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CASE REPORT

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Bilateral Sternoclavicular Joint Dislocation with Inferior Sternal Migration: Surgical Management and One-Year Outcome

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ABSTRACT

Bilateral sternoclavicular joint (SCJ) dislocation is an exceptionally rare injury, particularly when associated with inferior migration of the sternal body and multiple rib fractures. We report the case of a 51-year-old male who sustained high-energy thoracic crush trauma resulting in bilateral SCJ dislocation, inferior sternal displacement, rib fractures, and a Grade I open humeral shaft fracture. Surgical management required a multidisciplinary approach including SCJ reduction, ligament reconstruction with a semitendinosus tendon graft in a figure-of-eight configuration, clavicular fixation, and delayed intramedullary nailing of the humeral shaft.

Postoperatively, neuropathy secondary to a C8–T1 brachial plexus injury was diagnosed; it was considered traumatic in origin, as no intraoperative manipulation occurred. At one-year follow-up, full functional recovery was achieved in the right upper limb, whereas residual limitation on the left side was attributable to persistent neurological involvement rather than mechanical instability. This case represents an uncommon combination of bilateral SCJ dislocation with inferior sternal migration and associated thoracic and neurological injuries, providing relevant surgical and clinical insights.

Keywords: Sternoclavicular joint dislocation, sternum, bilateral injury, chest trauma, thoracic injury.

INTRODUCTION

The sternoclavicular joint (SCJ) is the sole bony articulation linking the upper limb to the axial skeleton and plays a critical role in shoulder girdle biomechanics. Despite its importance, the SCJ is often under-recognized in the literature and is often referred to as the "forgotten joint". It is a synovial, saddle-shaped joint, formed by the medial clavicle and the sternal manubrium, stabilized by a complex capsuloligamentous system[1–3].

Although reinforced by intra- and extra-articular ligaments, the SCJ remains biomechanically unstable, with less than 50% of the medial clavicular surface articulating with the manubrium[2,3]. Dislocations may occur anteriorly or, less frequently, posteriorly (retrosternal). Bilateral and posterior dislocations are extremely rare, and associated inferior sternal displacement is exceptionally uncommon, typically occurring after high-energy trauma[4–10].

We report a rare case of bilateral SCJ dislocation with inferior sternal migration and concomitant rib fractures, complicated by a Grade I open humeral shaft fracture, highlighting the surgical strategy and long-term functional outcome.

CASE PRESENTATION

The chronological sequence of diagnostic assessment, surgical management, and follow-up is summarized in Table I.

A 51-year-old man sustained polytrauma due to compression under a metal sheet at work. Initial imaging revealed:

- Left posterior SCJ dislocation with inferior sternal displacement, multiple left rib fractures, partial right SCJ dislocation with lateral clavicular comminution, and left scapular body fracture (Fig 1).

Table I. — Clinical timeline summarizing the patient's diagnostic work-up, surgical management, neurological assessment, and follow-up.

Time	Clinical Event
Day 0 (Trauma)	High-energy thoracic crush injury at work. Pre-hospital intubation due to respiratory compromise
Emergency admission	Whole-body CT scan showing bilateral sternoclavicular joint dislocation with inferior sternal migration, multiple left rib fractures, right clavicle fracture, left scapular fracture, and open humeral shaft fracture
Initial Management	Bilateral thoracic drains placement and external fixation of the open humeral fracture
Early neurological status	Reliable neurological assessment was initially limited due to sedation and mechanical ventilation. After stabilization, weakness and sensory deficit in the left hand suggested possible involvement of the lower brachial plexus (C8–T1).
Day 9	Multidisciplinary surgical reconstruction of the sternoclavicular joints with tendon graft and fixation of the second rib and right clavicle
Day 21	Definitive intramedullary nailing of the left humeral shaft fracture
4 weeks post-operative	Initiation of rehabilitation program: Shoulder immobilization discontinued and gradual mobilization initiated.
3 months	Electromyography (EMG) demonstrating neurogenic damage in the C8–T1 territory, predominantly affecting the ulnar nerve
6 months	Repeat EMG confirming proximal brachial plexus involvement, excluding distal compression at the elbow
1 year follow up	Final clinical follow-up showing stable sternoclavicular reconstruction and functional recovery of the right upper limb; residual left upper limb limitation due to persistent neurological deficit.

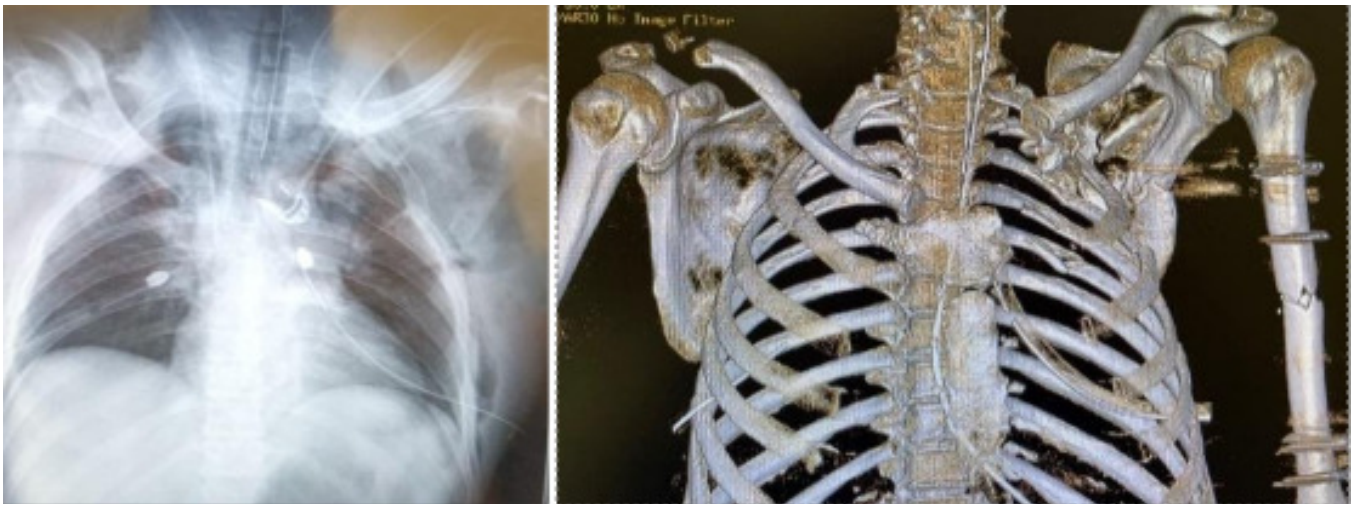

Fig. 1 — Preoperative radioghraps and CT scan showing: bilateral sternal clavicular dislocation with inferior sternal migration, multiple left rib fractures, lateral right clavicular fracture, left scapular fracture and left humeral shaft fracture.

- Displaced mid-shaft fracture of the left humerus (Grade I open injury, Gustilo classification).
- Right C7 transverse process fracture.
- Bilateral medium-basal pneumothorax (max 3.5 cm), mediastinal air, pleural effusion, bilateral apical pulmonary contusions, anterior herniation of left upper lobe lung tissue, diffuse subcutaneous emphysema, and soft tissue infarction in the left axilla.

Pre-hospital intubation precluded early neurological assessment. Due to the patient's critical condition and ongoing mechanical ventilation, neurological assessment at admission was not feasible. During early ICU stay, after sedation reduction, a neurological deficit of the left upper limb was suspected, characterized by weakness of intrinsic hand muscles and sensory impairment in the ulnar nerve distribution. These findings raised suspicion of a traumatic brachial plexus injury involving the lower trunk (C8–T1).

Bilateral thoracic drains were inserted and maintained for 18–19 days. Initial stabilization of the left humeral fracture was performed with external fixation prior to ICU transfer for ongoing mechanical ventilation and close monitoring.

Surgical Management

Nine days post-trauma, after stabilization, a multidisciplinary orthopedic and thoracic team performed surgical reconstruction of the SCJs. A thoracic surgeon was available during the procedure due to the potential risk of mediastinal injury.

Patient positioning: supine with bilateral anterior SCJ "Y" incision (Fig. 2). Inferior and contralateral displacement of the sternal manubrium was identified. Subperiosteal dissection of the cranial portion of the left pectoralis major allowed reduction of the sternal body to the midline of the thoracic cage. Partial detachment of the intercostal muscles between the first and second left ribs was performed with careful protection of the brachiocephalic artery. The posteriorly dislocated second left rib was identified and reduced at the sternocostal joint. The medial left clavicle was exposed using a blunt dissection technique. After detachment of the sternocleidomastoid muscle, the clavicle was reduced to restore normal sternal alignment. A homologous semitendinosus tendon graft obtained from a certified institutional tissue bank was prepared with Krackow sutures at both ends. The allograft was harvested from a cadaveric donor, cryopreserved, and stored according to national regulations governing human tissue transplantation. The use of allograft tissue was approved by the institutional ethics committee, and informed consent was obtained from the patient prior to surgery. Using a 3.5-mm drill, tunnels were created in the medial clavicle and superior manubrium. The graft was passed in a figure-of-eight configuration and secured with FiberWire suture (Fig. 3-4). The second left rib was stabilized with plates and screws. On the right side, exposure through the trapezio-deltoid fascia revealed rupture of the anterior sternoclavicular ligament with partial posterior injury. The anterior ligaments were repaired and the posterior structures reinforced with FiberWire suture; the interclavicular ligament was also sutured. The lateral third fracture of the right clavicle, displaced posteriorly, was reduced and fixed with an anatomical angular-stable titanium plate using 3.5-mm and 2.7-mm screws (Fig. 5-6).

After clinical stabilization, intramedullary nailing of the left humeral shaft fracture was performed 21 days post-trauma (Fig. 7).

Postoperatively, neuropathy secondary to C8–T1 brachial plexus injury was noted. The neurological deficit was considered traumatic in origin, as no intraoperative manipulation of the plexus occurred and preoperative imaging showed no evidence of iatrogenic injury.

Follow-up

Rehabilitation was tailored to the patient's clinical condition, with both shoulders immobilized for four weeks. Passive mobilization was then initiated, followed by active-assisted and active range-of-motion exercises under physiotherapy supervision, aimed at

Fig. 2 — Intraoperative image: bilateral sternoclavicular "Y" incision.

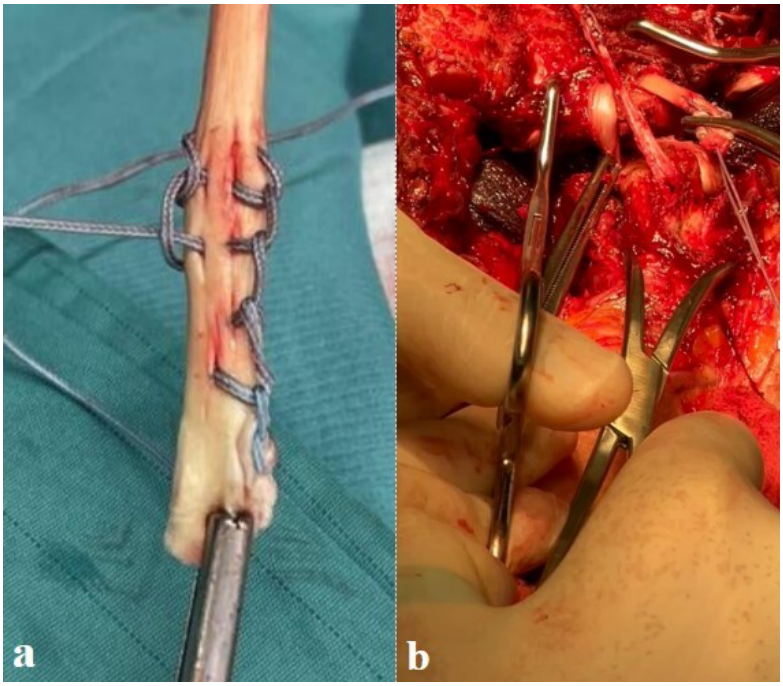

Fig. 3 — Homologous semitendinosus tendon graft preparation (a); reduction of left sternoclavicular dislocation with clamps and fiber-wire suture (b).

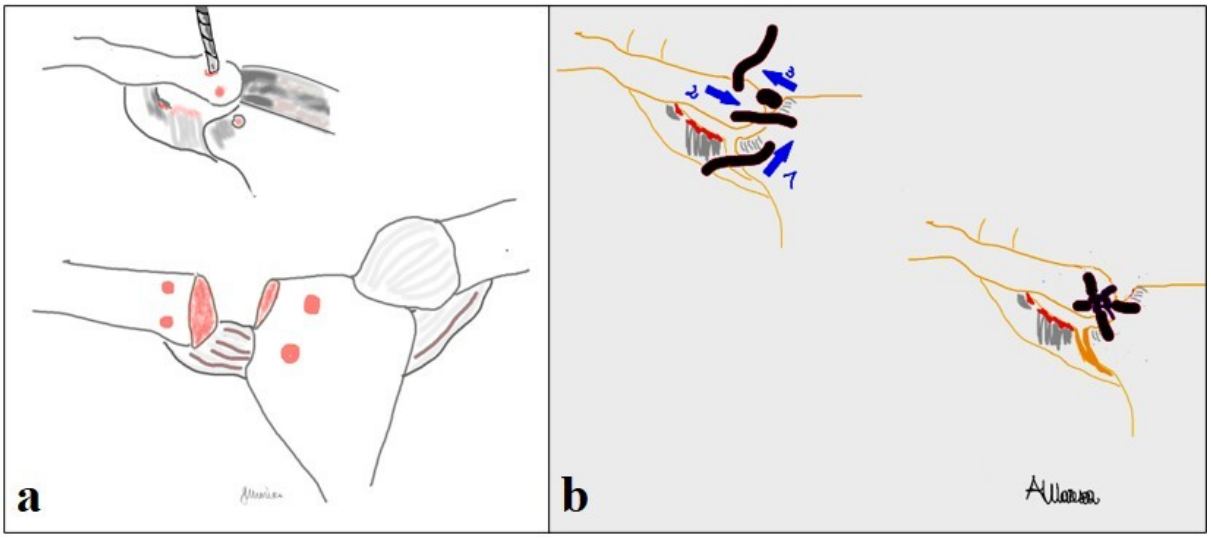

Fig. 4 — Illustration of technique: perforation of a 3.5 tunnel in the sternal handlebar and clavicle (a); upper tie-over loop "8" with tendon graft (b).

Fig. 5 — Radioghraps showing left second rib dislocation reduction and internal fixation with plate and screws.

Fig. 6 — Intraoperative image: right lateral clavicle fracture reduced and fixed with an anatomical angular-stable plate using 3.5-mm and 2.7-mm screws.

Fig. 7 — Postoperative radiograph showing definitive intramedullary nailing of the left humeral shaft fracture.

maintaining upper limb function and preventing joint stiffness. Progressive strengthening and functional activities were gradually introduced as tolerated, taking into account the associated neurological impairment. Return to heavy lifting or contact activities was not allowed before three months postoperatively.

Electromyography (EMG) performed at three months demonstrated neurogenic changes with denervation in the C8–T1 territory, predominantly affecting the ulnar nerve. A repeat EMG at six months confirmed proximal conduction impairment, suggesting a high brachial plexus traction injury rather than distal compression at the elbow.

The patient was evaluated by reconstructive microsurgery specialists, and no indication for ulnar nerve decompression was identified; therefore, conservative management was continued.

At one-year follow-up, the right shoulder had fully regained function. The left shoulder showed limited flexion (90°) and abduction (80°) due to neurological deficits; internal rotation reached L5, external rotation was preserved, and elbow function remained normal (Fig. 8). The patient resumed his pre-injury occupational duties and athletic activities, including professional running.

DISCUSSION

This case describes an exceptionally rare combination of bilateral posterior sternoclavicular joint dislocation with inferior sternal migration, multiple rib fractures, and concomitant C8–T1 brachial plexus injury. Its management required a multidisciplinary surgical approach, careful mediastinal protection, and staged reconstruction. This unique injury constellation provides an instructive example for orthopedic surgeons managing complex thoracic trauma and highlights key decision-making principles not addressed in previous reports. To place this case in context, previously published reports of bilateral SCJ dislocations were reviewed, with particular attention to cases involving associated sternal displacement or concomitant thoracic injuries.

Sternoclavicular joint (SCJ) dislocations account for less than 1% of all joint dislocations[6,7]. Despite strong ligamentous support, the limited articulating surface renders the joint biomechanically vulnerable. Posterior dislocations, although less frequent, carry higher clinical significance due to proximity to vital mediastinal structures. Potentially life-threatening complications include vascular injury, tracheal or esophageal compression, pneumothorax, and neurological deficits[10–12]. Subclavian vessel compromise and brachial plexus injuries have been reported, occasionally requiring urgent surgical intervention[13,14]. Early recognition with appropriate imaging, particularly computed tomography, is essential for accurate assessment of displacement and associated thoracic injuries[15,16].

Bilateral SCJ involvement is exceedingly rare (~5% of SCJ dislocations)[8,9], typically following

Fig. 8 — Satisfactory clinical outcome at y 1-year follow up.

high-energy trauma such as motor vehicle accidents or crush injuries[17,18]. The heterogeneity of injury patterns and management strategies has precluded the development of standardized treatment guidelines. Table II summarizes previously published cases of bilateral SCJ dislocations and highlights differences in mechanism of injury, associated lesions, surgical techniques, and outcomes.

Our case is distinguished by bilateral dislocation with posterior displacement on the left, inferior sternal migration, multiple rib fractures, lateral clavicular comminution, and traumatic C8–T1 brachial plexus injury. Such a combination has been rarely reported.

In this context, several surgical options have been described. Closed reduction is generally recommended within 24–48 hours for acute dislocations[5,6]. However, in the present case, it was considered unsafe due to the complexity of displacement, associated thoracic injuries, and risk to mediastinal structures. When closed reduction is not feasible or instability persists, operative strategies include ligament repair, cerclage fixation, plating constructs, and tendon graft reconstructions[19-21].

The absence of standardized treatment guidelines reflects the rarity and heterogeneity of these injuries. Some authors have reported satisfactory outcomes with rigid fixation techniques such as plates or cerclage wires, particularly in cases associated with sternal fractures[18,19]. However, transarticular metallic fixation carries risks, including hardware migration and mediastinal injury[22,23].

Tendon graft reconstruction has therefore gained increasing acceptance. Biomechanical studies have demonstrated that figure-of-eight tendon graft reconstruction provides superior stability compared with simple repair, reducing the risk of recurrent instability[24,25]. This technique reproduces the stabilizing function of the costoclavicular and sternoclavicular ligaments while avoiding the complications associated with transarticular hardware. Systematic reviews have reported favorable outcomes, although comparative evidence remains limited[20].

Table II. — Chronological overview of published cases of bilateral sternoclavicular joint injuries. The table highlights differences in injury pattern, sternal involvement, surgical technique, and outcomes, providing context for the present complex case.

Author	Year	Mechanism of Injury	Type of Dislocation	Sternal Involvement	Associated Injuries	Treatment	Outcome
Gleason et al [8]	2006	Spontaneous (atraumatic)	Bilateral anterior subluxation	No	None reported	Orthopedic reduction (conservative)	Good outcome
Wang et al [9]	2019	Motor vehicle accident	Asymmetrical bilateral (anterior/posterior)	No	Bilateral clavicle fractures	Clavicle plating fixation + Surgical fixation SCj by Kirschner wire	Good outcome
Saltzman et al [17]	2016	Sportive crush injury	Chronic bilateral posterior	Not Specified	Multiple rib fractures, left rotator cuff lesion	Resection medial end clavicle	Full recovery
Prangenberg et al [18]	2024	High-speed bicycle accident	Bilateral posterior	Sternal fracture	Open sternal fracture, bilateral dislocation of the first and second rib	Sternal locking plate + SCj cerclage reconstruction	Full recovery
Yi et al [26]	2016	Motor vehicle accident	Bilateral anterior	Sternal fracture with angolation	Bilateral fracture of the second rib	Sternal locking plate, conservative treatment of SCj	Good outcome
Present Case	2025	Occupational crush injury	Bilateral	Inferior sternal migration	Multiple left rib fractures, right clavicular fracture, left scapular body fracture left humeral fracture, C8–T1 plexus injury	SCj tendon graft reconstruction (figure-of-eight) clavicle and rib plating fixation	Right full recovery; residual left neurological deficit

From a biomechanical perspective, the SCJ is the principal stabilizing link between the axial skeleton and the upper limb; therefore, bilateral disruption with inferior sternal migration can significantly compromise both the shoulder girdle and the thoracic ring.

An important aspect of this case is the involvement of the sternum. Previous reports have described SCJ injuries associated with sternal fracture or separation[18,26]; however, inferior migration of the sternal body, as observed in this patient, represents a particularly unusual pattern likely resulting from asymmetric muscular traction combined with high-energy compressive forces. In this context, the injury may not represent a true SCJ dislocation, but rather a form of "sternoclavicular separation," as previously suggested by Yi et al[26]. When sternal fracture or migration is present, the sternum itself loses structural stability, contributing to global thoracic ring disruption rather than isolated joint incongruity.

From a conceptual standpoint, a "dislocation" implies loss of joint congruence with a stable reference structure, whereas a "separation" reflects disruption of the thoracic unit, in which the sternum itself becomes unstable. Previously reported cases of bilateral sternoclavicular joint dislocation have generally resulted from proximal clavicle fractures with preservation of the structural continuity between the sternum and the rib cage.

This distinction is clinically relevant, as it may influence both surgical strategy and postoperative expectations. Our case further supports this interpretation, given the associated rib fractures and the evident instability of the anterior thoracic cage.

Overall, these findings support interpreting this injury pattern as a disruption of the thoracic unit rather than an isolated joint dislocation.

This mechanism further complicates surgical management by altering thoracic ring alignment and requiring precise reduction of both the clavicle and the sternal body.

Unlike previously reported cases, the C8–T1 brachial plexus injury influenced functional recovery.

The right shoulder regained full mobility, whereas the left shoulder maintained limitations due to neurological deficit rather than mechanical instability. This finding underscores the importance of considering associated neurovascular injuries when evaluating postoperative outcomes. Serial electrophysiological studies confirmed a proximal traction injury of the brachial plexus rather than distal ulnar nerve compression at the elbow, supporting a high-energy traction mechanism involving the lower plexus (C8–T1).

A limitation of this report is the absence of standardized functional outcome scores, as functional assessment was based on clinical evaluation and range-of-motion measurements.

Finally, this case highlights the importance of multidisciplinary management in complex high-energy trauma, integrating thoracic protection, joint stabilization, and careful attention to neurovascular structures.

It demonstrates that tendon graft reconstruction can reliably restore mechanical multidirectional stability even in extreme bilateral injuries with sternal and rib involvement, while functional outcome is also influenced by associated neurological injury. These findings provide clinically relevant insights for orthopedic surgeons managing complex SCJ injuries associated with high-energy thoracic trauma.

Learning Points

- Bilateral sternoclavicular joint dislocation associated with inferior sternal migration represents an extremely rare injury pattern following high-energy thoracic trauma.
- Computed tomography is essential for accurate diagnosis and for assessing associated thoracic and mediastinal injuries.
- Open reconstruction using a figure-of-eight tendon graft can provide stable fixation while avoiding the complications related to metallic transarticular fixation.
- Functional outcome may depend not only on mechanical stability but also on associated neurovascular injuries.

Conflict of Interest: The authors declare that they have no financial or personal relationships that could have inappropriately influenced the conduct or reporting of this study.

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Authors' Contributions:

- AM: Conceptualization.
- PV: Data collection, Writing – original draft.
- RP: Supervision.
- SC: Writing – review & editing

All authors have read and approved the final version of the manuscript and assume responsibility for its integrity and originality.

Ethical Approval: As this is a case report, approval from an Institutional Review Board was not required.

Informed Consent: Written informed consent was obtained from the patient for the use of his clinical data and images for publication purposes. The patient was informed that identifying details would not be disclosed and that efforts would be made to ensure confidentiality, although absolute anonymity cannot be guaranteed.

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