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Managing lateral end clavicle fracture at a tertiary level hospital in India

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ABSTRACT

Background: With numerous methods and recommendations for managing fracture of lateral end of the clavicle, it always creates a clinical dilemma for the treating surgeon. This study is aimed to compare the functional outcome in patients with lateral end clavicle fracture treated either with operative and non-operative modalities.
Methods: This non-randomized comparative study was conducted at Department of Orthopedics, DY Patil Medical College, Pimpri between September 2017 till June 2018, in which all patients with lateral end clavicle fracture were included. Patients were managed either non-operatively or with precontoured locking compression plate was fixed with 4 mm locking screw or 3.5 mm cortical screw. At the final follow up (at least one year) patients' functional outcome was assessed using the Constant and Murley score.
Results: A total of 57 patients were included in the study and 93% of the patients with operative management and 66% with non-operative treatment had a union time of 8 weeks or less. Out of the 27 patients who underwent non-operative treatment, three had malunion, two had non-union and five had deformity. Based on the Constant and Murley score, 27% of the patients in the operative group had an excellent outcome, and in the non-operative group, 8% had excellent functional outcome. The functional outcome was significantly better in the operative group (p=0.034).
Conclusions: A better understanding of the risk factors for nonunion would help us to make decision between operative and nonoperative treatment. Randomized trials comparing the operative and non-operative treatments would help in understanding the merits of one method over other.

Keywords: Fracture clavicle, Distal end clavicle, Plating

INTRODUCTION

With numerous methods and recommendations for managing fracture of lateral end of the clavicle, it always creates a clinical dilemma for the treating surgeon. Unfortunately there is no reference standard treatment recommendation for this fracture. The unstable nature of these fractures makes them prone for non union and impeding the normal shoulder function. Although, these fractures account for 3% of fractures of the clavicle, they can cause morbidity in a significant number of patients. There is a high rate of non-union, and these fractures account for half of all clavicular non-unions when treated non-operatively.[1] Non-operative management in the form of sling, figure of 8 bandages with sling and arm pouch have been used in varied settings. Poor outcomes like malunion and non-union have been observed after conservative treatment of severely displaced clavicle fractures. Several methods of surgical treatment of these fractures have been described in the literature, such as K-wire stabilisation, lateral end of the clavicle excision and screw stabilisation from the clavicle to the coracoid

process, as described for stabilisation of the acromio-clavicular (AC) joint.[2,3] Flexible or rigid surgical fixation helps to avoid the deforming forces acting on the fragments. Though functional outcome achieved are similar, tension banding with sutures and coracoclavicular screws can help to avoid most of the implant related complications. Furthermore, revision of rigid fixations would need a major surgical procedure while flexible fixation can be removed with a simple surgery. This study is aimed to compare the functional outcome in patients with lateral end clavicle fracture treated either with operative and non-operative modalities.

METHODS

This non-randomized comparative study was conducted at Department of Orthopedics, DY Patil Medical College, Pimpri between September 2017 till June 2018. All patients aged 18 years or above with lateral end clavicle fracture were included in the study. Open fractures, fractures associated with complication like head injury with associated other bone injuries were included in this study. We excluded patients less than 18 years of age, patients with middle third or with medial end clavicle fracture. Patients with severe brain injury, intubated patients, those with open fractures and those with injury preventing operative fixation within 7 days of admission were excluded from the study as well. In the outpatient clinic, the principal investigator identified the patients eligible for the study. Patients were explained in detail the advantages and disadvantages of both operative and non- operative care by the treating surgeon regarding. The procedure of the study was explained to all the patients in their own language and necessary consent was obtained after the patients showed their willingness to participate in the study.

Demographic information of the patients was noted. A detailed history was elicited regarding mechanism of injury and enquiry was made to note site of pain and swelling over the affected clavicle. Past medical history and family history was also recorded. Decision to operate was made based on surgeon's assessment and patient's consent. Plain x-ray of clavicle with shoulder in anteroposterior view was taken to assess the site of fracture and the fracture type. Routine investigations like hemogram, blood sugar, urea, viral markers were done in all patients. For operative treatment, patients were operated under general anesthesia and the precontoured locking compression plate was fixed with 4 mm locking screw or 3.5mm cortical screw. Antibiotic coverage was given for 10 days and the operated arms were immobilized in an arm pouch. Sutures were removed on 10th day post-operatively. Active range of shoulder motion with abduction limited to 80 degrees was started 4 to 6 weeks post-operatively. After 6 weeks full range of motion was allowed. Non-operative management included reduction figure of eight bandage supported by arm pouch. Patients were counselled and after 6 weeks shoulder movements were started. All patients were followed up every week for first month, then every month till one year. At the final follow up patients' functional outcome was assessed using the Constant and Murley score, lower score represents higher level of functional disability.[4] The data was analysed using Epi Info software. Descriptive analysis was done for various demographic variables like age, gender, mechanism of injury and associated injuries. To compare conservative and operative management, we used chi square test and p value less than 0.05 was taken to be statistically significant.

RESULTS

Table 1: Clinico-demographic profile of the patients included in the study.

Variables	N (%)
Age distribution (in years)	
Less than 20	2 (4)
20 to 29	15 (26)
30 to 39	14 (24)
40 to 49	11 (19)
50 to 59	5 (9)
More than 60	10 (18)
Gender	
Males	36 (63)
Females	21 (37)
Side affected	
Dominant	26 (46)
Non-dominant	31 (54)
Mechanism of injury	
Outstretched hand	16 (27)
Road traffic accident	41 (73)
Associated injuries	
Scapula fracture	16 (27)
Skull fracture	14 (24)
Proximal tibia fracture	13 (23)
Superior and inferior pubic rami fracture	9 (16)
Distal end radius fracture	5 (10)

During the study period a total of 57 patients were included in the study. Most common age group of patients was 20 to 29 years and mean age was 34.6 years (Table 1). Approximately two thirds of the patients were males and non-dominant side was affected in 54% of the patients. We found the road traffic accident to be the most common mechanism of injury. Most common associated injury was scapular fracture (27%), skull fracture (24%) and proximal tibia fracture (23%). In the group of patients with operative management, union time was 8 weeks or less in 93% and more than 8 weeks in the rest (Table 2). For patients who received non-operative treatment, 66% had union time of 8 weeks of less. In the group of patients who underwent operative treatment two had superficial infections and implant failure each and one patient had deformity. Out of the 27 patients who

underwent non-operative treatment, three had malunion, two had non-union and five had deformity. We did not observe any case of superficial infection in the group of patients who received non-operative treatment. Based on the Constant and Murley score, 27% of the patients in the operative group had an excellent outcome, 47% had good and 17% had satisfactory functional outcome. None of the patients had a poor functional outcome. In the non-operative group, 8% had excellent functional outcome, 30% had a good outcome, 33% had a satisfactory outcome, 15% adequate and 15% had poor functional outcome. The functional outcome was significantly better in the operative group (p=0.034).

Table 2: Clinical outcome of patients included in the study.

	Treatment groups		P value
	Operative (n=30) N (%)	Non-operative (n=27) N (%)	
Union time			
≤ 8 weeks	28 (93)	18 (66)	0.01
> 8 weeks	2 (7)	9 (34)	
Complications			
Infection	2 (7)	0 (0)	0.02
Implant failure	2 (7)	0 (0)	
Malunion	0 (0)	3 (11)	
Non-union	0 (0)	2 (7)	
Deformity	1 (4)	5 (18)	

Table 3: Functional outcome of patients using Constant and Murley score

	Treatment groups		P value
	Operative (n=30) N (%)	Non-operative (n=27) N (%)	
Functional outcome			
Excellent	8 (27)	2 (8)	0.034
Good	14 (47)	8 (30)	
Satisfactory	5 (17)	9 (33)	
Adequate	3 (10)	4 (15)	
Poor	0 (0)	4 (15)	

DISCUSSION

Most lateral clavicle fractures are minimally displaced and are treated with a simple arm pouch. However, the treatment of displaced lateral clavicle fractures is debated as they have a higher rate of non- union and physical deformity.[5] The rate of nonunion of displaced type 2 lateral clavicle fractures has been reported to be 17%.[6] The authors described all of the nonunions in their patients as asymptomatic, with only 25% requesting operative correction.

Robinson et al reviewed patients with displaced lateral clavicle fracture treated non-operatively for a mean follow up of 6.2 years.[7] Approximately 15% of the patients in their study requested surgical intervention within 2 years of injury and patients with union and nonunion had Constant and Murley scores of 92 and 93 respectively. In another study, Robinson et al found that independent risk factors for non-union were increasing age and displaced fracture.[2]

As for the operative management, there are numerous options available. Using special precontoured locking plates with locking screws are most commonly used. As neither the distal clavicle nor the acromion provides a good fixation, clavicular hook plates were developed for displaced lateral clavicle fractures. AO hook plate is such that it has no rotational stiffness and allow normal rotation at the AC joint allowing undisturbed bone healing. These plates may result in rotator cuff injury, shoulder stiffness, and acromioclavicular joint osteoarthritis as has been reported by Henkel et al.[8] Removing these plates earlier than 6 months can result in nonunion or refracture, while late removal can cause shoulder stiffness.[9] Use of a low profile volar distal radius locking plate has been described by Kalamaras et al, in which all patients achieved union, with a mean Constant and Murley score of 96.[10] Though the functional outcome was good, approximately 10% of the patients in a study reported major complications.[11] Sambandam et al commented that despite giving good functional outcome, hook plates result in major complications.[12]

Distal radius plate can also be used to fix distal clavicle fracture. Simple isolated coracoclavicular fixation with Mersilene tape, Ethibond sutures, titanium cables, dacron graft neutralizes the displacement and brings the fracture

fragments together and have shown good functional outcomes with few minor complications.[13] Fixation with K wires and applying a tension band is an age old technique for distal clavicle fracture. Kona et al reported poor results in 10 of 19 patients, with 6 nonunions and 5 infections.[14] Eight of the poor results were in patients treated with Kirschner wire fixation. All the different techniques discussed above show not much difference in their union times. Complication rates can be high with rigid fixation techniques and major complications like peri-implant fracture has shown to occur more commonly with hook plate fixation.

CONCLUSION

Distal clavicular fracture due to its unstable nature can present as a clinical dilemma for the treating surgeon. A better understanding of the risk factors for nonunion would help us to make decision between operative and nonoperative treatment. It is recommended that due consideration should be given to patient's age, occupation, and activity level and the likely outcomes of treatment should be discussed with the patients. Randomized trials comparing the operative and non-operative treatments would help in understanding the merits of one method over other.

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