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ORIGINAL ARTICLE

A review on functional outcomes of intra-articular distal humerus fractures treated with recon plate using Mayo Elbow Performance Score (MEPS).

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ABSTRACT… Objective: To Review on Functional Outcomes of Intra-articular Distal Humerus Fractures Treated with Recon Plate Using the Mayo Elbow Performance Score (MEPS). **Study Design:** Retrospective study. **Setting:** Department of Orthopaedic & Spine Surgery, Ghurki Trust Teaching Hospital, Lahore. **Period:** 2015 to 2021. **Material & Methods:** A total of 353 patients meeting the inclusion criteria enrolled in the study. Patients were followed up at three months postoperatively to assess functional outcome using the Mayo Elbow Performance Score (MEPS). All data were recorded on the proforma. All the collected data were entered and analyzed through SPSS version 22. The chi-square test was applied post-stratification, taking $p \leq 0.05$ as significant. **Results:** In this study, 353 patients were included; among these majority, 220(62.4%) were males, and 133 were female (37.7%). The mean Age of patients was 42.5±14.32, ranging from 18 to 75 years. 182(51.6%) were affected on the left side compared to the right Side 170(48.2%). In most cases, the history of a mode of injury was fall 266(75.3%), and only 87(24.6%) had RTA history. The average MEPS score was 87.37±15.81, ranging from 40 to 100. According to the distribution of functional outcome, 265(75.1%) reported excellent outcome, 52(14.7%) with good, 26(7.5%) as fair, and only 10(2.8%) reported poor outcome. Stratification of functional outcome and patient demographic history showed a statistically significant association between age, gender, side effect, mode of injury, and functional outcome as $p < .05$. **Conclusion:** It is concluded that Recon plates provided patients who had distal humerus fractures an excellent functional result. It provides reliable stabilization for fractures of the distal humerus. Due to its improved stability, the device aids early mobility even in fractures with complications. Therefore, the surgeon should use this technique to avoid complications.

Key words: Chevron Osteotomy, Distal Humerus Fracture, MEP Score, Recon Plates, Trans Olecranon.

INTRODUCTION

Distal humerus fractures are uncommon, with an annual frequency of 5.7-8.3 per 100,000 persons.[1] Intra-articular fractures of the distal humerus account for 0.5% - 7% and 30% of elbow fractures, respectively.[2] The distribution of these injuries is bimodal, with the first peak seen in boys between the ages of 12 and 19 and typically following high-energy trauma. Due to osteoporotic bones, low-energy trauma, and falls, the second peak is evident in the elderly, particularly in women.[3]

For orthopaedic surgeons, intraarticular distal humerus fracture (AO type 13C) is a challenging problem. These fractures necessitate technically difficult surgical treatment, frequently with a significant morbidity rate. Selecting a technique for intraarticular distal humerus that allows for simple reduction and fixation of fractures with little soft tissue and an extensor mechanism is challenging.[3] Successful outcomes are challenging due to the complicated structure of the elbow joint osteopenia and the communition of the articular and metaphyseal areas.[4,5] The literature[6] has revealed that conservative treatment of these fractures is inadequate. These fractures must be precisely reduced, the intra-articular surface and anatomy restored, and rigidly fixed to allow early postoperative mobilization.[7,8] Using a combination of reconstructive plates, dynamic compression plates, screws, and K-wires, standard surgical methods are performed to repair both

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columns. Primary total elbow arthroplasty (TEA) might be thought of in extremely uncommon circumstances.[8,9]

Recon plates that provide compression and enable rigid fixation of distal humerus fractures are the most recent therapeutic option for these fractures. Better biomechanical qualities from this fixation aid in healing these complicated and unstable fractures. This treatment method enables early mobilization and rehabilitation, which might lead to better results. On an operational basis, many surgical techniques, such as olecranon osteotomy, reflective triceps, and fracturing approaches, have been used to treat intraarticular distal humerus fractures. These procedures are also linked to side effects such as early elbow failure, delayed mobilization, triceps weakness, wound dehiscence, implant prominence, delayed union or non-union at the osteotomy site, and triceps avulsion.[10,11]

Based on the Functional result of distal humerus fracture in adults treated with columnar Plating, Prakashappa et al.[12] did the research. The results revealed that using the Mayo Elbow performance score, 3 (10%) patients had excellent results at the end of 3 months, 18 (60%) good results, 7 (23.3%) fair results, and 2 (6.7%) poor results.

Additionally, our region of the globe lacks literature; thus, this study will assist us in developing population-based evidence-based treatment. As a result of this study, we can better predict patient outcomes, educate the patient, and select the most effective treatment for such fractures.

This study aims to analyze the functional results in distal humerus articular fractures treated with recon plates at a tertiary care hospital located in the periphery of Lahore, Pakistan, using the mayo elbow performance score.

MATERIAL & METHODS

The data were gathered using a retrospective research methodology. Patients from the Ghurki Trust Teaching Hospital, which specializes in orthopaedics, made up the research population. The data were gathered retrospectively from 2015 to 2021. At the Ghurki Trust Teaching Hospital in Lahore Department of Orthopaedic & Spine Surgery, a sample of 353 patients who had had treatment for distal humerus fractures was collected. Before beginning the study, hospital ethical committee consent (2022/12/R-04) was requested.

Patients who met the inclusion criteria for the AO categorization of intercondylar types A, B, and C and had undergone at least three months of postoperative therapy were included. Patients who had undergone any revision surgery, had a history of primary or metastatic tumors with a pathologic fracture, had developed inflammatory or degenerative elbow arthritis, or were lost to follow-up, were excluded. Before collecting any information, each patient's informed consent was obtained. All had surgery using the posterior trans olecranon technique. The 3.5 mm pre-contoured distal humerus recon represents the most recent generation of locking compression plates. It is advantageous in the distal region near the joint with little cancellous bone because the screws in the distal humerus were fixed into the plate and could not back out or totter. The plates were preshaped to fit on the ulnar and dorsal-radial columns in various sizes. The patients were told to move their fingers and elbow joints while maintaining the limb elevated. 48 hours after surgery and 48 hours after the drainage was removed, early controlled passive mobilization of the elbow was begun. After being released, patients finished a physical treatment regimen that included passive and active joint movement across its full range of motion.

After obtaining a check X-ray with anteroposterior and lateral views, the sutures and staples were removed between the ninth and sixteenth postoperative days. Patients were instructed to return for follow-up after 4 weeks, then at 8 weeks, 12 weeks, 16 weeks, and 24 weeks the following three months after suture removal. At each follow-up visit, patients were evaluated subjectively for symptoms such as pain, edoema, and limitation of joint mobility and their ability to carry out daily tasks. This was done in addition to a thorough clinical and radiological assessment.

We evaluated radiographic consolidation and the condition of the osteosynthesis material using 2 elbow projections (lateral and anterior). The Mayo Elbow Performance Score (MEPS), which includes an assessment of the arc of joint mobility, stability, and functioning of the elbow as well as the presence or absence of discomfort, was used to assess elbow stability as well as to measure the range of motion using a manual goniometer at 3 months postoperatively. A pre-defined proforma was used to collect the information. Version 23 of SPSS software was used for data analysis. The means were computed for each numerical value for qualitative variables, percentages, and proportions. Chi-square was used to examine the significance of categorical variables, and a p-value of 0.05 or below was regarded as significant.

RESULTS

In this study, 353 patients were included; among these majority, 220(62.4%) were males, and female were 133(37.7%). The mean Age of patients was 42.5, with a standard deviation of 14.32 years. The minimum age of the patients was 18, and the maximum was 75 years. 182(51.6%) were affected on the left side compared to the right Side 170(48.2%). In most cases, the history of a mode of injury was fall 266(75.3%), and only 87(24.6%) had RTA history. The average MEPS score was 87.37±15.81, ranging from 40 to 100. According to the distribution of functional outcome, 265(75.1%) reported excellent outcome, 52(14.7%) with good, 26(7.5%) as fair, and only 10(2.8%) reported poor outcome. Stratification of functional outcome and patient demographic history showed a significant association between age, gender, side effect, mode of injury, and functional outcome as $p<.05$. The findings revealed that in females, the majority reported the excellent outcome as compared to males and only seven females reported poor outcome. Patients between 18-40 years reported excellent outcomes compared to old patients as 73.8:65.5. 77.3% of fall cases were found with excellent results compared to RTA cases.

	Frequency (%)		Mean±S.D (Range)
Gender	Male	220(62.4)	42.5±14.32 years (Ranged = 18-75) years follow up duration ~3 months
	Female	133(37.7)	
Side	Left	182(51.6)	
	Right	170(48.2)	
Mode of Injury	RTA	87(24.6)	
	Fall	266(75.3)	

Table-I. Demographic characteristics of distal humerus patients (n=353)

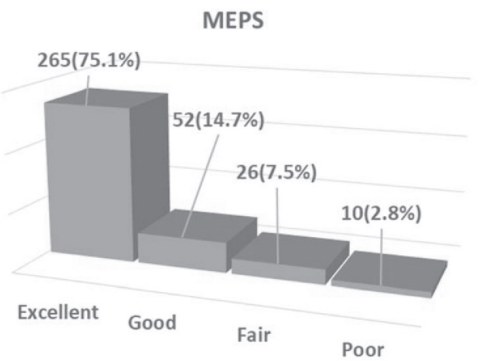

Figure-1. Functional outcome of patients using Mayo Elbow Performance Score (MEPS)

Parameters		Excellent	Good	Fair	Poor	P-Value
Gender	Male	138(62.7)	37(16.9)	19(8.5)	26(11.9)	*.014
	Female	105(78.9)	14(10.5)	7(5.3)	7(5.3)	
Age (years)	18-40	89(73.8)	20(16.7)	3(2.4)	9(7.1)	*.026
	40-75 years	153(65.5)	30(12.7)	25(10.9)	25(10.9)	
Side	Left	112(61.7)	35(19.1)	12(6.4)	23(12.8)	*.006
	Right	129(76)	17(10)	14(8)	10(6)	
Mode of Injury	RTA	36(40.9)	12(13.6)	16(18.2)	24(27.3)	
	Fall	206(77.3)	39(14.7)	11(4)	11(4)	**<.0001

Table-II. Comparison of functional outcome based on the demographic profile
*statistically significant at a 5% level of significance

DISCUSSION

Distal humerus fractures, particularly intraarticular ones, may be challenging to treat. Multiple issues might worsen these fractures, including considerable communition and numerous intra-articular fracture lines. This problem worsens since osteoporosis is becoming more common in older people. Numerous studies have revealed that treating these fractures has a beneficial effect. Nevertheless, a high failure rate of up to 25% has been noted in various studies, particularly for older people.[13]

In this study, the majority were males as compared to females. The mean Age of patients was 42.5±14.32, ranging from 18 to 75 years. The average MEPS score was 87.37±15.81, ranging from 40 to 100. Excellent outcome was found in more than half of cases 75.1%, good in 14.7% of cases, fair in 7.5%, and only 2.8%reported poor outcomes.

Our findings are consistent with the previous literature, as shown below; Similar results were observed in 2008. In the study by Greiner et al.[14], the functional results of osteosynthesis in distal humerus fractures were examined. With a mean flexion of 121 degrees and an extension deficit of 17.9 degrees, the mean DASH score was 18.511.5. The functional prognosis of 21 patients with complicated distal humerus fractures was examined in another study by Atalar et al.[15], and the mean MEPS and DASH scores were 86.1 and 7.5, respectively. Additionally, the mean flexion range was 118.1 degrees. The long-term effects of parallel plate fixation were examined by Doornberg et al. in thirty patients with various distal humerus fractures. MEPS and DASH average scores were 91 and 7 points, respectively.[16] The supination pronation arc was 165 degrees, while the average flexion arc was 106 degrees. The senior population was not the focus of any of this research. Only in the elderly were the functional results of columnar Plating investigated in retrospective research by Huang et al. The MEPS and DASH scores were 83 and 37.[6], respectively. The average elbow flexion-extension angle range was 20 to 120 degrees.[17]

Virani et al.[13] conducted the study, and the results showed that the typical follow-up period was 38 months. All patients' average MEP and DASH scores were 85, 15.5, 21.4, and 4.9, respectively. Despite being low, their scores were comparable to the other side (90 and 12.2, respectively). The mean flexion-extension and supination-pronation arcs were 156 degrees and 105 degrees, respectively. This is perfectly within the elbow's functioning range. With a mean maximum flexion of 120 degrees, the mean block to extension was 15 degrees.

Prakashappa et al.[12] performed a similar study, and the finding showed that at the end of 3 months, 3(10%) showed excellent, 18(60%) good, 7(23.3%) fair, and 2(6.7%) poor outcome using the Mayo Elbow performance score.

The functional result of complete elbow arthroplasty has been reviewed by several research, which has shown that it is a superior alternative, particularly for older patients. The mean flexion range was determined to be between 25 and 130 degrees in research conducted in 1997 by Cobb TK et al.[18] It comprised 15 elbows with complete elbow arthroplasty. At three years after total elbow replacement, Mean MEP and DASH scores were reported to be 93 and 23, respectively, by Gambirasio R et al.[19] A minimum follow-up of two years was observed by Kamineni S et al. for distal humerus fractures treated with complete elbow replacements.[20] The mean MEP score was 93, and the mean flexion-extension arc ranged from 24° to 131°.

Ullah[21] performed the same study, and the findings revealed that 66% were male cases while 34% were female cases enrolled in this study. The mean age of the patients was 32.92±9.79 years. 56% reported excellent outcome, and 22% good outcome using MEPS.

In distal humerus fractures, Recon plates are more advantageous than dynamic and k-wires. Conventional plates, Recon plating, and single columnar Plating all have a higher fixing failure rate. A full fixation using recon plate plates at a 90-degree angle is the most effective procedure

for treating distal humerus fractures. Recon plate users have a greater functional range of motion., earlier rehabilitation, secure bony fixation, faster bone healing, and better restoration of articular congruity.

The study had some limitations, like selection bias and only one hospital included in to review. To generalize results, the study should include more referral centers. Future studies should be conducted to include more predictors affecting the outcome of patients.

CONCLUSION

It is concluded that Recon Plates provided patients with distal humerus fractures with an excellent functional result. It provides reliable stabilization for fractures of the distal humerus. Due to its improved stability, the device aids early mobility, even in fractures with complications. Therefore, the surgeon should use this technique to avoid complications.

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5	Sadaf Saddiq	Data analysis.	
6	Rizwan Akram	Article reivew.	