

Clinico-Radiological Outcome of Fracture Neck of Humerus (Two Parts /Three Parts) Treated With Closed Reduction and External Fixation – A Record Based Study

Sanjay Gaikwad¹, Sanjay Baranwal^{1*}, Yogesh Rathod¹, Amogh Zawar¹, Vijaykumar Sagar¹, Aniruddha A. Malgaonkar²

¹Department of Orthopedics, Rajiv Gandhi Medical College, Kalwa, Thane, India

²Department of Community Medicine, Rajiv Gandhi Medical College, Kalwa, Thane, India.

Corresponding Author: Sanjay Gaikwad

Abstract: This record based study was conducted to assess the clinico-radiological outcome of fracture neck of humerus treated with closed reduction and external fixation. Demographic details, injury details, complications and outcomes of the patients as to restored range of motion were evaluated. Mean age of patients was 38 years with a SD of 15.26 years. 9 (45%) patients had an injury due to fall from a height while 11 (55%) patients got the injury due to a road traffic accident. 15 (75%) of the patients had 2-parts fracture and the rest 5 (25%) had 3-parts fracture. The difference in the percentage of complications between 2-parts and 3-parts fracture was statistically significant. ($X^2=10.06$, $p=0.002$). This technique is a good alternative in polytrauma as the procedure is minimally invasive with equally good results in comparison with other modalities of treatment.

Keywords: Fracture neck of femur, Closed reduction, external fixation

Date of Submission: 19-07-2019

Date of acceptance: 05-08-2019

I. Introduction

Neck of humerus fracture accounts for 4 -5% of all fractures, most of which are elderly and osteoporotic women.¹ 85% of their fractures shows minimal or no displacement and can be treated with close reduction and early mobilization.^{2,3,4} but in contrast in displaced proximal humeral fractures with conservative often results in malunion and poor shoulder function in that patient surgical treatment is recommended.⁵

Open reduction and internal fixation entails an intensive surgical exposure with the risk of infection and damage to the vascular supply of fragment leading to higher rates of non-union and avascular necrosis.⁶

As compared to open reduction and internal fixation, close reduction and percutaneous pinning has low risk of neurovascular complication or interference with gleno-humeral joint motion.⁷ External fixator achieves a satisfactory fracture reduction and stability, safer healing and superior functional result compared to conservative treatment.⁸

II. Objective

The objective of this study is to assess the clinico-radiological outcome of fracture neck of humerus treated with closed reduction and external fixation.

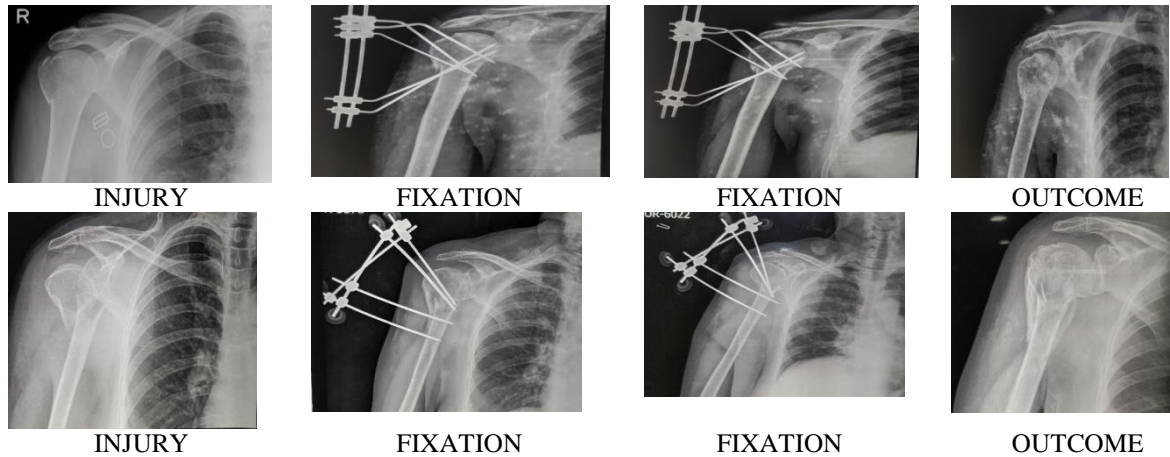
III. Methodology

This record based study was conducted in a tertiary hospital situated in a satellite township near a metropolitan city in Maharashtra state in western India. After obtaining permissions from the institutional authorities and the ethics committee, records of patients of fracture neck of humerus treated with closed reduction and external fixation were analysed for clinic-radiological outcome using NEER'S classification⁹ and External fixator injury mechanism.

Indication for external fixation includes displaced two part fractures of the surgical neck of humerus excluding isolated fractures of greater tuberosity.

Surgery: Patient lying down in supine position with side arm table, the procedure was mainly done under supraclavicular block or general anesthesia after all aseptic conditions maintained and scrubbing, painting and draping done. The fracture was reduced under C-arm guidance with traction and counter traction 2 k wire was inserted from the distal fragment to the head of humerus for temporary reduction and threaded 2.5 wire was inserted from distal fragment to the head of humerus. Two threaded wires were inserted from the lateral aspect of greater tuberosity one anteriorly and another posteriorly in the head of humerus. After confirmation of

reduction and placement of wires, wires were bent and connected to the External fixator construct and numbers of wires were manipulated according to the fracture pattern. Range of motion was assessed with fixator in situ.



In the post-operative management after operation, the pin sites were cleaned on daily basis with povidone iodine dressing, and systemic antibiotics. Functional exercises were started early and active use of the arm was encouraged and the pins were removed in the outpatient department after 6-8 weeks. After 8 weeks, assisted full range shoulder mobilization exercises were started. Clinical and radiological assessments were done at 0, 3 and 6 months.

Demographic details, injury details, complications and outcomes of the patients as to restored range of motion were noted. The obtained data were tabulated and statistically analysed using EpiInfo Version 7.0 (public domain software package from the Centre for Disease Control and Prevention, Atlanta, GA, USA). Continuous data were presented as Mean and Standard Deviation (SD). Categorical data were presented as percentage distribution. Statistical significance of difference (taken as p-value<0.05) was calculated using Karl Pearson’s Chi-square test, with Mantel-Haenszel correction where applicable.

IV. Results

4.1. Demographic details: Out of the total participants (n=20), 11 (55%) were females while 9 (45%) participants were males. Mean age of female participants was 39.55 years with a SD of 15.04 years while that of male participants was 36.11 years with a SD of 16.22 years.

Table 1: Demographic Details (n=20)

AGE (YRS)	FEMALE	MALE
18-35 years	6 (30)	5 (25)
36-60 years	4 (20)	4 (20)
>60 years	1 (5)	0 (0)

Figures in parentheses indicate percentages

1.2. Injury Details: 9 (45%) patients had an injury due to fall from a height while 11 (55%) patients got the injury due to a road traffic accident. 4 (20%) patients had forearm fractures while 2 (10%) patients had rib fractures as associated injuries along with the main injury.

Table 2: Injury Details

		FEMALE	MALE
Mechanism of Injury	Fall from a height	5 (25)	4 (20)
	Road traffic accident	6 (30)	5 (25)
Associated Injuries	Forearm Fractures	3 (15)	1 (5)
	Rib Fractures	1 (5)	1 (5)
	Others	3 (15)	2 (10)

Figures in parentheses indicate percentages

1.3. Fracture Classification: 15 (75%) of the patients had 2-parts fracture and the rest 5 (25%) had 3-parts fracture according to NEER’S classification.

Table 3: Fracture Classification

NEER'S Classification	FEMALE	MALE
2-parts	9 (45)	6 (30)
3-parts	2 (10)	3 (15)

Figures in parentheses indicate percentages

1.4. Complications: 1 (5%) patient had bicipital tendonitis while 1 (5%) patient has secondary displacement of glenohumeral joint as complication. The difference in the percentage of complications between 2-parts and 3-parts fracture was statistically significant. ($X^2=10.06$, $p=0.002$)

Table 4: Complications

Complications	FEMALE	MALE
Bicipital tendonitis	1 (5)	0 (0)
Secondary displacement of glenohumeral joint	0 (0)	1 (5)

Figures in parentheses indicate percentages

1.5. Shoulder Function: Shoulder function after treatment was excellent in 10 (50%) patients while it was satisfactory in 6 (30%) patients. Only 4 (20%) patients had unsatisfactory/ fair shoulder function.

Table 5: Shoulder Function

Shoulder Function	FEMALE	MALE
Excellent	7 (35)	3 (15)
Satisfactory	3 (15)	3 (15)
Unsatisfactory	0 (0)	2 (10)
Fair	1 (5)	1 (5)

Figures in parentheses indicate percentages

V. Discussion

The closed proximal humeral fractures have been treated with a wide range of options, namely non-operative, open reduction internal fixation, external fixation, closed K-wire fixation, percutaneous screw fixation, and tension band fixation. The use of internal fixation device prolongs the operative time, increases intra-operative bleeding, and increases the risk of avascular necrosis of humeral head because of the disruption of the residual vascularity.^{11,12} In developing countries with scarce resources, external fixation may be the treatment of choice for displaced proximal humeral fractures, because it preserves the vascularity of the fracture fragments, enables early mobilization, and achieves safe healing and good function.¹³

In our study, 20 patients with age group between 18-60 years, predominantly females were considered amongst which 11 patients had RTA (Road traffic accident) and 9 incurred domestic fall. 80% of patients had excellent to satisfactory results.

The incidence of complications in this series like, superficial pin track infection, loss of reduction, malunion is comparable to that in most other reports on external fixation¹⁴. The early functional results are very satisfactory, and further recovery can be expected up to one year after injury.¹⁵

The closed proximal humeral fractures have been treated with a wide range of options and each procedure has some limitations and complications. A major disadvantage of non-operative treatment is failure to obtain early mobilization, which results in a high rate of shoulder stiffness and pain, and malunion or nonunion is likely with certain fracture types.¹⁶⁻¹⁸ JESS fixator application in our study allowed sound fracture union with functional mobility in our study. A disadvantage of open internal fixation is difficulty in achieving rigid fixation in the osteoporotic cancellous bone of proximal humerus. Cortical bone in osteoporosis constitutes only a thin shell of bone and provides weak purchase for the screws. Presence of comminution offers difficulty in internal fixation while external fixation works on principle of ligamentotaxis. Internal fixation has been reported to have increased complication rates in these patients due to hardware loosening and pullout of the screws.¹⁸⁻²⁰ Additionally, the use of internal fixation device prolongs the operative time, increases intraoperative bleeding, and increases the risk of avascular necrosis of humeral head because of the disruption of the residual vascularity.²⁰⁻²¹ Postoperative adhesions further limit the range of motion as a result of extensive dissection needed in cases of open reduction and internal fixation.²²

VI. Conclusion

External fixator has the advantage of allowing the orthopedic surgeon to fix the fracture in more than one plane and achieve an early acceptable range of motion. This technique appears as a good alternative in polytrauma as the procedure can be performed in supine position with no additional blood loss, minimal invasive, less hospital stay with equally good results in comparison with other modalities of treatment.

References

- [1]. Handoll H.H., Gibson J.N., Madhok R., Interventions for treating proximal humeral fractures in adults. Cochrane Database Syst Rev 2003;4:CD000434.
- [2]. Brown C.M.C., Garg A., McQuesen M.M., The epidemiology of proximal humeral fractures, Acta Orthopaedica Scandinavica (2001), 72(4): 365-371.
- [3]. Clifford P.C., Fractures of the neck of the humerus: a review of the late results. Injury, (1980), 12(2): 91-95.
- [4]. Kristiansen B., Christensen S.W., Proximal humeral fractures. Late results in relation to classification and treatment., Acta Orthop Scand, (1987) 58(2): 124-127.
- [5]. Calvo E., De Miguel I., De La Cruz J.J., Martín N.L., Percutaneous fixation of proximal humeral fractures: indications based on the correlation between clinical and radiographic results., J Shoulder Elbow Surg (2007), 16(6): 774-781.
- [6]. Drosdowech D.S., Faber K.J., Athwal G.S., Open reduction and internal fixation of proximal humerus fractures. Orthop Clin North Am 2008;39:429-39.
- [7]. Kristiansen B., External fixation of proximal humerus fracture. Clinical and cadaver study of pinning technique., Acta Orthop Scand 1987;58:645-8.
- [8]. Kristiansen B., Kofoed H., Transcutaneous reduction and external fixation of displaced fractures of the proximal humerus. A controlled clinical trial, J Bone Joint Surg Br 1988;70:821-4.
- [9]. Neer C.S., 2nd. Displaced proximal humeral fractures. I. Classification and evaluation. J Bone Joint Surg Am 1970;52:1077-89.
- [10]. Dawson J., Rogers K., Fitzpatrick R., Carr A., The oxford shoulder score revisited, Arch orthop trauma surg 2019 ;129:119-123[pmid:18183410doi:10.1007/s00402-007-0549-7]
- [11]. Siegel J., Dines D., Proximal humerus malunions, Orthop Clin North Am. 2000;31:35-49.
- [12]. Wiggman A.J., Roolker W., Pall T.W., Raaymakers E.L., Marti R.K., Open reduction and internal fixation of three and four-part fracture of the proximal part of the humerus, J Bone Joint Surg. 2002;84:1919-25.
- [13]. Giannoudis P.V., Surgical priorities in damage control in polytrauma, J Bone Joint Surg Br 2003;85:478-83.
- [14]. Green S.A., Complications of external skeletal fixation, Chin Orthop 1983;180:109
- [15]. Lundberg B.J., Svemmgåon-Hartwl E., Wikmrk R., Independent exercises Versus physiotherapy in nondisplaced proximal humeral fractures, Scand J Rehab Med 1979: 1-3
- [16]. Hodgson S.A., Mawson S.J., Stanley D., Rehabilitation after two-part fracture of the neck of the humerus, J Bone Joint Surg. 2003;85:419-22.
- [17]. Jakob R.P., Miniaci A., Anson P.S., Jaberg H., Osterwalder A., Ganz R., Four-part valgus impacted fracture of the proximal humerus, J Bone Joint Surg. 1991;73:295-8.
- [18]. Zyto K., Kronberg M., Brostrom L.A., Shoulder function after displaced fractures of the proximal humerus, J Shoulder Elbow Surg. 1995;4:331-6.
- [19]. Koval K.J., Blair B., Takei R., Kummer F.J., Zuckerman J.D., Surgical neck fractures of the proximal humerus: A laboratory evaluation of ten fixation techniques, J Trauma. 1996;40:778-3.
- [20]. Siegel J., Dines D., Proximal humerus malunions, Orthop Clin North Am. 2000;31:35-49.
- [21]. Wiggman A.J., Roolker W., Pall T.W., Raaymakers E.L., Marti R.K., Open reduction and internal fixation of three and four-part fracture of the proximal part of the humerus, J Bone Joint Surg. 2002;84:1919-25.
- [22]. Neer C.S., Displaced humeral fractures, J Bone Joint Surg. 1970;52:1077-89.

Sanjay Gaikwad. "Clinico-Radiological Outcome of Fracture Neck of Humerus (Two Parts /Three Parts) Treated With Closed Reduction and External Fixation – A Record Based Study." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 8, 2019, pp 22-25.