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FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF INTRA ARTICULAR FRACTURES OF DISTAL HUMERUS IN ADULTS

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ABSTRACT

Background: Fractures of the distal humerus, particularly intra-articular types, continue to pose significant challenges due to the complex anatomy and biomechanics of the elbow joint.
Objective: This prospective study aims to evaluate the functional outcomes and determinants following surgical management of intra-articular distal humerus fractures in adults.
Subjects and Methods: This prospective hospital-based study was conducted from January 2017 to June 2018. Thirty adult patients with intra-articular distal humerus fractures were enrolled after obtaining informed consent. Thirty patients aged over 18 years underwent open reduction and internal fixation utilizing either parallel or orthogonal dual plating techniques via a transolecranon approach.
Results: Outcomes were assessed over six months using the Mayo Elbow Performance Score (MEPS), range of motion, union rates, and incidence of complications. The mean age was 38.4 years, with a predominance of males (60%). Road traffic accidents accounted for 63.3% of injuries. Radiologic union was achieved in all patients at an average of 12.87 weeks. The mean flexion-extension arc measured 104.5°, and the mean MEPS was 82.83, with 83.3% of patients attaining good to excellent results. No statistically significant differences were observed between parallel and orthogonal plating techniques regarding functional outcomes or complications. Complications were minimal and effectively managed.
Conclusion: The study concludes that dual plating techniques, when combined with adherence to surgical principles and early mobilization, result in satisfactory functional outcomes in intra-articular distal humerus fractures.

Keywords: *Intra articular fracture, Distal Humerus, Open reduction and internal fixation, transolecranon approach.*

INTRODUCTION

Fractures of distal end of humerus continue to be challenging problem for today's surgeons despite advances in technique and implants[1,2]. The complex anatomy of the elbow joint, the adjacent neurovascular architecture and the sparse soft tissue envelop combine to make these fractures difficult to treat[3-4]. Fractures of the distal humerus in adults are notoriously difficult to treat[5]. Elbow fractures encompass a spectrum of severity from low energy non-displaced fractures to high energy fractures with associated severe soft-tissue injury[6].

Intra articular fractures of distal humerus constitute 0.5-7% of all the fractures and 30% of fractures around elbow[7]. The primary goal in management of intra articular fractures of distal humerus is to achieve stable and mobile elbow.

Restoration of painless and satisfactory elbow function after a fracture of the distal humerus requires anatomic reconstruction of the articular surfaces, restitution of the overall geometry of the distal humerus and stable and rigid internal fixation of the fractured fragments to allow early mobilization and full rehabilitation. The standard surgical techniques are used for fixation of columns, using a combination of reconstruction plates, dynamic compression plates (DCP), locking compression plates (LCP) and screws and k-wires. In rare situations, primary total elbow replacement may be considered. Functional exercise in the early period is the crucial factor of enhancing the therapeutic effect[8].

This study is intended to assess the results following surgical treatment of intra articular fractures of distal humerus in adults.

OBJECTIVES

1. To estimate the functional outcome after surgical management of intra articular fracture of distal humerus.
2. To estimate the range of movements, pain, complications and union at follow ups.

SUBJECTS AND METHODS

Study Area: Department of Orthopedics, Santokba Durlabhji Memorial Hospital & Medical Research Institute, Jaipur.

Study Design: A Hospital Based Prospective study.

Study Period: From January 2017 to June 2018.

Sample Size: Sample size was calculated using good to excellent functional outcomes to be 80% (Kulkarniet al[9]) in the operated limb. The precision was taken as 20% and alpha error of 5%.

Sample size: 4pq/d2

Where, P= functional outcome of operated limb.

q= compliment of p i.e. (1-P)

d= precision i.e. 20% of P

Sample size = 4×80×20/16×16 = 25

We took total 30 subjects for this study.

Inclusion Criteria:

1. Patients with intra-articular fractures of the distal humerus
2. Patients aged more than 18 years.
3. Patients who give consent.

Exclusion Criteria:

1. Patients with co-morbid conditions and not fit for surgery.
2. Patients with Open fractures
3. Patients with severe un-reconstruct able intra-articular comminuted fractures in elderly

Methodology: All patients underwent surgical fixation via a transolecranon approach. Dual plating was performed using either parallel or orthogonal plating techniques, adhering to established fixation principles. Postoperative protocols included early active-assisted range of motion exercises initiated between postoperative days 3 and 7. Follow-up assessments occurred at 3, 6, and 12 weeks, and at 6 months. Functional outcomes were measured using the Mayo Elbow Performance Score (MEPS), range of motion evaluations, and radiological assessment of union. Statistical analyses were conducted using SPSS 20, with significance set at $p<0.05$.

RESULTS

The mean patient age was 38.4 ± 17.58 years, with males constituting 60% of the cohort. Road traffic accidents were the predominant injury mechanism (63.3%). According to the Riseborough and Radin classification, 53.3% of fractures were type IV. Radiological union was achieved in all patients at a mean of 12.87 ± 1.63 weeks. The mean flexion-extension arc at six months was 104.5° ± 20.14°, and the mean MEPS was 82.83 ± 11.12. Functional outcomes were classified as excellent in 30%, good in 53.3%, fair in 10%, and poor in 6.7% of patients.

No significant differences were observed between parallel and orthogonal plating groups in MEPS (83.33 vs. 82.08, p=0.769) or range of motion (101.94° vs. 108.33°, p=0.404). Complications occurred in 13.3% of cases, including superficial infection, ulnar nerve paresthesia, hardware prominence, and heterotopic ossification, without statistically

significant impact on outcomes. No significant associations were identified between functional outcomes and variables such as age, sex, affected side, mode of injury, fracture classification, or surgical technique.

Table 1: Mean Scoring

	Minimum	Maximum	Mean	Std. Dev.
Union (in weeks)	12	18	12.87	1.63
Mayo Elbow Performance Score (MEFS) at 6 months (out of 100)	55	100	82.83	11.12
Arc of Motion at 6 months	60°	130°	104.50°	20.14°

Table 2: Outcome

Outcome	No. of patients	Percentage
Excellent	9	30.0%
Good	16	53.3%
Fair	3	10.0%
Poor	2	6.7%
Total	**30**	**100.0**

DISCUSSION

In our study, we focused on functional outcome of these patients strictly adhering to principles of good anatomical alignment, absolute stabilization and early mobilization[1,10]. We evaluated our results and compared them with those obtained by various other studies.

The mean age of our study group was 38.4 years as compared to 58 years in the study by Sanchez-Sotelo et al[11] and 47 years in study by Atalar et al[12].This shows a rising incidence of these injuries among younger population due to the higher incidence of road traffic accidents in developing countries like India. Younger patients, often males had these high velocity injuries like motor vehicle accidents and fall from height in working place. Sex distribution in our study showed a male predominance. Other studies also found male predominance. Males are more prone for road traffic accidents compared to females because in our society females travel less.

The commonest mode of injury was Road traffic accident in our study. The findings were similar to observations of Kulkarni et al[9] while Sanchez-Sotelo et al[11] found that major mode of injury was accidental fall in their study.

We encountered 4 postoperative complications. One patient with superficial infection which resolved with antibiotics, one with ulnar neuropathy in the immediate post-operative period which spontaneously recovered, one patient had backed out screws which necessitated screw exchange and one patient developed heterotopic ossification which was treated conservatively.The other previously referenced studies reported complication rates of 11% to 29%[13-14]. Kulkarni et al[9] noted a complication rate of 16.7 percent, with complications arising in 5 of 30 patients. Our study showed a similar complication rate of 13.3 % (4 of 30 patients).

Bony union took an average of 12.87 weeks in our study which is comparable to 12 weeks obtained by Sanchez-Sotelo et al[11] and Kulkarni et al[9]. All patients had bony union at end of the study period.

Atalar et al[12] had a mayo elbow score of 86 with 85% good to excellent results in his series. Sanchez-Sotelo et al[11] showed an average Mayo elbow Performance score of 85 (flexion–extension 99 deg) with 83% good to excellent results in his series. Kulkarniet al[9], In their series of 30 patients, the mean elbow arc of motion was 104.2°. The mean Mayo Elbow Performance score was 76 points with 80% good to excellent results.

Our study group had an average Mayo Elbow Performance score of 82.83 (flexion extension arc of 104.5˚) which was comparable to the previous studies and shows that surgical treatment can produce consistently good to excellent functional outcomes in management of these complex injuries. In our study we didn't find any significant association of age-group, sex, side, MOI, fracture classification, surgery technique and complication with functional outcome.

CONCLUSION

Surgical management of intra-articular distal humerus fractures with dual plating techniques achieves good to excellent functional outcomes in the majority of patients. Careful preoperative planning, meticulous surgical technique, and early mobilization are critical to success. Both parallel and orthogonal plating methods are effective, with no significant differences in outcomes. Future studies with larger cohorts are warranted to further validate these findings.

LIMITATIONS

Limitations include the small sample size and absence of a control group, underscoring the need for larger randomized controlled trials to establish definitive treatment protocols.

Declaration:

Conflicts of interests: The authors declare no conflicts of interest.

Author contribution: All authors have contributed in the manuscript.

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