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Outcome of Medial Plating for Fracture Shaft of Humerus

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ABSTRACT

Introduction

Fracture shaft of humerus is commonly seen fracture which is managed by nonoperative and operative methods. Operative fixation allows early return to daily work with ease in rehabilitation and less complication. This study was conducted to evaluate outcome of fracture shaft of humerus treated with plating by anteromedial approach on medial surface of humerus.

Methods

A hospital based prospective study including 164 cases of humerus fracture shaft surgically managed with medial plating over a period 15th July 2017 to 14thJune 2022with the mean follow-up duration of 24 weeks was performed. The final outcome was evaluated on the basis of radiological union and Modified Stewart and Hundley Scoring criteria.

Results

Fracture united in 49.39% of cases within 12 weeks, 28.65% case united in 12-24 weeks time and 19.61% cases united later than 24 weeks. Non union seen in 4 cases in our study treated with bone grafting healed. Functional outcome was measured as per Modified Stewart and Hundley Scoringcriteria, it was excellent in 67.08% of cases, good in 18.29%, satisfactory in 7.93 % of cases. Poor results were seen in 6.7 percent of cases.

Conclusions

Anterolateral approach with medial plating was found to be better option for fixation of fracture shaft of humerus as per our study as it has fewer complication with comparable results to other literature.

Keywords: facture humerus; anterolateral approach humerus; plating humerus; iatrogenic radial nerve palsy; functional outcome of humerus fracture.

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INTRODUCTION

Humeral shaft fractures represent 3% of all fractures seen in orthopedic emergency and occur with an incidence of 13 per 100,000 per year.[1] These injuries are observed frequently in age group <30 years and in >65 years old.[2,3] These fractures can been managed non operatively as 20 degrees of anterior bowing, 30 degrees of varus angulation and 3 cm of shortening can be tolerated. Sarmiento popularized functional bracing in 1977.[4] However, conservative management more of prolonged immobilization, non union and stiffness of joints. Hence either intramedullary nailing or plating is now preferred. Intramedullary nailing is found to have complications like rotator cuff tear, tendinopathy and delayed unions.[5] Another option preffered is plating. The most frequent complication noted is radial nerve palsy which is less seen in anterolateral approach (5.4%) than in posterior approach (11%).[6] The aim of this study is to evaluate the outcome following medial plating through anterolateral approach.

METHODS

This study was prospective observational study conducted in College Of Medical Sciences and Teaching Hospital during the period of 15th July 2017 to 14th June 2022. All persons aged 16 years or older presenting to the Emergency Department or Outpatient Department with a displaced humeral shaft fracture, associated with multiple injuries, polytrauma and failure of conservative management were eligible for inclusion. Patients were excluded if they had pathological, recurrent, open humeral shaft fracture, neurovascular and additional traumatic injuries of the affected arm that would influence upper extremity function. The demographic data were obtained regarding, age, sex, occupation, address and contact number. Details of injury were also noted down like the side of the limb injured, mode of injury, any associated injury to other part of body. The fracture was classified according to AO/OTA.[7] An informed consent was obtained from each patient regarding the procedure and post operative protocol. Relevant investigations required for operative intervention. All the surgery was done under brachial plexus block or general anaesthesia. Standard anterolateral approach was used in all cases to expose the fractured bone and 4.5 mm narrow DCP or LCP was used to stabilize the fracture and wound was closed with suction drain which was removed on 2nd day. Then gentle range of movement was started as soon as the patient tolerated. Sutures were removed at 14th day. The patients were followed up at 6 weeks, 12 weeks, 18 weeks and 24 weeks with check x-ray of the operated arm to assess the union and also range of movement of all joints of the affected limb noted. The final outcome was graded according to Modified Stewart and Hundley Scoring criteria as excellent, good, satisfactory and poor (Table 1).[8]

Table 1. Modified Stewart and Hundley Scoring[8]

Outcome	Parameters
Excellent	Bony union Lack of pain Full mobility of adjoining joints
Good	Union Slight pain Limitation of mobility of adjoining joints less than 20 degrees Angular positioning of bone less than 10 degrees
Satisfactory	Union Periodical pain Limitation of mobility of adjoining joints between 20 and 40 degrees Angular positioning > 10 degrees
Poor	Lack of union Pathological mobility Continuous pain Limitation of adjoining joints > 40 degrees Nerve injury

RESULTS

In this study 164 cases of humeral shaft fracture were included satisfying the inclusion critera. The majority of them were male(82.93%) and

female 17.03%. The age group ranged from 18 years to 74 years (mean age 45.2 years). Most of the patients had fracture on left side (60.37). The most common mode of injury in this study was fall from height from height(47.56%) followed by road traffic accidents(46.34%). One case of wild elephant attack with fracture of left shaft humerus was also included in this study. Most common side involved in our study was left (60.37%). All fractures were closed and classified according to AO/OTA classification.[7] Most common type of fracture in our study was type A2 (31.70%) followed by type A3 (21.95%). All these demographic data have been summarized in (Table 2 and Table 3).

Table 2. Age and Sex distribution.

Variables		Frequency (%)
Sex	Male	136 (82.93%)
	Female	28 (17.07%)
Age	16-25 years	18 (10.97%)
	25-40 years	56 (34.14%)
	40-55 years	44 (26.82%)
	55-70 years	1 (0.60%)
Mode of injury	RTA	76 (46.34%)
	Fall from height	78 (47.56%)
	Playground injury	6 (3.65%)
	Physical assault	3 (1.82%)
	Wild animal attack	1 (0.60%)
Side of limb injured	Right	65 (39.63%)
	Left	99 (60.37%)

Table 3. Classification of fracture according to AO/OTA.

AO/OTA type	Frequency (%)
A1	28 (17.07%)
A2	52 (31.70%)
A3	36 (21.95%)
B1	21 (12.80%)
B2	22 (13.41%)
B3	2 (1.21%)
C1	0
C2	3 (1.82%)
C3	0

The mean operative time was 75.4 minutes (SD 10.5 minutes) with mean blood loss of 50 ml. Most of the cases were operated in brachial plexus block except for 13 cases operated under general anesthesia. Twenty-eight cases (17.07%) were associated with chest and blunt trauma abdomen injuries.One case had postoperative radial nerve palsy. The mean stay at hospital was 3 days. 12 cases had superficial surgical site infection treated with local wound care and appropriate antibiotics. Final follow up was at the average of 26 weeks. Radiological fracture union time was recorded accordingly (Table 4).

Table 4. Time of fracture union.

Weeks	Frequency (%)
<12 weeks	81 (49.39%)
12-24 weeks	47 (28.65%)
>24 weeks	32 (19.51%)
Non union	4 (2.43%)

Eighty one cases (49.39%) had fracture union at 12 weeks of follow up. Four cases had nonunion required bone grafting which united subsequently. Eventually the outcome was noted down as per Modified Stewart and Hundley Scoring system as per (Table 5).

Table 5. Results according to Modified Stewart and Hundley Scoring.

Functional result	Frequency (%)
Excellent	110 (67.08%)
Good	30 (18.29%)
Satisfactory	13 (7.93%)
Poor	11 (6.7%)

Figure 1. Pre-Op

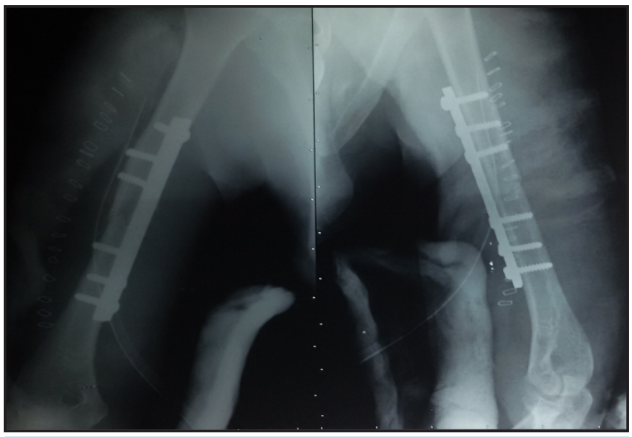

Figure 2. Immediate post Op

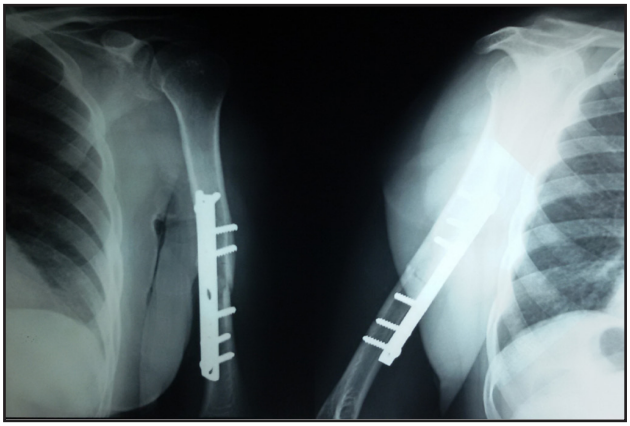

Figure 3. 6 weeks post Op

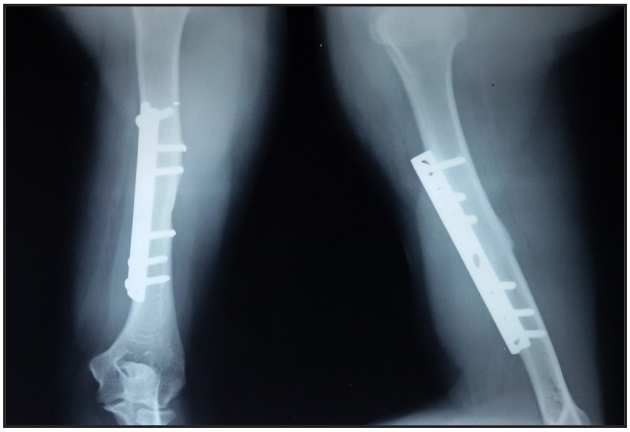

Figure 4. 24 weeks post Op

DISCUSSION

Although management of humerus shaft fracture have been successfully primarily managed conservative by functional bracing or casting as popularized Sarmiento[4], but the cast complication, prolonged immobilization, stiffness of joints were the issues to be considered and then operative fixation with nail or plates have become popular which allows the early return to the daily routine work. In our study we found this fracture more common in male than in females and more on left side. The majority of fracture was as result of RTA and in age group of 25 to 55 years which was same as observed in other studies. [9,10,11] Most common type of fracture seen in our study was type A2 and A3 comprising 53.65% of total cases. Similar findings were there in other studies.[9, 11] our operative time was approximately same as seen in other studies. Ivan Kirin et al noted operative time of 55.45±10.56 min for anteromedial humerus plating.[11] One case of radial nerve palsy observed in our case which was recovered at 12 weeks follow up. Literatures report iatrogenic nerve palsy of radial nerve up to 12 in anterolateral approach, although it is less seen than in posterior approach.[12,13] Fracture united in 49.39% of cases within 12 weeks, 28.65% case united in 12-24 weeks time and 19.61% cases united a bit delay. Non union seen in 4 cases in our study treated with bone grafting healed well. our observations were similar to findings in different literatures. Functional outcome was excellent and good in majority of cases in our studies similar to the finding of other literature.[14] The anteromedial surface is flat and does not require much soft tissue dissection to be exposed and the plate sits over the bone readily with no or minimal plate contouring. Only concern was damage to the nutrient vessel to the humerus which can be damaged during exposure of medial surface of humerus, accessory nutrient vessels are there hence the vascularity is maintained in bone as described by Liang.[15]

CONCLUSIONS

The fracture shaft of humerus can be managed by various modalities either conservatively with plaster, splint, functional bracing etc, operative treatment is preffered over it for various reason

so as to prevent malunion, non union, joint stiffness, prolonged immobilization and delay in rehabilitation. Medial plating of humerus through anterolateral approach is suggested as it has less of complication with good to excellent functional and radiological outcome.

Financial Disclosure: None

Conflict of Interest: None

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