

Study of the role of locking humerus plating for early mobilization of fractures of proximal humerus in adult at tertiary care center

S Anjaiah¹, Syed Saad Kadri^{2*}

^{1,2}Consultant, Department of Orthopaedic, Sai Sanjeevni Hospital, Kothapeth Hyderabad, Telangana, INDIA.

Email: dr.syedsaad@gmail.com

Abstract

Background: Proximal humeral fractures account for almost 4- 5% of all fractures. Locking compression plate is an advantageous implant in proximal humerus fractures due to angular stability, which allows their early mobilization. Present study was aimed to role of locking humerus plating for early mobilization of fractures of proximal humerus in adult at tertiary care center. **Material and Methods:** Present study was single-center, prospective, observational and descriptive study, conducted in patients of either gender, >18 years age, with displaced proximal humerus fractures according to NEER two, three- and four-part fracture, posted for surgery with locking humerus plating. **Results:** In present study, 32 cases satisfying study criteria were studied. Majority were males (65.63 %), > 60 years age (56.25 %), mode of injury due to RTA (71.88 %), injury on right side (56.25 %) and had co-morbidities such as hypertension (31.25 %), diabetes mellitus (21.88 %), coronary artery disease (15.63 %). Majority were 2 part fracture (46.88 %) as compared to part 3 (28.13 %) and part 4 (25 %). Complications noted were Plate impingement (9.38 %), Varus malunion (6.25 %) and Stiffness (6.25 %). The Neer's scoring system of the severity of pain, function, range of movement, anatomy, was done to determine the end results. In present study excellent, satisfactory and unsatisfactory results were noted in 28.13%, 56.25% and 15.63% patients. **Conclusion:** Locking compression plate for management of fractures of proximal humerus is beneficial mainly due to stable fixation, angular stability and early functional aftercare is possible.

Keywords: Locking compression plate, fractures of proximal humerus, stable fixation, early mobilization

*Address for Correspondence:

Dr Syed Saad Kadri, Consultant, Department of Orthopaedic, Sai Sanjeevni Hospital, Kothapeth Hyderabad, Telangana, INDIA.

Email: dr.syedsaad@gmail.com

Received Date: 17/10/2021 Revised Date: 19/11/2021 Accepted Date: 27/12/2021

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/). 

Access this article online

Quick Response Code:	Website: www.medpulse.in
	DOI: https://doi.org/10.26611/1032213

INTRODUCTION

Proximal humeral fractures account for almost 4- 5% of all fractures.^{1,2} These fractures have a dual age distribution occurring either in young people following high energy trauma or in those older than 50 years with low velocity injuries like simple fall.³ It has been always enigma of management because of numerous muscles attachment and

the paucity of space for fixing the implant in fracture of the proximal humerus. The treatment is more controversial for articular fractures which carry a high risk of the humeral head necrosis.⁴ Conservative treatment is usually associated with nonunion, malunion and avascular necrosis resulting in a painful dysfunction.⁵ Wide variety of treatments like percutaneous fixation, closed reduction, internal fixation, k-wire fixation, hemiarthroplasty, and recently locking compression plate are introduced.⁶ Locking compression plate is an advantageous implant in proximal humerus fractures due to angular stability, particularly in comminuted fractures and in osteoporotic bones of elderly patients, which allows their early mobilization.⁷ Present study was aimed to role of locking humerus plating for early mobilization of fractures of proximal humerus in adult at tertiary care center.

MATERIAL AND METHODS

Present study was single-center, prospective, observational and descriptive study, conducted in Department of Orthopaedic, Sai Sanjeevni Hospital, Kothapeth Hyderabad, Telangana, INDIA. Study duration was of 2 years (July 2019 to June 2021). Study was approved by institutional ethical committee.

Inclusion criteria: Patients of either gender, >18 years age, with displaced proximal humerus fractures according to NEER two, three- and four-part fracture, posted for surgery with locking humerus plating.

Exclusion criteria: With associated dislocation of the shoulder, Undergoing revision surgery for failure of other implants, Failure of conservative treatment. Pathologic fractures from primary or metastatic tumors, Open fractures and Poly trauma, Four-part fracture in elderly, with neurovascular deficits.

On admission, patients were informed about the study, and written consent was taken for participation and follow up. Patients underwent detailed history taking and

physical examination. X ray (Antero-Posterior and Lateral views.) of injured arm was done and diagnosis was confirmed. After confirmation of the proximal humerus fracture, patient were taken into the study, if they fit into the above criteria. Fractures were classified using Neer’s classification. Patients underwent open reduction internal fixation with philos locking plating under GA. Post-operative physiotherapy, was started on day 3 and gradually increased along with early mobilisation. Post-op sutures were removed on the 10th postop day and patient was discharged with the U-slab applied and arm supported in an arm pouch. Follow-up was advised at 3 weeks, 6th week, 3rd month, 6th month and 1year. At each visit, clinical examination (wound/scar, tenderness, movements of joints, NV status and radiological evaluation (evidence of union and status of the implant) was done and post-operative complications if any, noted.

Data was collected and compiled using Microsoft Excel, Statistical analysis was done using descriptive statistics.

RESULTS

In present study, 32 cases satisfying study criteria were studied. Majority were males (65.63 %), > 60 years age (56.25 %), mode of injury due to RTA (71.88 %), injury on right side (56.25 %) and had co-morbidities such as hypertension (31.25 %), diabetes mellitus (21.88 %), coronary artery disease (15.63 %). Majority were 2 part fracture (46.88 %) as compared to part 3 (28.13 %) and part 4 (25 %).

Table 1: General characteristics

Characteristics	No. of Patients	Percentage
Gender		
Males	21	65.63%
Females	11	34.38%
Age in years		
20-40	5	15.63%
40-60	9	28.13%
>60	18	56.25%
Mode of injury		
RTA	23	71.88%
Fall, others, etc.	9	28.13%
Limb involved		
Right Side	18	56.25%
Left Side	14	43.75%
Co-morbidity		
Hypertension	10	31.25%
Diabetes Mellitus	7	21.88%
coronary artery disease	5	15.63%
Classification		
2 Part Fracture	15	46.88%
3 Part Fracture	9	28.13%
4 Part Fracture	8	25.00%

Complications noted were Plate impingement (9.38 %), Varus malunion (6.25 %) and Stiffness (6.25 %).

Table 3: Complications among patients.

Complications	No. of patients (n=30)	Percentage (%)
Plate impingement	3	9.38%
Varus malunion	2	6.25%
Stiffness	2	6.25%

The Neer's scoring system of the severity of pain, function, range of movement, anatomy, was done to determine the end results. In present study excellent, satisfactory and unsatisfactory results were noted in 28.13%, 56.25% and 15.63% patients.

Table 3: Neer's scoring system

Final result	No. of patients	Percentage (%)
Excellent	9	28.13%
Satisfactory	18	56.25%
Unsatisfactory	5	15.63%

DISCUSSION

Neer recommended open reduction and internal fixation for displaced two and three parts fractures. Most of the poor results following open reduction and internal fixation of three-part fracture are due to imperfect technique.⁸ However, with the aim of getting anatomically accurate reductions, rapid healing and early restoration of function, which is a demand of today's life, open reduction, and internal fixation, is the preferred modality of treatment. The goals of surgery are to obtain anatomic fracture reduction and stable primary fixation to ensure rapid fracture healing and immediate post-operative functional therapy without prolonged immobilization.⁹ The PHILOS plate is an internal fixation system that enables stabilization thanks to multiple angular stable interlocking screws, with the goal of preserving the biological integrity of the humeral head while securing an anatomical reduction.¹⁰ In study of 30 patients, Arumugam S *et al.*,¹¹ noted that the majority of the patients were males, elderly aged, with RTA being the commonest mode of injury, involving 2 part, 3 part and 4 part fractures of the proximal humerus. Excellent and satisfactory results were found in 76.7% of patients with unsatisfactory results in 23.3 % according to Neer's criteria. There were 100 % union rates and no failures. In study by Chintan Doshi *et al.*,¹² average age was 54.3±5.8 years. As per the Neers classification system, there were 6 (11.32%) 1-part, 19 (35.85%) 2-part, 17 (32.085) and 11 (20.75%) 3 and 4-part fracture respectively. Average surgical duration was 94±10.2 minutes. Radiological union was seen at 12±4.6 weeks. There were 2 (3.77%) cases of varus collapse. Three (5.66%) cases had screw back out, which was later revised and had a favourable outcome. As per the Neer's scoring system, 7 (13.21%) cases had excellent results, 37 (69.81%) had satisfactory, 6 (11.32%) had unsatisfactory while 3 (05.66%) cases had poor outcomes. Sameer Aggarwal *et al.*,¹³ studied 47 patients who completed a minimum follow up of 1 year, average follow up period was around 21.5 months. Outcomes were excellent in 17%, good in 38.5%, moderate in 34% while poor in 10.5%. The Constant score was poorer for AO-OTA type 3 fractures as compared to other types. The scores were also inferior for older patients (> 65 years old). Complications included screw perforation of head, AVN, subacromial

impingement, loss of fixation, axillary nerve palsy and infection. A varus malalignment was found to be a strong predictor of loss of fixation. Internal fixation with non-locking plates has resulted in poor clinical outcomes and high failure rates in the past. Pre-countoured anatomical locking compression plates are more versatile with higher rates of union, especially in osteoporotic bones. They provide more stable buttress laterally and the diverging screw options in the cancellous bone, makes them the implant of choice in complex fractures.^{14,15} Locking compression plate (LCP) has demonstrated satisfactory results for severely displaced PHF compared with conventional plate. The fixed-angle construct could improve the fracture stability and increase the resistance to pull out through the bone-plate interface with a single beam construct, especially useful in poor-quality cancellous bone of the proximal humerus. However, some complications, such as avascular necrosis (AVN), screw cut out, implant failure, plate impingement, head collapse, and infection, have been reported.¹⁶ Other studies have shown high complication rates ranging from 16 - 36%, which include articular screw penetration, subacromial impingement, varus malalignment, nonunion, implant failure, and osteonecrosis of the humeral head which adversely affects the final outcome. Further, most of these complications were attributed to poor surgical technique, improper implant positioning, and failure of accurate intraoperative assessment of reduction and screw length. Additionally, meticulous surgical dissection to preserve vascularity of humeral head is necessary to prevent potential complications such as AVN.^{17,18,19} Surgery followed by early physiotherapy by rehabilitation programme plays important role in functional outcome of surgical management of proximal humerus fracture, thus allowing early mobilization and return to pre operative functional status.

CONCLUSION

Locking compression plate for management of fractures of proximal humerus is beneficial mainly due to stable fixation, angular stability and early functional aftercare is possible. It helps patients for early mobilization, to regain good shoulder function and resume normal activities much earlier.

REFERENCES

1. Helmy N, Hintermann B: New trends in the treatment of proximal humerus fractures. *Clin Orthop Relat Res* 2006, 442:100-108.
2. Court-Brown CM, Caesar B: Epidemiology of adult fractures: A review. *Injury* 2006, 37:691-697.
3. Chu SP, Kelsey JL, Keegan TH, et al.: Risk factors for proximal humerus fracture. *Am J Epidemiol* 2004, 15(160):360-367.
4. Williams GR, Wong KL. Two-part and three-part fractures-Management of proximal and distal humerus fracture. *Orthop Clin North Am.* 2000;31(1):1-21.
5. Russo R, Lombardi LV, Ciccarelli M, Giudice G, Cautiero F. A new osteosynthesis device for the treatment of proximal humerus fractures. Description of the technique and preliminary results. *Chir Organi Mov.* 2008;91(1):27-34.
6. Michael W, Andre F, Robert F. Locked plating: biomechanics and biology and locked plating: clinical indications. *Techniques in Orthopaedics.* 2007;22(4):209-18.
7. Mahesh G, Kiran KC, Ramesh KV, Kumar R. Functional Outcome of Locking Compression Plate in Neer's two-part, three-part, four-part Proximal Humerus Fractures. *J Med Sci* 2016;2(1):1-8.
8. Lous U, Bigiliani. The shoulder. Chapter 9. Volume 1. Fractures of the proximal humerus. In Rockwood CA, Matsen, editors. Philadelphia: W.B. Saunders; 1990: 278-334.
9. Gradl G, Dietze A, Kaab M, Hopfenmuller W, Mittlmeier T (2009) Is locking of nailing of humeral head fractures superior to locking plate fixation? *Clin Orthop Relat Res* 467(11): 2986-2993.
10. Haidukewych, G.J. Innovations in locking plate technology. *J. Am. Acad. Orthop. Surg.* 2004, 12, 205-212.
11. Arumugam S, Arumugam V, Raviraman V. Surgical management of proximal humerus fracture treated with locking compression plate. *Int J Res Orthop* 2017;3:1165-9.
12. Chintan Doshi, Gaurav Mahesh Sharma, Lokesh Gudda Naik, Krishna Badgire, Faisal Qureshi, Treatment of Proximal Humerus Fractures using PHILOS Plate, *Journal of Clinical and Diagnostic Research.* 2017 Jul, Vol-11(7): RC10-RC13
13. Sameer Aggarwal, Kamal Bali, Mandeep S Dhillon, Vishal Kumar, Aditya Mootha, Displaced proximal humeral fractures: an Indian experience with locking plates, *Journal of Orthopaedic Surgery and Research* 2010, 5:60
14. Gavaskar AS, Karthik BB, Tummala NC, Srinivasan P, Gopalan H. Second generation locked plating for complex proximal humerus fractures in very elderly patients. *Injury.* 2016;47(11):2534-38.
15. Brunner F, Sommer C, Bahrs C, Heuwinkel R, Hafner C, Rillmann P, et al. Open reduction and internal fixation of proximal humerus fractures using a proximal humeral locked plate: a prospective multicenter analysis. *J Orthop Trauma.* 2009;23(3):163-72.
16. Karl JW, Olson PR, Rosenwasser MP. The Epidemiology of Upper Extremity Fractures in the United States, 2009. *J Orthop Trauma.* 2015;29(8): e242-244
17. Jung WB, Moon ES, Kim SK, et al. Does medial support decrease major complications of unstable proximal humerus fractures treated with locking plate? *BMC Musculoskelet Disord.* 2013; 14: 102.
18. Egol KA, Ong CC, Walsh M, et al. Early complications in proximal humerus fractures (OTA Types 11) treated with locked plates. *J Orthop Trauma* 2008; 22(3): 159-164.
19. Dheerendra SK, Khan WS, Barber J, et al. Outcomes of locking plates in proximal humeral fractures: a systematic review. *Shoulder and Elbow* 2011; 3(2): 74-84.

Source of Support: None Declared
Conflict of Interest: None Declared