

Surgical Treatment of Scapular Fractures: A Prospective Study.

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ABSTRACT

Background: Scapular fractures can be seen following road traffic accidents, falls or following assaults. While nondisplaced scapular fractures can be managed conservatively displaced and comminuted fractures needs surgical intervention. Open reduction and internal fixation is associated with excellent functional outcome and acceptable complication rates. **Methods:** This was a prospective cohort study comprising of patients presenting with scapular fractures and treated by surgical interventions were included in this study depending upon a predefined inclusion criteria. Any patient having any exclusion criteria was excluded from the study. Demographic details, mechanism of injury and imaging finding were noted. All patients underwent surgical interventions in the form of open reduction and internal fixation. Post operatively patients were assessed for functional outcome and complications. **Results:** Out of 25 studied cases there were 16 (64%) males and 9 (36%) females with a M: F ratio of 1: 0.6. The most common age group affected was 18-30 years (44%) and most common mechanism of injury was road traffic accidents (60%). Majority of the patients had fractures of body of scapula (48%) followed by fractures of glenoid cavity (32%), coracoid process (12%) and acromion process (8%). Mean preoperative and postoperative quick DASH scores were found to 42.12 +/- 10.13 and 10.76 +/- 4.54. Mean VAS score at presentation and 48 hours postoperatively was 8.14 and 5.20 respectively. Minor complications were seen in 6 (24%) cases. **Conclusion:** Displaced or comminuted scapular fractures treated by surgical interventions are found to have excellent functional outcome and acceptable complication rate.

Keywords: Displaced scapular fracture, surgical intervention, functional outcome, Quick-DASH.

INTRODUCTION

Scapular fractures are relatively uncommon and accounts for approximately 0.4-1% of all the fractures.^[1] Though they are usually managed conservatively but complex injuries leading to fractures with significant displacements cannot be managed conservatively and needs operative intervention.^[2] Trying to manage these cases may result in continued pain, stiffness and functional disability. In majority of the instances scapular fractures are associated with other injuries and fractures. The management of such associated injuries may delay the diagnosis and consequently management of these fractures.^[3] The common mechanism of injuries causing fractures of scapula include road traffic accidents, direct blows, falling from heights and as a complication of surgical procedures such as shoulder arthroplasties.

The most common part to be fractured is either body or spine (approximately 50%) followed by glenoid (approximately 35-40%).^[4] The acromial and coracoid process are fractured in minority of the cases and are relatively uncommon. The patients with scapular fractures usually present with swelling, tenderness and functional disability.^[5] It is essential that the patients suspected to be having capsular fractures should be screened for associated injuries such as head injuries, rib fractures, vascular and visceral injuries.^[6] X-ray of shoulder with antero-posterior (AP), lateral, oblique and axillary views may be done for the diagnosis. In difficult cases the diagnosis can reliably be confirmed on the basis of computed tomography with 3D reconstruction can give excellent imaging diagnosis.^[7] Electromyography may be needed in cases where neuronal injury such as brachial plexus injuries are suspected. The management usually depends upon the type of fracture. Simple undisplaced fractures are usually treated conservatively whereas complex displaced and comminuted fractures need operative intervention. Since many of these fractures are associated with

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other significant injuries a thorough search should be made and if any significant injuries are present then they should be managed appropriately.^[8]

Surgical interventions in cases of scapular fractures are indicated in patients having significantly displaced fractures of the glenoid cavity or neck, fractures resulting in persistent subluxation of the humeral head and comminuted fractures. Postoperatively the limb is immobilized for 2-3 days after which gradual range of motion may be allowed depending upon the severity of fracture. Maintenance of reduction may be confirmed by X-rays taken every 2 weeks till 6 weeks. Sling is discontinued when satisfactory healing is noted on imaging. Post-operatively physiotherapy plays a crucial role in recovery though in some of the patients' full recovery may take 9-12 months to be achieved. Though rare but complications such as neurovascular injuries, shoulder stiffness and functional disability may be seen in some cases due to poor operative technique.^[9]

Many randomized controlled trials studying the outcome of conservatively managed scapular fractures came up with the conclusion that conservative management is associated with poor functional outcomes. These suboptimal outcomes have prompted many orthopedic surgeons to recommend surgical management in cases of scapular fractures except in simple undisplaced scapular fractures and open reduction and internal fixation is being increasingly done in cases with complex intraarticular as well as extraarticular fractures of scapula.^[10] We conducted this retrospective study of 20 patients with scapular fractures who were treated by surgical interventions in our institute.

MATERIALS AND METHODS

This was a prospective study conducted in the department of orthopedics of a tertiary care medical institute located in an urban area. The study consisted of 25 patients who were admitted to our department of scapular fractures and were treated by surgical intervention. The study was approved by institutional ethical committee. The information like demographic profile (age, sex and address), relevant history, clinical examination with a special emphasis on presence of swelling, pain and restricted movements of affected shoulder were all noted. Investigations like Complete blood count, biochemical tests and Imaging studies (X-Ray in all patients and 3D CT and MRI in selected patients) were done. After appropriate preoperative evaluation patients underwent open reduction and internal fixation.

Surgical Procedure

All patients were treated surgically in semiprone position. After mobilization of surrounding

muscles, the fracture fragments were mobilized. Fractures involving glenoid articular surface was first reduced and internal fixation was done. After internal fixation of intra-articular fractures any extra-articular fracture of lateral border was reduced and internal fixation was done with the help of appropriate plates and cortical screws. The fracture of the medial border was fixed in the spinomedial angle. If a fracture of the surgical neck was found then it was also reduced and fixed with plates and screws. After fracture reduction and internal fixation suction drainage was introduced and finally the sling was applied and extremity was immobilized.

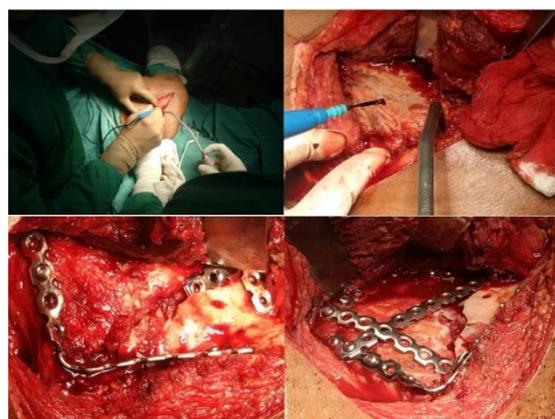


Figure 1: Surgical procedure (Clockwise from left upper corner) incision, mobilization of muscles, open reduction and internal fixation.

Appropriate post-operative care was taken in all the patients. After the surgical procedure the immobilization was done for 48 hours after which gradual mobilization was started. Patients were followed up every 2 weekly for initial 6 weeks followed by every month till 6 months and after that every 3 months till 1 year post-operatively. The outcome was determined on the basis of quick-Disabilities of Arm, Shoulder and Hand (quick - DASH) scores and VAS scores. Presence of complications during 1 year follow up period were also studied. The results were studied using appropriate statistical methods. P value less than 0.05 was taken as statistically significant. Data analysis was carried out using Minitab 17 version software. Microsoft word and excel were used for generating charts and graphs.

Inclusion Criteria

1. Patients with intraarticular or extraarticular scapular fractures who were treated by open reduction and internal fixation.
2. Those who consented to be part of the study.
3. Those who remained in follow up for at least 1 year postoperatively.

Exclusion Criteria

1. Patients of scapular fractures who were treated conservatively.

- Those patients who refused consent to be part of the study.
- Patients who didn't follow up at least for 1 year postoperatively.

RESULTS

Out of the 25 patients having scapular fractures and treated by open reduction and internal fixation there were 16 (64%) males and 9 (36%) females with a M: F ratio of 1: 0.6.

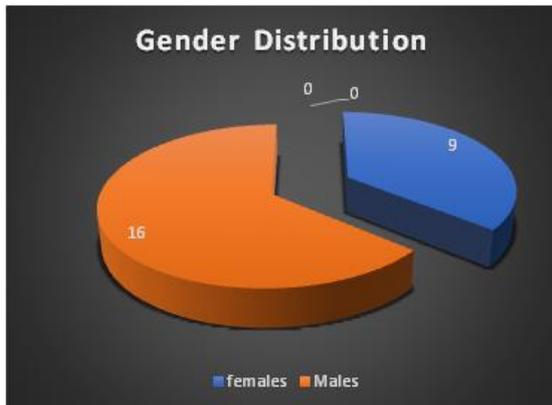


Figure 1: Gender Distribution of the studied cases.

The analysis of the age groups of the patients with scapular fractures showed that there were 11 (40 %) patients in age group between 18 – 30 years, 8 (33.33%) patients in age group between 31 – 40 years and 4 (26.66%) patients in age group between 41-50 years. 2 patients were above 50 years of age. Mean age of the study group was 32.52 ± 9.79.

Table 2: Age distribution of the studied cases.

Age groups	No. of Patients	Percentage
18 - 30 years	11	44.00%
31 - 40 years	8	32.00%
41 – 50 years	4	16.00%
> 50 years	2	8.00%
Total	25	100.00%
Mean Age ± SD =32.52 +/- 9.79		

Mechanism of injury in majority of the patients with intra-articular or extraarticular scapular fractures was found to be Road traffic accidents (60%) followed by fall from height (30) and direct blow (10%) and fall of heavy object.

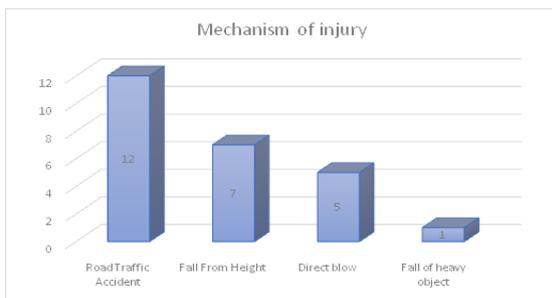


Figure 3: Mechanism of Injury in the studied cases.

In 19 (66.66 %) intraarticular or extraarticular scapular fractures were seen on right side and in 6 cases fracture was seen on left side.

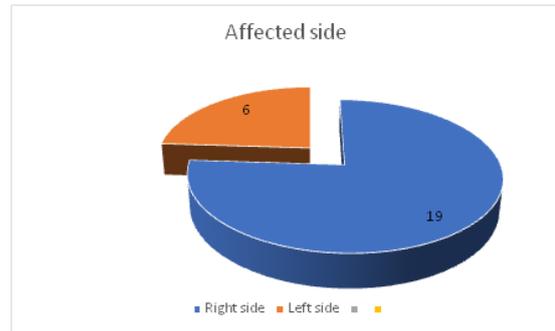


Figure 4: Affected side in the studied cases.

The analysis of fracture type on the basis of imaging and during operative intervention showed that the majority of the patients had fractures involving body of scapula (48%) followed by glenoid cavity fractures (32%). Fractures involving coracoid and acromian processes were seen in 3 (12%) and 2 (8%) patients respectively.

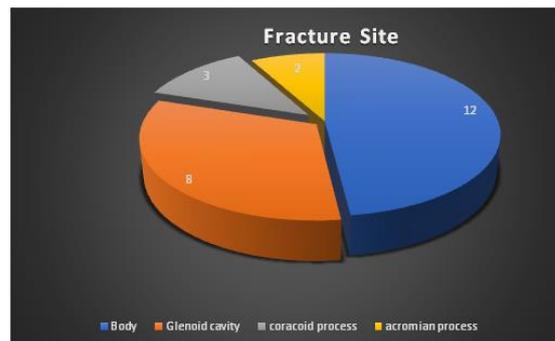


Figure 5: Fracture Site in studied cases.

All patients underwent open reduction and internal fixation. These were performed according to the institutional protocol and depending upon the type of fracture. The analysis of the results obtained from patients with scapular fractures showed that there was a significant difference in preoperative and postoperative quick Disabilities of arm, shoulder and hand (DASH) scores.

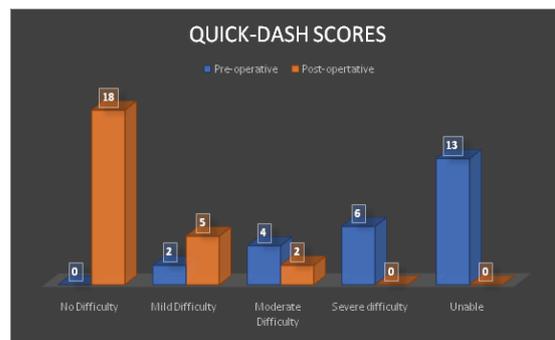


Figure 6: Preoperative and postoperative Quick DASH scores.

In studied cases mean preoperative and postoperative quick DASH scores were found to 42.12 +/- 10.13 and 10.76 +/- 4.54. The difference in mean preoperative and postoperative MEPS score was statistically highly significant (P < 0.0001).

Table 2: Preoperative and postoperative Quick DASH scores.

Mean Preoperative Quick-DASH score	42.12 +/- 10.13	P< 0.0001. Statistically Significant
Mean Postoperative Quick-DASH score	10.76 +/- 4.54.	

There was a significant reduction of pain in operated cases over the period of 24-48 hours. The analysis of VAS score showed that mean VAS score at 24 and 48 hours was 8.14 and 5.20 respectively. During follow up there was significant reduction in VAS scores and after 1 week postoperatively the mean VAS score was found to be 3.36. At the end of 1 year follow up period the mean VAS score was found to be 0.72 +/- 0.45.

Table 3: Mean VAS scores during preoperative, postoperative and during follow up period.

Time	Mean Vas Score	Std Deviation
Pre-operative	8.14	0.36
24 Hours- Post operative	5.20	1.82
1 Week	3.36	1.49
1 Month	2.28	1.27
3 Months	1.96	0.84
6 months	1.32	0.47
1 year	0.72	0.45

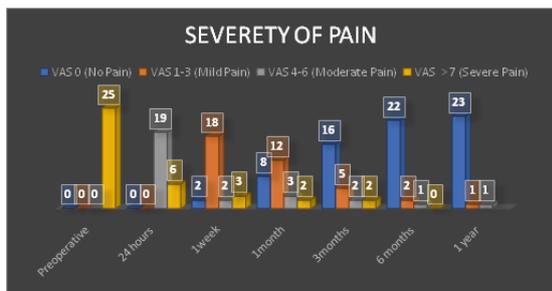


Figure 7: Severity of Pain during preoperative, postoperative and during follow up period.

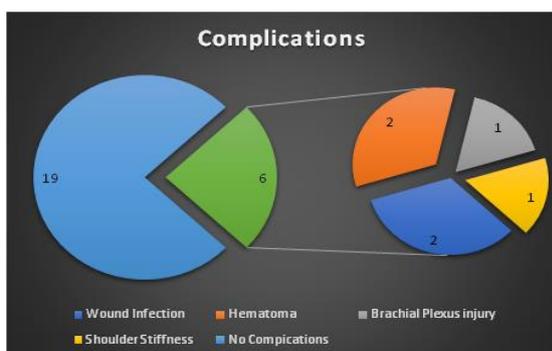


Figure 8: Complications in the studied cases.

Analysis of the complications in the studied cases revealed that out of 30 operated cases there were 6 cases with postoperative complications. These complications included wound infection (8%), hematoma (8%) and brachial plexus injury (4% patients) and shoulder stiffness (4%). There were no cases of implant failure.

DISCUSSION

In this study of 25 patients with scapular fractures who were treated by operative interventions in our department males were predominantly affected. The male preponderance has been reported by various authors. R ideberg et al conducted a study involving 100 intraarticular glenoid fractures and found that there were 55 (55%) men and 45 (45%) women.^[11] Similarly, Tucek M et al analyzed associated injuries in a group of 23 patients operated on for a dislocated scapula fracture. In this study also, there was a M:F ratio of 1:0.1512. This male preponderance is expected in view of males being more likely to be involved in road traffic accidents and assaults.

Mean age of the studied cases in our study was found to be 32.52 +/- 9.79. The fact that physically active age group is more likely to be affected by road traffic accidents and industrial accidents may be responsible for this age group to be affected most commonly. Weening B et al in their study of 2,538 motor vehicle accidents revealed that 76.6% of motor vehicle occupants who sustained scapular fractures were males with a mean age of 44.3 years (SD=18.9).^[13] Similarly Jan Bartoníček et al in their study of 22 patients with scapular body fractures found the mean age of the patients to be 35 years.^[14] Many other authors have reported mean age of the affected patients to be between 25-40 years.

Though the management of undisplaced scapular fracture is usually conservative displaced and comminuted fractures require open reduction and internal fixation. Many studies have confirmed the fact that displaced and comminuted scapular fractures treated by conservative management is more likely to have a suboptimal functional outcome in comparison with the patients in whom surgical intervention was done. Since Judet R described surgical treatment of scapular fractures in 1964 there is significant improvement in techniques of operative interventions in cases of displaced scapular fractures et al,^[12,15] in their extensive study of displaced scapular fractures have concluded that displaced intra-articular glenoid fracture, double disruptions of the shoulder suspensory complex, floating shoulder injury, significant angulation and displacement of the scapular neck should undergo surgical treatment.^[16] Similarly Hardegger FH et al in their study of 37 displaced scapular fractures by treated by open reduction and stable osteosynthesis

reported satisfactory functional outcomes (good to excellent) in 79% patients.^[17] The authors recommended that displaced intra-articular fractures, fractures of the glenoid rim associated with humeral head subluxation, or unstable fractures of the scapular neck should preferably be treated by surgical interventions since conservative management is associated with poor outcomes in these cases.

In our study complications such as wound infection (8%), hematoma (8%), brachial plexus injury (4% patients) and shoulder stiffness (4%) were seen in 6 (24%) patients. Similar complication rates were reported by many authors. Clifford B. Jones et al retrospectively reviewed 182 patients with scapular fractures.^[18] The complications reported by the authors include wound problems, deep and superficial infections, malunion, nerve injury, rotator cuff weakness and shoulder stiffness. Similar complication rates were reported by Lantry JM et al and Mayne IP et al.^[19,20]

CONCLUSION

Scapular fractures are seen after road traffic accidents, in victims of assault or following fall from heights. While nondisplaced fractures may be treated conservatively displaced and comminuted fractures require surgical interventions. Appropriate surgical interventions are found to have excellent functional outcome and acceptable complication rates.

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