconstruction of all disrupted components of the shoulder girdle in high-energy injuries to optimize outcomes.

Clinical Message

Timely anatomical fixation using dual-column scapular plating and acromial tension band wiring, combined with structured rehabilitation, can restore shoulder function and stability within a short time in rare scapulothoracic disruptions with associated fractures.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Naskar AK, Ganwir HP, Atram VA, Pawar SS. Complex Scapulothoracic Disruption Managed with Scapular Dual Column Plating and Acromion Tension Band Osteosynthesis: A Radiological and Functional Success Story. Journal of Orthopaedic Case Reports 2025 August;15(8): 135-139.

