ORIGINAL ARTICLE

Functional Outcomes of Pre-Contoured Parallel Plates in Distal Humerus AO/OTA Type C Fractures in adults

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ABSTRACT

Background: Open reduction and internal fixation utilizing two plates giving bicolumnar adjustment has been a proven strategy of management with excellent clinical results. There are various schools of work regards plate position. The generally utilized dual plating procedure includes perpendicular plating, equal plating and Y plating.
Aim: To determine the outcome of pre-countoured parallel plates in patients for treatment of bicoloumnar type C fractures of distal humerus in adults
Methodology: This descriptive, case series study was carried out in the Department of Orthopedic Surgery at Shaikh Zayed Hospital Lahore from 21st December 2017 to 20th June 2018. Total 72 type C intraarticular fractures of distal humerus according to AO/OTA classification within one week of initial injury, 20-55 years of age of both genders were selected. Patients with ipsilateral fractures of upper limb, pre-existing conditions of elbow joint e.g. advanced osteoarthritis, infective arthritis, gouty arthritis were excluded. In each patient fracture was treated with precontour parallel plates. The patient was followed in outpatient department for wound examination and stitch removal after 2 weeks. Further follow up was at 4 weeks 3 months and 6 months.
Results: Mean age was 37.76±8.57 years. Out of 72 patients, 53 (73.61%) were males and 19 (26.39%) were females with male to female ratio of 2.8:1. In this study, the excellent outcome was seen in 41 (56.94%) patients, good in 21 (29.17%) patients, fair in 6 (8.33%) and poor outcome in 4 (5.56%) patients.
Conclusion: This study concluded that outcome of pre-countoured parallel plates in patients for treatment of bicoloumnar type C fractures of distal humerus in adults is excellent.
Keywords: Distal Humerus Fracture, Pre-Countoured Parallel Plates, Outcome.

INTRODUCTION

Elbow fractures are commonly experienced in the intense consideration setting. Injury patterns for kids and adults are quite different. Elbow fractures include extra-articular and intra-articular fractures. Extra-articular fractures incorporate intercondylar, supracondylar, epicondylar and condyle fractures. Intra-articular fractures incorporate trochlea and capitellum fractures, radial head and ulnar fractures. The examining surgeon must play out an exhaustive neurovascular assessment with all speculated elbow fractures; perceive subtle fracture; give sufficient immobilization and survey whether fractures require admission, quick orthopedic assessment or less urgent referral.[1-3]

Distal humerus fractures comprise of 2% of the total fractures in adults[4]. Dealing with such fractures can be very challenging due to the intricate anatomy of the elbow and small fracture fragments.[5,6] In adults, the gold standard treatment for the distal humerus fractures is considered to be the open reduction internal fixation (ORIF) with plate fixation of both columns.[7] Recently, the developments in the treatment protocol e.g. operative techniques and the mini fragment implants usage have enhanced success ratio but still there is a significant possibility of hardware failure[8]. The AO/ASIF approach includes the use of screws for the initial fixation of the articular fragments and the stabilization of the column using two plates secured perpendicular to each other. They developed a methodology in which two plates are applied parallel to each other, resulting in adequate fixation and the stability of the distal humerus fractures which makes the instant mobilization of the elbow conceivable[9,10].

This study was conducted so as to determine the best technique for the fixation of type C distal humerus fractures in adults of local population with available resource, taking into account that currently local studies are not available in the respective aspect.

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MATERIALS AND METHODS

All the patients with bicoloumnar type C fractures of distal humerus were admitted in orthopedic department through emergency department or OPD. Demographic data and history was taken relevant to mode of injury and time since injury. All the patients were examined and back slab was applied to the affected limb. Using plain radiographs, all fractures were classified according to AO/OTA by 1 researcher to exclude the inter observer error. Baseline investigations were done and fitness for anesthesia and surgery was obtained preoperatively. Informed written consent was obtained from all patients preoperatively for surgery including for research inclusion also. All the patients were operated on next regular list. All patients were given intravenous antibiotics (first generation cephalosporin) preoperatively. Patients were placed in right/left lateral position. Using posterior Campbell's approach ulnar nerve was identified and protected. A tongue was made of triceps muscle. Fracture was exposed,

reduced and fixed with precontour parallel plates. Wound was closed over a drain. Antibiotics (first generation cephalosporin) were given postoperatively for few days. Drains were removed after 48 hours. Patients were encouraged to mobilize 1-2 days post operatively. They were advised to commence passive range of motion with support as tolerated after 3-4 days and active after 3 weeks.

The patient was followed in outpatient department for wound examination and stitch removal after 2 weeks. Further follow up was at 4 weeks 3 months and 6 months. Variables of Mayo elbow performance score was recorded on follow up visit at 6 months. Total score was calculated and graded as per operational definitions.

RESULTS

Age range in this study was from 20 to 55 years with mean age of 37.76 ± 8.57 years. Majority of the patients 27 (51.39%) were between 20 to 35 years (Table I). Out of 72 patients, 53 (73.61%) were males and 19 (26.39%) were females with male to female ratio of 2.8:1 (Figure 1). Distribution of patients according to mode of injury (Figure 3). Mean BMI was 28.65±2.62 kg/m^2 (Table II).

In this study, the excellent outcome was seen in 41 (56.94%) patients, good in 21 (29.17%) patients, fair in 06 (8.33%) and poor outcome in 04 (5.56%) patients (Table III). Significant outcome (excellent & good) was seen in 62 (86.11%) patients while remaining 10 (13.89%) had shown fair & poor outcome (Figure 3).

Stratification of significant outcome with respect to age groups & gender (Table IV & V) respectively which showed statistically no significant difference among different groups. Table VI & VII have shown the stratification of significant outcome with respect to mode of injury and BMI.

Table I: Distribution of patients according to age (n=72)

Age (in years)	n	%age
20-35	37	51.39
36-55	35	48.61
Total	**72**	**100.0**

Mean ± SD = 37.76 ± 8.57 years

Figure 1: Distribution of patients according to gender (n=72)

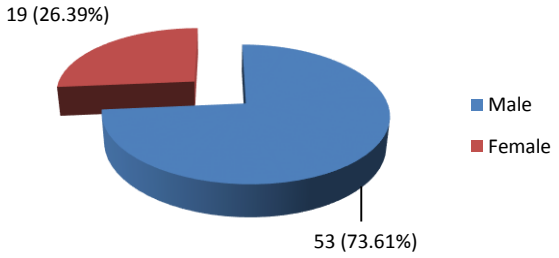

Figure 2: Distribution of patients according to mode of injury (n=72)

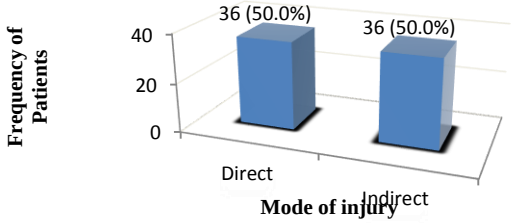

Table II: Distribution of patients according to BMI (n=72)

BMI (kg/m^2)	n	%age
≤27	25	34.72
>27	47	65.28

Mean ± SD = 28.65 ± 2.62 kg/m^2

Table III: Outcome of pre-countoured parallel plates in patients for treatment of bicoloumnar type C fractures of distal humerus in adults (n=72)

Functional Outcome	n	%age
Excellent	41	56.94
Good	21	29.17
Fair	06	8.33
Poor	04	5.56

Figure 3: Distribution of patients according to significant outcome (excellent & good) (n=72)

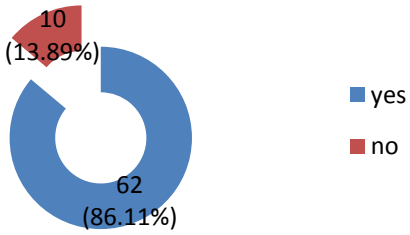

Table IV: Stratification of significant outcome with respect to age groups

Age (in years)	Significant outcome		P value
	Yes	No	
20-35	33 (89.19%)	04 (10.81%)	
36-55	29 (82.86%)	06 (17.14%)	0.437

Table V: Stratification of significant outcome with respect to gender.

Gender	Significant outcome		P value
	Yes	No	
Male	47 (88.68%)	06 (11.32%)	
Female	15 (78.95%)	04 (21.05%)	0.293

Table VI: Stratification of significant outcome with respect to mode of injury.

Mode of injury	Significant outcome		P value
	Yes	No	
Direct	32 (88.89%)	04 (11.11%)	
Indirect	30 (83.33%)	06 (16.67%)	0.496

Table VII: Stratification of significant outcome with respect to BMI.

BMI (kg/m^2)	Significant outcome		P value
	Yes	No	
≤27	20 (80.0%)	05 (20.0%)	0.274
>27	42 (89.36%)	05 (10.64%)	

DISCUSSION

Distal humerus fractures continue to present a significant dilemma in treatment despite recent advances in surgical technique. Mercifully these fractures remain uncommon with a UK rate of 5.7 per 100,000 and establish 2% of all fractures in young population[11]. Age range in this study was from 20 to 55 years with mean age of 37.76±8.57years. Majority of the patients 27 (51.39%) were between 20 to 35 years of age. Out of 72 patients, 53 (73.61%) were males and 19 (26.39%) were females with male to female ratio of

2.8:1. The excellent outcome was seen in 41 (56.94%) patients, good in 21 (29.17%) patients, fair in 6 (8.33%) and poor outcome in 4 (5.56%) patients. Significant outcome (excellent & good) was seen in 62 (86.11%) patients while remaining 10 (13.89%) had shown fair & poor outcome. A study conducted on 34 patients with type C distal humerus fractures fixation reported that out of 34 patients, 32 patients were monitored for a period of two years. The functional outcomes of the fixation were evaluated using Mayo Elbow Performance Score. The mean MEPS was marked to be 85 points. Eleven (34.5%) patients were graded as excellent, sixteen (50%) as good, two (6.2%) as fair and three (9.3%) as poor[12].

Rakesh et al[13] analyzed 55 inter-condylar fractures of the humerus. The patients were treated with bicolumnar plating on dorsal side of humerus with no ulnar nerve transposition. They had 93% excellent to good results with significant heterotopic ossification in one case (2%) and transient ulnar nerve neuropraxia in three cases (5%). They reported breakage of one one-third tubular plate. They attributed less incidence of complications in their series due to the fact that less dissection was required for dorsal plating than for parallel plating along the supracondylar ridges. Another study conducted on 27 patients with distal humerus fracture, the mean MEPS was recorded as 88; the result was marked as excellent in fourteen, (51.8%) good in 8t (29.5%), fair in 3(11.11%) and poor in 2(7.4%) patients.[9] Excellent to good outcome was found in 81.3% patients[14].

Atalar et al[15] evaluated 21 such cases. All fractures were united and the average MEPS score was 86 points. But the complications were higher with heterotopic ossification in 33% of patients and chondrolysis in one patient. Similarly, higher rate of complications occurred in the series of 32 patients treated with parallel plating by Athwal et al.[16] They reported post-operative nerve injuries in 16% of patients, with an overall complication rate of 53%, though union was seen in all cases. Sanchez-Soleto et al[17] found that parallel plating was efficient in comminuted fractures, but they needed to do additional surgery in 15% of the patients to treat elbow stiffness.

Lan et al[18] showed that both perpendicular and parallel locked plate arrangements with the appropriate surgical techniques can give anatomical reconstruction and stable fixation of type C intra-articular distal humeral fractures and permit early mobilization of elbow. There were no significant differences in the surgical time, blood loss, bone union time Mayo Elbow Performance Score (MEPS), flexion-extension arc and the total range of flexion and extension between the two groups. A biomechanical study regarding the stability provided by parallel, perpendicular and Y plating was done by Srecko et al[19] in 2013 in extraarticular distal humerus fractures. They proved that in all the three models, the displacements occurring with stress were minimal and within the range that allowed union. Numerous studies including studies by Shin et al[20] and Arnander et al[21] have compared outcomes of parallel and 90-90 plating systems for distal humerus fractures.

CONCLUSION

This study concluded that the outcome of pre-countoured parallel plates in patients for treatment of bicoloumnar type C fractures of distal humerus in adults is excellent. So, we recommend that this technique should be opted in our routine practice guidelines for these particular patients, so these patients will not only return to their normal activities but also reduce their morbidity and psychosocial impact on their minds due to this disability.

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