



STUDY OF FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF PROXIMAL HUMERUS FRACTURE BY VARIOUS MODALITIES

Orthopedics

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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 Central Institute of Orthopedics, VMMC and Safdarjung Hospital, New Delhi 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 were evaluated for each case based on Neer's shoulder score.

Results: 20 cases were included with a mean age of 48.2 years. Road traffic injury was common cause of fracture. Of the total 20 cases, 04 cases had excellent results, 10 cases were satisfactory, 5 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).

Conclusions: 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

Functional Outcome , Surgical Management , Proximal Humerus Fracture , Various Modalities

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. This is because of the complexity of these injuries, fracture displacements cared 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, further more even good anatomical results achieved at operative repair may lead to poor results unless there is meticulous postoperative rehabilitation, which can be more challenging in shoulder than operative technique.

AIMS AND OBJECTIVES

1. To study the occurrence, mechanism of injury and displacement of various types of fracture according to Neer's.
2. To study different modalities of the fixations in proximal humerus fractures.
3. To 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 Central Institute of Orthopedics, VMMC and Safdarjung Hospital, New Delhi from August 2018 to July 2019, 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. Polytrauma 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 comprising of:

1. Age of the patient.
 2. History of trauma whether injury was due to fall or road traffic accident.
 3. Time and place of injury.
 4. Time interval between injury and treatment in our casualty department. This
- 1) period was less than three days in all cases.

5. Occupation of the patient.
6. Associated injuries e.g. neuro-vascular status, tendon injury.
7. Medical history of the patient.

Then complete clinical examination comprising of local and systemic examination was recorded on trauma sheet itself.

1. Systemic Examination
2. Local Examination
 - a) Swelling and Deformity of the shoulder.
 - b) Check for circulatory status.
 - c) Sensation of the shoulder and arm.
 - d) Condition of the skin.

Radiologic evaluation of the shoulder were done according to Neer's trauma series which consists of:

- A true anteroposterior (AP) view of the scapula,
- A lateral 'Y-view' of scapula, and
- An axillary view.
- Occasionally, the velpau view was taken.

Pre-Operative Investigations :

Routine Investigations

- Haemogram
- Minirenals
- Bleeding time, clotting time
- Blood grouping and cross matching.
- Urine routine.
- Chest x-ray
- Electrocardiogram for patients over 40 years of age.

Investigations carried out if required in a particular patient.

- Serum electrolytes.
- Additional x-rays
- C.T. Scan

Fractures were classified according to the Neer's classification and patients were shifted to the ward after initial temporary immobilization with Universal shoulder immobilizer. All the routine investigations were done on all the patients pre- operatively with complete medical and anesthetic fitness of patient for surgery.

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.
6. Open or compound fracture.
7. Age of the patient.
8. Associated general and medical condition of the patient.
9. Other associated lesions e.g. brachial plexus palsy, etc.
10. Functional requirements of the patient.

Anaesthesia used : General Anaesthesia

At least one unit of compatible blood was kept in reserve for all patients who underwent surgery.

Method of Treatment:

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.

If the bone was severely osteoporotic and fixation was less than rigid, motion was delayed, otherwise redisplacement of the fracture fragments could have occurred. Shoulder wheel exercises were permitted by the second or third week and gentle passive forward flexion and internal and external rotation exercises by the third or fourth week. By the fourth to sixth week, active exercises were started. Patients were discharged with arm pouch and advise to continue pendulum exercises. Patients underwent rehabilitation as per protocol.

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 consider 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



FIG 1 : pre op x-ray: three part fracture

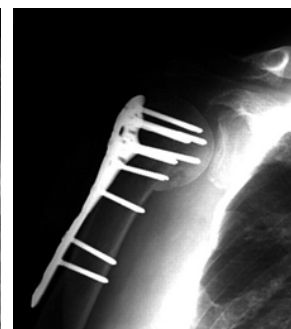


FIG 2 : follow up x-ray at 16 weeks revealing fracture union

CASE OF CR&IF WITH K-WIRE



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



FIG 4 : Fixation with K-wire

CASE OF CR&IF WITH INTRAMEDULLARY NAILING



FIG 4 :Pre-op x-ray:two part fracture

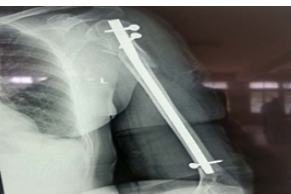


FIG 5: Fixation with Intramedullary nail

CASE OF PROSTHETIC REPLACEMENT



Fig 6 :PREOP X-Ray: Four part # with dislocation

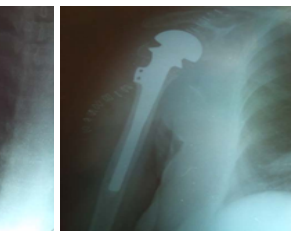


FIG 7 :post op x-ray with prosthesis insertion

RESULTS

20 cases of proximal humerus fractures managed surgically by various techniques and rigid fixation achieved.

Post-operative mobilization i.e. pendulum exercises were started after 3 weeks in cases in whom fixation was good and in others it was delayed for 6-8 weeks.

The study included 40% of male patients and 60% of female patients. 45% of the fracture occurred in 41 to 60 years age group.

Road Traffic Accident accounts for 65% of the cases.

According to the Neer's classification there were

- Two part fracture – 40%
- Three part fracture – 40%
- Four part fracture – 10%
- Fracture with dislocation – 10%

Surgical techniques used were closed reduction and percutaneous k-wires fixation, closed reduction and percutaneous k-wires and cancellous screws fixation, open reduction and internal fixation with locking compression plates, open reduction and fixation with ethibond suturing, closed reduction and internal fixation with intramedullary nail and shoulder hemiarthroplasty.

Osteosynthesis with open reduction and internal fixation with Locking Compression Plate, pinning has given good results.

Operative management yields good functional results in proximal humeral fractures in adults b/n 20-40 years with fewer complications. These patients responded well to the rehabilitation programme than their older counterparts.

Overall Results

	Excellent	Satisfactory	Unsatisfactory	Failure
NEER'S	15(17.4%)	43(50%)	02(2.3%)	26(30%)
RICHARD J HAWKINS	08(53.3%)	06(40%)	00	01(6.7%)
PRESENT STUDY	04(20%)	10(50%)	05(25%)	01(05%)

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.

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.

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.

Treatment options for these 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.

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. 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.

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