e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(3); 229-235

Original Research Article

A Prospective Study to Assess and Compare the Functional Outcome with Different Modalities in Fixation of Proximal Humerus Shaft Fractures

Shankar Niwas[1], Shashi kant Kumar Singh[2], Kumar Satyam[3]

[1]Assistant Professor & HOD Department of Orthopaedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India

[2]Assistant Professor, Department of Orthopaedics, S B Medical College & Hospital, Hazaribagh, Jharkhand, India

[3]Senior Resident, Department of Orthopaedics, S B Medical College & Hospital, Hazaribagh, Jharkhand, India

Received: 01-12-2021 / Revised: 29-01-2022 / Accepted: 23-02-2022
Corresponding author: Dr Shashi kant Kumar Singh
Conflict of interest: Nil

Abstract

Aim: To assess and compare the functional outcome with different modalities in fixation of proximal humerus shaft fractures.

Methodology: The present prospective study was conducted in the Department of Orthopaedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India for a period of one year. The study participants were informed about the study details and informed written consent was obtained from them. The history of injury of the participants, general condition and any associated soft tissue injury were evaluated. The severity of the injury was assessed to assess local injury and axillary nerve was assessed by examining any anaesthetic patch over lateral aspect of the shoulder. All the cases with proximal humerus fractures above 18 years of age and consenting for the study were included. The modality of the treatment was decided based upon the following factors: Neer's classification [grade 2 to grade 4]; presence of humeral head dislocation and comminution; valgus impaction, quality of bone, open or compound fracture and age of the patient.

Results: A total of 50 cases who fulfilled the inclusion criteria were enrolled. 52% of cases were females and 48% were males. 42% of the cases were between 41-60 years with 28% between <18-40 years and 10% of cases >60 years of age. 60% of the cases sustained fracture on the left side and 40% on right side. 74% of fractures were of closed type and 26% were open. As per Neer's type of fracture classification, the most common type of fracture observed in our study cases was two-part fracture accounting to 36% of cases followed in order by three part (28%), four part observed in 26% of cases. 5 cases (10%) had fracture dislocation. Road traffic injury was the most common mechanism for injury in 52% of cases and next was a history of fall in 38% of cases. At the end of clinical and radiological union and full functional recovery the results were evaluated. Of the total 50 cases in the study, 74% cases had excellent results, 14% cases were satisfactory, 8% cases were unsatisfactory, and 4% cases had failure.

Conclusion: To conclude, the options as to the management modality used depend on the pattern of the fracture, the quality of the bone encountered, the patient's goals and the surgeon's familiarity with the techniques. Principle of fixation is reconstruction of the articular surface, including the restoration of the anatomy, stable fixation, with minimal injury to the soft tissues preserving the vascular supply, should be applied.

Keywords: Humerus, internal fixation, open reduction.

Introduction

Proximal humerus fractures are one of the commonest fractures encountered in an orthopaedic practice. They account for nearly 6-10% and may be on a rise. They are the third most common osteoporotic fracture after distal radius and vertebra. The distribution of humeral fracture according to age is typical with high velocity trauma being the common cause among young individuals and a simple fall in older individuals because of osteoporosis [1]. Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures [2].

Cylindrical in shape, the shaft inherently provides strength and resistance to both torsional and bending forces. Distally the bone transitions into a triangular geometry with the base posterior which forms a supra-condylar region. This region maintains a narrow anterior-posterior dimension [3].

The most common mechanism of injury in proximal humeral fractures in elderly patients is a fall from standing height onto an outstretched upper extremity. In young patients, the mechanism is often related to high-energy trauma, such as significant falls from height, motor vehicle accidents, or athletic injuries. The risk factors for proximal humeral fractures are primarily associated with low bone mineral density and an increased risk of falls. Majority of these fractures are stable, minimally displaced or non-displaced and mostly managed by non-operative techniques like immobilization, splints and casts etc. However, these techniques are associated with complications and disabilities like avascular necrosis, non-union and malunion [4].

Being one of the most versatile bones its fracture can be managed with a wide variety of treatments. Humerus has a vide functionally acceptable criteria due to mobile shoulder joint and is highly amenable to conservative treatment. However, the same requires a splint or cast for 4 to 6 weeks and is cumbersome for the patient. Though functional bracing continues to be the gold standard treatment for the diaphyseal fractures of humerus, the trend in near past has moved towards surgical fixation so as to achieve the aim of early rehabilitation and return to activities of daily living. There is a significant heterogeneity among the studies in describing the best surgical procedure in proximal humerus fracture. No single approach is considered the best of standard of care in management of fracture [5].

Materials and Methods:

The present prospective study was conducted in the Department of Orthopaedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India for a period of one year. The study participants were informed about the study details and informed written consent was obtained from them. The history of injury of the participants, general condition and any associated soft tissue injury were evaluated. The severity of the injury was assessed to assess local injury and axillary nerve was assessed by examining any anaesthetic patch over lateral aspect of the shoulder.

Inclusion criteria:

All the cases with proximal humerus fractures above 18 years of age and consenting for the study were included.

[Neer's classification: grade 2 to Grade 4] [6].

Exclusion criteria:

Cases with Pathological fractures, with distal neuro vascular deficit, poly trauma patients with injury severity score >16, shaft humerus fractures with proximal extension.

Radiological evaluation of all the included cases were done as per the Neer's trauma series which include AP view of the scapula, lateral "Y" view of the scapula, axillary view and occasionally the velpeau view was taken. All the routine surgical investigations were done on the included cases and anaesthetic fitness was also evaluated. The modality of the treatment was decided based upon the following factors: Neer's classification [grade 2 to grade 4]; presence of humeral head dislocation and comminution; valgus impaction, quality of bone, open or compound fracture and age of the patient. General anaesthesia was used in all the patients. One of the following methods was used as treatment in all the cases.

- Closed reduction and percutaneous K-wires fixation.
- Open reduction and internal fixation with K -wire.
- Open reduction and internal fixation with ethibond sutures.
- Open reduction and internal fixation with locking compression plates.
- Closed reduction and internal fixation by Intramedullary nail.
- Shoulder hemiarthroplasty.

The operated limb was immobilized in arm pouch and mobilization was started in 2nd week with shoulder wheel exercises as per patient's tolerance. Post-operative radiological evaluation was done to assess reduction and stability of fixation. Gentle passive forward flexion and internal and external rotation exercises by end of 3rd week and active exercises by 4th to 6th week were done. Patients were followed on OPD basis at the end of 6 weeks to one year and full functional evaluation with range of movements and function was assessed and recorded. Results were evaluated for each case based on Neer's shoulder score based on pain, function, range of motion and anatomy. The maximum points are 100 and on overall score the patient's outcome was grouped as excellent >89 units; satisfactory 80-89 units; unsatisfactory 70-79 units and failure <70 units.

Results:

In this study, a total of 50 cases who fulfilled the inclusion criteria were enrolled. 52% of cases were females and 48% were males. 42% of the cases were between 41-60 years with 28% between <18-40 years and 10% of cases >60 years of age. The age range was from 19 to 68 years with a mean age of 45.7 years. 60% of the cases sustained fracture on the left side and 40% on right side. 74% of fractures were of closed type and 26% were open.

As per Neer's type of fracture classification, the most common type of fracture observed in our study cases was two-part fracture accounting to 36% of cases followed in order by three part (28%), four part observed in 26% of cases. 5 cases (10%) had fracture dislocation. Road traffic injury was the most common mechanism for injury in 52% of cases and next was a history of fall in 38% of cases.

Table 1: Patients demographic, surgical, and post-surgical details

Distribution of cases	**N=50**	**%**
Age wise (years)		
≤18-40	14	28

41-60	21	42
>61	5	10
Gender		
Male	24	48
Female	26	52
Side of fracture		
Right	20	40
Left	30	60
Type of fracture		
Closed	37	74
Open	13	26
Neers's type of fracture		
2 part	18	36
3 part	14	28
4 part	13	26
Fracture with dislocation	5	10
Cause of injury		
Road traffic accident	26	52
Fall	19	38
Others	5	10
Surgical treatment		
ORIF with LCP	22	44
ORIF with K-wire	8	16
ORIF with K-wire and cancellous screws	4	8
Percutaneous pinning	9	18
Shoulder hemiarthroplasty	2	4
CRIF with intramedullary nailing	4	8
ORIF with ethibond suture	1	2
Clinical union (in weeks)		
11	5	10
12	17	34
13	8	16
14	12	24
15	8	16
Radiological union (in weeks)		
16-18	30	60
19-20	13	26
>20	7	14

22 cases (44%) were managed by open reduction and internal fixation with locking compression plate using 4.5 mm cortical screw plates and 6.5 mm cancellous screws. Percutaneous pinning was done in 9 cases (18%); shoulder hemiarthroplasty in 2 cases (4%) and open reduction internal fixation (ORIF) with ethibond suture in one case (2%). Open reduction with K-wire was done in 8 cases (16%) and open reduction with K-wire and cancellous screws in 4 cases (8%). Closed reduction with intramedullary nailing was done in four cases (8%). Clinical union was observed in 44% of cases by 12 weeks and the average time taken was 12.9 weeks. 60% of cases developed radiological union between 16-18 weeks and the average time was 18.5 weeks.

During the period of entire follow up, only 9 cases (18%) developed post-operative infection and stiffness was observed in 5 cases (10%). No other serious complications were noted in the study cases throughout the follow up period.

Table 2: Distribution of Neer's score of cases and results

Neer's score	1st week (%)	4th week (%)	8th week (%)	Final (%)	Result
<70	50 (100)	36 (72)	6 (12)	2 (4)	Failure
70-79	0	14 (28)	4 (8)	4 (8)	Unsatisfactory
80-89	0	0	36 (72)	7 (14)	Satisfactory
>90	0	0	4 (8)	37 (74)	Excellent

At the end of clinical and radiological union and full functional recovery the results were evaluated. Of the total 50 cases in the study, 74% cases had excellent results, 14% cases were satisfactory, 8% cases were unsatisfactory, and 4% cases had failure.

Discussion:

Management of proximal humerus fractures is a challenging task and the choice of surgical management is always a controversy. 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. Earlier these fractures were considered simple and were managed by plaster cast technique, slings and slabs,[7] but recent advances in understanding of anatomy, good surgical skills and better instrumentation has lead to various modalities for the treatment of these fractures like percutaneous pinning,[8, 9] Intramedullary nailing, plate fixation [10, 11]or Prosthetic replacement.

Our study has focussed on outcome of fractures irrespective of age and type of surgical modality used in management of proximal humerus fracture based on Neer's classification of fracture and Neer's score of outcomes. The average age incidence and range was from 19 to 68 years with a mean of 45.7 years which was similar to the finding in the study of Launonen et al with 52.65 years [12].The most common mode of injury in our study was road traffic injury indicating high velocity injury as main mechanism of fracture. In our study, fracture was more common on left side (60%) than right (40%) which is similar to finding of Gerber et al and contrary to the findings of Björkenheim et al [13, 14]. The study of the type of the fracture in our study found 2 part type as the most common which is similar to the findings in the study of Vijayvargiya et al and in some of the studies 3 and 4 part fractures were more common than 2 part fractures [15].

In our present study at the end, of the total 50 cases in the study, 74% cases had excellent results, 14% cases were

satisfactory, 8% cases were unsatisfactory, and 4% cases had failure. Different studies using Neer's scoring system in final outcome also reported similar pattern of results with 70-80% patient shaving excellent to satisfactory results and rest 20-30% with unsatisfactory and failure result. In our study, one case of failure was seen in elderly who underwent ORIF with K-wiring and failure was due to infection with the pin tract infection which was deep seated and lead to arthritis and failure. Our results with ORIF almost correlated with studies in literature but improved results are seen with minimal fixation techniques. In our study, 9 cases were performed percutaneous pinning with 7 excellent result, 1 satisfactory and 1 unsatisfactory. Few of the studies reveal that percutaneous pinning is far superior to ORIF regarding functional outcome [16,17]. The unsatisfactory results in our series was seen mostly in elderly patients who were reluctant or not compatible for rigorous rehabilitation programme. Decreased immunity status lead to infection in few of these patients resulting in unsatisfactory and failure outcome.[18]

Conclusion:

To conclude, the options as to the management modality used depend on the pattern of the fracture, the quality of the bone encountered, the patient's goals and the surgeon's familiarity with the techniques. Principle of fixation is reconstruction of the articular surface, including the restoration of the anatomy, stable fixation, with minimal injury to the soft tissues preserving the vascular supply, should be applied. good surgical skills, surgeons experience in selection of the type of surgery depending upon the factors like type of fracture are necessary to achieve correct and best outcome. Clinical evaluation, obtaining proper radiological views, age of the patient and activity holds the key for realistic approach and surgical management of complex humerus fractures.

References:

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. Injury. 2006;37(8):691–7.
2. Court-Brown CM, Garg A, McQueen M, et al. The epidemiology of proximal humeral fractures. Acta Orthop Scand 2001; 72: 365-371.
3. Mader K, Mader S, Berntsson P-O. The Diaphysis: Nonsurgical Treatment. Simple and Complex Fractures of the Humerus. Springer Milan; 2012:13-20.
4. Clement ND. Management of Humeral Shaft Fractures; Non-Operative Versus Operative. Arch Trauma Res. 2015;4(2):e28013.
5. Kumar A, Waddell JP. Non-operative Management of Proximal Humerus Fractures. In: Biberthaler P, Kirchhoff C, Waddell J, eds. Fractures of the Proximal Humerus. Strategies in Fracture Treatments. Springer: Cham; 2015.
6. Carofino BC, Leopold SS. Classifications in brief: the Neer classification for proximal humerus fractures. Clin Orthop Relat Res. 2013;471(1):39–43.
7. G. Tytherleigh strong, "The Epidemiology of Humeral shaft fracture" JBJS 1998; March Vol. 80B, No. 2.
8. M Pritsch, A. Greental, "Closed pinning for humeral fractures" JBJS 1997; 79B: Supp III.
9. Sheppard, T. Pressure Injury Prevention: Patient Education for Spinal cord Injury Patients- The I mportance of Teaching Nurses to Teach. Journal of Medical Research and Health Sciences, 2022:5(2), 1791–1795.
10. Herbert Resch, "Percutaneous pinning of 3–4-part fractures of the proximal humerus. JBJS March 1997.

11. Dimakopoulos P, Potamitis N, Lambiris E, et al. Hemiarthroplasty in the treatment of comminuted intraarticular fractures of the proximal humerus. Clin Orthop. Aug 1997;(341):7-11.
12. C. Michael Robinson, Richard S. Page, "Hemiarthroplasty for treatment of proximal humeral fractures" JBJS Am 2003;85: 1215- 23.
13. Launonen AP, Lepola V, Saranko A, Flinkkilä T, Laitinen M, Mattila VM. Epidemiology of proximal humerus fractures. Arch Osteoporos. 2015; 10:209.
14. Gerber C, Worner CM, Vienne P. Internal fixation of complex fractures of the proximal humerus. J Bone Joint Surg (Br). 2004;86(60):848-55.
15. Björkenheim JM, Pajarinen J, Savolainen V. Internal fixation of proximal humeral fractures with locking compression plate: A retrospective evaluation of 72 patients followed for a minimum of 1 year. Acta Orthop Scand. 2004; 75:741-5.
16. Vijayvargiya M, Pathak A, Gaur S. Outcome analysis of locking plate fixation in proximal humerus fracture. J Clin Diag Res. 2016;10(8):1-5.
17. Wijgman AJ, Roolker W, Patt TW, Raaymakers EL, Marti RK. Open reduction and internal fixation of three and four‐part fractures of the proximal part of the humerus. J Bone Joint Surg Am. 2002; 84:1919‐25.
18. Thyagarajan DS, Haridas SJ, Jones D, Dent C, Evans R, Williams R. Functional outcome following proximal humeral interlocking system plating for displaced proximal humeral fractures. Int J Shoulder Surg. 2009; 3:57‐62.