

# Epidemiology of Scapula Fracture at a Level 1 Trauma Center in North India: A Pilot Study

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## ABSTRACT

**Aim:** We did this study as a pilot project to plan the future research work in the field, with the aim to study the incidence and epidemiology of scapular fractures. Results of the study would be helpful in identifying the mass impact of the injury to the trauma victim and laying down the training curriculum.

**Materials and methods:** It was a cross-sectional study from July 1, 2018, to December 31, 2018; all patients presented to our level 1 trauma center with polytrauma and shoulder injuries were screened for fracture of the scapula. The demographic details, mode and mechanism of injury, associated injury, severity, and fracture pattern of all patients with scapula fracture were recorded. Patients were evaluated for concomitant injuries.

**Results:** Out of total 1,730 patients presenting to the Advanced Trauma Center, PGIMER, Chandigarh, between July 2018 and December 2018, 44 (2.3%) patients were diagnosed with scapular fractures. Total 63.4% (28) of patients sustained various associated injuries.

**Clinical significance:** Results of this study have raised the awareness that fractures of the scapula are on the rise compared to what was thought previously.

**Conclusion:** Our study mandates the need of more dedicated screening methodology at the busy trauma center, which could reduce the chances of missed scapular fracture. Moreover, we could be able to identify more frequent fracture patterns and area of research specific to our setting.

**Keywords:** Age distribution, CT diagnostics, Epidemiology, Incidence, Scapula fracture, Shoulder girdle injury, Trauma centers.

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## BACKGROUND

Scapula fractures are relatively uncommon injuries observed in the trauma patients, constituting for 3–5% of shoulder girdle injuries.<sup>1,2</sup> Fractures involving the body of the scapula are more common and result from a direct high-energy blunt force, whereas both glenoid and scapular neck fractures happen because of the indirect force transferred by impaction of the humeral head into the glenoid fossa.<sup>3–5</sup> However, most of the scapular fracture does not require any surgical intervention while there is need for severely displaced fractures. Inadequate management of such fractures can result in malunion and subsequent poor shoulder function as a consequence to rotator cuff dysfunction, scapula-thoracic dyskinesis, and impingement.<sup>6–9</sup>

Initially in developing countries, the timely diagnosis and inadequate management was the primary concern among scapula fracture patients. However, as a consequence of the increasing rate of the road traffic accident (RTA), increased awareness, and advanced imaging techniques, the reported incidence of the scapula fractures is showing the rising trend, which has attracted more research in this field.

India is one of the developing countries with a remarkably high rate of RTA, with 464,910 RTAs registered in 2017, claiming 147,913 lives and causing injuries to 470,975 persons, which hypothetically hint for a higher incidence of scapular fracture.<sup>10</sup> Despite that, no reports are currently available from India regarding the prevalence and epidemiology of scapular fractures. Based on this background, we did a pilot project study to plan future research work on the incidence and epidemiology of scapular fractures. The results of the study would help to identify the mass impact of the injury to the trauma victim and laying down the training curriculum for the management of scapular fracture based on the associated injuries.

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## PATIENT SELECTION AND METHODS

It was a cross-sectional study conducted from July 1, 2018, to December 31, 2018, at the level 1 trauma center in the Postgraduate Institute of medical education and research (PGIMER), Chandigarh. The active screening for fracture of the scapula was conducted in all patients presenting to the emergency with polytrauma and shoulder injuries. The patients were screened clinically combined with radiology in conscious patients. However, in unconscious polytrauma patients without any external signs of shoulder injury, only radiological assessment was the main element for screening.

Clinically, the patients with painful shoulder range of motion, swelling, abrasion or bruises around the scapula region, and tenderness around scapula on palpation were evaluated with radiographs for scapula fractures. However, in unconscious polytrauma patients, the chest radiograph was the primary screening tool to identify the fracture of scapula.

All the cases with suspected fracture of the scapula on clinical examination or chest radiograph were advised true anteroposterior

(AP) shoulder view (Grashey's view) and scapular Y-lateral view. Patients diagnosed with scapula fracture on initial X-ray were taken up for computed tomography (CT) scan with standard axial, coronal, sagittal cuts, and 3D reconstruction views with humerus subtraction. Lateral base offset (LBO), angular deformity between fracture fragments, glenopolar angle (GPA), articular step at glenoid, and displacement of fracture fragments were taken into consideration and accordingly, further management was planned. All intra-articular scapular fractures were classified further according to the Ideberg classification system.<sup>11</sup>

The demographic details, mode, mechanism of injury, associated injury, severity, and fracture pattern of all patients with scapula fracture were recorded. The patients were also evaluated for concomitant injuries.

### Statistical Analysis

This study is mainly descriptive, so data analysis consisted of mean/median values with maximum and minimum range and standard deviations. The Chi-square test or student's *t*-test were used to analyze the significance of distributions of frequencies by sex and age group.

### RESULTS

Out of total 1,730 patients presented to Advanced Trauma Center, PGIMER, Chandigarh between July 2018 and December 2018, scapular fractures were diagnosed in 44 (2.3%) patients. Out of all patients diagnosed with scapula fracture, 39 were males and 5 were females. The mean age of the patients was 42.3 years (range 18–67 years). Also, 63.4% (28) patients were polytrauma cases out of a total of 44 patients (Flowchart 1).

The majority of patients presented with right-side scapula fracture (27 patients) and left-side scapula was fractured in 15 patients, whereas 2 patients had bilateral injury. The most common mode of injury was RTAs, which was the case in 84% (37) patients, whereas the rest of the patients had injuries due to fall from height. After the screening of all 1,730 patients presenting to the emergency during the period of the study, 162 patients were clinically suspected of having scapula fracture, out of which 37 patients had scapula fracture on confirmation with radiographs. However, out of all, 57 patients had poor level of consciousness due to associated injuries, and screening for that group of patients was conducted using radiographics only. Total 7 patients had scapular fracture out of 57 patients of the second group (Table 1).

The majority of concomitant injuries included blunt trauma chest, which was diagnosed in 39% (18) out of all patients with scapula fracture. The clavicle was fractured in 28% (13), other orthopedic injuries were reported in 24% (11), head injury in 17.3%

(8), and spine injury in 4% (2) accounted for other major associated injuries (Table 2). Scapula fracture was associated with brachial plexus injury in 13% (six), vascular injury in one patient, shoulder dislocation in one patient, and acromioclavicular joint injury in one patient.

The fracture pattern assessment review was done for all 46 fractures in 44 patients (including two patients with bilateral scapula fracture). The scapular body was involved in 41% (19), glenoid involved in 30% (14), neck of scapula in 19% (9), combined fracture in 4 patients, and processes fracture in 2 patients (Table 3).

### DISCUSSION

This study was conducted in the level 1 trauma center and tertiary care referral center covering the significant patient load of this region. The reported incidence of scapula fracture in trauma victims was 2.3% in our series. Previous studies by Court Brown et al. in 2000

**Table 1:** Demographic details of included patients

Details	Result
Total number of patients presented in 6 months	1,730
Total patients clinically suspected to have scapular fracture	162
Number of patients evaluated radiographically only	57
Total number of patients with scapular fracture	44
Age	42.3 years (18–67)
Gender	39-males, 5-females
Mode of injury	
RSA	37
Fall from height	7
Side involved	27—right side, 15—left side, 2—bilateral

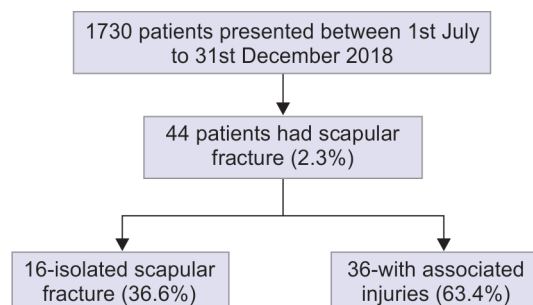
**Table 2:** Incidence of associated injuries among scapular fracture patients

Associated injuries	Number of patients
Chest injuries (rib fractures, pneumomediastinum, pneumothorax, hemothorax)	18
Clavicle fracture	13
Associated bony injuries (except clavicle fracture, spine injury)	11
Head injury	8
Brachial plexus injury	6
Spine injury	2
Vascular injury	1
Shoulder dislocation	1
Acromioclavicular joint injury	1

**Table 3:** Ratio of fracture patterns among included patients

Type of fracture pattern	Number of fractures (46)
Scapular body	39% (18)
Glenoid	28% (13)
Scapular neck	19.5% (9)
Acromion or coracoid process fracture	4% (2)
Combined fracture	8.6% (4)

**Flowchart 1:** Depicting the incidence of scapula fracture



reported 0.3% incidence of scapular fracture at their level 1 trauma center.<sup>1</sup> Brown et al. in 2014 diagnosed scapula fracture using both X-ray and CT scan at level 1 trauma center and incidence measured by them was 1.3%.<sup>12</sup> Our finding was corroborative to the increasing trend of scapular fracture over the last two decades. A recent study by Launonen et al. reported increase in annual incidence of scapula fracture from 0.48% in 1998 to 0.66% in 2014.<sup>13</sup> With passing years, a rise in scapula fracture has been observed, which can be explained as an effect of increase in number of RTAs, awareness about fracture of scapula, and primary use of the radiology as a diagnostic tool, specifically in polytrauma and unconscious patients.<sup>1,10,12</sup> Altered consciousness has been one of the common reasons to miss a scapula fracture and use of radiology as primary tool for diagnosis has made it possible to reduce such incidences.<sup>12</sup> In our study too, if we had relied solely on clinical examination, we could have missed the scapula fracture in seven patients (15%), due to the lower conscious level.

Scapula fracture is usually complicated by associated severe injuries to the vital organs. In our study, 63.4% of the patients had associated injuries, while the rest of the patients had isolated scapula fracture. A retrospective analysis by Ada et al. on 113 scapula fracture patients depicted that 96% of patients had associated injuries, where chest injury was the major insult (rib fracture in 37%, hemopneumothorax in 29%, pulmonary contusion in 8%).<sup>3</sup> Other injuries reported were head injury in 34%, clavicle fracture in 25% patients, brachial plexus injury in 3.5% patients, and subclavian artery injury in 1% patient.<sup>3</sup> In a study by Brown et al. on 144 patients with scapula fracture, 58 (40.2%) reported with associated pneumothorax, 27 (18%) had hemothorax, and 26 (18%) with clavicle fracture.<sup>12</sup> Data reviewed by Launonen et al. depicted concomitant injuries in 55% of patients comprised of blunt trauma chest in 23.4%, clavicle fracture in 16.5%, and cervical spine or head injury in 6.9% of total patients.<sup>13</sup> Associated injuries in scapular fracture patients lead to increased morbidity, higher injury severity scores, which limit the management protocols. In our study, chest injuries (rib fractures, pneumomediastinum, pneumothorax, hemothorax) were reported in 39% (18) patients, clavicle fractures in 28% (13), other orthopedic injuries in 24% (11), head injury in 17.3% (8), brachial plexus injury in 13% (6), and spine injury in 4% (2) of patients. Incidence of the serious associated injury in cases with scapula fracture was found to be much less than previous reports.

Similar to demographic figures in other orthopedic injuries, higher presentation in males was seen in our study. Increased incidence among males (M:F ratio—8:1) might be attributed to the more active status of males in the community making them susceptible to accidents. The most common mode of injury in the previous study is RTA, followed by fall from height.<sup>12</sup> Age of affected patients range from 18 to 67 years (mean age—42.3 years) in contrast to 5 to 75 years (mean age—25.9 years) in the study by Ada et al. and 16 to 85 years (mean age—43.6 years) in the study by Courtlyn Brown et al.<sup>3,12</sup>

Fracture of the scapular body was the commonest pattern in our series, which is comparable to findings of the Ada et al.<sup>3</sup> However, the incidence of the intra-articular fracture of glenoid was relatively more frequent and comparable to reports of Ideberg et al. and Schandelmaier et al.<sup>14,15</sup> It is important to understand that intra-articular fracture involving the glenoid fracture requires surgical intervention more often than the extra-articular fracture of the scapula. This finding could be significant in identifying the future area of research at our center.

The limitation of this study was the small sample size; however, this was a pilot study designed to find the relevance of doing further research in our setup.

## CLINICAL SIGNIFICANCE

The results of this study have raised the awareness that the incidence of scapula fracture is rising in comparison to what was thought previously.

## CONCLUSION

Our study mandates the need for more dedicated screening methodology at busy trauma center, which can reduce the chances of missed scapula fracture. Moreover, further research would enable the identification of more frequent fracture patterns and specific areas of research to our setting.

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