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Treatment of Fracture Distal End Humerus with open Reduction and Internal Fixation with Plate Osteosynthesis

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Abstract

Background: Fractures of distal humerus represent one of the most complicated and challenging fractures in the upper extremity. These are rare fractures. Most fractures involve the joint surface, significant proportions are open, and the complex three-dimensional geometry of the distal humerus poses a considerable challenge to reconstruction.

Objectives: To study the treatment of fracture distal end humerus with open reduction and internal fixation with plate osteosynthesis

Methods: A prospective study of 15 consecutive cases of intercondylar fractures of humerus treated by open reduction and internal fixation over two and half years was conducted. These included 12 fresh cases and 3 old cases. Case wise detailed study was done in 12 cases by noting the age, sex social status, nature of violence and the duration of injury, information regarding medical problems and any local problems, in relation to bone and joint.

Results: At follow up, patients were assessed clinically and radiologically, most patients regained fair to good range of motion obtained in 3 months time fracture was united in an average of a 10 weeks and olecranon osteotomy in an average of 8 weeks. Patients were followed up for an average of 9 months, excellent results were found in five cases (33.33%). Good results in five cases(33.33%) and fair results were obtained in three (20%) cases, poor results in two cases(13.33%)

Conclusion: Comminuted fractures of distal humerus in the hands of competent surgeon with open reduction, anatomic assemblage and internal fixation of the fragments offer better results in majority of the cases. In young patients the results are good and in old patients results fair probably because of good physiotherapy in young and also cartilage changes limit the functional outcome in the old. Physiotherapy has a great role in the outcome of functional result.

Keywords: Comminuted fractures, distal humerus, Open reduction, internal fixation

Introduction

Fractures of distal humerus represent one of the most complicated and challenging fractures in the upper extremity. These are rare fractures. Most fractures involve the joint surface, significant proportions are open, and the complex three-dimensional geometry of the distal humerus poses a considerable challenge to reconstruction.[1] The goal of treatment is to re-establish the articular congruity and alignment and begin active motion as soon as possible. In most cases, open reduction with rigid internal fixation is preferred.

The treatment of severely comminuted fractures of the elbow long has been a subject of controversy.[2]

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Recommendations for treatment have ranged widely, from essentially no treatment to operative reduction and extensive internal fixation, the problem of management has been made more difficult by the fact that the fracture is relatively uncommon, which prevents the individual surgeon from accumulating sufficient personal experience to critically evaluate the results of treatment.[3]

In some of these fractures, particularly those with intra-articular comminution, anatomical restoration of the articular surface cannot be adequately achieved or maintained through manipulative reduction alone.[4] Critics of open reduction have argued that the additional surgical trauma and the inherent difficulty in securely stabilizing the small intra articular fragments will lead to added fibrosis and a less satisfactory result. Even authors who have recommended open reduction differed widely in their opinions with regard to the extent of ad type of internal fixation to be used, as well as when post operative mobilization can be started.[5] Do the recent advances in surgical techniques and equipment designed to make possible rigid Osteosynthesis of smaller intra articular fracture now permit early post operative rehabilitation. Does the possibility now exist to achieve improved and more predictable results with the operative treatment of even the comminuted intercondylar fracture. Many Orthopaedic surgeons stress on preserving the architecture of any joint for its normal restoration of function. The recent trend has been immediate open reduction and stable internal fixation, and early post operative active range of motion. The anatomic complexity of the distal humeurs has made surgical reconstruction difficult. The Fabrication of new implants, however, has increased the rehabilitee of operative stabilization, while placing additional demands upon the surgeons expertise.[6]

Injuries of the elbow lead to chronic pain and permanent restriction of motion limit use of the hand in most activities. Positioning of hand for grip and apprehension is dominated by freedom of motion at the elbow. Basic daily activities from eating to perineal hygiene, require a wide range of positions and movements at the elbow in both flexion and extension and forearm rotation. Any restricted motion of the neck, shoulder or wrist magnifies impairment of elbow. More complex tasks, at the work place or recreation, require greater functional demands.

Materials and Methods

Study Duration: January 2019 to December 2019

A prospective study of 15 consecutive cases of intercondylar fractures of humerus treated by open reduction and internal fixation. These included 12 fresh cases and 3 old cases. Case wise detailed study was done in 12 cases by noting the age, sex social status, nature of violence and the duration of injury, information regarding medical problems and any local problems, in relation to bone and joint.

A thorough general examination and local examination was performed. Radiological examination of the part and routine investigations were carried out. Patients were taken up for surgery as early as possible in all the fresh cases. In old people with medical problems after thorough work up were taken up for surgery, once patient is fit for surgery for anesthesia. Preoperatively all patients were immobilized in above elbow POP slab with elevation of the limb. Associated injuries were dealt simultaneously or at a later date depending upon convenience. But every effort was made to operate as early as possible because of intra articular fracture and mobilized as possible. Selection of cases:

Criteria taken are history, clinical and radiological. All people below 70 years, who had type A,B and C closed fractures are taken up for surgery. Even patients who came late with stiffness are taken up for surgery. Patients with external wounds and associated injuries waited till the conditions permit for surgery. Indications for surgery

Inclusion Criteria

The indications for operative intervention, anatomic reduction, rigid fixation and early active mobilization are:

- Intra articular displacement greater than 2 mm
- Marked supracondylar comminution and displacement.
- Open fractures
- Neurovascular injury / compartment syndrome
- The floating elbow
- The multiply injured
- Young people
- Exclusion criteria:
- Unwilling to participate in the study

It is important to differentiate the fracture indications listed above from the patient indications, or rather, contraindications. The patient age, expectations, and medical status must be carefully considered. The biology of bones must be taken into account, especially the degree of osteopenia, the fracture configuration and also the associated soft tissue trauma, i.e. the fracture personality. Another factor is an honest assessment by the surgeon of his or her ability to perform stable internal fixation without the necessity for prolonged post operative immobilization.

Treatment

In all cases open reduction and internal fixation was done using 4mm cancellous screws, 3.5 mm recon plates, or 1/3 tubular plates or precontoured dynamic compression plates or locking compression plates depending upon fracture pattern, age of pt, affordibility, and bone stock . In few cases olecranon osteotomy was performed where there is difficulty in visualising the articular surface. Tension band wiring with k wire or cancellous screw fixation of osteotomy performed.

Follow up

Most of the patients were followed up every 4 weeks following discharge. Maximum period of follow up was 2 years, minimum period of follow up was six months. All patients were followed up. All patients could able to execute routine normal work after 3 months. During review they were assessed clinically for complaints of pain and range of movements. They were educated regarding physiotherapy. For all cases radiological examination to access the progress of union of osteotomy and fracture site was done regularly.

Statistical analysis: The SPSS 22 software was used to do the statistical analysis and the data was presented in the form of graphs and tables.

Observation and Results

15 cases of fractures of distal humerus were treated in the orthopedics department.

All the cases were treated by open reduction and internal fixation with or without olecranon osteotomy.

In the present series all the cases had history of trauma either direct or indirect type.

Table 1: Distribution based on demographic and associated injury parameters

Gender	No. of cases	Percent
Male	12	80%
Female	3	40%
Age group (yrs)		
10-20	1	6.6%
21-30	4	26.6%
31-40	6	40.0%
41-50	1	6.6%
51-70	3	20%
Type of injury		
Road Traffic Accident	7	46.6
Fall on point of elbow from height	5	33.3
Slipped and fell down	3	20
Laterality		
Right	8	53.33
Left	7	46.66
Duration		
Old	3	20
Fresh	12	80

In this series Males sustained more no. of injuries than females, both in RTA and fall due to slips. Open reduction and internal fixation was done for fractures of the distal humerus between 20 years (youngest) and 65 years (oldest) in this series. It is apparent that 6 cases (40%) were in the active productive age group. Average age was 37.4 years

Therefore, it is apparent that 8 cases are due to high velocity injuries and 7 cases moderate to low velocity injuries. The cases approached our institute as early as a day (some within hours) from time of injury to as late 2 months.

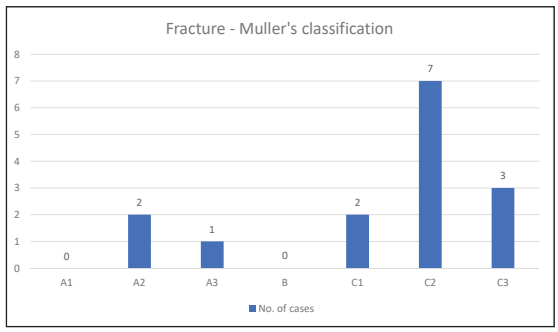

Figure 1: Type of fracture incidence – Muller's et al classification

Around 46.66% of the cases had Complex segmental (C2) type of fracture, 20% of the cases had Complex irregular (C3) fracture, 13.33% of the cases each had Complex spiral C1) and Simple Oblique (A2) fracture, 6.66% of the cases had Simple transverse fracture.

Two cases were on with native treatment and massages and the other case closed reduction and percutaneous fixation with k wires done outside.

Table 2: Radiological assessment

	No. of Cases	Union	Average	Range
Osteotomy (olecranon)	1	1	8 weeks	8 Weeks
Fracture	14	13	10 weeks	8-12 weeks

Table 3: Distribution based on complications

Complications	Frequency	Percentage
Infection (deep)	1	6.66%
Infection (superficial)	1	6.66%
Hypertrophic ossification	1	6.66%
Non-union of fracture	1	6.66%
Non-union of osteotomy (olecranon)	0	0%
Hardware pain	3	20%
Torniquet palsy	1	6.66%
Implant Failure	1	6.66%

Majority had satisfactory functional results. Mild pain on excessive work in excellent and good functional cases mild to moderate in fair range of motion functional cases mild pain ever at rest in a case of non union.

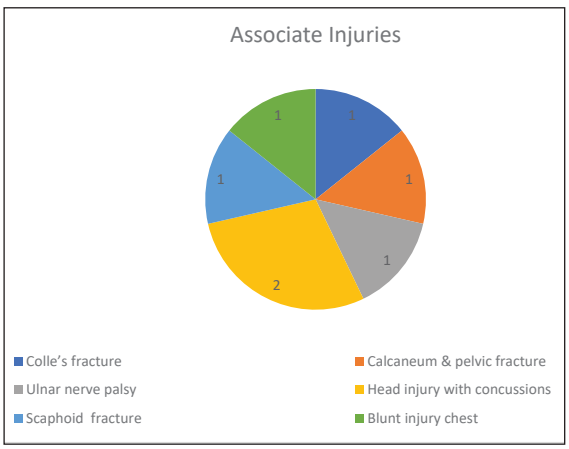

Figure 2: Associated injuries

Head injury with concussions was seen in 2 cases, while colle's fracture, ulnar nerve palsy, Calcaneum & pelvic fracture, Scphoid fracture and blunt injury chest was seen in 1 case each.

Table 4 : CASSEBAUM SCALE

Rating	Motion	Pain	Disability	No. of cases
Excellent	Normal 1 or near normal	None	None	5
Good	Slight Limitation	Occasional	Minimum	5
Fair	Moderate Limitation	With Activity	Moderate	3
Poor	Marked Limitation	Variable	Severe	2

The data on elbow motion was combined with the patients subjective symptoms to provide an overall functional rating. An excellent rating was given for a symptom free elbow with a normal or early normal range of motion;a good rating for good or excellent elbow with some subjective symptoms; a fair rating for a fair range of motion of the elbow with or without symptoms; and a poor rating for both limited mobility and limited function.

Discussion

Fractures of the distal humerus are difficult to treat both by the nature of the injury and because most surgeons don't have a great experience to deal with them. The Management of distal humerus fractures has been controversial. Advocates of closed treatment felt that operative treatment was technically difficult with complications and inconsistent results and those of operative management stressed the importance of anatomic restoration of the elbow joint for stability and function.[7,8]

While there have been numerous studies regarding the management of this uncommon fracture, the overall number of reported cases has been small, the fracture has been classified by varying criteria, and the results have been judged by wide range of methods of functional evaluation.[9] Diversity has been found even within individual series, as different treatment recommendations were proposed for selected types of fractures patterns.[10] Accurate comparisons between operative and non-operative treatment remain difficult, even with in the series of individual authors. In some previous series, open reduction and internal

fixation was attempted only after conservative methods had proved unsatisfactory.[11,12] Utilizing trans olecranon approach and rigid internal fixation, acceptable results were still achieved in many patients who had the surgery delayed.

Post operative period was uneventful in all patients. Early mobilization started in many cases, delayed only in inadequate fixation in two cases, osteoporosis in two cases. Patients were discharged with advice of active, assisted active range of motion exercises. The above elbow posterior slab was continued for 3 weeks.

At follow up, patients were assessed clinically and radiologically, most patients regained fair to good range of motion obtained in 3 months time fracture was united in an average of a 10 weeks and olecranon osteotomy in an average of 8 weeks. Patients were followed up for an average of 9 months, excellent results were found in five cases (33.33%). Good results in five cases(33.33%) and fair results were obtained in three (20%) cases, poor results in two cases(13.33%)

Deep infection was found in one case associated with sinuses, implant removal was done later infection has controlled but resulted in a poot range of motion. In another case superficial infection is found which subsided with antibiotics and implant extraction at later date and fair range of motion is obtained. In one case heterotrophic ossification was found, this case has been given indomethacin for 3 months hoping to reduce or prevent the further progress. This has resulted in limitation of her range of motion and resulted in fair range of motion. In four case; range of motion was delayed because two cases have inadequate fixation and the other two because of osteoporosis. After 5-6 weeks these patients were advised vigorous physiotherapy. One patient developed non-union and Implant Failure . This case was operated after 2 months of injury and had prior massages and native treatment and the patient compliance was also poor. No post operative permanent nerve palsies were found except for a transient radial nerve palsy in one case. Hardware pain was noticed in 3 patients, in three cases their implants were removed after union.

In summary, the concept of Open Reduction and Internal Fixation of Fractures of the Distal end of Humerus with Plate Osteosynthesis is very valuable, in restoring articular surface and early rehabilitation decreasing morbidity resulting in good results.

Conclusion

Comminuted fractures of distal humerus in the hands of competent surgeon with open reduction, anatomic assemblage and internal fixation of the fragments offer better results in majority of the cases. In young patients the results are good and in old patients results fair probably because of good physiotherapy in young and also cartilage changes limit the functional outcome in the old. Physiotherapy has a great role in the outcome of functional result.

Ethical Clearance: Ethical Clearance was obtained from the institutional ethics committee of Government Medical College, Nalgonda prior to the commencement of study.

Source of funding: Self

Conflict of interest: Nil

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