Section: Orthopaedics

Original Research Article

MANAGEMENT OF DISTAL HUMERUS FRACTURES BY THE TRICEPS-SPARING APPROACH: A PROSPECTIVE STUDY

Kalaiyarasan Thamizharasan[1], Aravinth Thamizholi[1], Vijay Karthik P G[1], Vetri Selvan K[2], Praveen Kumar P J[2]

[1]*Assistant Professor, Government Stanley Medical College, Chennai, India*
[2]*Resident, Government Stanley Medical College, Chennai, India*

Received *: 04/01/2025*
Received in revised form *: 09/02/2025*
Accepted *: 25/02/2025*

Corresponding Author:
Dr. Kalaiyarasan Thamizharasan, Assistant Professor, Government Stanley Medical College, Chennai, India.
Email: artsking2003@gmail.com

DOI: 10.70034/ijmedph.2026.1.447

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (1); 2589-2592

ABSTRACT

Background: Distal humerus fractures are complex injuries that require stable fixation to permit early elbow mobilization and optimal functional recovery. Although the olecranon osteotomy approach offers excellent visualization of the articular surface, it is associated with complications such as nonunion, implant irritation, and compromise of the extensor mechanism. The triceps-sparing paratricipital approach provides an alternative that preserves triceps integrity while allowing adequate exposure for fracture fixation.

Materials and Methods: A prospective observational study was conducted on 16 adult patients with distal humerus fractures treated using the triceps-sparing paratricipital approach between March 2022 and November 2024 at a tertiary care teaching hospital. Patients with closed fractures or Gustilo–Anderson Grade I open fractures with age above 18 years were included. Open reduction and internal fixation was performed using bicolumnar plating. Functional outcomes were assessed using the Mayo Elbow Performance Score (MEPS), and fracture union was evaluated radiologically.

Results: The mean age of the patients was 41 years, with a male predominance. Road traffic accidents were the most common cause of injury. Eight fractures were extra-articular and five were intra-articular. Radiological union was achieved in all patients within 12–18 weeks. Functional assessment showed excellent MEPS in 1 patients and good outcomes in two patients. The mean elbow flexion arc achieved was 127.7°. Complications were minimal, including transient ulnar nerve neuropraxia in one patient and symptomatic plate prominence in two patients.

Conclusion: The triceps-sparing approach offers reliable fixation with preservation of triceps function and enables early rehabilitation. It is a safe and effective alternative to olecranon osteotomy for selected distal humerus fractures.

Keywords: Distal humerus fracture, Triceps-sparing approach, Paratricipital approach, Elbow fracture, Internal fixation.

INTRODUCTION

Distal humerus fractures account for a small proportion of adult fractures but are associated with significant morbidity if not managed appropriately. The intricate anatomy of the distal humerus, limited bone stock, and close proximity to neurovascular structures make surgical treatment technically demanding.[1-3]

Open reduction and internal fixation remains the preferred treatment for displaced distal humerus fractures, aiming to restore articular congruity and achieve stable fixation to allow early mobilization.[4] The posterior olecranon osteotomy approach has traditionally been considered the gold standard due to excellent articular exposure; however, it is associated with complications such as delayed union, nonunion, implant prominence, and triceps dysfunction.[5]

The triceps-sparing paratricipital approach, first described by Alonso-Llames[1], provides exposure to the distal humerus through medial and lateral windows without detaching the triceps insertion. Preservation of the extensor mechanism may reduce postoperative morbidity and improve functional recovery. This study evaluates the functional and radiological outcomes of distal humerus fractures managed using the triceps-sparing approach.

MATERIALS AND METHODS

This prospective observational study was conducted at Government Stanley Medical College and Hospital from March 2022 to November 2023. 16 adult patients with distal humerus fractures were included after obtaining informed consent.

Inclusion Criteria

- Age ≥18 years
- Closed fractures or Gustilo–Anderson Grade I open fractures
- Displaced distal humerus fractures requiring surgical intervention

Exclusion Criteria

- Patients below 18 years of age
- Gustilo–Anderson Grade II or III open fractures
- Associated neurovascular injuries
- Pathological fractures

Preoperative evaluation included clinical assessment and standard anteroposterior and lateral radiographs of the elbow. Computed tomography was performed when required for detailed fracture assessment[6]. Fractures were managed surgically using the triceps-sparing paratricipital approach with bicolumnar plating.

Postoperatively, early elbow mobilization was initiated as tolerated. Patients were followed up at regular intervals for clinical and radiological evaluation.

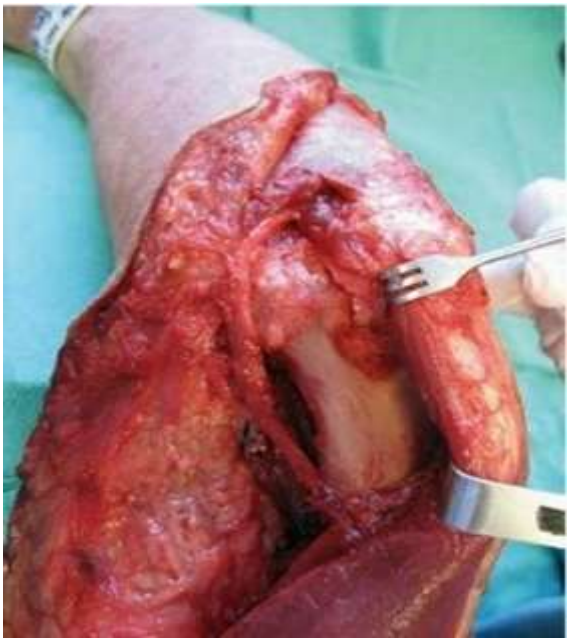

Figure 1

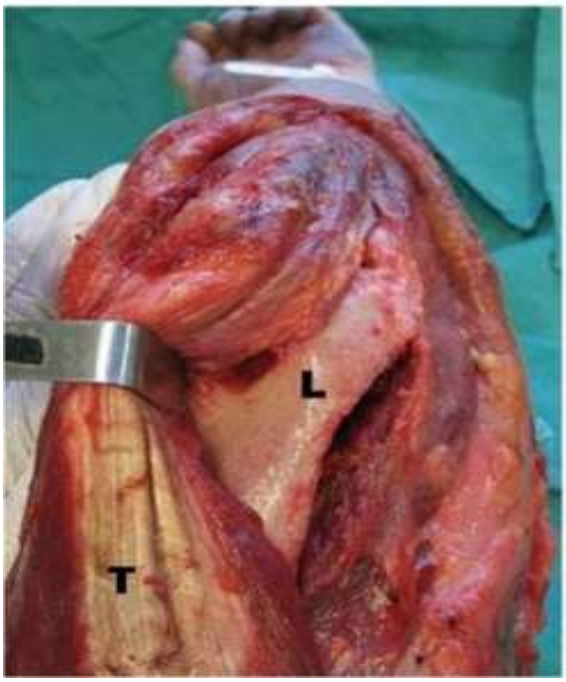

Figure 2: ?

Surgical Technique: Patients were positioned in the lateral decubitus position under general or regional anesthesia. A posterior midline incision was made, and full-thickness skin flaps were elevated. The ulnar nerve was identified, isolated, and protected throughout the procedure.

Medial and lateral paratricipital windows were developed by elevating the triceps muscle off the posterior aspect of the distal humerus while preserving its insertion on the olecranon.[2] This provided adequate exposure of both columns of the distal humerus.

After anatomical reduction of the fracture fragments, definitive fixation was achieved using bicolumnar plates placed in orthogonal or parallel configuration, depending on fracture morphology.[7] The triceps mechanism was preserved in all cases.

RESULTS

The study included 12 male and 4 female patients with a mean age of 41 years. Road traffic accidents accounted for 87% of injuries, while the remaining cases resulted from falls. 10 patients had extra-articular fractures, and 6 had intra-articular fractures. Radiological union was achieved in all patients within 12–18 weeks. Functional evaluation using MEPS showed excellent outcomes in 14 patients (87.5%) and good outcomes in 2 patients (12.5%). No fair or poor results were recorded.

The mean elbow flexion arc achieved was 127.7°, with all patients attaining a functional range of motion greater than 100°. Complications included transient ulnar nerve neuropraxia in one patient and symptomatic plate prominence in two patients. No cases of infection, implant failure, or nonunion were observed.

Table 1: Patient Demographics and Fracture Characteristics (n = 16)

Variable	Categories	No. of Cases	Percentage (%)
Sex	Male	12	75%
	Female	4	25%
Age Group	20–40 years	10	62.5%
	40–60 years	4	25%
	>60 years	2	12.5%
Side Involved	Right	9	56.25%
	Left	7	43.75%
Mode of Injury	Road Traffic Accident	14	87.5%
	Fall	2	12.5%
Fracture Type	Extra-articular	10	62.5%
	Intra-articular	6	37.5%

Table 2: Surgical and Postoperative Details

Parameter	Category	No. of Cases	Percentage (%)
Plates Used	Anatomical locking plate	6	31.25%
	Conventional non- locking plates	10	62.5%
Time to Surgery	<14 days	12	75%
	>14 days	4	25%
Fracture Union Time	12 weeks	7	43.75%
	14 weeks	7	43.75%
	16–18 weeks	2	12.5%

Table 3: Functional Outcome (MEPS) and Range of Motion

Outcome Metric	Number of Patients	Percentage (%)
MEPS Score: Excellent (>90)	14	87.5%
Good (75–89)	2	12.5%
Fair or Poor	0	0%
ROM (Flexion Arc >100°)	16	100%
ROM (Flexion Arc ≤100°)	0	0%
Pain: None	14	87.5%
Pain: At extreme ROM	2	12.5%

Figure 3: Pre op X ray

Figure 4: Post op X ray

Figure 5: one year follow up

Figure 6: Post Implant Exit

Figure 7: Clinical picture

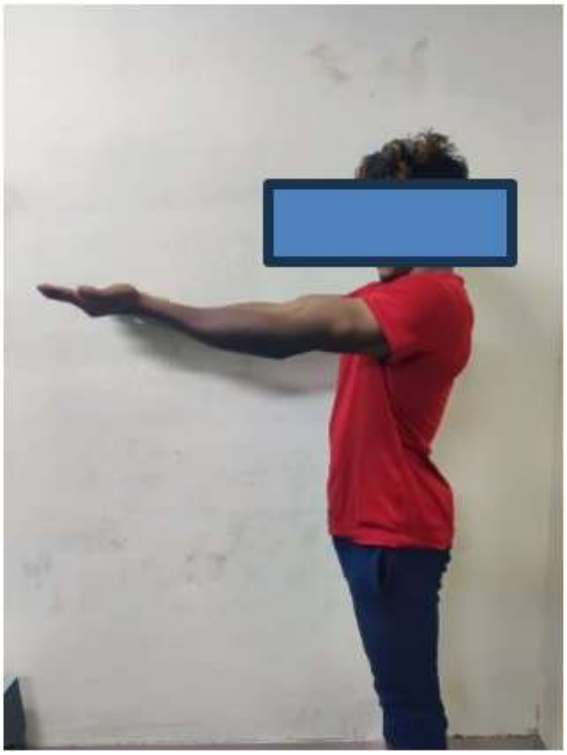

Figure 8: Clinical picture

DISCUSSION

Stable fixation and early mobilization are critical for achieving favorable outcomes following distal humerus fractures[8]. Although olecranon osteotomy provides excellent exposure, reported complication rates of up to 20% have been documented, including nonunion, infection, and implant- related irritation.[5] The triceps-sparing paratricipital approach preserves the extensor mechanism, facilitating early rehabilitation and reducing approach-related morbidity.[1,2] In the present study, this approach resulted in reliable fracture union and excellent functional outcomes, particularly in extra-articular and simple intra-articular fractures.

The mean elbow flexion arc achieved in this study is comparable to that reported in other series utilizing triceps-preserving techniques.[9] However, complex comminuted intra-articular fractures (AO/OTA type C3) may require extensile exposure to achieve anatomical reduction, and surgeons should be prepared to convert to an olecranon osteotomy when necessary.[10]

CONCLUSION

The triceps-sparing approach is a safe and effective technique for the management of distal humerus fractures. Preservation of the triceps mechanism allows early mobilization, reliable fracture union, and excellent functional outcomes with minimal complications. This approach represents a valuable alternative to olecranon osteotomy in appropriately selected cases.

REFERENCES

1. Alonso-Llames M. Bilaterotricipital approach to the elbow. Acta Orthop Scand. 1972;43(6):479–490.
2. Schildhauer TA, Nork SE, Mills WJ, et al. Extensor mechanism-sparing paratricipital posterior approach to the distal humerus. J Orthop Trauma. 2003;17(5):374–378.
3. Jupiter JB, Mehne DK. Fractures of the distal humerus. Orthopedics. 1992;15(7):825–833.
4. Nauth A, McKee MD, Ristevski B, et al. Distal humeral fractures in adults. J Bone Joint Surg Am. 2011;93(7):686–700.
5. Ring D, Gulotta L, Chin K, et al. Complications of olecranon osteotomy for exposure of fractures of the distal humerus. J Shoulder Elbow Surg. 2004;13(3):315–317.
6. Robinson CM, Hill RMF, Jacobs N, et al. Adult distal humeral metaphyseal fractures: epidemiology and results of treatment. J Orthop Trauma. 2003;17(1):38–47.
7. Athwal GS, Hoxie SC, Rispoli DM, et al. Precontoured parallel plating of AO/OTA type C distal humerus fractures. J Orthop Trauma. 2009;23(8):575–580.
8. McKee MD, Wilson TL, Winston L, et al. Functional outcome following surgical treatment of intra-articular distal humeral fractures through a posterior approach. J Bone Joint Surg Am. 2000;82(12):1701–1707.
9. Ali AM, Mencia MM, Leach R, et al. Treatment of intercondylar fractures of the distal humerus using a triceps-sparing approach. Acta Orthop Belg. 2008;74(6):747–752.
10. O'Driscoll SW. Optimizing stability in distal humeral fracture fixation. J Shoulder Elbow Surg. 2005;14(1 Suppl S):186S–194S.