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Case Report

A concurrent clavicle and scapular fixation in a complex floating shoulder girdle: A case report

Lavindra Tomar[1], Gaurav Govil[1]*

[1]Dept. of Orthopaedics, Max Super Speciality Hospital, Patparganj, Delhi, India

Abstract

The isolated clavicle and scapular fractures are commonly managed by conservative measures. A concomitant injury of clavicle, scapula and rib fractures following a high energy trauma causes significant disruption leading to complex floating shoulder girdle. The literature lacks in clear treatment guidelines for this rare entity. The concurrent clavicle and scapular fracture in a 42-year-old lady with associated ipsilateral multiple rib fractures involving right shoulder girdle presented ten days after injury with severe pain and marked discomfort in doing any routine daily activity. The injury was evaluated by computer tomography and managed by fixation of clavicle and scapular fracture for a favourable outcome. The complex shoulder girdle injury needs an individualized management. The early identification of complex injury pattern, a thorough assessment by CT evaluation and primary stable fixation allowed an early rehabilitation with a good clinical and functional outcome.

Keywords: Clavicle, Scapular, Fracture, Floating shoulder, Polytrauma

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1. Introduction

The concurrent occurrence of an ipsilateral clavicle, scapula and rib fracture presents rarely. The complex shoulder injury presents majorly due to high energy trauma.[1,2] The ipsilateral fracture in midshaft of clavicle and neck of glenoid has been identified as a floating shoulder (FS).[3] The disruption of superior shoulder suspensory complex comprising of glenoid, coracoid process, coracoclavicular ligament, distal clavicle, acromioclavicular joint and acromion process has also been further labelled as FS.[1,4,5,6] The biomechanical study identified the unstable nature of a combined bony and ligamentous discontinuity to present a FS.[7] The misinterpretation should be avoided for a combination of a midshaft clavicle fracture with a scapular body fracture as a FS and they need to be considered as a separate entity.[2] The complex rare injury with an ipsilateral concurrent fracture of clavicle, scapula and ribs is difficult to classify and the management with conservative measures give poor clinical and functional outcomes.[5] Importantly, the associated injuries to neurovascular bundles, cervical spine and thoracic wall need to be identified early for the decision-making process.[1,6,8] There is no consensus in literature on treatment strategy or protocol for a complex shoulder girdle injury.[2,8] The understanding of the patho-anatomy for the complex shoulder girdle injury and fracture pattern may allow better decision making for the conservative or surgical management option.[3] The surgical options include reduction and fixation of clavicle fracture either in isolation or along with scapular fracture stabilization with occasional need of fracture rib fixation for a flail fragment of chest wall. The clavicle fracture has an associated scapular fracture in more than 25% cases.[9] The scapular fracture may be missed on plain radiographs on initial survey and a computer tomographic (CT) study will better delineate the fracture morphology.[10]

We report a rare case of a concurrent clavicle and scapular fracture in a 42-year-old lady with associated ipsilateral multiple rib fractures. It was managed surgically by fixation of clavicle and scapular fracture for a good clinical and functional outcome.

*Corresponding author: Gaurav Govil
Email: gauravgovil@yahoo.co.in

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2. Case Report

A 42-year-old female had an injury to right side torso region after a severe fall. She had a history of hypertension on irregular medications. She presented to us after 10 days of injury with severe pain in right shoulder, chest wall and was unable to do her routine activities independently without support. Preoperative radiographs showed the right sided clavicle, scapular, and ipsilateral rib fractures of right 2th to 8th ribs posteriorly and laterally.

Pre-operative computerised tomographic (CT) imaging templating of the extremity and chest confirmed the injury pattern **Figure 1**. A CT of cervical spine was additionally done to ascertain integrity of the spine. It revealed no osseous or soft tissue abnormality and the cervical canal dimensions were reported normal. The conservative trial had not alleviated the pain and discomfort. Surgical fixation of fractures was discussed and planned.

Surgery was performed the next day under general anaesthesia. First patient in supine posture was operated for clavicle fracture with a standard superior approach. The subperiosteal exposure was done and reduction was achieved by applying longitudinal manual traction to the fractured limb with elevation of the distal fragment. Fracture alignment was held corrected with a reconstruction locking titanium plate. Thereafter, a prone position was taken. Another incision was given along the lateral border of the scapula with extension of incision curving along the scapular spine to expose the scapular fracture on infra glenoid and medial border after careful retraction of muscular attachments. The fractures were fixed and stabilized by two plates for the fracture of body, scapular spine and infra glenoid segments. The fixation with reconstruction buttress plate along the lateral scapular body was done. The medial border was buttressed with a T plate. The final hardware placement was rechecked with fluoroscopic imaging in both planes before irrigation and wound closure. The immediate post-operative radiographs show reasonable corrections in chest wall alignment of rib fractures too. **Figure 2**

Range of motion (ROM) on bed was encouraged the second day after surgery and a shoulder immobiliser was used in the immediate post-operative period. A rehabilitation protocol involving spirometry and chest wall exercises was initiated in the immediate post- operative period. The stable fixation allowed an intensive respiratory therapy with visual analogue score reduced gradually with this early post-operative rehabilitation. At six weeks, radiographic evaluation showed maintained fracture reduction and sound union. There were no post-operative complications noted. At three months, full range of shoulder movements was obtained under physiotherapeutic guidance. Return to pre-injury level of shoulder range of movements was uneventful. An evaluation at two years follow-up had a good clinical recovery with radiographs showed no loosening, implant failure or secondary arthritis of shoulder joint. **Figure 3**

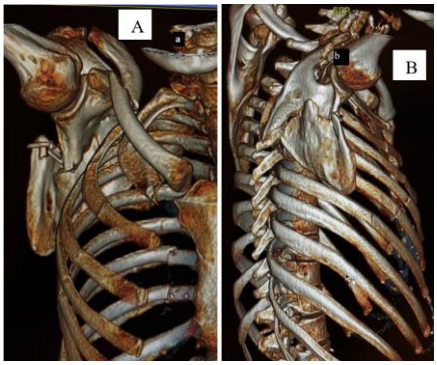

Figure 1: Pre-operative CT imaging with antero-posterior (**A**) and lateral (**B**) view of the right side chest wall with clavicle fracture, scapular fracture and multiple rib fractures.

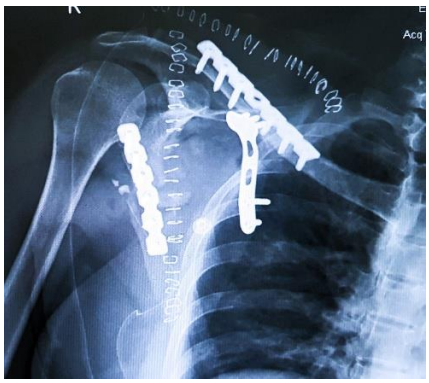

Figure 2: Immediate post-operative radiographs with anteroposterior view of the right shoulder girdle with chest wall.

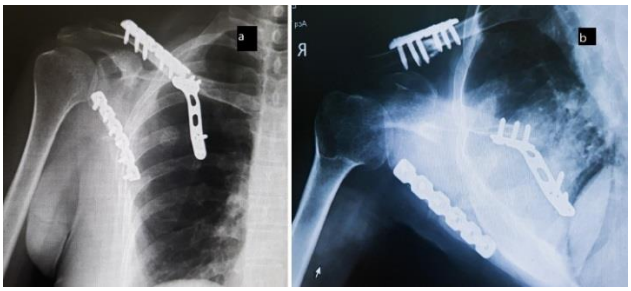

Figure 3: Follow-up radiographs at 2 years with antero-posterior (**A**) and lateral (**B**) view show no loosening, avascular necrosis or secondary osteoarthritis.

3. Discussion

The presence of multiple fractures in an upper limb girdle injury involving clavicle, scapula and ribs presents with significant challenges in the management either with conservative or surgical treatment. The immobilisation of displaced fractures of clavicle, scapula and ribs with support immobilizers, arm pouch sling and rib belt are inadequate to control the pain and multiple mobile fragments may predispose for non-union of fractures.[11] There is marked discomfort if not reduced and stabilized adequately delaying the rehabilitation.

The isolated mid-shaft clavicle fracture has been commonly treated non-operatively with good outcomes. An

associated scapular fracture along with rib fractures may predispose a clavicle fracture to non-union or mal-union with poor outcomes.[12] The identifiable risk factors for non-union of fracture clavicle have been displaced fracture of more than 2 cm, lack of opposing fracture ends, and comminuted fracture.[5] The injury to coraco-clavicular and acromio-clavicular ligaments may disrupt the bony alignment of concomitant clavicle and scapular fractures leading to poor outcomes.[2]

The various classifications for scapular fractures do not give any clear decision-making strategy. There is lack of any ideal classification system for scapular fracture. The classification based on the scapular pillar involvement has been followed commonly. A CT with 3D reconstruction plays an important role in identification and classification of the fracture pattern for the decision-making process.[2] The Bartoníček classification for scapular body fracture divides it into three pillars. The medialization of scapula of more than 10 mm for double disruptions and decreased gleno-polar angle were indications for scapular fracture fixation to avoid poor outcomes.[2,6] The surgery for scapular fracture needs comprehensive experience and expertise with a long learning curve for a surgeon due to its complex anatomy, muscular attachments and comminuted fractures[2]. The scapular fractures if not treated well, may compromise the shoulder function with impingement, malunion, non-union, or scapulothoracic dyskinesia on treatment with conservative measures.[2,9,13] A mirror Judet approach has been described to surgically manage an ipsilateral scapular and multiple rib fractures with favourable outcomes.[14]

There are high chances and propensity to miss an associated fracture of scapula or ribs with a predominant clavicle fracture. A study identified an approximately 40% prevalence to miss identifying the existent scapular fracture on an initial standard chest radiograph which was done for trauma evaluation.[6,10] The possible reasons include an improper radiographic view or an obscured fracture due to an associated bony injury, artefacts on the radiographic film or an associated abnormal finding of chest contusion, pneumothorax or emphysema.[10] The CT evaluation allows for thorough assessment and assists in decision making process.

The stabilization of the clavicle fracture with plate fixation alone may allow alignment of other bony disruption to acceptable limits if ligamentous disruptions are not significant.[3,4,15] The displacement of scapular glenoid injury even after an adequate clavicle fracture fixation may predispose the fixation to fail due to untreated double disruption in FS.[12] The advantages of clavicle fixation are multi-fold with better contouring of the clavicular prominence, less incidences of non-union, improved shoulder function, less traction on neurovascular structures and early rehabilitation.[5] The clinical and biomechanical assessment studies are non-conclusive and lack any concrete evidence to guide regarding the surgical fixation of concomitant fractures.[3] The FS injury needs thorough assessment and evaluation to plan for treatment either by conservative or surgical methods.[4]

4. Conclusion

The complex shoulder girdle injury needs individualized management due to paucity of literature with a defined treatment strategy or protocol for the concurrent fractures of clavicle, scapula and ribs. The surgical management of clavicle, scapula and rib fractures need thorough pre-operative assessment, identification of concomitant injuries and adequate stabilization of fracture for a favourable outcome.

5. Abbreviations

FS: Floating shoulder; CT: computerised tomographic imaging.

6. Patient Consent

A written and informed consent was taken from the patient prior to the publication.

7. Conflict of Interest

None.

8. Source of Funding

None.

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