

Case Series

Para-tricipital approach for extra articular fractures of the distal humerus: a case series

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ABSTRACT

Extra-articular fractures of the distal humerus are frequently managed surgically as these fractures are often unstable and have associated radial nerve injury. Different surgical approaches can be used to fix this fracture. We operated on a series of 9 patients with extra-articular fractures of the distal humerus utilizing the para-tricipital approach. Clinical outcomes were assessed by Mayo elbow performance score and visual analog scores. Radiological outcomes were assessed by plain radiographs. Time to union was an average of 4.2 months. Mean range of motion achieved at final follow-up was 122.5°. Mean Mayo elbow performance score was 92.4. Excellent clinical results can be achieved by utilizing para-tricipital approach in extra-articular fractures of the distal humerus. Besides providing adequate exposure for rigid fracture fixation, this approach prevents the morbidity associated with triceps injury.

Keywords: Para tricipital, Triceps sparing, Adequate exposure, VAS, Extra articular, Humerus fracture

INTRODUCTION

Incidence of distal humerus fractures in adults is 2-6% of all humeral fractures with majority being intra-articular.¹ These fractures have a bimodal incidence. These are often seen resulting from high velocity trauma in young persons. Other age group presenting with these fractures are elderly osteoporotic patients. In these it often results from trivial trauma and falls. Fractures in the distal 1/3 of the humeral shaft are oftentimes complex and unstable. Conservative treatment is difficult due to the unwieldy prolonged immobilisation in a brace notwithstanding the fact that maintenance of reduction and acceptable alignment is often unsuccessful.² The course of radial nerve traversing from posterior to anterior in the distal 1/3 of humerus close to the bone makes it just vulnerable to be caught inside the fracture fragments causing radial nerve palsy (RNP) manifesting as wrist drop. The incidence of such traumatic RNP has been reported to the tune of 22%.³ Surgical management is also warranted in such cases of RNP.⁴

Surgical management of extra-articular distal humerus fractures (EADHFs) is not without challenges. Some of them are: 1) exploration (and repair) of radial nerve, 2) dissection and protection of ulnar nerve, 3) small surgical window with extensor mechanism sparing approaches, 4) complexity of fractures and poor bone quality in elderly patients.

Many approaches have been described to approach EADHFs. These are combined medial and lateral approach, para-tricipital, triceps reflecting anconeus pedicle approach (TRAP), lateral approach and triceps splitting approach. In addition to compromising extensor mechanism, the limitation of triceps splitting approach is that only a little of the lateral condyle area can be exposed especially while placing extra-articular plates.⁵

Regarding choosing an appropriate surgical approach in EADHFs, there is not much published literature in English language. We used para-tricipital approach to stabilise these fractures. This not only eased fracture reduction and

plate placement but also allowed exposure of radial nerve. We conducted this study to assess the outcomes of this approach in EADHFs.

METHODS

This study was conducted at SKIMS medical college hospital from Feb 2021 till July 2022. Patients were followed till fracture healing or 6 months whichever was earlier. Patients more than 18 years of age and all sexes were included. Patients with pathological fractures, open fractures and other associated fractures in the ipsilateral limb were excluded. A total of 9 cases were operated. There were 6 male and 3 female patients with mean age of 29. 5 patients sustained trauma by MVA, 2 from fall from significant height and 2 from trivial trauma. All patients were operated by senior registrars. Para-tricipital approach was used in all the cases. Traumatic radial nerve palsy was present in 2 cases. A surgical plan was made one day before surgery keeping into consideration fracture geometry, placement of plates and radial nerve exploration/repair needed.

Surgical technique

No tourniquet was used as it hampers proper draping and exposure. On a normal fracture table patient were positioned in lateral decubitus and arm was supported on cushions. An 8-10 cm long midline posterior incision was given. Deep flaps were raised on either side. Ulnar nerve was dissected and protected. Triceps was detached from intermuscular septum by blunt finger dissection. An interval was developed laterally by splitting along the lateral head of the triceps and fracture was exposed. Fractures were fixed either by a single plate or dual plate depending on pattern of fractures. Radial nerve was explored in all cases. 1gram of vancomycin powder was used locally in all cases after wound wash. Wound was closed in layers over a suction drain after achieving hemostasis. A long-arm backs lab was given for a period of 24 hours. Postoperatively at 24 hours, suction drain was removed and anti-septic dressings were applied. All patients were encouraged to participate in a supervised physiotherapy regimen to regain elbow ROM.

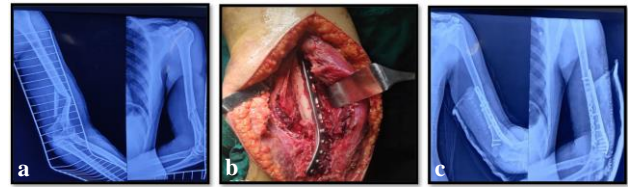


Figure 1: (a) Pre-operative X-ray, (b) intra-operative clinical picture showing exposure of fracture using para-tricipital approach, (c) immediate post-operative X-ray showing rigid anatomic fixation using EADHP and 3.5 recon plate.

RESULTS

A total of 9 patients were operated on. Mean time from injury to operation was 4.6 days. Mean duration of operation was 2.1 hours. Mean blood-loss was 290 ml. In two patients with pre-operative radial nerve palsy, one patient had complete transection of radial nerve at the fracture site on exploration. End-to-end repair of radial nerve was done by plastic surgeon after fracture fixation. The other patient had contusion over a course of 6 cm of radial nerve. On a final follow-up of 6 months, the weakness was partially recovering. Anatomical reduction could be achieved in all cases. In 6 patients only a single posterolateral extra-articular plate was enough to stabilize the fractures. An additional medial-sided 3.5 recon plate was used in 2 cases. Ulnar nerve was carefully mobilized and protected throughout the procedure in all cases and was left *in situ* without anterior transposition. There was no iatrogenic radial nerve injury. Mean range of motion (ROM) achieved at 6-months follow-up was 122.5°. Mean VAS score was 1.4. Two patients had superficial surgical site infections (SSSIs) which resolved with culture guided antibiotics and daily dressings. One case had ulnar nerve paresthesias which resolved over a period of 2 months. One patient had screw backout at 2 months’ follow-up which required early removal. Orthogonal x-rays were obtained at 2 weeks, 3 months and 6 months. Union was assessed by all the three operating surgeons. All fractures healed at an average time of 4.2 months. At final follow-up all patients resumed their activities of daily living.

Table 1: Demographic, injury patterns and clinical results of all patients.

S. no.	Age	Sex	Mechanism of injury	Fracture geometry	RNP	Fixation	ROM	VAS Scores	Complications
1	27	F	FFH	Spiral	Yes	1EADHP+3.5 Recon	0-120	2	SSSI
2	34	M	MVA	SO	-	1 EADHP	5-110	1	-
3	20	M	MVA	LO	-	1 EADHP	0-125	3	2 distal screw backout
4	40	F	MVA	SO	-	1 EADHP	10-135	1	SSSI
5	68	M	Hit by animal	Comm	-	1 EADHP+ 3.5 Recon	0-140	0	-
6	31	M	FFH	Comm	Yes	1 EADHP	0-145	0	-
7	29	M	MVA	Spiral	-	1 EADHP	0-90	4	-
8	54	F	Fall from stairs	SO	-		15-145	0	Ulnar N palsy

MVA: motor vehicle accident, FFH: fall from height, LO: long oblique, SO: short oblique, Comm.: comminuted, EADHP: extra-articular distal humeral plate, SSSI: superficial surgical site infectio

DISCUSSION

Surgical intervention is favoured in EADHFs as it allows regaining early range of motion and acceptable alignment.² Surgical treatment, though demanding, also diminishes the possibility of late union or nonunion.⁶ Among the surgical challenges are proper exposure of fracture, small distal fragment, comminution, osteoporotic bone (in elderly patients) and risk of neurovascular compromise.

The para-tricipital approach was initially described by Alonso-llames in 1972. He made medial and lateral windows along the sides of triceps to avoid disruption of elbow extensor mechanism.⁷ Trikha et al used triceps reflecting approach in 36 cases of extra-articular distal humerus fractures and achieved mean union rate of 94.4%. Mean ROM was: flexion 122.9±23, extension 4.03±6.5.² Prasarn et al in a study of 15 cases of EADHFs utilizing triceps-splitting and modified posterior approach had excellent restoration and maintenance of reduction and alignment; no fixation failures, and 100% union at an average of 11.1 weeks.⁸ Scolaro et al in a study of 40 patients with EADHFs using triceps reflecting approach achieved union in 95% cases, with average VAS score of 1.⁹ Parmaksizoğlu in a study of 23 patients of EADHFs using lateral approach achieved 100% union.⁶

The extensor mechanism-sparing approach decreases operative time, allows an early ROM, thus minimizing minimize elbow stiffness and mitigates risks of perioperative or postoperative complications associated with other extensive approaches.¹⁰

We utilised the para-tricipital approach in all of our patients and could achieve good fracture reduction and rigid fixation and our results were comparable to other studies on EADHFs. One limitation in our study is the small study period which resulted in a small sample size. We advocate this approach in all extra articular fractures.

CONCLUSION

Excellent clinical results are obtainable by utilizing para-tricipital approach in extra-articular fractures of the distal humerus. Besides providing adequate exposure for rigid fracture fixation, this approach prevents the morbidity associated with triceps injury.

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