

Medial plating of humerus shaft fractures through anterolateral approach.

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Abstract:

Background: Communitated humeral shaft fractures treated with anterolateral and posterior plating may have gaping with poor fixation and have chances of radial nerve injury. Hence an alternate technique of medial plating through anterolateral approach is done which showed stable fixation with fewer complications.

Aims and objectives: Anatomical stabilization of fractures of humerus shaft by medial Plating through anterolateral approach, and to evaluate the functional outcome.

Materials and methods: 40 patients who had fractures of humerus shaft, in the age group of 21 to 60 years, were treated with medial plating through anterolateral approach, these patients were followed over a period of 3 years from june 2013 to may 2016.

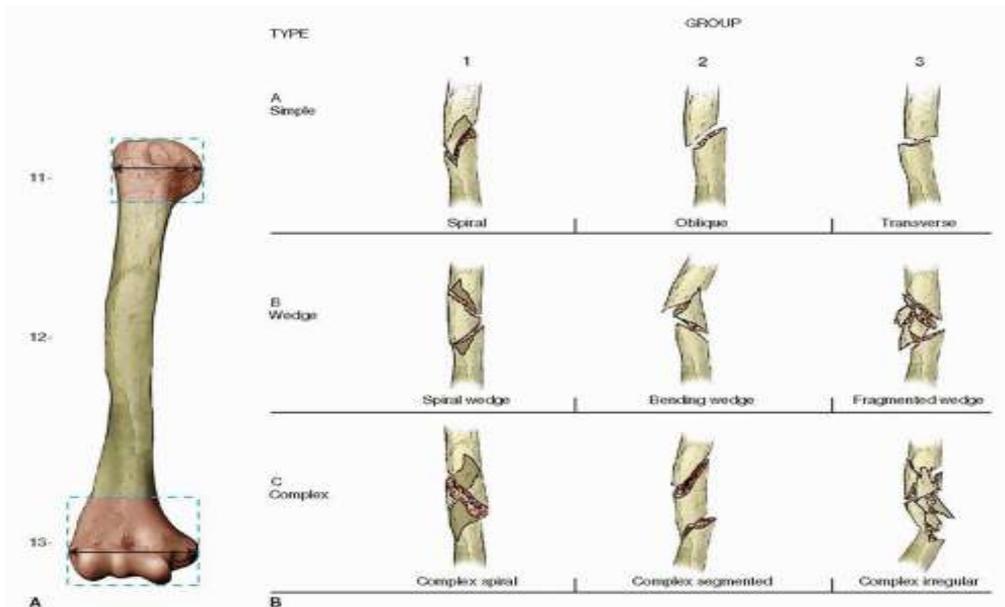
Results: 39 patients out of 40 recovered completely (97.5%) had good union, no nerve injury, except one patient who had loosening of the plate followed by twisting injury during sleep.

Conclusions: Medial plating through Anterolateral approach showed favorable results with less gaping, good fixation, with less surgical time and with fewer complications.

Keywords: Fracture humeral shaft, medial plating, anterolateral approach, posterior plating, anterolateral plating, stable fixation, fewer complications, radial nerve injury.

I. Introduction

Incidence of humerus fracture is not uncommon accounts for 1.6% in casualty¹, Fractures of the humeral shaft (diaphysis) account for approximately 1-3% of all fractures and represent 20% of all humeral fractures². Primary cause of fracture includes road traffic accidents, accidental falls, or violent injuries. Most humeral shaft fractures will heal with nonoperative management. A supportive brace and active use of the arm are the two key parts of this. The indications for which surgical management is generally recommended are open fractures with or without concomitant vessel and nerve injuries and also deteriorating neurological deficit, multi-segmental fractures, and failure of non-surgical treatment. Additional indications are positioning problems with polytraumatized patients and bilateral humerus fractures and severe obesity. The standard management of fracture shaft humerus is with anterolateral plating or posterior plating². Anatomy of humerus on lateral surface is curved and Irregular⁴, so plate on lateral aspect is not fixed well always, has little angulation with lesser contact with bone, which takes longer time for fixation of plate to the bone. Even If it is fixed, it is in stress on lateral border. Fracture pattern is wedge shaped many times, most of the butterfly fragments are lateral in location, reducing butterfly fragment anatomically and plate fixation may be difficult. In Lateral plating radial nerve lies closer to the humeral shaft as it exits from posterior to the anterior shaft, is in danger of being entrapped underneath the distal lateral corner of a compression plate, applied through the anterolateral plating⁵. In posterior approach main disadvantage is the proximity and danger of injury to the radial nerve as plate extension past to midshaft of the bone must be done under the nerve, resulting in the awkward situation of having the nerve lying directly on the plate⁴ with more chances of radial nerve getting irritated or damaged. We have done medial plating with anterolateral approach for humerus shaft fractures. In this procedure, anterolateral incision always helps in better radial nerve exploration, less chances of radial nerve injury, stable medial plate fixation due to fewer irregularities, good union rates with fewer complications.



AO/OTA classification of humeral shaft fractures. The humerus is designated as number 1. The second number refers to the location along the shaft (proximal = 1, middle = 2, distal = 3)—the humeral diaphysis would be designated as 1 and 2. The letters *A*, *B*, and *C* refer to the type of the diaphyseal fracture (simple, wedge, or complex) with further numeral classification (1, 2, 3) based on fracture group. Lastly, subgroup classification further localizes the fracture to the proximal, middle, or distal zone (.1,.2, or.3, respectively)⁶.

II. Aims and objectives of the study.

Anatomical stabilization of humerus shaft fractures by medial plating through anterolateral approach and to evaluate the functional outcome of medial plate fixation and to compare the results of two approaches used for fixation.

III. Materials and methods.

Study design: we conducted prospective cohort study.

Sample size and study place: Current study was conducted in MNR medical college sangareddy, Telangana, India, for a period of 3 years from June 2013 to May 2016. 40 patients who had humerus shaft fractures in the age group 21 to 60 years were included in the study. Patients with high risk and those who refused consent were excluded. 28 were female patients 12 were male patients. 31 patients had right arm fracture, 9 had left arm fracture. 34 were injured in road traffic accidents, rest were due to household injuries. Ethical clearance and informed consent was taken from all patients.

All patients were evaluated clinically and radiologically, operated under general anesthesia. Injection tetanus toxoid was given, prophylactic antibiotics started 15 minutes before incision. Anterolateral approach with anteromedial plating of humerus was done after reduction of fracture. As in most fractures comminution is not present medially so reduction becomes easy and is also easy to fix the plate with good alignment. To have clear view of humerus on medial surface it is externally rotated and plate applied over medial surface, lateral butterfly fragment fixed with interference screw. There was no significant blood loss during surgery. X-ray imaging was used to verify proper plate placement. Wound closed, with antiseptic dressing. Patient followed next day and on 10th day for suture removal. Then successively at the end of 1st month, 6 weeks, 3rd month, 6th month then yearly for 3 years. Arm pouch used for four weeks with sedentary works allowed, advised elbow flexing and extension an hour in a day.



Fig 1. Plate on lateral surface is not in full contact with bone (irregular surface).



Fig 2. Acceptable contact of plate on posterior surface of bone.



Fig 3. plate on medial surface is in full contact with bone.



Fig4. Intraoperative full contact of plate to humerus.

III. Results

40 patients with humeral shaft fractures were operated with medial plating through anterolateral approach. Operation time was 50 min (average time was 45min) the average intraoperative blood loss was 200 ml. 4 patients had preoperative radial nerve symptoms for those patients nerve explored with anterolateral incision which showed no nerve pathology, these patients with preoperative nerve symptoms recovered completely over four months. Patients were followed up for 3 years, mean follow up was 24 months and Callus seen from 8 to 10 weeks. All patients carried on their regular activities by three months. 39 patients recovered well, no iatrogenic nerve or vessel injuries, no infections, malunions, broken plates were noted in our study. Only complication observed was in one patient who had twisting injury during sleep, with plate loosening in 2nd week, who refused reoperation. She continued her regular sedentary activities without heavy work at home after 3 months. We lost follow up of this patient after four months.



Fig 5. Fracture shaft humerus
(a) Comminuted and (b) simple fracture.



Fig 6. Fractures (a) fixed with interfragmentary medial plating.(b) medial plating.



Fig7. 6 weeks old fracture humerus(a) and(b).



Fig8. Fracture at the end of 3 months(a) and(b).

Table 1. Sex wise distribution.

sex	No of cases	percentage
female	28	70%
male	12	30%

Table 2. Side wise distribution.

side	No of cases	percentage
Right arm	31	77.5%
Left arm	9	22.5%

IV. Discussion

Plate fixation is considered the gold standard for shaft fractures of humerus⁶⁻⁹. Anterolateral approach is widely accepted for treatment of these injuries¹⁰⁻¹⁴, and posterior plating is also largely accepted. The complex and nonunion fractures of humeral shaft plate fixed medially by Judet^{15, 16}. Medial surface plating is easy for fracture reduction. Anterolateral plate fixation has complication of radial nerve injury which is distally getting compressed⁵, under surface of radial nerve high chances getting irritated¹⁶. Lateral placement of humerus plate leads to medial gapping during fixation¹⁶. The plate has to be pre-bent for better fixation. Always locking compression can't be pre-bent as they lose fixation strength. Fractures in female are more common because of osteoporotic weak bones. Majority was road traffic accidents. And all elderly women in our study sustained humerus fractures due to fall during household activities. Unlike femur or tibia whose primary stress are weight bearing¹⁶. The major stress on the humerus are rotational forces and it's a non weight bearing bone¹⁶ hence plate can be placed on the medial aspect of humerus¹⁷ Callus formation in our study seen around 8 to 10 weeks with best rate of healing, which is comparable to other studies. Lateral plating and posterior plating has iatrogenic

nerve injuries, incidence about 11% and 5.4% respectively, whereas medial plating has minimal nerve injuries. We did not have any nerve injuries in our study, as there are no vessels or nerves close to plate or bone medially.

V. Conclusion.

Our study concludes that medial plating through anterolateral approach is a novel alternate technique for humerus shaft fractures, can be practiced regularly for easy plating, stable fixation, with less surgery time, fewer or no nerve complications.

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Ethical approval: The study was approved by the institutional ethics committee.

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