Evaluation of Outcome of Clavicle Fractures Managed with Locking Plates

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Abstract

Introduction: To evaluate outcome of clavicle fractures managed with locking plates. **Subjects and Methods:** Seventy patients of clavicle fractures of either gender was enrolled in the study. Open reduction and internal fixation was done using a 3.5 mm locking plate with lateral extension. The postoperative pain was assessed using Visual Analogue Scale (VAS) on postoperative days 1, 3 and 10. The functional outcome was assessed at the end of 2nd and 6th month with the help of Disabilities of the Arm, Shoulder and Hand (DASH) scoring. **Results:** Out of 70 patients, males were 40 (57.1%) and females were 30 (42.9%). Side involved was right in 28, left in 22 and both in 20. Mode of injury was RTA in 42, fall in 20 and violence in 8 cases. The difference was significant (P< 0.05). The mean VAS on day 1st was 5.8, on day 3rd was 3.0 and on day 10th was 0. DASH at 2 months was 12.1 and at 6 months was 4.9. The difference was significant (P< 0.05). Functional outcome was excellent in 52, good in 11 and moderate in 7 cases. The difference was significant (P< 0.05). **Conclusion:** The management of distal end clavicle fractures with compression plating resulted superior outcome.

Key Words: compression plating, clavicle fractures, Functional outcome.

INTRODUCTION

Clavicle fractures comprise five to ten percent of all fractures. The commonest site of fracture in clavicle is the midshaft followed by the lateral end, which accounts for about 25% of all the clavicle fractures.[1] Clavicle fractures are one of the most common injuries in an adult population. It is also commonly associated with injuries to ribs, head and the upper extremities. These fractures are being encountered increasingly due to increase in high-velocity trauma as seen in the young population.[2]

Due to more soft tissue injuries associated with these accidental injuries, the fracture fragments are displaced and require adequate reduction and fixation. Moreover, the functional demands in younger patients are high, and hence there has been a recent increase in the operative fixation of these fractures.[3] Twenty-five percent of these fractures are unstable due to the displacing forces acting on the fracture fragments: an inferior force on the lateral clavicle fracture fragment and an anterosuperior force on the medial clavicle fragment. Many operative treatment modalities have been tried for the management of lateral clavicle fracture including coracoclavicular screws, Kirschner wires, tension bands, hook plates, nonlocked and locked plates.[4] The pre-contoured locking plate is now the preferred choice of implant for surgical treatment of clavicle fractures. The locking plate theoretically offers increased stability of fixation, which again should allow for application of greater forces than conventional reconstruction or dynamic compression plates (DCP) plates.[5] Considering this, the present study evaluated outcome of clavicle fractures managed with locking plates.

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MATERIALS AND METHODS

Seventy patients of clavicle fractures of either gender was enrolled in the study. Ethical approval was from institutional ethical and review committee was obtained. They voluntarily signed written consent.

Baseline characteristics were recorded. A thorough examination was done. Preoperative investigation was performed. Open reduction and internal fixation was done using a 3.5 mm locking plate with lateral extension. Postoperative radiographs were done on day 1 and every 6 weeks after surgical procedure. The postoperative pain was assessed using Visual Analogue Scale (VAS) on postoperative days 1, 3 and 10. The functional outcome was assessed at the end of 2nd and 6th month with the help of Disabilities of the Arm, Shoulder and Hand (DASH) scoring. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table I Patients distribution

Total- 70		
Gender	**Male**	**Female**
Number (%)	40 (57.1%)	30 (42.9%)

Out of 70 patients, males were 40 (57.1%) and females were 30 (42.9%) (Table I).

Table II Assessment of parameters

Parameters	Variables	Number	P value
Side	Right	28	0.15
	Left	22	
	Both	20	
Mode of injury	RTA	42	0.01
	Fall	20	
	Violence	8	

Side involved was right in 28, left in 22 and both in 20. Mode of injury was RTA in 42, fall in 20 and violence in 8 cases. The difference was significant (P< 0.05) (Table II).

Table III Assessment of score

Score	Variables	Number	P value
VAS	1st	5.8	0.05
	3rd	3.0	
	10th	0	
DASH	2 months	12.1	0.01
	6 months	4.9	

The mean VAS on day 1st was 5.8, on day 3rd was 3.0 and on day 10th was 0. DASH at 2 months was 12.1 and at 6 months was 4.9. The difference was significant (P< 0.05) (Table III).

Table IV Assessment of outcome

Functional outcome	Number	P value
Excellent	52	0.01
Good	11	
Moderate	7	

Functional outcome was excellent in 52, good in 11 and moderate in 7 cases. The difference was significant (P< 0.05) (Table IV).

DISCUSSION

Approximately 75 % of these fractures are located in the middle third of the clavicle, with the majority of fractures being displaced. Despite the relative high prevalence of clavicle fractures, the optimal treatment of displaced mid-shaft clavicle fractures remains a matter for debate. These fractures can be classified using the Neer's Classification. The lateral fractured fragment is small and hence, it is difficult to get an anatomical reduction and also poses problems in its fixation, which results in instability of the lateral clavicle fractures.[6] Many treatment modalities have been used for the management of such fractures. Biomechanical studies investigating the impact of torsional and bending load forces on both locking and DCP supports the concept that improved fixation is achieved when using a locking plate.[7] Clinical studies support advantages of locking plates over more conventional plate types.[8] The present study evaluated outcome of clavicle fractures managed with locking plates.

Our results showed that out of 70 patients, males were 40 (57.1%) and females were 30 (42.9%). Kalamaras et al[9] were the first to report the concept of locking plate in distal clavicle fracture in their study where distal radius locking plate was used and finally concluded that the use of the locking plate gave good results and was promising for the management of the lateral clavicle fracture as it showed to have a better control on the distal fracture fragment.

Side involved was right in 28, left in 22 and both in 20. Mode of injury was RTA in 42, fall in 20 and violence in 8 cases. Fridberg et al[10] identified all locking plate osteosynthesis of mid-shaft clavicle fractures operated in 105 patients. The study group of 105 fractures (104 patients, 86 males) had a median age of 36 years (14–75 years). Follow-up ranged from 0.5 to 3.5 years. No patients were allowed to load the upper extremity for six weeks. Overall, there were 31 cases (30 %) of plate removals for discomfort. There were five cases (5 %) of failure of osteosynthesis: two occurred early after approximately six weeks and three late after ten to 13 months postoperatively.

The mean VAS on day 1st was 5.8, on day 3rd was 3.0 and on day 10th was 0. DASH at 2 months was 12.1 and at 6 months was 4.9. Nordqvist et al[11] in their study 32 patients with lateral end clavicle fracture were included. There were no intraoperative complications in the procedure. The mean VAS score on postoperative day 1 was found to be 5 which decreased to 3 on day 2 and 0 on day 10. The mean DASH score was calculated as 11.63 at the end of postoperative month 2 and then 4.6 at the end of month 6. There was one case of malunion in whom the overhead abduction was restricted but was not painful and was managed conservatively.

Functional outcome was excellent in 52, good in 11 and moderate in 7 cases. Rokito et al[12] compared nonoperative and operative treatments of Type II distal clavicle fractures. From a total of 30 diagnosed patients, 16 were identified as receiving nonoperative treatment and 14 open reduction and coracoclavicular stabilization. The average follow-up was 53.5 months for the nonoperative group and 59.8 months for the operative group. All patients were evaluated postoperatively for pain, range of motion, function, and fracture healing as well as for isokinetic strength. Fractures treated surgically achieved union within six to ten weeks. Nonoperative treatment resulted in seven non-unions. There were no significant differences between the two groups in the mean UCLA, Constant, and ASES scores. Non-union had no significant effect on functional outcome or strength. This study suggests that Type II distal clavicle fractures can be successfully managed nonoperatively. The high incidence of non-union does not impede a clinical outcome comparable to that achieved by surgical treatment.

Hall et al[13] in their study patients with completely displaced type II distal clavicle fractures were included. Fifty-seven patients were randomized: 27 to the operative group and 30 to the nonoperative group. Patients randomized to nonoperative care received a standard shoulder sling, followed by pendulum or gentle range of motion shoulder exercises at any time as directed by the attending surgeon. Patients randomized to the operative group received plate fixation with a pre-contoured distal clavicular plate or a "hook" plate within 28 days from injury. There were no between-group differences in Disabilities of the Arm, Shoulder and Hand or Constant scores at 1 year. More patients in the operative group went on to union (95% vs. 64%, P = 0.02) within 1 year. Twelve patients in the operative group underwent a second operation for implant removal (12/27, 44%). In the nonoperative group, 6 patients (6/30, 20%) subsequently underwent 8 operative procedures.

CONCLUSION

The management of distal end clavicle fractures with compression plating resulted superior outcome.

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