



Original Research Article

Study of Functional Outcome of Surgical Management of Proximal Humerus Fractures

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ABSTRACT

Introduction: Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures.

Aims: To Study the occurrence, mechanism of injury and displacement of various types of fracture according to Neer's.

Results: 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.

Discussion: Proximal humeral fractures account for almost 4 to 5% of all fractures. 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.

Conclusion: The incidence of proximal humeral fractures has increased in last few years due to changes in life style and increase in road traffic accidents. The best management in these injuries is still inconclusive. Studies have shown non-operative and operative treatments, both give favourable results, and the confusion remains.

Keywords: proximal humerus fractures, Neer's shoulder score, closed and open fracture.

INTRODUCTION

Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures. ^[1] These are the second most common upper-extremity fracture and the third most common fracture, after hip and distal radial fractures.

Treatment of proximal humerus fracture has been the subject of much controversy and confusion. This is because

of the complexity of these injuries, fracture displacements without careful radiographic views and associated soft tissue injuries. Further, there has always been diversity of opinion about the care of shoulder fractures, with frequent controversies and lively debate. Furthermore even good anatomical results achieved at operative repair may lead to poor results unless there is meticulous post operative rehabilitation, which can be

more challenging in shoulder than operative technique. [2-4]

Aims and Objectives of Study

1. Study the occurrence, mechanism of injury and displacement of various types of fracture according to Neer's.
2. Study different modalities of the fixations in proximal humerus fractures.
3. Assess and compare the functional outcome.
4. Come to conclusion about preferred modality of treatment of proximal humerus fractures.

MATERIALS AND METHODS

This study was carried out in Adichunchanagiri Institute of Medical Sciences, from June 2010 to June 2012, twenty 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. Poly trauma patients with an Injury Severity Score > 16
5. Shaft humerus fractures with proximal extension.

After the admission, necessary clinical details were recorded in a trauma sheet.

Following factors were taken into consideration while deciding the modality of treatment to be used:

1. Neer's classification two, three or four part fracture with associated displacement.
2. Presence of humeral head dislocation and humeral head comminution.
3. Valgus impaction.
4. Comminution.
5. Quality of bone

All the patients were operated on either elective or emergency basis depending on whether fracture is closed or open. All patients were treated by one of the following methods.

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

Post-operative care: Post-operatively limb is immobilized in arm pouch, sutures were then removed and if secure fixation was achieved, mobilization was started in the second week with shoulder wheel exercises as per patient's tolerance. Immediate post-op X-Rays were done routine A-P and scapular view to assess the reduction of fracture and stability of fixation.

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.

OBSERVATIONS AND RESULTS

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.

Age Incidence of Fractures : In our series of twenty patients, four were in the age group of less than 20 years (20%), four in the age group of 21-40(20%), nine in the age group of 41-60(20%), three in the age group of greater than 60 (35%) .

Sex Incidence: In our study eight out of twenty (40%) were males and twelve (60%) were females.

Side of the Extremity: In our study most of the patient sustained injury to the right side 11(55%) and involvement of left side is 9(45%).

Type of Fracture: In our study 18 cases (90%) were closed fracture and only two cases (10%) were open fracture.

The common type of fracture observed in our series was two part fracture accounting for eight of twenty patients (40%), along with three-part fracture accounting for eight of twenty patients (40%).Four-part fracture accounted for two

of twenty patients(10%).The fracture dislocation was observed in two patient (10%).

Table 1: Distribution of Neer's Type of #of patients studied.

Neer's Type of #	Number of patients	%
2 part	8	40.0
3 part	8	40.0
4 part	2	10.0
Fracture with dislocation	2	10.0
Total	20	100.0

Mode of Internal Fixation

In our study , seven patients (35%) were treated by open reduction and internal fixation with Locking compression plate, four patients (20%) were treated by Percutaneous pinning, three patients (15%) were treated by closed reduction and internal fixation with Intramedullary nail, two patients (10%) were treated by open reduction and fixation with k-wires, two patients (10%) were treated by open reduction and fixation with k-wires and cancellous screws, one patients (5%) undergone ethibond suturing and one patient (5%) treated with shoulder Hemi-arthroplasty.

Neer's Score Study

In our study Neers score study was done on patient every 1st week, 4th week, 8th week and finally at 14th week.

Table 2: Distribution of Neer's Score of patients studied.

Neer's Score	1 st week	4 th week	8 th week	Final
<70	20(100.0%)	17(85.0%)	5(25.0%)	1(5.0%)
70-79	0	3(15.0%)	12(60.0%)	5(25.0%)
80-89	0	0	3(15.0%)	10(50.0%)
90& above	0	0	0	4(20.0%)
Total	20(100.0%)	20(100.0%)	20(100.0%)	20(100.0%)
Mean ± SD	52.10±6.50	62.00±7.23	71.95±7.82	80.95±8.41

Complications

During the follow up period six patients had post-operative infection (30%), nine patients had shoulder stiffness (45%). There were no incidences of Implant loosening, non-union, malunion & osteonecrosis of the proximal humerus.

Evaluation Of Results By Neers Shoulder Score

At the end of clinical and radiological union and full functional recovery the results were evaluated by Neer's score. Of the twenty patients four (20%) had excellent results, ten patients

(50%) had satisfactory results, five (25%) had unsatisfactory results and one (5%) was a failure. The mean scores observed on Neer's score was pain (34.25units), function (23.25units), range of motion (15.55units), anatomy(7.9units) and the total Neer's score was 80.95.

Table 3: Average of score of pain, function, ROM and Anatomy of patients studied.

Modalities	Min-Max	Mean	Median	SD
PAIN	30-35	34.25	35.00	1.83
FUNCTION	13-30	23.25	22.00	4.44
ROM	12-19	15.55	15.00	1.90
ANATOMY	4-10	7.90	8.00	1.52
Total	59-92	80.95	81.00	8.41

DISCUSSION

Proximal humeral fractures account for almost 4 to 5% of all fractures. 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, [5] 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, [6,7] Intramedullary nailing, plate fixation [8,9] or Prosthetic replacement.

Due to awareness of its complexity and complications, these fractures have stimulated a growing interest in finding the optimal treatment. Most of the proximal humeral fractures are non-displaced or minimally displaced and stable. These can be treated non-operatively successfully with early rehabilitation. But severely displaced and comminuted fractures warrant surgical management for optimum shoulder function.

In our institution we managed 20 patients with fractures of proximal humerus by open reduction and internal fixation and

closed reduction and internal fixation, 8 were treated with k wires and cancellous screws, 7 were treated with locking compression plate, 3 were treated with interlocking nail, 1 were treated with ethibond sutures and 1 underwent hemiarthroplasty.

Type of fracture:

The study of type of fracture in our series revealed 08(40%) were 2 part fractures, 08(40%) were 3 part fractures and 02 (10%) were a 4 part fracture and 02(10%) were fracture with dislocation. Neer [4,9] study shows , 31(26.5%) were 2 part fractures, 43(36.8%) were 3 part fractures and 43(36.8%) were 4 part fractures. In study done by DolfiHerscovici, 20(50%) were 2 part fractures, 16(40%) were 3 part fractures and 4(10%) were 4 part fractures indicating that the incidence of type of fracture is nearly consistent with the studies in literature. [10]

Modes of internal fixation:

Various modes of internal fixation was employed in our series of 20 patients 7(35%) underwent open reduction and internal fixation with buttress plate, 08(40%) underwent fixation with K-wires and cancellous screws, 01(5%) underwent prosthetic replacement and 01(5%) underwent ethibond sutures. In study of literature, study done by Neer , 43(36.8%) underwent open reduction and internal fixation with buttress plate and tension band wiring, 43(36.8%) of 4 part fractures and selected 3 part fractures underwent prosthetic replacement. [4,9] In another series of 15 patients 14(93.3%) underwent internal fixation with K-wires/cancellous screws and only one underwent fixation with AO buttress plate. [11]

Many authors in their published literature have mentioned that, in management of displaced proximal humerus, good reduction is mandatory and stable fixation gave good results. They also

reported that open reduction and internal fixation in young adults gives better outcome. In older persons the quality of bone and soft tissue disruption should be given importance, and it is better to fix percutaneously. [6,7,12-16]

Different studies, which have used the Neer's scoring system for assessment of results, demonstrate a fairly similar pattern of results with 70 - 80% patients having satisfactory to excellent results and 20 - 30% having un-satisfactory to failure results. In our series 12 cases of two part ,three part and four part fractures and fracture dislocation treated with open reduction and internal fixation, 1 (05%) excellent results, 07 (35%) had satisfactory results, 03 (15%) had unsatisfactory results and 1(05%) was a failure. When compared with other studies in case of Neer's, (63.3%) had excellent and satisfactory results.[4,10] and in other study of 3 part fracture (93.3%) had excellent and satisfactory results all of them had underwent OR & IF with K wires/cancellous screws and one failure in this series was fixation with AO buttress plate. This implies that our results with OR& IF almost correlated with the studies in literature but improved results are seen in minimal fixation techniques.

Studies reveal that results of percutaneous pinning are more superior to OR & IF regarding functional outcome. Jaberg and associates study shows, 91.6% of the cases had excellent (70.8%) and satisfactory (20.8%) results with 04 (8.3%) failure. In our series four patients underwent percutaneous pinning two had excellent results one satisfactory and one unsatisfactory.

Results pertaining to prosthetic replacement were studied studies reveal that prosthetic replacement is of chores in 4 part fracture and selected 3 part fracture in elderly. Neer study shows (11.6%) had excellent (79%) had satisfactory results only

(9.4%) had unsatisfactory and failure. In another study (44.3%) had excellent results, (31.4%) had satisfactory results and (24.3%) had unsatisfactory results. In our series of 20 patients, 01 underwent prosthetic replacement for four part fracture with dislocation which showed satisfactory result.

CONCLUSION

Studies have shown non-operative and operative treatments, both give favourable results, and the confusion remains.

3-D CT scan is useful to classify fracture according to Neer's and to determine the treatment of choice.

Treatment options for the displaced fractures include closed reduction and percutaneous k- wires fixation (20% cases) open reduction and internal fixation with k-wires and cancellous screws (20 % cases), open reduction and internal fixation with locking compression plate (35%), open reduction and internal fixation with ethibond sutures (5%), closed reduction and internal fixation by intramedullary nailing (15%) and shoulder hemiarthroplasty (5%).

Biologically the technique of closed reduction and percutaneous pinning is good from the standpoint of retaining the vascularity of the humeral head. It can be used for un-displaced or displaced two, three or four part fracture of the proximal humerus without comminution, in the younger age groups with good bone quality. In older individuals it is good to fix with percutaneous 'K' wires, keeping in mind about quality of bone (osteoporosis) and also to shorten the period of surgery.

Patients who has two part greater tuberosity avulsion fracture can be treated by closed reduction and percutaneous screws fixation or open reduction and internal fixation with ethibond sutures. Patients who have metaphyseal comminution are more appropriately treated

by open reduction and internal fixation with a plate (35% cases). In patients who have a three-part fracture with appreciable displacement of the greater tuberosity, open reduction, limited dissection and internal fixation should be performed.

The only preferred treatment for displaced anatomical neck fracture is primary hemiarthroplasty. The Neer's four part fractures and 4-part fracture dislocation are rare compared to other fractures of proximal humerus. The chances of avascular necrosis are very high. The Neer's primary hemiarthroplasty is preferred treatment.

Early open reduction and internal fixation prevents complications like Frozen shoulder, malunion and late osteoarthritis. There is direct relationship between displaced proximal humeral fractures, between fractures severity (i.e. greater displacement, comminution) and eventual results. The more the initial insult, worse the prognosis.

Rehabilitation is the key to success. After the fracture is stabilized by whatever means, continuous active followed by passive motion should be started. On discharge, the patients must be instructed regarding physiotherapy exercises to be done several times a day.

Results assessed with standard shoulder scoring system of Neer's we have achieved 70% of excellent and satisfactory results, 25% unsatisfactory and 5% failure outcome.

Ethical Clearance: Clearance has been taken from institutional ethical board.

Consent: Written informed consent has been obtained from patient.

Competing Interests: The authors declared that they have no competing interests. All the authors have read and approved the final manuscript.

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