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Outcome of lateral column fixation in displaced scapular fracture-a prospective study.

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Abstract

Purpose: To evaluate the functional outcome of displaced fracture body of scapula extending to lateral column treated by open reduction and internal fixation.

Methods: A prospective case series study was performed between 2012 and 2015. 12 patients with fracture body of scapula extending to lateral column, with or without apophyseal fractures, were treated by open reduction internal fixation. Age, sex of the patient, mechanism and type of injury, associated injuries were evaluated. Followup was carried out at 3 months, 6 months by radiological and physical examination, functional outcome assessed at 1 year with DASH score.

Results: Out of 12 scapular body fractures extending to lateral column, 7 had associated apophyseal fracture. Associated injuries include hemopneumothorax, spine injury, head injury, ipsilateral clavicle fracture and brachial plexus injury. Average fracture union time was 3 months. There was no non-union or delayed union. DASH score shows 8 out of 12 patients have outcome ranging from normal function to mild disability (28.57 ± 13.14).

Conclusion: Open reduction internal fixation of scapular body fracture allows for early mobilisation and chest rehabilitation, leading to better functional outcomes. Displaced lateral column fractures needs to be fixed since it affects the orientation of gleno-humeral joint.

Keywords: Scapular fractures, Extra-articular scapular fractures, Lateral column scapula, Judet approach, Modified Judet approach.

Accepted on 19 April, 2021

Introduction

Historically, scapular fractures have been identified to account for 3 - 5% of all fractures of the shoulder girdle, and compose 0.4 - 1% of all fractures. Certain regional studies estimate the annual incidence of these fractures at nearly 10 per 100000 such fractures usually resulting from a high velocity blunt injury. Direct impact may cause fracture of any region of the scapula whereas indirect force, through impaction of humeral head into the glenoid fossa, cause fractures of the glenoid articular surface or the scapular neck. Most of the scapular fractures are associated with fracture ribs, head injuries, ipsilateral clavicle fracture and acromioclavicular joint dislocation. The injuries were often overlooked in routine supine anteroposterior chest radiograph, and, therefore all patients with a suspected fracture of scapula should take true anteroposterior and lateral X-rays [1]. CT scan is indicated in complex fracture pattern. Three dimensional CT scan can be helpful in visualising complex fractures and for pre-operative planning. Scapular fractures are anatomically classified into-fracture body and spine, fracture glenoid neck, intra-articular glenoid fracture and apophyseal fractures (includes coracoid and acromion). Management of fracture scapula has received increasing attention in recent years. Even though some fractures give better results with non-operative treatment, not all fractures have a favourable outcome. Indications of non-operative management for extra-articular scapular fractures includes displacement less than 20 mm and angulation less than 450. Surgical management has been preferred for intra-articular fractures of glenoid with more than 4 mm articular step-off or more than 20% of glenoid involvement, fracture body and neck with more than 450 angular deformity, or multiple lesion to the superior shoulder suspensory complex. The purpose of this study is to evaluate the functional outcome of scapular body fractures extending to lateral column treated by open reduction and internal fixation [2].

Materials and Methods

An open labeled prospective case series study was performed. We have treated 12 patients, with fracture body of scapula extending to the lateral column with or without displaced

apophyseal (acromion or coracoid) fractures, by open reduction internal fixation with plate and screw. Cases with intra-articular glenoid fracture and pure apophyseal fractures were excluded from the study. Intercostal drainage tube was put even though there was no X ray suggestive of pneumothorax, and surgery was done prior to removal of intercostal drainage tube [3]. All patients were operated within two weeks of admission. Posterior universal approach was used under general anaesthesia with patient positioned in lateral or prone position. An L-shaped incision starting from the acromion along the spine of scapula up to the medial border is used. Skin and subcutaneous tissue was elevated, and a plane created between infraspinatous and teres minor muscles. For fractures of the acromion, anterior limb of the incision can be extended up to the acromio-clavicular joint. Fracture is identified, reduced and fixed with either Locking Reconstruction Plate or Lateral End Clavicle Plate. Wound was then closed in layers. Post operatively arm pouch was given. Mobilisation exercise was started at day 1 post-op with excellent pain relief.

The study was approved by the Institutional Ethical and Scientific Committee. Written informed consent was obtained from the patients for publication of this study and any accompanying images. Age, gender of the patients, mechanism of injury, type of injury and associated injuries were evaluated. Follow up was carried out at 3 months, 6 months by radiological and physical examination. Functional outcome assessed at 1 year with DASH (Disabilities of the Arm, Shoulder and Hand) score a scale score ranging from 0 (no disability) to 100 (most severe disability).

Statistical analysis

Twelve patients with fracture body of scapula extending to the lateral column with or without displaced apophyseal (acromion or coracoid) fractures were treated. Descriptive statistics were computed on variables such as age, gender, diagnosis, mode of injury and DASH score. A pie diagram was used to study the distribution of associated injuries for the whole population. All of the statistical analyses were performed using Statistical Package for Social Sciences [4].

Results

A total of 12 patients were a part of this study, of which 9 were male and 3 female. Mean age of patients is 36 years. 9 patients were of age less than 45 years. 6 patients had direct injury to scapula. Out of 12 scapular body fractures extending to lateral column, 7 had associated apophyseal fractures. Studies indicate that DASH score ranging from 0 to 29 was thought to be the point where patients were 'no longer considering their upper-limb disorder a problem. DASH score assessment in our study shows that 8 out of 12 patients have outcome ranging from normal function to mild disability (Table 1). Out of 12 patients, 9 patients underwent definite fixation within 2 days of trauma, and the remaining 3 within two weeks allowing for stabilization of associated injuries. 33.34% of displaced body fracture extending to lateral column was associated with hemopneumothorax, 33.34% with spine injuries, 16.66% with head injury, 8.33% with ipsilateral clavicle fracture and 8.33% fracture with brachial plexus injury. No patient required blood transfusion. Patient was started passive and active assisted movements on day 1 onwards with good analgesia. There was no infection reported [5]. Average fracture union time was found to be 3 months. There was no non-union or delayed union (Figures 1-6).

Table 1. *Baseline characteristics and outline of data.*

No.	Age	Gender	Mode of injury	Fracture side	DASH score
1	57	M	Self fall while escape from a falling post	R	24.68
2	43	F	RTA (bike)	R	41.66
3	25	F	Self fall	R	27.5
4	22	M	RTA (bike)	R	24.16
5	24	M	RTA (bike)	L	26.66
6	27	M	Coconut fall to right shoulder	R	25
7	45	F	Slip on a oily surface	L	6.66
8	49	M	RTA (bike)	L	40.41
9	45	M	RTA (bike)	R	48.33
10	19	M	RTA (bike)	R	20.62
11	26	M	RTA	L	34.52

Figure 1. *Pre-op X ray showing fracture body of right scapula extending to lateral column.*

Figure 2. *Post operative X ray AP and lateral view at 3 months.*

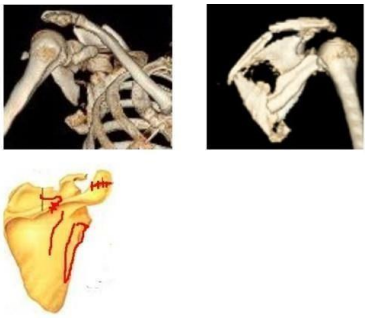

Figure 3. *Pre-operative 3D CT.*

Figure 4. *Intra-operative images.*

Figure 5. *Post-operative X ray.*

Figure 6. *Healed surgical scar.*

Discussion

Scapular fractures usually results from sandwiching injury, more common in younger age group with poly trauma [6,7]. Even though rare, such fractures are associated with other injuries most of the time; commonly ipsilateral chest injury, head injury, spine, brachial plexus injury etc. Definite indication for fixation of scapular fracture is still a dilemma among orthopaedic surgeons especially in the peripheral healthcare setup. Most extra-articular scapular fractures can be treated non- operatively but surgical fixation is required for significantly displaced fractures. The reason for many surgeons not opting for operative procedure in scapular fractures include the cancellous nature of the bone, excessive muscle attachment, insufficient bone stock, complex anatomy and difficult exposure. Also, the larger range of movement of scapulo-thorasic and gleno-humeral joint often compensate for malunion or non union. Most of the fracture heals spontaneously and pain decreases allowing patients to resume routine activities but whether complete functional normalcy is attained remains a question [8,9]. Recently, a better understanding of the fracture has resulted in greater acceptance of surgical treatment. Primary goal of the surgery is to get anatomical reduction and rigid fixation so that the scapulo-thorasic movement and scapulo-humeral movement can be initiated at the earliest. This will in turn give better result especially in poly traumatised patients as far as rehabilitation is concerned. Scapula connects the upper extremity with the axial skeleton. It forms three joints; the gleno-humeral, the scapulo-thorasic and the acromio-clavicular joint, and the articulation all the three is important for the full range of motion at the shoulder joint. Fractures of the body and neck especially affect the scapulo-thorasic movement and gleno-humeral joint which in turn causes problems with scapulo-thorasic rhythm [10]. The lateral border of scapula is of crucial importance in reduction and internal fixation of the scapular body. Fixation of the medial border aids in counterbalancing the shear and rotational forces.

In our study we have treated 12 patients with fracture scapula body with or without apophyseal fractures. 2 fractures body of scapula extending to lateral column were associated with displaced fracture of acromion, 4 with displaced fracture acromion extending to spine of scapula, 1 displaced fracture acromion and coracoid fracture, 3 fractures were isolated comminuted body fracture extending to lateral column, 2 comminuted fracture body of the scapula extending to lateral column associated with acromion-clavicular joint dislocation. Nearly 75% of the cases were aged less than 45 years old

indicating the preponderance of high velocity injury in the aetiology of scapular fractures. All patients underwent surgery within 2 weeks of trauma. Since we used the inter- muscular plane, there was not much blood loss, and hence none of the patients required blood transfusion. Early surgical fixation with plate and screw made the rehabilitation process easy, especially chest physiotherapy. Since there was no infection, non union or neurovascular complications, fracture fixation of body of scapula and apophysis is found to be a promising treatment for displaced fractures [11,12]. To get synchronised scapulo-thorasic and gleno-humeral movement, lateral column of the scapula needs to be fixed. The associated injury most commonly encountered in our study is chest and spine injury, which delayed the definitive fixation fracture up to two weeks in 25% of the cases. Functional outcome assessed at 1 year is found to be highly satisfactory in two-third of the cases [13].

Conclusion

Increased number of high energy trauma has led to a rise in incidence of displaced fracture of scapula, and cases are being increasingly identified due to advancement in imaging technology. Proper selection of cases gives better result after open reduction and internal fixation. Main indications for surgical fixation are based on the angulation and displacement of the fracture fragment. Along with these other parameters like ipsilateral injuries, patient activity level, hand dominance age and co-morbidities need to be considered. Open reduction internal fixation of scapular body fracture allows for early mobilisation and chest rehabilitation, leading to better functional outcomes and minimal complication rates. Displaced fractures of the body and lateral column are commonly associated with thorax, spine and head injuries. Displaced lateral column fractures needs to be fixed since it affects the orientation of gleno-humeral joint.

Conflict of interest

The authors report no conflict of interests.

Funding

No benefits or funds were received in support of this study.

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