Original Article

Outcome of precontoured locking compression plate in patients with distal humerus intra-articular fracture

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Objective: To determine the outcome of a precontoured locking compression plate in patients with distal humerus intra-articular fracture.

Methodology: From January to December 2018, patients with distal humerus intraarticular fracture who underwent open reduction and fixation with a precontoured blocked plate were included in this study. The final union and functional outcomes were assessed at 12 weeks. Radiological union and functional outcomes of good to excellent performance were considered as an acceptable outcome. The presence of dense callus at the fracture site and disappearance of the fracture line on X-ray was taken as a union. The functional outcome was assessed by Mayo Elbow Performance Score.

Results: Out of 84 patients, 50 (60%) were male and the mean age of the patients was 42.55±7.26 years. Excellent, good, satisfactory and poor outcome was observed in 48(57.1%), 25(29.8%), 7(8.3%) and 4(4.8%) patients, respectively. The radiological union was found in 80(95.2%) patients and acceptable outcomes in 73(86.9%) patients. Poor outcome was associated with older age (>45 years), female gender, and presence of diabetes with p-values of <0.001, 0.044, and 0.002, respectively.

Conclusion: Acceptable outcomes of precontoured locking compression plate for distal humerus intra-articular fracture were seen in 86.9%. Poor acceptable outcomes were associated with older age (>45 years), female gender, and presence of diabetes mellitus. (Rawal Med J 202;45:111-114).

Keywords: Intra-articular Fractures, Distal Humerus, Precontoured Locking Compression Plate.

INTRODUCTION

Fractures of the distal humerus are rare fractures of the elbow joint.[1] Intra-articular multi-fragment fractures with poor bone quality are a challenge for the treating surgeon. Western industrial nations have these complex fracture types.[2] Fractures of the distal humerus, with a frequency of 2-3%, are a rare injury and about one-third of those around elbow.[3] Over 25% of such fractures develop significant complications during treatment and a few of them may need further surgery.[4] High-energy trauma are typical in younger patients, while in senior low-energy accidental mechanisms, such as simple falls from standing are predominant.[5]

Fractures of the shaft of humerus have successfully been managed conservatively by bracing as well as surgically by plate fixation or intramedullary nail.[6] However, the management of extra-articular distal humeral fractures (EADHF) has always been difficult and challenging.[7] Non-surgical management with hanging cast and bracing is not always a feasible option as the distal fragment is small and difficult to control with a tendency to go into adduction. Associated metaphyseal comminution further adds to the difficulty of non-surgical treatment.[8] Treatment of EADHF is debatable, with advocates of non-surgical management in a brace as well as surgical fixation using plates.[8]

Over 25% of such fractures develop significant complications during treatment and a few of them may need further surgery.[9] In a local study, the union was succeeded in 84% patients with intraarticular distal humerus fracture and the overall score came out to be excellent in 48%, good in 32%, fair in 12% and poor in 8% of the cases by using Mayo elbow score.[10] Functional recovery is often rarely complete. Immediate operative treatment has lesser

chances of infection, less ossification, and better functional results than after delayed operative treatment.

Usually, open reduction and internal fixation are chosen to restore active elbow extensions and anatomically reduce the articular surface and results of these techniques generally have been good.[11] The local literature is deficient in this technique and on extensive search only one article was found. Therefore, the present study was designed to determine the outcome of a precontoured locking compression plate in patients with distal humerus intra-articular fracture.

METHODOLOGY

From January 2018 to December 2018, patients with distal humerus intraarticular fracture who underwent open reduction and fixation with precontoured blocked plate (Acumed®, Beaverton, Oregon, USA) were included in this study. The inclusion criteria were age between 25 to 75 years and either gender. Distal humerus fracture with intraarticular extension diagnosed on local examination and confirmed on X-rays anteroposterior (AP)/lateral view with presence of all of the swelling like tenderness, movement at the fracture site, X-rays showing break in two or more cortex of shaft of humerus, extending to distal joint were taken as distal humerus intraarticular fracture. Those patients who managed conservatively with open fracture and with polytrauma were excluded.

All patients were underwent screw and plate fixation using a precontoured locking compression plate (LCP). Long arm plaster splint was applied in all cases for two weeks. The follow-up was scheduled at four weeks, eight weeks and at 12 weeks. Outcomes were assessed in terms of radiological union and functional outcome. The presence of dense callus (radio-opaque mass appearance) at the fracture site and disappearance of fracture line on X-rays posteroanterior (PA)/lateral views after 12 weeks of procedure was taken as a union. The functional outcome was assessed by Mayo Elbow Performance Score and categorized as: score>90 excellent, score 75-89 good, score 60-74, fair, score < 60 poor. The final outcome was assessed at the end of 12 weeks, radiological union and functional outcomes of good to excellent performance were considered as an acceptable outcome.

Statistical Analysis: SPSS Version 21.0. was used for the analysis of data. The continuous variables were expressed as Mean ± standard deviations (SD) and frequency and percentages were calculated for categorical variables. Chi-square test was performed to assess the association of acceptable outcomes by various baseline and demographic characteristics.

RESULTS

Out of 84 patients, 50(60%) were male and mean age of the patients was 42.55±7.26 years with 95% confidence interval of 40.97 to 44.12. Patient's height and weight were 1.76±0.48 meters and 58.25±8.48 kg with BMI of 27.58±4.98 kg/m2. Mode of injury was road traffic accident in 55 (65%) patients (Table 1).

Table 1. Patients demographic and injury details.

Characteristics	Summary statistic
Gender	
Male	59.5% (50)
Female	40.5% (34)
Age	42.55 ± 7.26 years
Height	1.76 ± 0.48 meters
Weight	58.25 ± 8.48 kg
Body Mass Index (BMI)	27.58 ± 4.98 kg/m^2
Diabetes mellitus	
Yes	22.6% (19)
No	77.4% (65)
Mode of injury	
Road traffic accident	65.5% (55)
Falling	23.8% (20)
Falling from height	10.7% (9)
Side of fracture	
Left	54.8% (46)
Right	45.2% (38)

Table 2. Functional and radiological outcomes after 12 weeks using Mayo Elbow Performance Score (MEPS).

Outcomes	Summary statistic
Functional outcome	
Excellent	57.1% (48)
Good	29.8% (25)
Satisfactory	8.3% (7)
Poor	4.8% (4)
Very poor	0% (0)
Radiological union	
Yes	95.2% (80)
No	4.8% (4)
Acceptable outcome	
Yes	86.9% (73)
No	13.1% (11)

Table 3. Outcomes by patients demographic and type of injury.

Characteristics	Acceptable outcome [N=84]		P-value
	Yes	No	
Age groups			
Up to 45 years	77.4% (65)	4.8% (4)	<0.001*
More than 45 years	9.5% (8)	8.3% (7)	
Gender			
Male	56% (47)	3.6% (3)	0.044*
Female	31% (26)	9.5% (8)	
Body mass index (BMI)			
Up to 30 kg/m^2	45.2% (38)	7.1% (6)	>0.999
More than 30 kg/m^2	41.7% (35)	6% (5)	
Diabetes mellitus			
Yes	14.3% (12)	8.3% (7)	0.002*
No	72.6% (61)	4.8% (4)	
Side of fracture			
Right	41.7% (35)	3.6% (3)	0.330
Left	45.2% (38)	9.5% (8)	
Mode of injury			
Falling	21.4% (18)	2.4% (2)	0.162
Falling from height	7.1% (6)	3.6% (3)	
Road traffic accident	58.3% (49)	7.1% (6)	

Functional outcome was excellent, good, satisfactory and poor in 57.1% (48), 29.8% (25), 8.3% (seven), and 4.8% (four), respectively. The radiological union was found in 95.2% (80) patients and acceptable outcomes were observed in 86.9% (73) patients (Table 2). Relatively poor outcomes were found to be associated with older age of the patients (p<0.001), female gender (p=0.044), and presence of diabetes mellitus (p=0.002) (Table 3).

DISCUSSION

Around 2% of the total fractures are on account for the intra-articular fractures of the distal humerus and about one-third of those around elbow.[12] In studies regarding the management and functional outcomes of this relatively less common fracture, study sample are relatively small and a wide range of assessment methods have been adopted for the evaluation of functional outcomes.[13,14] The limited subchondral bone amount, the smaller size of fracture fragments, and lack of exposure and experience as a consequence of uncommon nature of the fracture have added to the situation.[15]

The functional outcome usually deteriorates after surgical treatment of fracture as a result of extended immobilization of elbow joints and the fact that it has poor tolerance for immobilization. The early reconstruction of the elbow joint and restoration of the articular surface is important to attain the optimum joint function.[15] Functional outcomes were reported to be unsatisfactory in a significant number of patients after the conservative treatment of these fractures.[16] Treatment with plates and screws has been reported to have other complications such as implant loosening, ulnar neuropraxia, malunion of the fragments, and malposition.[17]

In this study, we observed excellent or good outcomes in 73 (86.9%) out of 84 patients and radiological union were observed in the majority (80 out of 84) patients with acceptable outcomes in 73 (86.9%) out of 84 patients. A study by Patel et al reported excellent or good functional outcomes in 90% of the patients with Mayo elbow performance score (MEPS) of 87.9 points.[17] Another study by Kosters et al reported excellent or good functional outcomes in 89.7% of the patients.[15] Reising et al had excellent or good functional outcomes in 29 out of 40 patients (72.5%).[18] Acceptable outcomes observed in our study are in the range of reported data in the literature ranging from 72 to 90%.[15,17,18] In our study, poor acceptable outcomes were associated with older age of the patients, female gender, and presence of diabetes mellitus. A single

center experience in a small number of patients are the key limitations of this study.

CONCLUSION

Acceptable outcomes of precontoured locking compression plate for distal humerus intraarticular fracture were seen in 86.9% of the patients with radiological union in 95.2% and good or excellent functional outcome in 86.9% of the patients. Relatively poor acceptable outcomes were associated with older age (>45 years), female gender, and presence of diabetes mellitus. Hence, precontoured distal humerus locking plates are useful in providing stable fixation of distal humerus fractures in our population.

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