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Surgical management of intercondylar fracture of distal humerus in adults by olecranon osteotomy

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Abstract
Intercondylar fracture of the distal humerus are uncommon injuries and present the most difficult challenge of the fracture of lower end of humerus. Restoration of the articular surface of distal humerus must be nearly perfect and sufficiently rigid to permit early mobilization of the elbow if the results is to be satisfactory. This is a prospective study of 20 cases of intercondylar fracture of distal humerus in adults admitted to hospital, between august 2011 to September 2013. Cases were taken according to inclusion and exclusion criteria i.e. with intercondylar fracture distal humerus above the age of 18 years and fit for surgery. Medically unfit and not willing for surgery were excluded from the study. Good results seen in 8 cases, fair results in 9 cases and poor results in 3 cases. There were 2(10%) cases each of superficial infection, implant failure, ulnar neuropathy and one (5%) case of non- union and they treated accordingly. Operative treatment with rigid anatomical internal fixation. Should be the line of treatment for all grades of riseborough radin internal fracture as it gives best chance to achieve good elbow function.

Keywords: Intercondylar, fracture, ORIF, humerus

Introduction
An Intercondylar fracture of the distal humerus are uncommon injuries and present the most difficult challenge of fracture of lower end of humerus. The complex shape of the elbow joint, the adjacent neurovascular architecture, and the sparse soft tissue envelope combine to make these fractures difficult to treat. Acceptable results have been reported in a majority of patients treated by open reduction and internal fixation [1].

The only reliable method for restoring the normal alignment and contour of the distal humerus is operative exposure and direct manipulation of fracture fragments. However, fixation of fracture fragments must be stable enough to allow motion while ensuring union. In the early and middle parts of twentieth century, operative treatment was combined with devascularization exposure, inadequate fixation, and cast immobilization. The result was often elbow stiffness and delayed healing. In this context, nonoperative treatments, such as the so-called bag- of -bones technique (a short duration of immobilization in either a cast or a collar and cuff followed by mobilization as tolerated) were established as treatment alternatives [2].

Restoration of painless and satisfactory elbow function after a fracture of the distal humerus requires anatomic reconstruction of the articular surface, restitution of the overall geometry of the distal humerus, and stable fixation of the fractured fragments to allow early and full rehabilitation [3].

Restoration of the articular surface of the distal humerus must be nearly perfect and sufficiently rigid to permit early mobilization of the elbow if the results is to be satisfactory.

Depending upon the frequency of communition and displacement, open reduction and internal fixation with 1/3 tubular plate, reconstruction plate, Kirschner wire and double tension band wiring can be done individually or in combination.

The result of operative fixation of fractures of the distal humerus remained unpredictable until improved techniques for the fixation of small, articular fractures as developed by the Arbeitsgemeinschaft fur osteosynthesefragen/association for the study of internal fixation (AO/ASIF) and others were applied. On the basis of the results reported in the more recent series, fixation with two plates at 90 degrees angle with one another has become the standard against which all other treatments are measured. Despite the confidence in operative fixation

that believes this shift in treatment preference, these remain challenging fractures to treat effectively and best managed by surgeons with interest and experience in skeletal trauma involving upper extremity. Even the most experienced surgeons, however may be intimidated with certain fracture characteristics, including poor bone quality, fractures involving the distal most aspects of the bone columns, and fragmentation of articular surface in sagittal and coronal planes. Some have even suggested total elbow arthroplasty as an alternative to operative fixation.

Although it is wise to be prepared to perform a total elbow arthroplasty in the event that a complex fracture is not amenable to internal fixation, one must keep in mind the functional limitations and eventual failure associated with total elbow arthroplasty. A surgeon treating a healthy active patient with a fracture of distal humerus should make every attempt to reconstruct and preserve the distal humerus [4].

The quality of elbow function following intercondylar fractures is related to the degree to which normal anatomic relationships are restored. Residual elbow stiffness still remains the worst complication of intercondylar fractures as it is poorly tolerated because of lack of compensatory motions in adjacent joints.

The aim of the present study is to evaluate the functional outcome of surgical management of intercondylar fracture of distal humerus in adults.

Methodology

The present study includes 20 cases of intercondylar fracture of distal humerus admitted in vims hospital, between July 2011 to September 2013.

On arrival of patients at casualty or at OPD level, the various points were noted down according to the proforma.

On admission of the patient, a careful history was elicited from the patient and/or attendants to reveal the mechanism of injury and the severity of trauma. The patients were then assessed clinically to evaluate their general condition and the local injury.

The general condition of the patient, the vital signs were recorded. Methodical examination was done to rule out fractures at other sites. Local examination of injured elbow revealed swelling, deformity and loss of function. Any nerve injury was looked for and noted.

Palpation revealed, abnormal mobility and crepitus. Distal vascularity was assessed by radial artery pulsations, capillary filling, pallor and paraesthesia at finger tips.

Radiographic study was done taking anteroposterior and lateral x-ray of the involved elbow. The limb was then immobilized in above elbow plaster of paris slab with sling.

The patient was taken for surgery after routine investigations and after obtaining fitness towards surgery. The investigations were as follows: Hb%, Urine for sugar, FBS, Blood urea, Serum creatinine, HIV, HbSAg and ECG.

All patients were treated surgically with open reduction and rigid internal fixation. Patients treated surgically were done so in routine operation theatre as soon as possible. Most of the patients were operated within 8 days of admission.

All the patients were put in lateral position with arm supported and forearm hanging. In all patients a posterior trans-olecranon approach was used to give better exposure of the articular surface.

Preoperative planning

- Consent of the patient or relative was taken prior to the surgery.
- A dose of tetanus toxoid and antibiotic were given preoperatively.
- Preparation of the part was done before a day of surgery.
- The injured elbow was immobilised in above elbow slab during preoperative period.
- Instruments to be used were checked before hand and sterilised.

Results

Table 1: Showing the Time Interval between Injury and Surgery

Duration	No. of cases	Percentage
<24 hours	-	-
2-4 days	9	45%
5-7 days	8	40%
7-10 days	3	15%

No case was operated as a surgical emergency. All the cases were operated on regular operation theatre days, at the earliest possible time. 9 (45%) patients were operated between 2 to 4 days, 8 (35%) patients were operated between 5 to 7 days and 3 (15%) patients were operated between 7 to 10 days.

Associated Injury

None of the cases had any associated fracture of other bones. All the patients had an isolated intercondylar fractures of the distal humerus.

Table 2: Type of Fixation

Type of fixation	No. of cases	Percentage
Distal humerus locking compression plate	11	55%
Reconstruction plate with screws	9	45%
Total	20	100

In this series 11 (55%) patients were fixed with double reconstruction plates of which supplementary kirschner wires were used in 2 cases and 9 (45%) patients were fixed with Y plate and screws.

Immobilization

Three cases of comminuted intercondylar fractures of humerus wherein it was difficult to obtain rigid fixation were immobilized with above elbow posterior plaster of paris slab for a period of 3 weeks.

All the other cases were encouraged active elbow motion from the 3rd postoperative day.

Table 3: Complications

Complications	No. of cases	Percentage
Superficial infection	2	10%
Ulnar neuropathy	2	10%
Non union	1	5%
Implant failure	2	10%
Heterotopic ossification	0	0

Intraoperative complications

There were no cases of intraoperative complications.

Postoperative complications

1. Superficial infection: Two patients developed superficial infection, infection was controlled with appropriate antibiotics after culture and sensitivity report.
2. Ulnar neuropathy: Two patients developed ulnar neuropathy which recovere spontaneously after 3 weeks.

3. Non-union: One patient had non union in which Y plate was removed and internal fixation with two 3.5mm reconstruction plate with bone grafting was done.
4. Implant failure: Y plate breakage occured in two patient where re-surgery was done, broken Y plate was removed and two 3.5mm reconstruction plates were applied with bone grafting.

Table 4: Grading of Results

RR Types	Our Present Series		
	Good	Fair	Poor
I	-	-	
II	3	2	-
III	5	5	2
IV	1	-	2

In the present study there were no type I fractures, 5 cases were of type II out of which 3 had good and 2 fair results. There were 12 cases of type III fractures out of which 5 had good, 5 fair and 2 poor results. There were 3 cases of type IV fractures out of which 1 had good and 2 had poor results.

Discussion

Table 5: The comparison of present study with the Riseborough Radin series [5] is as follows

Riseborough Radin Series			RR types	Present study		
Good	Fair	Poor		Good	Fair	Poor
-	-	-	I	-	-	-
3	1	1	II	3	2	-
4	5	3	III	5	5	2
3	4	4	IV	1	-	2

In the RR and our series there were no type-I fractures. In RR series, there were 5 type II cases of which 3 had good, 1 fair and 1 poor results. In our series 5 type II cases were found out of which 3 had good and 2 fair results. There were 12 cases of type III fractures in RR series and 12 in ours. RR series had 4 good, 5 fair and 3 poor while our series had 5 good, 5 fair and 2 poor results. RR series had 11 type -IV fractures of which 3 good, 4 fair and 4 poor results were obtained. Our series had 3 type IV fracture of which 1 good and 2 poor results were obtained.

Table 6: Comparison of Complications

Complications	Present study	Henly *et al* 1993 [6]
Superficial infection	2 (10%)	4%
Ulnar neuropathy	2 (10%)	7%
Implant failure	2 (10%)	5%
Non union	1 (5%)	2%
Heterotopic ossification	-	4%

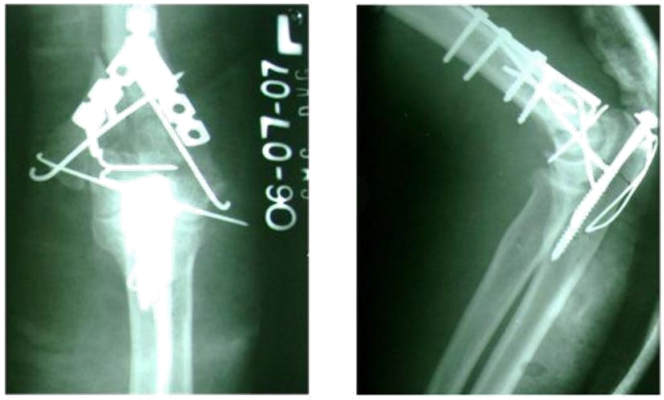
In our series we had a two cases of superficial infection which resolved with appropriate antibiotics.
Two cases of ulnar neuropathy was seen which resolved spontaneously after conservative treatment.
One patient had a non union, in which Y plate was removed and internal fixation with two 3.5mm reconstruction plate with bone grafting was done.
Y plate breakage occured in two patient where re-surgery was done, broken Y plate was removed and two 3.5mm reconstruction plates were applied with bone grafting.
Henly *et al* reported 4% superficial infection 7% of ulnar neuropathy, 5% of implant failure, 2% of non union and 4% incidence of heterotopic ossification.

Conclusion

- Open reduction internal fixation should be done as early as possible. Delay in open reduction internal fixation with delayed soft tissue dissection leads to increased chances of elbow stiffness due to periarticular fibrosis.
- Operative treatment with rigid anatomical internal fixation should be the line of treatment for all grades of Riseborough Radin intercondylar fractures, more so in young adults as it gives best chance to achieve good elbow function.
- During open reduction internal fixation, anatomic nature of articular surface should be given prime importance.

Case no. 6- showing radiographs

Pre-operative radiographs



Immediate post operative radiographs

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