



A PROSPECTIVE STUDY ON FUNCTIONAL OUTCOME OF DISTAL HUMERUS FRACTURE TREATED BY ORTHOGONAL PLATING

Orthopaedics

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ABSTRACT

The distal humeral fractures, especially the comminuted intra articular, remain one of the most challenging injuries to treat. Various problems in distal humerus fracture management include frequent articular involvement, metaphyseal comminution, bone loss and osteopenia. The study analysed the functional outcome of twenty patients of distal humeral fractures treated surgically with orthogonal plating with average follow up of 13 months (6 months – 2 ½ years). The good anatomical alignment, absolute stabilization and early mobilization were of prime importance in elbow fractures. Subjects of this prospective study were 20 consecutive patients based on the exclusion and inclusion criteria. All patients underwent ORIF with orthogonal plating through Olecranon osteotomy (Chevron) approach. The patients were followed up periodically based on the MEPS (Mayo Elbow Performance Score) and radiological outcome were analysed. The Mean age of the patients was 45 years ranging from 20 to 65 years. AO type C3 fractures constituted 50% while C2 fractures constituted 45% and C1 fractures constituted only 5% of our cases. In our study, the average surgical time delay was 6 days ranging from 5 to 20 days. Two patients had infection. None of them had ulnar nerve damage post operatively. Stiffness was noted in 2 patients. No patient died during treatment or follow up. The average time to union was about 14 weeks. There was no hardware failure or non-union in any patient. The mean flexion-extension arc was 96°. The mean MEPS score was 78 in our study. Of the 20 patients, 9(45%) patients had Excellent, 5(25%) patients had good, 4(20%) patients had fair, 2(10%) patients had poor final outcome. We conclude that with good anatomical reduction with a stable internal fixation, preserving the blood supply to the bone along with protection of the ulnar nerve and early elbow mobilization ensure the good functional outcome and early return to activities.

KEYWORDS

Distal humerus fracture, Orthogonal plating, Chevron osteotomy, MEPS

INTRODUCTION

Distal humerus fractures account for about 2%– 6% of all fractures in adults. Despite various advances, distal humeral fractures remain one of the most challenging injuries to treat. Composite problems in distal humerus fracture management include frequent articular involvement, metaphyseal comminution, bone loss and osteopenia. The forementioned issues along with the complex three-dimensional geometry pose great difficulties in internal fixation. Poor outcomes like contracture secondary to prolonged immobilization thought to be necessary to protect the fixation, non-union, high failure rate are noted with old internal fixation techniques. Attempt to achieve painless, stable yet mobile elbow requires a systematic approach in for open reduction and internal fixation.

The chances of functional impairment and deformity are very high following conservative treatment of distal fractures of the humerus. In the elbow, the principles of good anatomical alignment, absolute stabilization and early mobilization is of prime importance than in any other joint.

Majority of current recommendations in the management of distal humeral fractures include open reduction and internal fixation (ORIF) with plates and screws. The anatomical location to place the plates on the distal humerus has recently been debated throughout the literature with the most of authors currently recommending at least two plates be utilized to provide adequate stability and allow for adequate restoration of anatomy.

MATERIALS AND METHOD

We followed AO classification of distal humerus fracture. Twenty consecutive patients with AO type C1-C3 fractures, closed and Open type 1&2 Gustillo Anderson, were included in our study. The complex anatomy of the distal humerus and its articular surfaces required perfect anatomical reduction of the fragments and rigid fixation followed by early mobilization. **SURGICAL TECHNIQUE:** Posterior approach with Chevron osteotomy for joint exposure was followed in all patients. **IMPLANTS:** The anatomical LCDCP plates were used for fixing the fractures and MTBW was done for the osteotomy. Post operatively, the patients were evaluated clinically according to the Mayo Elbow Performance Score (MEPS) and radiological progression of union was recorded periodically. **PREOPERATIVE PROTOCOL:** All study patients in our group were initially immobilized with above elbow slab and limb elevation was given. For all the study patients,

plain radiographs (AP, lateral views) and CT Elbow were taken and thoroughly reviewed to study the personality of the fracture pattern including the number of articular fragments and extent of fracture displacement, extent of comminution. This allows to anticipate certain technical manoeuvres to facilitate fracture reduction as well as to save tourniquet time duration which may decrease the wound complication rate. **PROCEDURE:** Through posterior midline incision, ulna nerve was exposed, tagged and protected. Joint exposed through Chevron osteotomy. The fracture fragments were anatomically reduced, provisionally held with K wires and rigidly fixed with two anatomical 3.5mm LCDCP (medial column plate in the medial surface and lateral column plate over the posterior surface). The Olecranon osteotomy was fixed with modified tension band wiring.

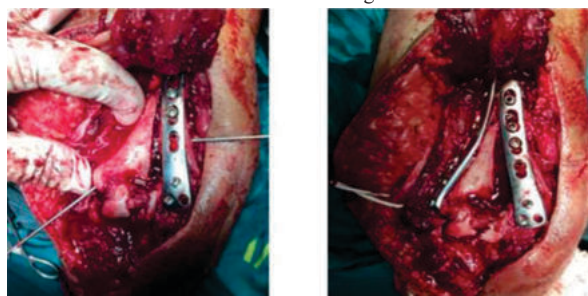


Figure 1 Medial And Lateral Lcp 1. Ulnar Nerve

POST OP PROTOCOL: Patients were placed in a well-padded plaster extension splint applied posteriorly and the limb elevated for first 3 days. Active finger movements were started from day 1. Intravenous antibiotics were given for 3 days; Oral antibiotics were given for 7 days. Drain was removed at 48 hours and suture removal done on 12th day POD. Indomethacin prophylaxis for heterotopic ossification was given for the first postoperative month (75 mg/day) Elbow range of motion was started between days 3 and 7 postoperatively, as tolerated by the patient. Active-assisted and active range of motion were encouraged (flexion, pronation, and supination). At 6 months patients were allowed to their routine full activities. The patients were followed up at 2nd, 4th, 8th week and monthly thereafter. At each follow up, patients were evaluated clinically and radiologically for union, and the outcomes were measured in terms of Mayo elbow performance score (MEPS).

RESULTS

The outcome of the study was as tabulated:

MEPS SCORE	Number of patients	FREQUENCY (%)
90-100	9	45%- Excellent
75-89	5	25%- Good
60-74	4	20%- Fair
0-59	2	10%- Poor

Post-surgery, complications were encountered in some of the patients. The early and late complications that occurred are summarized separately below.

Of the 20, 2 patients developed infection of which one was superficial and settled with antibiotics. One patient, Grade II open fracture pre operatively, developed deep infection and required wound debridement and flap cover.

One patient had hardware prominence, after 8 months of fixation, olecranon K wire and SS wire exit was done. One patient with elbow stiffness, after 3 months of fixation, underwent elbow mobilisation under anaesthesia. None of the patient had ulnar nerve injury. All the patients had union of fracture and good functional range of motion.

During the average follow up of 13 months (6 months – 2 ½ years) solid radiologic union was achieved primarily in all patients. The average time to union was about 14 weeks. Hardware failure or Non-union did not occur in any patient. The mean flexion-extension arc was 96°. The mean MEPS score was 78 in our study.



Figure 2 Case Illustration 2



Figure 3 Case Illustration 1

DISCUSSION

AO type C fractures are quite difficult to treat since they are intra articular fractures often associated with comminution and osteoporosis especially in the elderly age group and they can be associated with complications leading to a poor functional outcome. Fractures around the elbow are prone to develop stiffness with loss of movement which can be quite disabling and can also be associated with complications such as non-union, malunion, post traumatic arthritis, heterotrophic ossification as well as iatrogenic injury to the ulnar nerve. Fixation options such as K wire and screw fixation alone do not provide a good fixation, and single-column plating is not biomechanically stable since the two-column theory proposes that the distal humerus coronal section is in the shape of a triangle with medial and lateral columns. A good fixation construct should restore the capitollo-trochlear joint as well as the medial and lateral columns.

Orthogonal plating techniques evolved after a publication by Jupiter and colleagues in 1985, reporting on patients having successful outcomes with ORIF of distal humerus fractures. They noted that the key to surgical success was obtaining enough bony stability to permit early range of motion. This usually required the utilization of two plates, one on the medial column and the other on the lateral column. In addition, Waddell and colleagues have shown that elbow immobilization of three to four weeks post-operatively leads to unacceptable stiffness. In this prospective hospital-based study, we have analysed 20 cases of distal humerus fracture treated by

orthogonal plating using olecranon osteotomy approach in our hospital. The average time to fracture union was 14 weeks in our study ,which was not corresponding to the reports by Yeshwanth Subash et al , average time of union was 11.16 weeks, 9.53 weeks in Rajeev Kelkar et al.

In our study the Mean elbow range of movement was 96 degrees (85-105), which was not corresponding to the reports by Yeshwanth Subash et al, there was 110 degree (86-122) and Rajeev Kelkar et al the mean range of elbow movement was 99 degree in their study, mean range of elbow movement was 100 degree in Reising et al study.

In our study two patients had hardware prominence (olecranon k wires) for that, after 6 months they had implant exit of k wire and SS wire in our hospital. It was corresponding to study conducted by Reising et al, in their study tension band wiring removal was done after 12 weeks of follow up due to soft tissue irritation. In our study final outcome by MEPS Scoring 45% had excellent outcome,25% had good outcome,20% had fair outcome,10 % had poor outcome, which was not corresponding to Yeshwanth Subash et al,in their study 85.6% had good or excellent scores,14,4% had poor score. In Rajeev Kelkar et al, they had 47% excellent score,33% had good score,7% had fair score,13 % poor score. In Reising et al study 75% patients had good or excellent results.

In our study,4 patients had complications, two patients had joint stiffness, one patient had superficial infection and one patient had deep seated infection that required flap cover which was corresponding to study conducted by Yeshwanth Subash et al, in their study 3 patients developed superficial infections, one patient developed superficial infection in Rajeev Kelkar et al study. In Reising et al study 3 patients had superficial infection; it was treated with intravenous antibiotics. In Reising et al study,4 patient had postoperative ulnar injury, it recovered within 6 weeks period. In our study, we did not encounter ulnar nerve injury, heterotopic ossification, malunion, non-union like complications, which was reported commonly in various literature.

It was observed that the good anatomical reduction with strong construct and early vigorous physiotherapy will give good functional elbow to do daily routine activities and return to their previous occupation.

CONCLUSION

We conclude that even in AO type C distal humerus fracture, ORIF by trans olecranon osteotomy approach will provide better visualization of the ulnar nerve, and reduces the ulnar nerve injury.

Good anatomical reduction with a stable internal fixation while preserving the blood supply to the bone along with protection of the ulnar nerve and early elbow mobilization ensure the good functional outcome to the patient to enable them to return to activities of work and daily living at the earliest.

REFERENCES

- 1) WADDELL, JAMES P., JEREMY HATCH, and ROBIN RICHARDS. "Supracondylar fractures of the humerus—results of surgical treatment." *Journal of Trauma and Acute Care Surgery* 28.12 (1988): 1615-1621.
- 2) Subash, Yeshwanth & S, Vishnu & Damodharan,. (2020). ORIF with orthogonal plating in the management of complex distal humerus fractures -A prospective study of 30 patients. *International Journal of Research in Pharmaceutical Sciences*. 11. 6060-6065. 10.26452/ijrps.v11i4.3275.
- 3) Kelkar, Rajeev, and Deepak Singh Rajput. "Functional outcome of orthogonal plating in treatment of distal humerus fracture." *Int J Orthopaed* 4 (2018): 78-83.
- 4) Kaiser, T., Brunner, A., Hohendorff, B., Ulmar, B., & Babst, R. (2011). Treatment of supra- and intra-articular fractures of the distal humerus with the LCP Distal Humerus Plate: a 2-year follow-up. *Journal of shoulder and elbow surgery*, 20(2), 206-212.