ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 08 | August - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION OF RESULTS OF DIFFERENT APPROACHES OF TREATMENT OF INTRAARTICULAR FRACTURE OF THE DISTAL HUMERUS AT A TERTIARY CARE CENTER IN BIHAR.

Orthopedics

Dr. Uday Prakash Senior Resident, Department of Orthopedics, DMCH, Darbhanga.
Dr. Nand Kumar* Professor, Department of Orthopedics, DMCH, Darbhanga. *Corresponding Author

ABSTRACT

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. **Methodology:** This prospective study was based on a series of 32 consecutive patients who presented with intercondylar intraarticular fracture of distal humerus in the orthopedic OPD of Darbhanga Medical College, Bihar, during the study period that is from Dec 2019 to Jan 2021. **Results:** On final follow up, the mean MEPS was 85.7 points out of 100 (range 62–100) with a mean elbow flexion of 119.2° (range 89°–150°). The mean deficit in extension was 17° (range 6°–32°). There were no final limitations in pronation and supination in any cases. All elbows were stable at followup with no difference in radial or ulnar stress opening in comparison to the contralateral side, a negative pivot shift test and a negative moving valgus stress test. **Conclusion:** Open reduction internal fixation still being considered the gold standard for treatment of distal humerus fractures, parallel and perpendicular plating have been showing similar clinical results. Total elbow arthroplasty has proven itself to be an adequate option for treatment in older patients especially when suffering from low bone density.

KEYWORDS

Intraarticular Fracture, Distal 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.

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 [2 - 7]

In 1972, Alonso-Llames described a “two-window” approach to treat supracondylar fractures in children where closed reduction had failed [8]. In 2003, this approach was expanded by Schildhauer et al [9] for the treatment of distal humeral fractures with intraarticular extension. They described an extensor mechanism-sparing, paratricipital approach with bicolumnar visualization through medial and lateral windows, with the triceps insertion intact on the olecranon. There is limited literature focusing on the paratricipital approach to treat distal humerus fractures [9 - 13].

We conducted a prospective, observational study on patients with intraarticular distal humerus fractures treated with the triceps-sparing paratricipital approach, with the key aim of assessing the clinical and functional outcome in the Indian population.

METHODOLOGY

This prospective study was based on a series of 32 consecutive patients who presented with intercondylar intraarticular fracture of distal humerus in the orthopedic OPD of Darbhanga Medical College, Bihar, during the study period that is from Dec 2019 to Jan 2021.

Data Collection

Preoperative data collection was done by detailed history taking and systematic clinical examination of injured elbow. Preoperative radiographs in two planes (antero-posterior (AP), and lateral views) were obtained to analyze the fracture. Fractures were classified according to the preoperative X-rays and the intraoperative findings. Post-operative data was collected in form of Mayo elbow performance score (MEPS), radiographical assessment and onset of any complication. A score of 90-100 was considered to be excellent, 75-89 as good, 60-74 as fair and less than 60 as poor.

Various Surgical Approach Adopted

1. Olecranon osteotomy

Olecranon osteotomy (Chevron osteotomy) is the traditional standard approach to the distal humerus and elbow joint [14]. A V-shaped olecranon osteotomy is performed, creating a wide exposure of the articular surface of the distal humerus making reduction and internal fixation of complex fractures feasible [15].

2. Triceps-reflecting (elevating) approach (Bryan-Morrey)

Avoiding the abovementioned complications of the olecranon osteotomy, Bryan and Morrey established in 1982 the triceps-reflecting approach. The approach being basically posterior, the triceps mechanism is reflected from medial to lateral from the olecranon and the ulnar periosteum and in the end of the procedure is being resuturedtransosseously. This approach allows the surgeon a widespread view of the joint without olecranon osteotomy and is used for arthroplasty and internal fixation of intraarticular fractures [7].

3. Triceps-sparing approach

After a posterior midline incision, a window on the lateral side of the triceps is created by elevating it off the posterior border of the intermuscular septum and posterior humerus. The radial nerve is being identified and mobilized for its protection. Not detaching the triceps from its insertion, the view of the distal articular surface is relatively impaired. Indication is open reduction internal fixation (ORIF) in extra-articular or simple articular fractures [16].

Inclusion And Exclusion Criteria

The criteria for inclusion were: patients aged more than 18 years, with close and open grade 1 (according to Gustilo-anderson classification) intraarticular distal humerus fractures and fracture dislocations classified intercondylar type B and C according to the AO classification system. Exclusion criteria were: patient below age of 18 years, open grade 2 & 3 fracture, supracondylar extraarticular fractures (AO type A), previous operative treatment because of the fracture (external fixation excluded), history of primary or metastatic tumors with pathologic fracture and those who were unfit for major surgery. Mean follow-up up to the final interview was 10 months (from 6 to 20 months). All patients were available at the time of last follow up.

Post-operative Care

Patients were instructed to keep the limb elevated and move their fingers and elbow joint. Early controlled passive mobilization of the elbow was started 48 h postoperatively after removal of the drainage. After discharge, patients completed a physical therapy program with passive and active mobilization of the joint in full range of motion. Suture/staples were removed within the 9th to 16th postoperative day and check X-ray in anteroposterior and lateral views were obtained.

RESULTS

On final follow up, the mean MEPS was 85.7 points out of 100 (range 62–100) with a mean elbow flexion of 119.2° (range 89°–150°). The

mean deficit in extension was 17° (range 6°–32°). There were no final limitations in pronation and supination in any cases. All elbows were stable at followup with no difference in radial or ulnar stress opening in comparison to the contralateral side, a negative pivot shift test and a negative moving valgus stress test.

The mean functional result of the MEPS was 23.54 points of 25. Majority of patient (26 out of 32) were able to do all 5 functions included in mayo elbow performance score (daily hygiene work by themselves, comb their hair by themselves, feed by their own, put on their shirts by their own and put on their shoes by their own). The majority of patients (28/32) reported no pain at all, eleven patients reported mild pain over 24 h and usual activities of daily living and working. Based upon Mayo Elbow Performance Score, there were 23 patients (71.2%) with a mean excellent result (90–100), 5 patients (15.7%) with good (75–89), 2 patients with a fair result (60–74) and 2 patients with poor result. (below 60).

Radiographic Assessment

Union was achieved completely in 30 patients (93.8%) at final follow up. Average time required for union was 15.6 weeks (range 11. –23.7). 1 fracture remained as painless nonunion. The patients did not require reoperation in either of these cases. There were no cases of primary malposition or secondary dislocation. All osteotomy of the olecranon underwent consolidation as well.

Complications

There have been no complications with respect to the fixation of the implants and the retention of the fragments in anatomical position. Apart from 1 fracture nonunion, other complication was 1 ulnar neurapraxias with altered sensation in fourth & fifth finger. These recovered fully during follow up without any associated sequelae. Four patients had superficial infection over surgical wound, all were treated successfully by oral antibiotics & local dressing wound care. In 3 patients, implants were clinically prominent without causing any discomfort.

Comparison Of Three Surgical Approach

The outcome from the various three surgical approach adopted during the course of the study was done using Kruskal Wallis method. The outcome considered for this comparison of surgical approaches was their MEPS post-operative. There was no significant difference found between the three methods. This may be attributed to a very limited sample size.

DISCUSSION

Olecranon osteotomy has been considered the gold standard, providing excellent exposure and avoiding problems associated with triceps-splitting techniques, including disruption of the extensor mechanism, fibrosis, and intramuscular nerve injuries [15, 17, 18]. On the other hand, osteotomies can be complicated with delayed union, nonunion, and prominent hardware, thereby necessitating further surgery [17, 19]. In our study, we found 3 patients having clinically prominent & palpable implant without causing any discomfort.

Reising K et al [20] carried out a study of 40 patients with mean age of 60.5 years with distal humerus intraarticular fractures treated by open reduction & internal fixation using a novel, perpendicular, fixed-angle distal Humerus Plate (DHP, Synthes) system with a mean follow-up of 11 months. 'Good' or 'excellent' results were observed in 29/40 patients. Mean MEPS was 84 and Mean ROM was 100°. Complications comprised two superficial wound infections, two cases of heterotopic ossification, one case of delayed union and five cases of transient ulnar neuropathy. Implant failure was observed twice in one patient.

S. Greiner et al [21] published the results of open reduction and internal fixation of 14 distal humerus intraarticular fracture using anatomically preshaped angular distal humerus plate (12C types and 2B type according to AO CLASSIFICATION SYSTEM) with mean age of 55.2 years. Clinical MEPS results were good to excellent with a mean of 91+/−11.7 points. Mean flexion was 121+/−20.9, mean extension deficit was 17.9° +/− 10.3. Radiographically, complete union was achieved in all patients. There were no cases of primary malposition or secondary dislocation. Complications were 1 delayed union after olecranon osteotomy and 2 transient ulnar nerve irritations.

CONCLUSION

Open reduction internal fixation still being considered the gold standard for treatment of distal humerus fractures, parallel and perpendicular plating have been showing similar clinical results. Total elbow arthroplasty has proven itself to be an adequate option for treatment in older patients especially when suffering from low bone density. More recently established less invasive approaches to the elbow joint like the triceps-reflecting and triceps-sparing approach have successfully challenged the traditional olecranon osteotomy with low complication rates and good overview of the articular surface.

Evaluation of literature showed high complication rates for internal fixation in patients with osteoporosis highlighting the need of supplemental systemic antiosteoporotic treatment. Future studies will have to further evaluate the correlation between the bone healing process and such treatment.

Conflict of interest – None of the authors declared any conflict of interest

Funding – Self funded

Ethical Clearance – obtained from the institutional ethics committeeanddetailed Informed consent of the patient or relatives was taken prior to the surgery.

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