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Original Research Article

Study of Functional Outcome of Surgical Management of Proximal Humerus Fracture by Various Modalities

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Conflict of interest: Nil

Abstract:

Background: Proximal humerus fractures account for nearly 6-10% and are on a rise. The management of this is controversial and is challenging task. There is a significant heterogeneity among the studies in describing the best surgical procedure in proximal humerus fracture. The objective of the study is to assess and compare the functional outcome with different modalities in fixation of proximal humerus shaft fractures.

Methods: A one-year prospective study was conducted at JLNMCH, Bhagalpur, Bihar from August 2020 to July 2021 on cases admitted with proximal humerus fractures as per the inclusion criteria based on Neer's classification. Radiological evaluation was done, and surgery was performed. Postoperative follow-up was done at 1st, 4th, 8th and 14th week and outcome was evaluated for each case based on Neer's shoulder score.

Results: 30 cases were included with a mean age of 48.2 years. Road traffic injury was common cause of fracture. Of the total 30 cases, 23 cases had excellent results, 4 cases were satisfactory, 2 cases were unsatisfactory, and one case had a failure. The mean scores observed on Neer's score was pain (33.5 units), Function (23.5 units), range of motion (16.55 units) and anatomy (6.9 units).

Conclusion: 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. Proper patient selection and thorough knowledge of the anatomy and biomechanical principles are the pre-requisites for a successful surgery and good functional outcome.

Keywords: Neer's score, Humerus fracture, Range of motion, Functional outcome.

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 However the management of this is controversial and is challenging task. Majority of these fractures are stable, minimally displaced or nondisplaced 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.2 With increase in the incidence of upper humerus fractures and advances in the techniques of surgery most of the surgeons prefer an operative management than conservative management. The various surgical modalities used are transosseous suture fixation, closed reduction and percutaneous fixation, open reduction and internal fixation with conventional plates, locking plate fixation and hemiarthroplasty which have shown to have mixed results. 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.3

The present aim of the study is to study the occurrence, mechanism of injury and displacement of various types of fracture according to Neer's score system. The study aims to assess and compare the functional outcome with different modalities in fixation of proximal humerus shaft fractures.

Materials and Methods

This study was carried out in Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar

from August 2020 to July 2021, 30 patients of proximal humeral fractures were attended in the casualty and OPD and were admitted in this hospital and were treated surgically.

We collected records of the patients by asking the patients history and examining the patients. Essential investigations of all the patients were done. The patients were operated with various modalities of fixation. Patients followed up at regular interval.

Inclusion Criteria

1. All adults patients admitted with proximal humerus fractures. [Neer's classification: grade 2 to grade 4].

Exclusion Criteria

1. Skeletally immature patients
2. Pathological fractures,
3. Patients with distal neurovascular deficit,
4. Polytrauma patients with an Injury Severity Score >16
5. 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.

1. Open reduction and Internal fixation with K-wire.
2. Open reduction and Internal fixation with ethibond sutures.
3. Open reduction and Internal fixation with Locking Compression Plate.
4. Closed reduction and Internal fixation by Intramedullary Nail.
5. Shoulder Hemiarthroplasty.

Patients were followed from 6 weeks -1 year on OPD basis at intervals of 6 Weeks, 12 Weeks, 6 Months and 1 Year. During this period in each visit clinical evaluation of wound healing, pain, shoulder function and range of movements were assessed and recorded. Clinically fracture was considered united when there was no tenderness at the fracture site and full shoulder function is present. Radiologically fracture was regarded as united when there is no visible fracture line.

Results were evaluated by the use of Neer's shoulder score based on pain, function, range of motion and anatomy for each case assessed and recorded.

Case of OR & IF with Locking Compression Plate

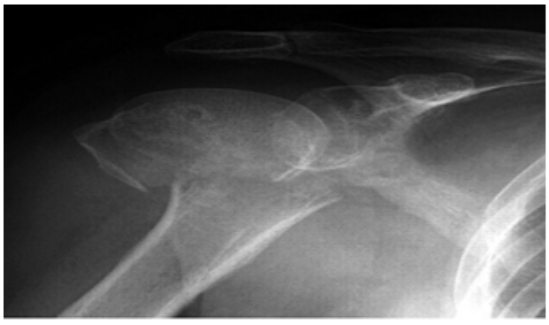

Figure 1: Pre-op x-ray : three part fracture

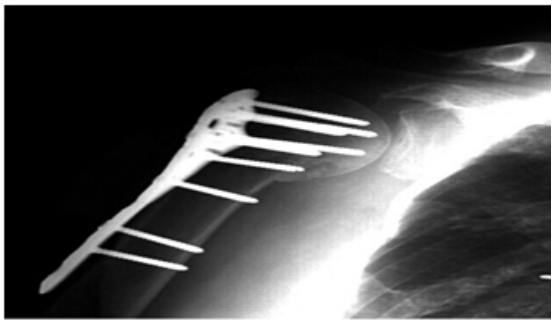

Figure 2: Follow up x-ray at 16weeks revealing fracture union

Case of CR & IF with K-Wire

Figure 3: Pre-op x-ray: Two part fracture

Figure 4: Fixation with K-wire

Case of CR & IF with Intramedullary Nailing

Figure 5: Pre-op x-ray: two part fracture

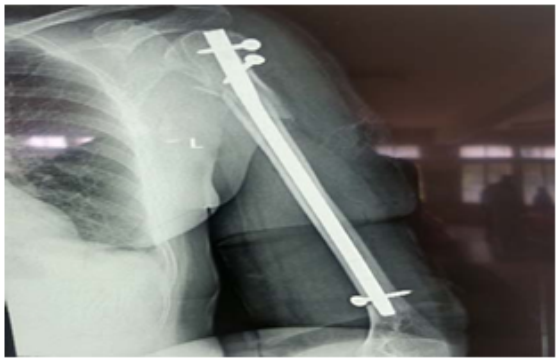

Figure 6: Fixation with Intramedullary nail

Figure 7: PRE-OP X-Ray : Four part # with dislocation

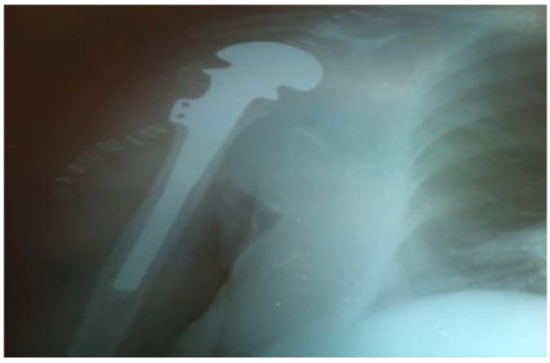

Figure 8: Post-op x-ray with prosthesis insertion

Results

Table 1: Demographic data among the cases in the study

Distribution of cases	No. of cases	Percentage
Age wise (years)		
≤18-40	10	33.3%
41-60	14	46.7%
>61	6	20%
Gender		
Male	14	46.7%
Female	16	53.3%
Side of fracture		
Right	11	36.7%
Left	19	63.3%
Type of fracture		
Closed	25	83.3%
Open	5	16.7%
Neers's type of fracture		
2part	12	40%
3part	8	26.7%
4part	7	23.3%
Fracture with dislocation	3	10%
Cause of injury		
Road traffic accident	18	60%
Fall	10	33.3%
Others	2	6.7%

Table 2: Distribution of surgical management among the cases in the study

Surgical treatment	No.ofcases	Percentage
ORIF with LCP	14	46.7%
ORIF with K-wire	4	13.3%
ORIF with K-wire and cancellous screws	2	6.7%

Percutaneous pinning	6	20%
Shoulder hemiarthroplasty	1	3.3%
CRIF with intramedullary nailing	2	6.7%
ORIF with ethibond suture	1	3.3%

Table 3: Distribution of clinical and radiological union among the cases in the study

Distribution of cases	No. of cases	Percentage
Clinical union (in weeks)		
11	1	3.3%
12	15	50%
13	4	13.3%
14	7	23.3%
15	3	10%
Radiological union (in weeks)		
16-18	22	73.3%
19-20	6	20%
>20	2	6.7%

Table 4: Distribution of Neer's score of cases and result in the study (n=30)

Neer's score	1st week (%)	4th week (%)	8th week (%)	Final (%)	Result
<70	30(100%)	22(73.3%)	4(13.3%)	1(3.3%)	Failure
70-79	0	8(26.7%)	3(10%)	2(6.7%)	Unsatisfactory
80-89	0	0	22(73.3%)	4(13.3%)	Satisfactory
>90	0	0	1(3.3%)	23(76.7%)	Excellent

Table 5: Average score of pain, function, ROM and anatomy of cases in the study

Modalities	Min-max	Mean	Median	SD
Pain	29-35	33.5	35	1.65
Function	12-30	23.5	24	3.5
Range of Motion	14-19	16.55	16	1.85
Anatomy	4-10	6.9	8	1.68
Total	59-90	79.65	82	7.65

Discussion

Management of proximal humerus fractures is a challenging task and the choice of surgical management is always a controversy. Literature and various studies describe different modalities of management, operative and non-operative techniques with different functional outcomes and complications. Age is a crucial factor in outcome where in young adults' results are uniformly good and in elderly often poor. 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 48.2 years which was similar to the finding in the study of Launonen et al with 52.65 years.5 Court-Brown et al reported in their epidemiological study with an average of 66 years, for men 56 and women 70 years.1,6 Females were more numbered than males in our study indicating more elderly females with osteoporosis as a risk factor. Similar reports were observed in the studies of Nwachukwu et al with male to female sex ratio of 8:12.7 The risk of fracture increases linearly with age in females due to lack of postmenopausal treatment and awareness. The most common mode of injury in our study was road traffic injury indicating high velocity injury as main mechanism of fracture. This finding of our study was consistent to many studies in the literature which also revealed other mechanisms like electric shock, assault by a rod as other mechanisms of injury. In our study, fracture was more common on left side (63.3%) than right (36.7%) which is similar to finding of Gerber et al and contrary to the findings of Björkenheim et al.8,9 The study of the type of the fracture in our study found 2 part type as the most common with 40% 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.10

In the present study 21 cases of 30 were fixed by internal fixation either by K-wires or by intramedullary nails or cancellous screws. Many authors in published literature mentioned that stable fixation and good reduction is mandatory in management of displaced fractures. In postoperative period, 40% of cases developed postoperative infection which subsided after antibiotic therapy without any sequale. Six cases developed stiffness which is due to elderly patients who were unwilling to undergo rehabili-

tation completely. In cases with stiffness phase wise physiotherapy was started after clinical union and satisfactory results were obtained. Similar findings were reported in the study of Doshi et al who also observed few cases of avascular necrosis post-operatively in his study.11

In our present study at the end, of total 30 cases participated 23 cases had excellent results, 4 cases were satisfactory, 2 cases were unsatisfactory, and one case was a 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 21 cases were managed by ORIF and 16 had excellent, 3 were satisfactory and 2 unsatisfactory. 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, six cases were performed percutaneous pinning with 4 excellent result, one satisfactory and one unsatisfactory. Few of the studies reveal that percutaneous pinning is far superior to ORIF regarding functional outcome.12,13

Conclusion

To conclude, 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. Proper patient selection and thorough knowledge of the anatomy and biomechanical principles are the pre-requisites for a successful surgery and good functional outcome.

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