

## To Investigate the Efficacy of Single Extra-Articular Humerus Plating and Bipillar Plating in the Treatment of Distal Humerus Fractures: a Comparative Study

Rahul Kumar<sup>1</sup>, Wasim Ahmed<sup>2</sup>, Santosh Kumar<sup>3</sup>, Indrajeet Kumar<sup>4</sup>

<sup>1</sup>Senior resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

<sup>2</sup>Associate Professor, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

<sup>3</sup>Professor and HOD, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

<sup>4</sup>Assistant Professor, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

Received: 10-02-2024 / Revised: 16-03-2024 / Accepted: 22-04-2024

Corresponding Author: Dr. Indrajeet Kumar

Conflict of interest: Nil

### Abstract

**Aim:** To investigate the efficacy of single extra-articular humerus plating and bipillar plating in the treatment of distal humerus fractures in a tertiary healthcare center.

**Material and Methods:** This study was conducted in the Department of orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India from October 2019 to August 2022. Total 80 patients were included in this study. Patients were grouped into two groups. Group A included humerus fracture treated with single extra articular plating and Group B included patients treated by bipillar plating.

**Results:** Mean duration of surgery was significantly less in Group A ( $92.43 \pm 13.27$  mins) than Group B ( $183.53 \pm 5.38$  mins) ( $P < 0.05$ ). Mean operative blood loss in Group A was  $178 \pm 42$  ml while in Group B it was  $215 \pm 36$  ml. Difference between these two groups is statistically significant ( $p < 0.05$ ). Mean fracture union time was  $23.2 \pm 1.1$  and  $22.4 \pm 1.2$  in Group A and Group B respectively. Bone impingement was not seen in Group A. only one patient had Bone impingement in Group B. Table 2 shows comparison of both the groups according to Mayo Elbow Performance Score. Score of  $>90$  was considered as excellent and score of 75-89 was considered as good. In our study we found that 29 patients from group A were with excellent score and 27 patients from Group B were with excellent score. Good score was achieved by 1 patient in Group A and 3 patients in Group B.

**Conclusion:** Single extra articular humerus plating is better than bipillar plating for distal humerus fracture as it has less duration of surgery and less blood loss with good performance score.

**Keywords:** single extra-articular humerus plating, bipillar plating, distal humerus fractures

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Distal humerus fractures are complex injuries that pose significant challenges for orthopedic surgeons due to the intricate anatomy and the necessity for stable fixation to enable early motion and functional recovery. The treatment modalities for these fractures often include operative interventions, which aim to restore the anatomical structure and ensure joint stability. Two widely used surgical approaches for distal humerus fractures are single extra-articular humerus plating and bipillar plating. [1-3] Single extra-articular humerus plating involves the placement of a single plate along the humerus to provide stabilization. This method is generally less

invasive, with a reduced risk of disturbing the soft tissue envelope around the fracture site. It is particularly suitable for simple fractures where the bone fragments can be adequately aligned and stabilized with a single plate. The advantages of this technique include reduced surgical time, decreased blood loss, and potentially lower complication rates associated with less extensive hardware. [4-6] Bipillar plating, on the other hand, is often utilized for more complex fractures, particularly those involving the articular surface of the distal humerus. This technique employs two plates, usually placed at a 90-degree angle to each other, to provide

comprehensive stabilization from multiple directions. Bipillar plating is advantageous in achieving rigid fixation in multifragmentary fractures, allowing for early range of motion exercises which are critical for functional recovery. This method, however, can be associated with longer operative times and increased potential for complications such as infection and hardware-related issues due to the more extensive surgical exposure required. However, the choice of technique must be individualized based on the specific fracture characteristics and patient factors to optimize outcomes. [7,8]

### Material and Methods

This study was conducted in the Department of orthopedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India from October 2019 to August 2022. Total 80 patients were included in this study. Patients were grouped into two groups. Group A included humerus fracture treated with single extra articular plating and Group B included patients treated by bipillar plating.

### Inclusion Criteria:

1. Patients with extra articular distal humerus fractures
2. Lost fracture patients
3. Fresh trauma up to 2 weeks

### Exclusion Criteria

1. Age less than 18 years and above 60 years
2. Open fracture
3. Osteoporotic patients
4. Pathological fractures
5. Patients not willing to participate.

Study was approved by ethical committee. A valid written consent was taken from the patients after explaining study and operative procedure to them. Data was collected with pre tested questionnaire. Data included socio- demographic data, detailed clinical history. Patients undergone pre operative assessment before surgery. Tourniquets were not used. Posterolateral approach was used and skin incision was done in between lateral epicondyle and olecranon 2.5 cm distally to elbow joint. Triceps was split and lifted to reach fracture site. Periosteum was isolated through use of periosteum elevator and proximal and distal humerus was aligned and fracture was reduced with the use of reduction clamps and plates. Plates were

fixed. in Group A single extra articular plating was done while in Group B bipolar plating was done. Post operative physiotherapy and assisted exercise were allowed after radiological bone union. All the patients were followed after 15 days for suture removal and later on every monthly for ortho-clinico radiological correlation till fracture got united. Union of fracture was defined as formation of bridging callus on two radiographic antero-posterior and lateral views and clinically defined as no pain at fracture site. Clinical examination and follow up included patient satisfaction, visual analogue scale, range of motion over elbow joint, and mayo elbow performance score (MEPS) was used for functional assessment of elbow and shoulder joint. Mean duration of surgery, mean blood loss during procedure and post-operative complications were noted in both the groups. Data was analysed with appropriate statistical tests.

### Results

Total 80 patients were studied. Mean age of the patient in group A was  $42.72 \pm 3.51$  years. Mean age of the patients in Group B was  $41.84 \pm 3.15$  years. Majority patients were male in both the groups. Out of all 60 patients were male and 20 patients were female. Both the groups were comparable with respect to age and sex (P value  $>0.05$ ). Table 1 shows comparison of Group A and Group B with respect to different parameters. Mean duration of surgery was significantly less in Group A ( $92.43 \pm 13.27$  mins) than Group B ( $183.53 \pm 5.38$  mins) (P $<0.05$ ). Mean operative blood loss in Group A was  $178 \pm 42$  ml while in Group B it was  $215 \pm 36$  ml. Difference between these two groups is statistically significant (p $<0.05$ ). Mean fracture union time was  $23.2 \pm 1.1$  and  $22.4 \pm 1.2$  in Group A and Group B respectively. Bone impingement was not seen in Group A. only one patient had Bone impingement in Group B. Table 2 shows comparison of both the groups according to Mayo Elbow Performance Score. Score of  $>90$  was considered as excellent and score of 75-89 was considered as good. In our study we found that 29 patients from group A were with excellent score and 27 patients from Group B were with excellent score. Good score was achieved by 1 patient in Group A and 3 patients in Group B. Post operative complications were less in our study. One patient had non union of fracture this patient undergone revised surgery. 2 patients had post operative site infection these patients were treated with higher antibiotics. Radial nerve injury was not observed in any patient.

**Table 1: Demographic and Operative Characteristics**

Parameter	Group A (n=40)	Group B (n=40)	P Value
Mean Age (years)	42.72 ± 3.51	41.84 ± 3.15	>0.05
Gender Distribution			
- Male	30	30	
- Female	10	10	
Mean Duration of Surgery (mins)	92.43 ± 13.27	183.53 ± 5.38	<0.05
Mean Operative Blood Loss (ml)	178 ± 42	215 ± 36	<0.05
Mean Fracture Union Time (weeks)	23.2 ± 1.1	22.4 ± 1.2	>0.05
Bone Impingement	0	1	>0.05

**Table 2: Mayo Elbow Performance Score**

Performance Score	Group A (n=40)	Group B (n=40)
Excellent (Score > 90)	29	27
Good (Score 75-89)	1	3

**Table 3: Postoperative Complications**

Complications	Number of Patients
Non-union of Fracture	1
Postoperative Site Infection	2
Radial Nerve Injury	0

## Discussion

In our study Mean duration of surgery was significantly less in Group A (92.43± 13.27mins) than Group B (183.53± 5.38 mins) (P<0.05). Mean operative blood loss in Group A was 178± 42 ml while in Group B it was 215± 36 ml. Difference between these two groups is statistically significant (p<0.05). Similar findings were seen in previous studies where they found that mean operative time and blood loss was less. [9,10] According to Mayo Elbow Performance Score. Score of > 90 was considered as excellent and score of 75-89 was considered as good. In our study we found that 29 patients from group A were with excellent score and 27 patients from Group B were with excellent score. Good score was achieved by 1 patient in Group A and 3 patients in Group B. [11] Post operative complications were less in our study. One patient had non union of fracture this patient undergone revised surgery. 2 patients had post operative site infection these patients were treated with higher antibiotics. Operative site infection was seen in two patients only. Functional bracing was not seen. Similar findings were observed in previous studies like Fjalestad T *et al* [12] and Papasoulis E *et al* [13] Radial nerve palsy was not observed in any patient. Similar results were seen in previous study. [12] Meloy GM *et al* observed that The single plating group had an overall better range of movement than the dual plating group, and the overall complication rate was significantly greater in the latter. [14]

## Conclusion

Single extra articular humerus plating is better than bipillar plating for distal humerus fracture as it has less duration of surgery and less blood loss

with good performance score.

## References

1. Ring D, Jupiter JB, Sanders RA, et al. Transolecranon approach to the elbow for fractures of the distal humerus. *J Orthop Trauma*. 2000;14(7):462-466.
2. Palvanen M, Kannus P, Niemi S, et al. Secular trends in the osteoporotic fractures of the distal humerus. *Eur J Epidemiol*. 1998;14(2):159-164.
3. O'Driscoll SW, Sanchez-Sotelo J, Torchia ME. Management of the smashed distal humerus. *Orthop Clin North Am*. 2000;31(1):103-118.
4. Pajarinen J, Björkenheim JM. Operative treatment of type C fractures of the distal humerus: Results after a mean follow-up of 2 years in a series of 18 patients. *J Shoulder Elbow Surg*. 2002;11(1):48-52.
5. Shin SJ, Sohn HS, Do NH. A clinical comparison of two different double plating methods for intra-articular distal humerus fractures. *J Shoulder Elbow Surg*. 2010; 19(1):2-9.
6. Anglen JO, Mallon WK. Distal humerus fractures. *Orthop Clin North Am*. 1997;28(1):51-57.
7. Scolaro JA, Voleti P, Makani A, Namdari S, Mirza A, Mehta S. Surgical fixation of extra-articular distal humerus fractures with a posterolateral plate through a triceps-reflecting technique. *J Shoulder Elbow Surg*. 2014;23: 251-7.
8. Capo JT, Debkowska MP, Liporace F, Beutel BG, Melamed E. Outcomes of distal humerus diaphyseal injuries fixed with a single-column anatomic plate. *Int Orthop*. 2014;38: 1037-43.
9. Fawi H, Lewis J, Rao P, Parfitt D, Mohanty K,

Ghandour

10. Distal third humeri fractures treated using the Synthes™ 3.5-mm extra-articular distal humeral locking compression plate: Clinical, radiographic and patient outcome scores. *Shoulder Elbow*. 2015;7: 104–9.
11. Morrey BF, An KN, Chao EYS. Functional evaluation of the elbow. In: Morrey BF, editor. *The elbow and its disorders*. 2. Philadelphia: W. B. Saunders; 1993. pp. 86–89
12. Fjalestad T, Strømsøe K, Salvesen P, Rostad B. Functional results of braced humeral diaphyseal fractures: Why do 38% lose external rotation of the shoulder? *Arch Orthop Trauma Surg*. 2000; 120: 281-5.
13. Papasoulis E, Drosos GI, Ververidis AN, Verettas DA. Functional bracing of humeral shaft fractures. A review of clinical studies. *Injury*. 2010; 41:e21-7.
14. Meloy GM, Mormino MA, Siska PA, Tarkin IS. A paradigm shift in the surgical reconstruction of extra-articular distal humeral fractures: single column plating. *Injury*. 2013; 44: 1620-24.