

Comparison of Single Versus Double Plate Fixation in Inter and Supracondylar Fractures of Distal Humerus in Adults

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ABSTRACT

Objective To compare the outcome of supracondylar and intercondylar fractures of humerus treated by single and double plates.

Study design Comparative study.

Place & Duration of study This study was conducted in the Department of Orthopaedics, Lahore General Hospital, Lahore and Department of Orthopaedic and Trauma Hayatabad Medical Complex Peshawar.

Methodology Thirty patients of intercondylar and supracondylar fractures of distal humerus were divided randomly into two groups. Fifteen cases were managed by single plate and K wire and 15 cases by bicondylar plate fixation. All patients were operated through posterior trans-olecranon approach. Elbow exercises were started at second postoperative day. Patients were followed at two weeks and thereafter monthly, with clinical examination and x-rays.

Results The mean age of the patients was 40.3 years. The healing time was sixteen weeks in both the groups. The final grading of the results showed better results with double plate fixation with excellent to good results in 13 (86.6%) and fair to poor in 2 (13.3%). The outcome in single plate was excellent to good in 6 (40%) and fair to poor in 9 (60%).

Conclusion The results of dual plate fixation is better than single plate fixation in intercondylar and supracondylar fractures of humerus.

Key word Intercondylar fractures, Supracondylar fractures, Humerus.

INTRODUCTION:

Intercondylar and supracondylar fractures involve the distal humerus with extension into intercondylar area and are not uncommon.¹ Intercondylar fractures represent one of the most complicated and challenging fractures in the upper extremity and account for approximately 2% of all fractures in adults.^{2,3} The medial and lateral condyles are usually separate fragments, displaced in T or Y configuration and both are disconnected from the humeral shaft and rotated in the axial plane.⁴ The AO / Muller classification divides these fractures into three main types: A (extra articular), B (partial articular), and C (complete articular fractures).⁵ Type C fractures

represent the most complex pattern and are often called bicondylar humeral fractures because of the involvement of both condyles in addition to the articular surface.^{6,7}

The injury may occur in either flexion or extension.⁸ In flexion type injury, the force against the posterior elbow (olecranon) coupled with contraction of the forearm muscles, produces the fracture with less force than expected. In many instances, however, the force applied to the posterior flexed elbow is violent, as in motor vehicle injuries. In extension type of injury, the ulna is directed anteriorly against the posterior aspect of trochlea, separating the condyles at the same time as the supracondylar portion is fractured. The bony fragments are displaced by unopposed muscle action.⁹

In Pakistan most of these patients after injury visit the quacks or bone setters instead of doctors and

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thus they loose precious time which is necessary for early open reduction and internal fixation to begin early mobilization and to get good results by the procedure adopted for the injury. The study was conducted to compare the results of single versus double plate fixation.

METHODOLOGY:

This comparative study was conducted at the Department of Orthopaedics, Lahore General Hospital, Lahore and Department of Orthopaedic and Trauma Hayatabad Medical Complex Peshawar. Thirty patients of intercondylar and supracondylar fractures of distal humerus were divided randomly into two groups. Method of random selection was based on even and odd number of registration. Fifteen cases were managed by single plate and K-wire and 15 cases by bicondylar plate fixation. Patients age above 16 years and Riseborough and Radin Type II and III fractures were included. Patient with open fractures and osteoporotic bones were excluded.

General anaesthesia was used in both groups under antibiotic cover using 1.5 gm cephazoline (2nd generation cephalosporin) 30 minutes before surgery. In all cases operation was done in lateral decubitus position with the arm flexed to 90° over an arm rest. A pneumatic tourniquet was used in all cases. A posterior mid dorsal incision was used in all cases. Trans-olecranon approach with Chevron osteotomy was used. The ulnar nerve was isolated and retracted.

Group A: In this group of patients with intercondylar fractures, the reduction was secured using inter-fragmentary 4 mm cancellous screw with or without wires. One column was fixed with a 3.5 mm reconstruction or dynamic compression plate. The other column was held with inter-fragmentary 55-65 mm long malleolar / 4.5 mm cortical screws with or without supporting K wires.

Group B: In this group the reduction was secured using inter-fragmentary 4 mm cancellous screw with or without K-wires. 3.5 mm reconstruction / dynamic compression plate was applied posteriorly along the medial column, and a reconstruction or 1/3 tubular plate applied over metaphyseal flare along the posterolateral column.

Elbow exercises were started at second postoperative day. Patients were followed at two weeks and thereafter monthly, with clinical examination and x-rays. Improvement noted and recorded on performa.

The data was entered in SPSS 10.0 version. Mean and standard deviation were calculated for numerical variables like age. Frequency and percentage were calculated for qualitative variables like sex, mode of injury, type of injury and other variables. On the quantitative variables like operation time, hospital stay, and healing time, student t-test was applied to find out the significance between the groups. For postoperative complications, postoperative pain severity and range of motion and final outcome, Chi square test was applied as a test of significance.

RESULTS:

Riseborough and Radin classification was applied in both groups.¹⁰ In group A, 13 patients were Riseborough and Radin type II and 2 patients were type III. In group B 9 cases were of type II and 6 cases of type III variety. In group A average duration of surgery was 120 minutes, while in group B average duration of operation was 130 minutes.

In group A, the average hospital stay was 8.47 days and in group B the average stay was 6.87 days. Table I summarizes postoperative complications. Wound infection was noted in one patient each in both the groups. In both groups there was one case of radial nerve palsy. Both these nerve palsy cases recovered in three months. Time to union in group A was achieved in 14 (93.3%) patients, within 16

Complications	Group A (n=15) No. (%)	Group B (n=15) No. (%)
Wound infection	1 (6.7%)	1 (6.7%)
Stiff elbow and wrist	1 (6.7%)	-
Radial nerve palsy	1 (6.7%)	1 (6.7%)
Non union of lateral condyle	1 (6.7%)	-
No complication	11 (73.3%)	13 (86.7%)
p 0.086		

Table II: Final Outcome (Jupitar et al ¹¹ Criteria)

	Group A (n=15) No. (%)	Group B (n=15) No. (%)
Excellent	-	2 (13.3%)
Good	6 (40%)	11 (73.3%)
Fair	7 (46.7.0%)	2 (13.3%)
Poor	2 (13.3%)	-
p 0.001		

weeks, while one (6.7%) patient got non union of lateral condyle. In group B, all the 15 (100%) patients achieved union of the fracture site at the end of 16 weeks. Table II summarizes the final outcome.

DISCUSSION:

Management of intercondylar and supracondylar fractures of distal humerus has always been a serious problem.¹² Being relatively uncommon the problem is accentuated because individual surgeon does not come across too many of them to accumulate sufficient experience to critically evaluate the results. Recommendations for treatment greatly vary ranging from conservative to full reconstruction of the joint. In case of intra-articular comminution adequate reconstruction of articular surface is very difficult and may need total elbow arthroplasty in physiologically older individuals.¹³ Critics of open reduction argue that additional surgical trauma and the inherent difficulty in stabilizing the small intra articular fragments will lead to added fibrosis and a less than satisfactory outcome.^{7,14} Initial attempts at open reduction and internal fixation failed to provide rigid fixation and supplemental splint immobilization was required to minimize the risk for hardware failure with early motion.^{4,8}

The inter-condylar position of the fracture has been usually secured with screws, appropriate to the size of the fragments and their alignment. Multiple Kirschner wires are also used for fixation.¹⁵ Locking plates are preferred in case of osteoporotic bones.¹⁶ Dual plate has been used by several authors and seems to provide the most secure fixation.¹⁷ The recommendation of the AO group are for placement of semi-tubular plate medially and 3.5 mm reconstruction plate postero-laterally to achieve the technical objectives.¹⁸

Restoration of anatomy and early range of motion of elbow is the goal of operative treatment of fractures of distal humerus in adults. We found the optimal exposure with posterior approach with intra-articular trans-olecranon (Chevron) osteotomy.³ This is in contrast to the Van Gorder approach in which the triceps aponeurosis is divided and repaired

subsequent to osteosynthesis.¹⁹ The range of motion gained in dual plate fixation was better than single plate fixation.

The restoration of articular surface was achieved far better, in group with dual plates. There was no significant difference in healing time between the two groups and was about 16 weeks. When final outcome was compared using Jupitar scoring system it was found that results were excellent to good in 13 (86.6%) cases and poor in 2 (13.3%) cases where dual plate was used, while in single plate fixation the excellent to good results were in 6 (40%) cases and fair to poor in 9 (60%) cases. P value was 0.001. The results of this study showed that dual plate fixation in inter/supracondylar fracture has better outcome as compared to single plate fixation.

There was no difference in infection rate and radial nerve injury in both the groups. The only difference was a case of nonunion of lateral condyle and one case of stiff elbow and wrist in single plate fixation. In this study the mean age of the patients in group A was 37.8 years and in group B 42.8 years. As compared with the study of Mehboob and Hussain where mean age of the patients was 33.2 years in group A and 36 years in group B, which is comparable with our study.²⁰

In our study the mean operation time in group A and B were 120 minutes and 130 minutes respectively, which is a little longer than other studies.¹⁸

CONCLUSION:

In supracondylar and intercondylar fractures of humerus dual plate fixation gives superior results as compared to single plate fixation.

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