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## Outcome of precontoured locking plate fixation in distal humerus fractures

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### Abstract

**Aim:** Outcome of precontoured locking plates fixation in Distal Humerus Fractures.

**Material and methods:** Twenty-five patients with distal humerus fractures were treated with ORIF with pre-contoured locking plates. There were 16 males, 9 females, with an average age of 42.8 years (21-59years). As per the AO classification performance score, the results obtained were graded as excellent or good results in 24 patients (96%), fair in 1 (4%) and poor in 0 (0%) of cases. Average time interval between admission and surgery was 3.8 days (average 1, there were 3 type A fractures(12%),1 type B(4%) and 21 type C fractures (84%).In addition to clinical examination, functional results were evaluated using the Mayo elbow performance score (MEPS).

**Results:** Using the Mayo elbow -9 days). All the fractures as well as the olecranon osteotomies united by 10-16 weeks (13.76 weeks). No patient had deep infection, implant failure, non-union of fracture site or olecranon osteotomy site. Superficial wound infection, which occurred in 2 (8%) patients, resolved with oral antibiotics. Transient ulnar nerve palsy developed in 1(4%) case. However, the patient recovered with conservative treatment.

**Conclusions:** An anatomically precontoured distal humerus locking plates are useful in providing stable fixation of distal humerus fractures, thereby facilitating early postoperative rehabilitation.

**Keywords:** Distal humerus, precontoured locking plates

### 1. Introduction

Distal humerus fractures comprise about 2% of all fractures and remain among the most challenging fractures to manage [1]. Ever since the description of these fractures, the management of these fractures has passed through various stages, i.e. bag of bones technique, cast or splint immobilization, limited open reduction, K-wire fixation, Ilizarov type external fixation and primary total elbow arthroplasty [2-8]. However, with respect to anatomic reduction, reconstitution of joint congruity, fixation stability and mobilization, it is generally accepted that internal fixation provides the most favourable outcome for distal humeral fractures [9, 10]. The multi-fragmentary nature of these fractures with comminution of the articular surface makes accurate reduction and fixation very difficult. Conventional implants have not been able to completely address the problem of implant failure and substantial stability in small distal osteoporotic fragments [10, 11]. The high failure rate in these fractures is due to insufficient area for insertion of many screws in a small sized distal fragment, resulting in poor stability at bone-plate interface [12, 13]. Pre-contoured distal humeral Locking Plates provide higher stability by permitting multiple screws in small distal fragment, thereby addressing some of the limitations of conventional implants [14-17]. The present prospective study was planned to see outcome of precontoured Locking plates fixation in distal humeral fractures.

### 2. Material and Methods

25 patients with distal humeral fractures were treated in our hospital with open reduction and internal fixation with precontoured locking plates.

#### 2.1 The inclusion criteria were as follows:

1. Age of 15 years or more

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- 2. Mature skeleton
- 3. Age less than 15 years

In this prospective study, a posterior approach with olecranon osteotomy was used. There were 16 males and 9 females. Their ages ranged between 22-59 years (average 42.8 years). The mechanism of injury in 21 patients is road traffic accident and fall in 4 cases. Associated injuries were seen in only road traffic accident cases. One patient had a shaft fracture of the ipsilateral humerus. Another patient had a fracture shaft femur and two patients had head injury and one had fracture hand bone. As per the classification system of AO/ASIF, 8 were type C1, 10 were type C2 and 3 cases were type C3 and one each of type A1, A2, A3 and B2. Twenty three cases are closed and one each of Gustilo grade 1 and 2 open fractures.

The first step in the fixation was reduction of the condyles and reconstruction of the joint surface. Medial and lateral condyles were fixed together with a cancellous screw. The next step was to anatomically reattach the condyles to the humeral shaft. Stable fixation was achieved by using two orthogonal and anatomically pre-contoured locking plates, one on either side. At the end of the procedure, the olecranon was reduced and then fixed with two longitudinal 2.0 mm K-wires and a tension band wire. Usually by the 2nd postoperative day, active or active-assisted exercises were started. The Mayo elbow score was used to rate elbow function and for determining the satisfaction level of patients (MEPS).

**2.2 Assessment system (according to Mayo elbow performance index)**

Function	Points
Pain	
None	45
Mild	30
Moderate	15
Severe	0
<b>Movement ARC (Degrees)</b>	
>100	20
50-100	15
<50	5
<b>Stability</b>	
Stable	10
Moderate instability	5
Gross instability	0
<b>Function</b>	
Combing hair	5
Feeding oneself	5
Hygiene	5
Putting on shirt	5
Putting on shoe	5
Total	100

**2.3 Evaluation of Results**

Excellent	90 or more
Good	75 – 89
Fair	60-74
Poor	<60

The arms were assessed clinically with respect to pain relief, instability, range of motion and functional improvement. Radiological assessment was done by anteroposterior and lateral views.

**3. Results**

In this study patients were followed up for up to six months.

The average time to union was 13.76 weeks (range: 10-16 weeks). 20(80%) patients had >100° while 5(20%) patients had 50-100° ROM at elbow. Good to excellent results were found in 24(96%), fair in 1(4%) and poor in 0(0%) of cases as per Mayo Elbow Performance scoring system (Fig. 1). No patient had deep infection, implant failure, non-union of fracture site or olecranon osteotomy site. Only minor complications occurred in this study. Two patients had superficial wound infection, 1 patient had transient ulnar nerve palsy and 2 had metal prominence (olecranon K-wires). Superficial wound infection, which occurred in 2 patients, resolved with oral antibiotics.



**Fig 1:** pre op and immediate post op xrays



**Fig 2:** Xray at 6 months showing union

#### 4. Discussion

Intercondylar fractures of the distal humerus are difficult to treat because of the nature of injury and the fact that most surgeons do not have a great deal of experience with them [21, 22]. Most intra-articular fractures of the distal humerus are often displaced and therefore the successful treatment demands an anatomic reduction, stable fixation and the ability to allow early elbow motion [23, 24]. As the elbow joint tolerates immobilization poorly, the functional outcome after surgical treatment is unavoidably worsened by prolonged immobilization. Despite being uncommon, distal humerus fractures pose the greatest challenge in terms of surgical fixation and absolute anatomical reduction. Surgical expertise is of paramount importance. Good functional outcomes are expected with intelligent surgical approach and early rehabilitation. Articular surface restoration and reconstruction of elbow joint is mandatory to restore maximum joint function. This can be safely achieved by stabilization of fracture fragments with plate osteosynthesis based on restoration of joint congruity. Although various approaches have been used for reduction and fixation of distal humeral fractures, the posterior approach through an olecranon osteotomy is the most widely used [25-28]. This approach provides excellent visualisation, particularly of the distal articular fragments and the plate fixation [28, 29]. In this study, a posterior approach with olecranon osteotomy was done in all cases. Non-union of olecranon osteotomies has been reported, independent of patient age, in up to 30% of patients. Use of chevron-V osteotomy has decreased the incidence of non-union. Two patients had metal prominence. However, in our study, we did not report any cases of non-union of olecranon osteotomy. All fractures as well as the osteotomy united by 10-16 weeks (average 13.72 weeks). Incidence of ulnar nerve injury has been reported in 5-15% of patients [30-32]. In this study, 1(4%) patient had ulnar nerve palsy which recovered with conservative treatment. In all our patients we started active and active assisted range of motion exercises from 2nd postoperative day. 20(80%) patients had >100° while 5(20%) patients had 50-100° ROM at the elbow. The aim of treatment of intercondylar fractures of the distal humerus is a painless elbow which is fully mobile and stable. The operative treatment in expert hands has yielded 75-85% excellent to good results. In the present series, we treated 25 adult patients with distal humeral fractures both articular as well as extraarticular, age ranging from 22-59 years. We obtained 96% of excellent to good results, 4% of fair and no poor results which are slightly better than results reported with the use of precontoured LCP by other authors [32, 33]. The complications encountered in the operative treatment of distal humeral fractures as reported by various authors are: superficial wound infection, deep wound infection, nerve injuries, delayed union, nonunion of fractures and osteotomy, heterotopic ossification, stiffness, pain and implant failure. In our study, 2 patients had superficial wound infection, 1 patient had transient ulnar nerve palsy, 2 had metal prominence (olecranon K-wires), and 3 patients had occasional mild post-operative pain. There was no nonunion or delayed union of fracture and osteotomy site.

#### 5. Conclusions

An anatomically pre-shaped distal humerus locking plate system is useful in providing stable fixation of distal humerus fractures, thereby facilitating early postoperative rehabilitation.

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