ORIGINAL RESEARCH

A clinical study of bicolumnar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma: A tertiary care centre

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ABSTRACT

Background: The study was conducted to evaluate the role of bi-columnar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma. **Material and methods:** A cohort of 20 patients presenting with distal humeral fractures underwent treatment via open reduction and internal fixation utilizing bicolumnar plating through an extensor mechanism-sparing paratricipital approach. The study participants received open reduction and internal fixation with bicolumnar plating, and intraoperative assessments were conducted to monitor blood loss, fracture reduction, and articular continuity using an image intensifier (C-arm). Postoperative follow-up occurred at one month, two months, and six months, during which clinical evaluations were performed using the Mayo Elbow Performance Score at each visit. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** A total of 20 patients were evaluated. Mean age of the patients was 43.5 years. Majority proportion of patients were males. On six months follow-up, excellent result was seen in 90 percent of the patients while good and fair results were seen in 5 percent of the patients each. **Conclusion:** The extensor mechanism-sparing paratricipital approach represents a superior alternative for addressing distal humeral fractures in adults; however, olecranon osteotomy remains the gold standard for AO type C3 fractures. This paratricipital technique effectively preserves the triceps and extensor mechanism, facilitating earlier mobilization.

Keywords: Extensor, Paratricipital, Humerus

INTRODUCTION

An intraarticular distal humerus fracture (AO type 13C) is a challenging condition for orthopedic surgeons. These fractures demand technically difficult operative treatment, often with a relatively high morbidity.[1] It is troublesome to choose an approach for intraarticular distal humerus that provides easy access for reduction and fixation of fracture with minimal soft tissue and extensor mechanism disruption.[2,3]

Conventionally, intraarticular distal humerus fractures have been managed operatively using various surgical techniques, including olecranon osteotomy, triceps reflecting and splitting approaches. These approaches are often associated with complications, such as delayed union or nonunion at the osteotomy site, prominence of the implant, triceps weakness, wound dehiscence, triceps avulsion, delayed mobilization, and failure to gain early elbow function.[4-6]

The ideal approach for open reduction and internal fixation (ORIF) of intraarticular fractures of the distal humerus is still a topic of debate. Olecranon osteotomy through a posterior approach has been the gold standard for intraarticular fractures of distal humerus.[7,8] However, reconstruction of osteotomy may lead to delayed union, nonunion, and prominence of implant, which may require additional surgery. Similarly, a triceps-splitting approach does not expose the articular surface adequately compared with other approaches as shown by Wilkinson and Stanley in their cadaveric study; this approach has a further disadvantage of direct muscle trauma leading to fibrosis and damage to intermuscular nerve branches, which can cause muscle weakness.[9,10] All

these problems can be avoided by a paratricipital, "two-window" approach. As this approach utilizes a relatively bloodless plane and avoids direct trauma to the triceps muscle, it may limit the scar formation and reduce triceps muscle dysfunction postoperatively.[10]This study was conducted to evaluate the role of bi-columnar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma.

MATERIAL AND METHODS

A cohort of 20 patients presenting with distal humeral fractures underwent treatment via open reduction and internal fixation utilizing bicolumnar plating through an extensor mechanism-sparing paratricipital approach. The outcomes of these cases were systematically analyzed. Diagnostic evaluations included elbow X-rays, which were subsequently assessed. The fractures were categorized according to the AO classification system. Initial management involved immobilization of the fracture with an above-elbow slab extending to the mid-arm, after which patients were transferred to the ward with the affected limb elevated. The study participants received open reduction and internal fixation with bicolumnar plating, and intraoperative assessments were conducted to monitor blood loss, fracture reduction, and articular continuity using an image intensifier (C-arm). Postoperative follow-up occurred at one month, two months, and six months, during which clinical evaluations were performed using the Mayo Elbow Performance Score at each visit.All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

A total of 20 patients were evaluated. Mean age of the patients was 43.5 years. Majority proportion of patients were males. On six months follow-up, excellent result was seen in 90 percent of the patients while good and fair results were seen in 5 percent of the patients each.

Table 1: Demographic data

Variable	Number	Percentage
Mean age (years)	43.5	
Males	13	65
Females	7	35

Table 2: Comparison of Mayo elbow performance score

MEPS	Number	Percentage
Excellent	18	90
Good	1	5
Fair	1	5
Poor	0	0
Total	20	100

DISCUSSION

Adequate exposure of the articular surface of the distal humerus and elbow joint is required for operative stabilization of bicolumnar distal humerus fractures. The transolecranon approach, which provides complete posterior visualization and access to the distal humerus, is commonly used. Nevertheless, an olecranon osteotomy and other extensor mechanism-disrupting approaches have risks and possible complications. Alternative exposures have been described primarily for total elbow arthroplasty, but these involve extensive and potentially devascularizing dissections.[11]In extra-articular (OTA type A) and simple articular distal humeral fractures with simple or multifragmentary metaphyseal involvement (OTA type C1 and C2), extensile approaches may not be necessary. For these fracture patterns, an alternative exposure is the extensor mechanism-sparing paratricipital posterior approach to the distal humerus through a midline posterior incision. This approach avoids an osteotomy and mobilizes the triceps and anconeus muscle off the posterior humerus and the intermuscular septae and provides adequate exposure for open reduction and internal fixation.[11]This study was conducted to evaluate the role of bi-columnar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma.

A total of 20 patients were evaluated. Mean age of the patients was 43.5 years. Majority proportion of patients were males. On six months follow-up, excellent result was seen in 90 percent of the patients while good and fair results were seen in 5 percent of the patients each.Yadav V et al (2016)[12] presented the functional outcome of intraarticular distal humerus fracture fixation using a triceps-sparing paratricipital approach which allows early elbow mobilization and preserving triceps strength. Twenty-five patients with intraarticular distal humerus fracture were operated using triceps-sparing paratricipital approach with orthogonal plate construct. There were 16 male and 9 female patients and average age was 42.16 years (range 23-65 years). The mechanism of injury was fall from height (n = 8), road traffic accident (n = 13) and ground level fall (n = 4). Clinical, radiological, and functional assessment with Mayo Elbow Performance Index (MEPI) were obtained at follow up period. All fractures united primarily. At the mean follow up of 13.58 months (range 6-22 months), mean elbow flexion was 121.08° (range 94°–142°) and mean motion arc was 114.92°(range 65°-140°). The mean MEPI score was 94.40 points (range 70–100) with 17 excellent, five good, and three fair results. The mean flexion deformity or extension loss was 6.16° (range 5°–15°). Open reduction and internal fixation of intraarticular distal humerus fractures with triceps-sparing paratricipital approach provide adequate exposure with no adverse effect on triceps muscle strength and allows early initiation of elbow motion. They analyzed, age and injury to surgical interval with

relation to functional range of elbow using Z-test which is insignificant.Kural C et al (2017)[13] evaluated functional results and complication rate of patients who underwent medial-dorsolateral plating for intra-articular distal humeral fracture (Müller AO type 13C). Twenty-four patients (14 men, 10 women; mean age: 47 years) with AO type 13C distal humerus fracture were included in the study. Mean follow-up time was 28 months. Nine patients were in 13C1 subgroup, according to AO classification system, 11 patients were categorized as 13C2, and 4 patients were 13C3. Final follow-up assessment of outcomes included Broberg and Morrey radiological criteria; Mayo Elbow Performance Score, disabilities of the Arm, Shoulder and Hand (DASH) Outcome Measure, score based on Jupiter criteria; and range of motion (ROM) values. The mean carrying angle of operated elbows was 11.37° (range: 0-20°). According to Broberg and Morrey radiological criteria, 14 patients, had radiologically normal elbow, 4 patients had mild change, 3 patients had moderate change, and 3 patients had severe radiological change. Mean DASH score was 21.91 (range: 0-50), and mean Mayo rating was 83.37 (range: 55-100). Jupiter criteria evaluation revealed excellent results in 10 cases, good in 12, and fair results in 2. One patient with fair result had open fracture, and the other had previous hemiparesis in the same extremity. There was no instance of nonunion observed at follow-up. Osteosynthesis with medial-dorsolateral plating is a safe and effective method for the treatment of intra-articular fractures of distal humerus.

CONCLUSION

The extensor mechanism-sparing paratricipital approach represents a superior alternative for addressing distal humeral fractures in adults; however, olecranon osteotomy remains the gold standard for AO type C3 fractures. This paratricipital technique effectively preserves the triceps and extensor mechanism, facilitating earlier mobilization.

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