



Orthopaedics

CLINICAL STUDY OF FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF PROXIMAL HUMERUS FRACTURE

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**ABSTRACT** **BACKGROUND:** Fractures of the proximal humerus are complex injuries with significant morbidity. Although various options of management available including non-operative management are present the choice of treatment depends upon the pattern of the fracture, the quality of the bone encountered, the patient's goals and the surgeon's familiarity with the techniques. The aim of this study was to review the functional, radiographic results and complications of the operative procedure in a series of twenty patients.

**METHODS:** Over a 18 months period we treated twenty patients with failed conservative treatment of two part fractures, three part fractures, four part fractures and fracture dislocations. Initial pre operative clinical and radiological assessment was done and appropriate mode of treatment of given depending upon type of fracture according Neer's classification. Follow up of patient was done both clinically and radiologically at 2nd, 6th and 8th weeks and assessed for any complications. Final assessment was done according to Neer's shoulder scoring criteria.

**RESULTS:** Eight patients were treated with Locking Compression Plate, eight patients were treated with K-wires and cancellous screws, three patient were treated by interlocking nail, remaining one underwent hemi-arthroplasty. All fractures united with average of 17.7 weeks. In the overall results analyzed in our series, 70% of the patients had excellent and satisfactory results and 30% had unsatisfactory and failure outcome

**CONCLUSION:** There is direct relationship in displaced proximal humeral fractures between fracture severity i.e. displacement and comminution, and the eventual results. That is more the initial insult, worse the prognosis. Internal fixation of fractures of proximal end of humerus produced good functional outcome and fewer complications. Rehabilitation is the key to success.

**KEYWORDS :** Proximal end of humerus, internal fixation, rehabilitation, Neer's shoulder score

**INTRODUCTION**

Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures. These are the second most common upper- extremity fracture and the third most common fracture, after hip and distal radial fractures. The fractures can occur at any age, but the incidence rapidly increases with age. The risk factors for proximal humeral fractures are primarily associated with low bone mineral density and an increased risk of falls. 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 patients aged less than 50 years, the mechanism is often related to high-energy trauma, such as significant falls from height, motor vehicle accidents, or athletic injuries.

The injury is of great importance when it affects the young and middle

age groups of the population. It leads to temporary disability and loss of working hours. Restoration of the function of the limb is of paramount importance.

Treatment of proximal humerus fracture has been the subject of much controversy and confusion. Most studies indicate that for the majority of good results of fractures of this region are obtained by conservative methods. Some studies state that operative treatment is better, depending on type of fracture and the quality of the bone. Management of these fractures is associated with some morbidity and undesirable sequelae. They include complication like avascular necrosis, malunion, non-union, infection, neurovascular injury, loss of motion of shoulder from adhesive capsulitis, chronic edema, elbow stiffness and atrophy of the soft tissues of the immobilized limb causing significant disability during healing and afterwards.

Non/minimally displaced		Displaced fractures and fracture-dislocations				
		Two-part	Three-part	Four-part	Articular segment	
AN		AN				
SN		SN				
		Angulated				
		Displaced				
		Comminuted				
GT		GT				
GT and SN		LT				
LT		Anterior dislocation				Posterior
LT and SN		Posterior dislocation				Anterior
AN GT LT SN						Split

**Neer's classification**

He classified proximal humeral fractures based on displacement of fracture fragments and vascular supply to humeral head. The identification of fragments can be accomplished only with proper radiographs consisting of anteroposterior and lateral view in scapular plane, as well as axillary view. He defined "a fracture fragment is considered displaced, if there is more than one centimeter of separation or fragment angulated more than 45° from the other fragment"

**MANAGEMENT**

**(a) Medical Therapy**

Proximal humerus fractures may be treated nonoperatively with an initial period of immobilization followed by early motion. Initial immobilization may be achieved with a sling, shoulder immobilizer, or a sling with an accompanying swathe.

**(b) Surgical Therapy**

Surgical management of proximal humerus fractures may be divided by fracture type (eg, Neer type, anatomic type, greater tuberosity, surgical neck, anatomic neck, articular surface, lesser tuberosity fragments) or by method of fixation (eg, closed reduction with no fixation, percutaneous fixation, open reduction with internal fixation, humeral head replacement associated with tuberosity fixation)

**Indications for operative treatment :**

- 1) Avulsion fractures involving tuberosities.
- 2) Failed closed reduction.

**Objectives Of The 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 fixation in proximal humerus fracture
3. Assess and compare the functional outcome.
4. Come to conclusion about preferred modality of treatment of proximal Humerus fracture

**MATERIAL AND METHODS**

This study was carried out at Government General hospital, Kurnool, from September 2018 to February 2020, twenty patients of proximal humeral fractures were attended in the casualty and OPD and were admitted in this hospital and were treated surgically.

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- wire 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.

**Inclusion criteria :**

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

**RESULTS :**

**1. AGE INCIDENCE**

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%) .

**2. SEX INCIDENCE**

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

**3. SIDE OF INVOLVEMENT**

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

**4. MODE OF INJURY**

The most common mode of injury observed in our series was road traffic accident. It accounted for thirteen of twenty patients(65%). The next common cause was history of fall accounting for six of twenty patients (30%) and one patient had a Electric shock(5%).

**5. TYPE OF FRACTURE**

**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

**6. MODE OF TREATMENT :**

**Table 2: Distribution of Surgical Treatment of patients studied**

Surgical Treatment	Number of patients (n=20)	%
1. ORIF with LCP	7	35.0
2. Percutaneous pinning	4	20.0
3. CRIF with LM nail	3	15.0
4. ORIF with k-wires	2	10.0
5. ORIF with k-wires and cancellous screws	2	10.0
6. Shoulder Hemiarthroplasty	1	5.0
7. ORIF with Ethibond Suture	1	5.0

**7. RADIOLOGICAL UNION OF FRACTURE :**

**Table 3 : Radiological union in weeks of patients studied**

Radiological union in weeks	Number of patients	%
16 -18 weeks	15	75.0
19-20 weeks	4	20.0
>20 weeks	1	5.0
Total	20	100.0

**8. FUNCTIONAL OUTCOME**

**Table 4 : Distribution of Neer's Score of patients studied**

Neer's Score	1 <sup>st</sup> week	4 <sup>th</sup> week	8 <sup>th</sup> 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

**9. 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.

**10. 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.

**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, 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. 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

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

Clinical evaluation, obtaining proper radiological views, age of the patient and activity levels holds the key for realistic approach and proper surgical management of these complex fractures. For complex fracture pattern 3-D CT scan was used to classify fracture according to Neer's classification and to determine the treatment of choice. In younger patients, proximal humeral fractures usually are caused by high-energy trauma (65%). In older patients with osteoporosis, even less severe trauma (fall in 35%) can produce significant injury. They occur more frequently in older patients after the cancellous bone has become weakened by senility and osteoporosis.

Fractures of the proximal humerus are complex injuries involving two articulating surfaces, the glenohumeral joint and the subacromial arch. 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.

Biologically the technique of closed reduction and percutaneous pinning is good from the stand point 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.

Literature says anatomical neck fractures of proximal humerus account for only 0.54% of proximal humeral fractures. Displaced anatomical neck fractures cause complete disruption of blood supply to the articular segment. The success rate of closed pinning and headless screw fixation is very less. The chance of avascular necrosis of humeral head increases by 5 times in these type of fractures. 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 is 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.

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.

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