

Original Research Article

Functional outcome of conservative versus plate osteosynthesis in displaced midshaft clavicle fracture in manual labours

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ABSTRACT

Background: Clavicle fracture is a one of most common shoulder injury which is commonly treated conservatively. Operative methods are used for open reduction and internal fixation of displaced fracture shaft clavicle with better functional outcome preserving the shoulder biomechanics needed for overhead manual workers. This study is aimed at study of functional outcome of different modalities of treatment used in treatment of displaced fracture midshaft clavicle in manual laborers.

Methods: This study was conducted with permission of ethical committee in B.R.D Medical College, Gorakhpur, Uttar Pradesh, India. This study included 36 patients with closed displaced fracture midshaft fractures. Out of 36 patients, 17 were treated conservatively using clavicle brace and sling and 19 patients were treated operatively by open reduction and internal fixation using reconstruction plate or AO pre-contoured plate. All patients were followed clinically and radiologically, regularly at 1 month duration for 18 months. Functional outcome both, conservative and operatively treated patients were assessed using constant and murley scoring system.

Results: 17 patients treated conservatively had good to average functional results and 19 patients treated surgically had excellent functional outcome at 4 weeks of the treatment. At 12 weeks all fractures united well in operative group patients had better functional outcome with good range of shoulder abduction than conservative group of patients where in 4 patients fractures did not unite and later underwent operative treatment to achieve fracture union. Average time of fracture healing in operative group was 8 weeks, less than time average time (12 weeks) taken by fracture healing in conservatively treated patients. Complication rate in conservatively treated group was tenting of skin and formation of discharging wound later, malunion, delayed fracture healing leading to shoulder stiffness and decreased shoulder abduction. Wound infection, implant failure or wound dehiscence like common complications were not seen in operative group.

Conclusions: In manual laborers, clavicle fractures treated operatively had united early with excellent functional outcome and better shoulder abduction and early return to work with no complications in comparison to fractures treated conservatively.

Keywords: Clavicle fracture, Manual labours

INTRODUCTION

Clavicle is a bone placed horizontally in shoulder connecting upper limb through shoulder joint to axial skeleton by sterno-clavicular joint. Clavicle fractures involve the middle third of the bone in 70-80% cases

while lateral third in 12-15% and medial third in 5-8% cases.¹ Since decades, in general, clavicle fracture is successfully treated conservatively.² But conservative treatment of displaced fracture midshaft of clavicle has produced mixed result from malunion to non-union as end result.³ In general population who don't need much

overhead shoulder abduction, malunion of fracture shaft clavicle is well tolerated without functional deficit. But functional result of conservative management and its merits and demerits have never being studied in a large population of manual laborers who need frequent overhead abduction of upper limb in their profession.

Conservative management need longer duration for producing union at fracture site, so longer duration of useful work days loss which put more economic and financial burden on these already financially weak laborers group. In Non-union end results, operative treatment done to achieve union, further increases morbidity and more work days loss and more economic burden.

METHODS

This study was conducted at B.R.D Medical College, Uttar Pradesh, India from March 2015 to September 2016, for 18 months duration with permission from ethical committee and with consent of patients willing to participate in study. All the patients were admitted from trauma center and all selected patients were having closed displaced fracture shaft of clavicle.

Exclusion criteria were fracture medial third shaft and fracture lateral end of clavicle, compound fractures with or without loss of bony segments.

Inclusion criterion were patients with closed displaced fracture midshaft clavicle with or without associated head injury, abdominal injury or polytrauma.

Each patient was thoroughly evaluated clinically and radiologically using plain radiograph of affected shoulder anteroposterior view to determine the site and nature of fracture. Fractures were then classified according to Robinson's classification.⁴

All closed displaced fractures midshaft clavicle were treated conservatively or operatively according to consent given by each patients. For conservative management, clavicle brace and arm sling was used. For operative management, open reduction and internal fixation of fracture was done using reconstruction plate or AO precontoured plate. All patients were operated under general anaesthesia.

Operative technique for plate and screw fixation: Patient was kept in supine position with one towel in between the scapula.

Affected shoulder, neck and entire upper limb was prepared and draped. Skin incision made slightly anterior to shaft of clavicle adjacent to fracture site, so that after completion of surgery, sutured wound should not be overlying under tension over plate and screw which decreases chance of wound dehiscence.

Skin, subcutaneous tissue and platysma are incised without wedging of the edges. The overlying fascia is exposed and incised. The fracture ends were exposed and freed from surrounding tissue. Fracture fragments were reduced and internally fixed with plate and 3 screws (3.5mm cortical screws) on each side of fracture site with or without interfragmentary lag screw fixation over the superior surface of clavicle, protecting the underlying neurovascular structures.

After attaining proper haemostasis, wound closed in layers and sterile dressing was applied.⁵⁻⁸



Figure 1: Pre-operative X-ray right shoulder-AP view.

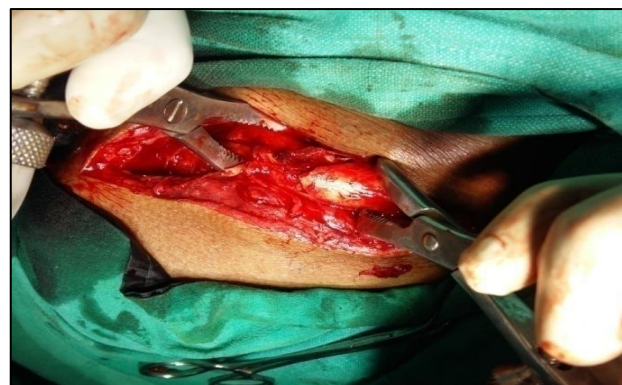


Figure 2: Intra-operative photograph showing reduction of fracture fragments.



Figure 3: Intra-operative photograph showing fixation.



Figure 4: Post-operative X ray right shoulder-AP view.

Post-Operative care: day 1, fracture fragments reduction and fixation was assessed with X-rays shoulder anteroposterior view. Affected upper limb was supported in arm sling. Dressings of surgical wounds were done on third and eight post-operative days and suture removed on 12th day.

Rehabilitation of the affected arm was started on first postoperative day. Gentle pendulum exercises to the shoulder were allowed. After 7 days active range of motion in all planes were allowed.

RESULTS

Regular follow up was done at 4 weeks interval for first 4 months by clinical examination and radiologically, then at 3 months interval till 1 year of fixation. In each follow up, progress of fracture union and range of movements at shoulder joint achieved was assessed. The functional outcome were assessed by constant and Murley score.⁷

Table 1: Activity related pain.

Pain	Activities
Severe	Unaffected sleep yes/no
Moderate	Full recreation/sport yes/no
Mild	Full work yes/no

Table 2: Abduction of arm.

Arms positioning	Strength of abduction (pounds)	
Up to waist	0	13-15
Up to xiphoid	1-3	16-18
Up to neck	4-6	19-21
Up to top of head	7-9	22-24
Above head	10-12	>24

Table 3: Range of movement.

Forward flexion	Abduction
31-60 degrees	31-60 degrees
61-90 degrees	61-90 degrees
91-120 degrees	91-120 degrees
121-150 degrees	121-150 degrees
151-180 degrees	151-180 degrees
External rotation	Internal rotation
Hand behind head, elbow forward	Up to lateral thigh
Hand behind head, elbow back	Up to buttock
Hand to top of head, elbow forward	Up to lumbosacral junction
Hand to top of head, elbow back	Up to waist (L3 vertebra)
Full elevation	Up to T12 vertebra Up to interscapular region (T7)

Based on total score obtained by subjective and objective evaluations, functional outcome in each patient was graded as the following:

- Excellent: 91- 100
- Good 81-89
- Satisfactory 71-80
- Adequate 61-70
- Poor 0-60.

This study was carried out on 36 patients of fresh fracture of the clavicle, out of which 17 were treated conservatively and 19 operatively at our hospital. All patients sustained clavicle fractures due to road traffic accidents. Mean age of the patients in the study was 32 years. Out of the 36 patients participated in this study, 4 (11.1%) were females while 32 (88.9%) were males. All patients were regularly followed up and were evaluated clinically in form of tenderness over fracture site and radiographic union and range of movement achieved. The associated injuries were scapulae fracture (5), acromion fracture (1), coracoid fracture (7), and ribs fracture (14). In this study, 12 (33.3%) patients had clavicle fracture on left side and 24 (66.7%) patients had right side clavicle fractures. Functional outcome of each patient was noted at each 1 month interval. All of 19 operative patients, (100%) had excellent or good functional outcome at 4 weeks 11, 14.

7 of the 17 patients who were managed conservatively had satisfactory scores and 10 had poor scores. The functional outcome results were assessed by the Constant and Murley Score.⁷ It was found that the difference between the number of excellent outcomes between the two groups was highly significant ($p < 0.001$) (Table 4).

Table 4: Outcomes of the two groups.

Outcome Results	Group			
	Conservative		Operative	
	No.	%	No.	%
According to constant and Murley score				
Excellent/good	0	0.0	19	100.0
Satisfactory	7	41.2	0	0.0
Poor	10	58.8	0	0.0
Total	17	100.0	19	100.0
Significance	chi square = 36; p<0.001			
According to final union status				
Union	0	0.0	19	100.0
Mal-union	9	52.9	0	0.0
Non-union	4	23.5	0	0.0
Total	17	100.0	19	100.0
Significance	chi square = 32; p<0.001			

All of patients in the operative group showed excellent results which was significantly better than that in the conservative group. Out of the 19 operated patients, 27 (75%) of them were treated with the help of a reconstruction plate while 9 (25%) of the patients were operated using pre-contoured locking plate.

In our study, the 19 patients who were operated upon showed an average union time of 8 weeks. Average union time in conservative group was 12 weeks. In our study, the 19 patients who were operated upon showed an average union time of 8 weeks. In the conservatively managed group, 13 patients reported fracture malunion but 4 patients had non-union.

Average union time in conservative group was 12 weeks. Malunion was the main complication and stiffness of shoulder joint with decreased abduction was present in 13 out of 17 patients (76.4%) in the conservatively managed group. It was found that the difference in the outcomes from the view of number of unions between the two groups was highly significant (p<0.001).

DISCUSSION

Clavicle fractures are mostly treated by conservative methods like clavicle brace and arm sling support. These conservative methods of treatment of all types of clavicle fractures produced good results in general population who don't need much overhead abduction of shoulder in their daily life. However, this doesn't produced good result in subgroup of manual laborers who need good overhead abduction of shoulder joint.

Conservative management of displaced fracture shaft clavicle needed longer duration for union and some went into non-union, thereby increasing the morbidity and stiffness of shoulder joint with poor functional outcome and need for operative treatment to achieve union.² This increased financial burden in manual laborers life with delayed return to work and loss of working days.

To decrease the duration of treatment and to achieve early union of displaced fracture clavicle and early mobilisation of shoulder and good functional outcome, operative treatment was used and found to be having good to excellent result with early return to work.

In operative treatment, with proper technique and using safety measures, open reduction and internal fixation using reconstruction plate or AO precontoured plate has been found to produce excellent results with no hardware failure and no other complications like wound dehiscence and injury underlying neurovascular structures.

According to various studies, conservative therapy of displaced middle third clavicle fracture has been associated with poor outcomes.⁹⁻¹³

CONCLUSION

In management of displaced fracture midshaft of clavicle in manual laborers, operative treatment achieved early union of fracture with early mobilisation of shoulder joint and thereby early return to work was possible. The overall functional outcome of operative treatment was excellent than the conservative management.

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Ethical approval: The study was approved by the institutional ethics committee

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