Original Research Article

Anterolateral surgical approach for the treatment of humeral shaft fractures

Abhishek Garg[1*], Umesh Yadav[2], Anand Gupta[3], Rahul Sharma[4], Nishan Yadav[5], Puneet Yadav[6]

[1]Senior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India
[2]Associate Prof, Department of Orthopaedics, PGIMS Rohtak, Haryana, India
[3]Fellow National Board (FNB), Department of Orthopaedics, PGIMS Rohtak, Haryana, India
[4]Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India
[5]Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India
[6]Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

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Abstract

Background: The posterior approach is the most commonly used approach for mid-shaft and distal humeral fractures. However, fixation via the posterior approach is associated with iatrogenic radial nerve palsy. The purpose of this study was to evaluate the functional outcomes of shaft humerus fracture plating with anterolateral approach. **Material and Methods**: The present retrospective study was conducted in the Department of Orthopaedics, PGIMS Rohtak and included 20 cases aged between 20-70 years, who were operated for shaft humerus fractures over last 3 years with plating by anterolateral approach. **Results:** The mean age was 42.65±12.42 with a range of 20-70 years. Mean time of fracture union was 15.65±1.82 weeks. Range of motion at elbow at final follow up was 120±15.46 degrees. 1 patient had superficial infection which was managed with intravenous antibiotics. One case of non-union with implant failure was noted in this study which was further managed by replating and bone grafting. No case of neurovascular injury post injury was reported in the present study. The mean MEPS score was 88.45±8.18. **Conclusion:** We conclude that anterolateral approach is a good approach for the treatment of humeral shaft fractures with a lower complication rate and better functional outcomes.

Keywords: Shaft Humerus fracture, Anterolateral approach, Radial nerve palsy,fracture fixation.

Introduction

Fractures of the shaft of humerus represent 1–3 % of all fractures. Humerus shaft fractures are unique in having good results with non-operative methods like hanging cast and functional brace[1,2]. However, all fractures are not amenable to conservative methods. The indications for operative treatment of the humeral shaft fractures include open fractures, segmental fractures, pathological fractures, fractures associated with vascular injuries and nerve injuries after fracture manipulation, fractures with unacceptable alignment and failure of conservative treatment[3]. Non-operative treatment requires a long period of immobilization, which carries a risk of prolonged shoulder joint stiffness and inconvenience for the patient[4]. Furthermore, non-union after conservative treatment of these fractures does occur in up to 10% of the cases, and treatment of this condition can be very difficult[5]. There is a growing interest in treating even simple humeral shaft fractures by surgical modalities in order to avoid these problems and to allow earlier mobilization and rapid return to work. Various surgical approaches have been described for internal fixation of humeral shaft fractures. The posterior approach is the most commonly used approach for mid-shaft and distal humeral fractures. However, fixation via the posterior approach is associated with iatrogenic radial nerve palsy rate of 11.5%, which is reported as the most common post-operative complication with the posterior approach[6]. Additionally, the posterior approach requires prone or lateral positioning, which might be not possible or may even be contraindicated in polytrauma patients. The anterolateral approach is becoming increasingly popular because it provides adequate exposure to proximal third and mid-shaft fractures of the humerus.

*Correspondence
Dr. Abhishek Garg
Senior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India.
E-mail: abhi.garg003@gmail.com

Additionally, some authors have found lower iatrogenic radial nerve palsy rate following fixation via the anterolateral approach compared with the posterior approach[7]. The purpose of this study was to evaluate the functional outcomes of shaft humerus fracture plating with anterolateral approach.

Material and Methods

The present retrospective study was conducted at the author's tertiary care hospital and included 20 cases aged between 20-70 years, who were operated for shaft humerus fractures over last 3 years with plating by anterolateral approach. Patients were retrospectively followed up with all their previous surgical records and radiographs. Patients were clinically examined and functional outcomes were noted. Patients with humeral shaft fractures OTA/AO type 12 based on AO classification were included in the study. Patients with age more than 70 years, patients having elbow stiffness before surgery, having congenital or acquired deformity of injured limb before surgery, pathological fractures and open fractures were excluded from the study. Informed and written consent was taken from all the participants before enrolling in the study. On presentation full demographic profile of the patient, necessary investigations and radiographs were taken in two planes, anteroposterior view and lateral view, before planning for surgical fixation. Patient is laid supine on operating table with affected limb on arm board, abducted 45-60 degrees. A curved incision is made over the lateral border of the biceps centered over the fracture site. Lateral border of the biceps muscle is identified and is retracted medially. Fascia overlying the brachialis and brachioradialis muscles is incised and intermuscular plane is developed. Brachialis and biceps are retracted medially and the brachioradialis laterally. Subperiosteal elevation of the brachialis reveals the humeral shaft underneath. The radial nerve could be identified 5 cm above the lateral condyle of the humerus as it lies between the brachialis and brachioradialis muscles. After fracture

reduction, fixation is done using 4.5 mm narrow Limited Contact Dynamic Compression Plate LCDCP/ 4.5 mm Locking Compression Plate (LCP). A posterior above elbow slab was applied at the time of surgery (Fig 1,2 and 3).

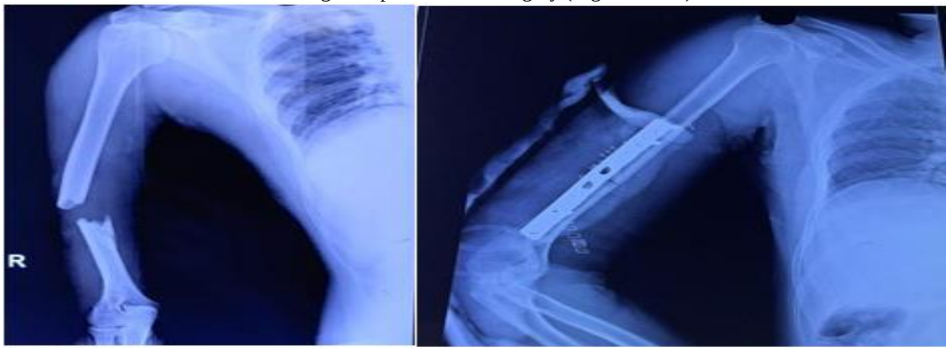

Fig 1: Showing preoperative and Postoperative X-ray of humerus plating

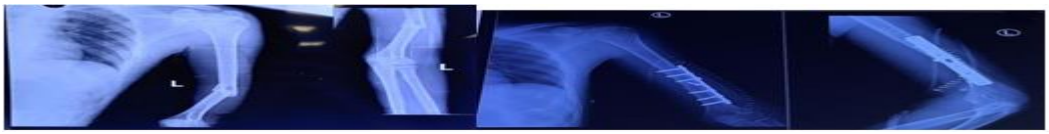

Fig 2: Showing preoperative and Postoperative xray

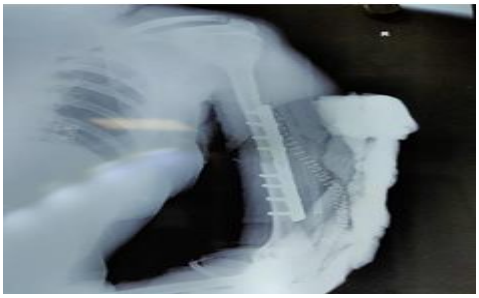

Fig 3: Showing Postoperative X-ray

Passive elbow mobilization exercise was started only 3 days after surgery while a full range of elbow exercises were started after suture removal. The functional results of elbow were assessed Mayo Elbow performance Score (MEPS) and total range of motion of elbow joint at least 6 months after surgery and patient's satisfaction based on surgical outcomes were assessed individually. Statistical analysis was done with SPSS version 16 using descriptive statistical methods including the Pearson Chi squared test and student-t test. A p-value of <0.05 was considered as statistically significant.

Results

The mean age was 42.65±12.42 with a range of 20-70 years. There were 13 males (65%) and 7 females (35%). Right side was involved in 12 patients (60%) while left side was involved in 8 patients (40%). 15 patients (75%) had Road side accident (RSA) as mode of trauma for their fracture,4 patients (20%) had simple fall as the mechanism of injury for their fracture and 1 patient had wrestling (5%) as the mode of injury. The choice of implants was based on surgeons' preference and financial constraints of the patient. Mean time of fracture union was 15.65±1.82 weeks. Range of motion at elbow at final follow up was 120±15.46 degrees (Table 1).

Table 1: Showing demographic profile and results

Parameter	Number
Mean Age	42.65±12.42
Sex	M=13 F=7
Side	R=12 L=8
Mode of Injury	RSA-15 Fall- 4 Wrestling- 1
Mean time of fracture healing (weeks)	15.65±1.82
Mean Range of Motion (degrees)	120±15.46
Mean MEPS score	88.45±8.18

1 patient had superficial infection which was managed with intravenous antibiotics. No case of deep infection was noted in our study. One case of non-union with implant failure was noted in this study which was further managed by replating and bone grafting. No case of neurovascular injury post injury was reported in the present study (Table 2).

Table 2: Complications

Complication	No of patients
Superficial infection	1

Deep infection	-
Non union	1
Elbow stiffness	-
Radial Nerve Palsy	-

Final results using MEPS scoring system showed excellent outcome in 12 patients (60%), good results in 5 patients (25%), fair result in 2 patients (10%) and poor result in 1 patient (5%). The mean MEPS score was 88.45±8.18 with a range of 70-96.

Discussion

Conservative treatment of mid-shaft fractures of the humerus with functional bracing can achieve excellent clinical outcomes as reported in the literature; however, bracing is associated with a variety of complications including a non-union and stiffness[8]. Surgeons tend to favour surgery for treating mid-shaft fractures to achieve faster recovery of function. Compared to plating, the intramedullary nailing technique carries higher risks of restricted shoulder movement due to injury to rotator cuff and difficulty in locking during fixation[9]. The posterior approach has been traditionally used for humerus plating due to advantage of intra-operative protection of the radial nerve as it is under direct visualization of the surgeon and the more suitability of the posterior humeral shaft surface for internal fixation[10]. However, polytrauma patients are in potential danger due to the lateral position used in the posterior approach due to difficulty in positioning the patient in posterior approach. Alternatively, mid-shaft fractures can be treated with the anterolateral approach to the humerus[11]. The advantages of this approach include the supine positioning of the patient and availability of distal and proximal extensions to achieve good exposure of the humerus shaft during the surgery. Several clinical studies of patients with humeral diaphyseal fractures fixation in the literature have reported no iatrogenic radial nerve palsy and high union rates after fixation via the anterolateral approach. Further, during anterolateral approach, patient positioning is easy and the adequate exposure of the proximal and middle humeral shaft that can be achieved via this approach[12]. Femke et al in their multicentre retrospective study analysed 325 patients with humeral shaft fractures who underwent surgical fixation and reported iatrogenic radial nerve palsy in approximately 11% of patients operated with posterior approach[13]. Prasarn et al in their study stated that the posterior approach is at a disadvantage as the plate must be placed under the radial nerve which can lead to nerve irritation thus, the posterior approach risks radial nerve damage for iatrogenic injury during the surgery[14]. In the current study, no iatrogenic radial nerve palsy was seen. There was 1 case of non union and implant failure in our study. The case was managed by replating and bone grafting. The non union rate in our study (5%) was lower as compared to other studies probably due to small no of cases[7,15]. We achieved 95% fracture union rate which compares favourably to other studies that have demonstrated the non-union rate following humeral shaft fracture fixation of 1.6–30%[16,17]. The mean MEPS score was 88.45±8.18 in our study. Our results are consistent with results of Li et al and Chang et al who reported excellent functional results in their respective study[7,18]. Limitation of our study is small number of cases and short term follow-up.

Conclusion

We found that the anterolateral approach is a good approach for the treatment of humeral shaft fractures with a lower complication rate and better functional outcomes. The advantages of this approach include the easy positioning of the patient during the surgery and the availability of distal and proximal extensions to achieve good exposure of the humeral shaft during the surgery.

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