



A PROSPECTIVE STUDY OF MANAGEMENT OF FRACTURE SHAFT HUMERUS BY AN ANTEROMEDIAL SURFACE PLATING.

Orthopaedics

Rohit

Rameshchandra Assistant Professor, Dept of Orthopedics, SRTR Medical college, Ambejogai.

Kakani

Kaustubh MS Ortho, DNB Ortho, BJ Medical college and Sassoon General Hospital, Pune.

Yeshwant Kale* *Corresponding Author

Rahul Prakash

Jadhao MS Orthopedics, BJ Medical college and Sassoon General Hospital, Pune.

Kedar Sunil Bhoi

D.Ortho, DNB Ortho, Assistant Professor, Dept of Orthopedics, BJ Medical college and Sassoon General Hospital, Pune.

ABSTRACT

Introduction: During conventional anterolateral plating Radial nerve injury may occur which can be avoided by applying plate on the medial flat surface. The aim of this study was to evaluate the results of anteromedial plating rather than the conventional anterolateral surface on fracture shaft humerus.

Materials and Methods: This study was conducted between January 2020 to Dec 2020. Seventy five patients having fracture shafts of the humerus were treated with the anteromedial plating through the anterolateral approach.

Results: Seventy five patients with a fracture shaft of the humerus were treated with anteromedial plating. 10 were female (mean $\pm$ SD, 27 $\pm$ 4.5 years) and 65 were male (mean $\pm$ SD, 37 $\pm$ 5.6 years). 74 out of 75 (98.7%) patients achieved union at 12 months.

Conclusion: Based on our results, we recommend the application of an anteromedial plate for treatment of midshaft fractures humerus.

KEYWORDS

Medial Surface Plating, Humerus Shaft Fractures, Anterolateral Approach, Radial Nerve Palsy

INTRODUCTION:

Anterolateral approach is widely used to help in osteosynthesis by plate fixation for internal fixation for diaphyseal fracture of the humerus. However, the outcome of humeral shaft fracture fixation using a medial approach is not much discussed in the present literature. The aim of this study is to explore the management and outcomes of the application of medial plate in humeral mid-shaft fractures through a standard anterolateral approach.

Fracture shaft of humerus account for 1.2% of the majority of cases seen in the orthopaedics as well as in the emergency department (1). Denies *et al*, (2) in his study of 91 patients showed medial plate fixation was better than intramedullary nailing. Livani *et al* (3) in their study showed anterior plating is a simple, safe, and effective treatment for humeral shaft nonunion. Antero-Medial placement of the plate avoids the requirement of unnecessary radial nerve exploration, retraction, and thus extensive soft-tissue dissection.

As per literature, the overall incidence of the radial nerve injury through posterior approach is 11% and by anterolateral approach is 5.4%.

The most commonly used approaches for treating distal 1/3rd shaft fractures are posterior and sometimes anterior. Boschi *et al*, described Sub-brachial approach to Humeral shaft fractures (4). Hence this study was undertaken to evaluate the results of anteromedial plating rather than the conventional anterolateral surface on fracture shaft humerus.

Methodology

This is a prospective study of 75 patients where medial surface plating was done for the mid shaft fracture of humerus between January 2020 to Dec 2020 in the department of Orthopedics in a medical college in Maharashtra. A total of 43 fracture humerus were plated in conventional anterolateral way named as Anterolateral plate group in present study. Fracture exposure time, blood loss, requirement of radial nerve exposure, post-operative radial nerve palsy and requirement of plate contouring was compared with previous recorded data. Total of 75 patients (Table 1) with a midshaft humerus fractures were included and treated with antero-medial plating through standard anterolateral approach.

Tables:

Table 1: Patient characteristics:

Characteristics	No of patients
Number of cases	75
Gender (male/female)	65/10
Mean age, years (range)	18-66
Mechanism of injury	
Road Traffic accident	12
Fall during military training and duty	38
Sport injury	18
Injury during fall at home	7
Fracture type (AO/OTA Classification)	
Type A	50
Type B	11
Type C	14

EXCLUSION CRITERIA:

1. The patients of non-union of fracture Humerus or
2. any previous surgery on the same part,
3. patients with pathological humerus fracture,
4. infected non-union, gap non-union and
5. patients presented with radial nerve injury/palsy

Included patients were followed for a period of minimum six months and maximum up to 1 year. Injury during duties and training accounted for 50% of the cases. All patients were operated within three to seven days following injury. All patients were given general anaesthesia and were placed in supine position. Our skin incision begins from the lateral edge of the biceps brachii muscle and follows its border, avoiding the cephalic vein till 5 cm above flexion crease of elbow. We used this approach, in which the whole brachialis muscle was spared and act as protection between the operative field and the radial nerve. The separation of the biceps and the brachialis muscle start proximally. With this sub-brachialis approach there is absolutely no requirement to expose the radial and the musculocutaneous nerve because they are outside the operative field.

The observations were made and appropriate tests were applied for statistical analysis. P value less than 0.05 was significant.

RESULTS:

75 patients with fracture shaft of humerus were treated with the

anteromedial plating. 10 were female and 65 were males. Two out of three patients developed a superficial infection, both of which were treated successfully by antibiotics and one developed a deep infection, which was treated by wound debridement and prolonged antibiotics with plate removal and delayed plate fixation with bone grafting. 74 out of 75 (98.7%) patients achieved union at 12 months.

A comparison including fracture exposure time, amount of bleeding, post-operative radial nerve palsy is shown in (Table 2).

Table 2: Comparison between application of plate on flat anteromedial surface vs application of plate on anterolateral surface.

Humerus Surface	Number of patients (n)	Fracture exposure time (mean)	Blood loss in dissection (Mean)	Radial nerve exposure required (n)	Features of Post-operative Radial nerve palsy (n)
Anteromedial – Flat surface	75	24 min	50 ml	nil	nil
Anterolateral – slight convex surface (Control group)	43	47 min	110 ml	12	01

Fracture exposure time and amount of blood loss is significantly less in application of plate on flat medial surface as compared to application on anterolateral surface (p-value 0.05). The continuous variables were analysed between anterolateral plate groups and medial plate group using Independent sample t test. P value of <0.05 was considered statistically significant.

We measured shoulder and elbow range of motion and muscle power after surgery in all 75 patients after four weeks of surgery when they become totally pain free. 73 patients had full muscle power 5/5 and full range of motion in shoulder and elbow. Two patients had 15° of FFD in elbow and one had 20° because both patients had developed post-operative infection (Table 3).

Table 3: Shoulder and Elbow range of motion and muscle power after surgery

No of patients	Shoulder power (MRC grade)	Shoulder-ROM	Elbow power - flexion	Elbow ROM	Reason
73	5/5	full	5/5	full	No infection
02	4/5	full	4/5	15° FFD	Developed superficial infection post-operatively
01	5/5	full	3/5	20° FFD	Developed deep infection post-operatively

DISCUSSION:

In the recent times, due to development in surgical techniques and better implants, fracture shaft of humerus is being treated by surgical means with good results. A study by Denies *et al* (2) compared conventional plating with intramedullary interlocking nail in 91 patients and showed that there were significant number of complications present in nailing group as compared to plating group.

The posterior and anterolateral approaches are still most common and widely used. Kirin *et al* (5) in their study recommended anteromedial plating of humeral shaft fractures through anterolateral approach as simple, safe, effective and also fast surgical treatment. In using medial approach, the plate can be placed on flat medial surface of humerus without the need of contouring. As per AO guidelines, the plate should be placed on the tensile surface. The plate should therefore be placed on either the anterolateral or the posterior aspects in case for humerus fracture. (6,7)

Another study by Oh *et al* (8) and Luthar *et al* (9) where they compared open reduction with minimally invasive plate osteosynthesis in

humeral shaft fractures and both reported no significant difference in fracture union. Incidence of radial nerve palsy in posterior plating has been reported to be 11.14% (10). In our study, we did not notice any radial nerve palsy postoperatively.

In a study on humerus shaft non-union treated with vascularised fibular bone graft, Jupiter suggested medial approach and application of plate anteriorly. (11) More recently Kumar *et al* reported on 54 patients that the medial surface plating gives good result without any radial nerve palsy and has reported that it takes much less time than conventional anterolateral plating. (12)

There are many advantages of anteromedial plating over conventional anterolateral plating, (a) easier to apply plate on flat medial surface than uneven anterolateral surface of humerus (b) surgical dissection is safe, (c) almost no chance of iatrogenic radial nerve injury, (d) less surgical time than conventional anterolateral plating, (e) less bleeding as no muscle splitting is involved as compared to conventional anterolateral plating, (f) no plate contouring is required as medial surface is flat as it is required in conventional anterolateral plating, (g) comparable outcome with conventional anterolateral plating and (h) removal of plate is easier and there is no chance of radial nerve injury.

In our study, we did not find any radial nerve palsy and operating time is significantly less as compared to standard anterolateral plating as later involved muscle stripping and more dissection.

The limitation of this approach is far proximal and far distal extension of fracture. If fracture extends far proximal and distal then, plate contouring is required for proper plate application.

CONCLUSION:

In our study, the purpose was to reduce the dissection through brachialis and minimise neurological complication. Based on our results, which includes less operating time, less tissue dissection, easy application of plate, we can now recommend anteromedial surface plating for treatment of humeral mid shaft fractures.

REFERENCES:

- Hee HT, Low BY, See HF. Surgical Results of Open Reduction and Plating of Humeral Shaft Fractures. *Ann Acad Med Singap*. 1998;27(6):772–5.
- Denies E, Nijs S, Sermon A, Broos P. Operative treatment of humeral shaft fractures. Comparison of plating and intramedullary nailing. *Acta Orthop Belg*. 2010;76 (6): 735–42.
- Livani B, Belangero W, Medina G, Pimenta C, Zogaib R, Mongon M. Anterior plating as a surgical alternative in the treatment of humeral shaft non-union. *Int Orthop*. 2010;34:1025–31.
- Boschi V, Pogorelec Z, Gulian G, Vilovic K, Stalekar H, Bilan K et al. Subbrachial approach to humeral shaft fractures: new surgical technique and retrospective case series study. *Can J Surg*. 2013;56:27–34.
- Kirin I, Jurisic D, Grebic D, Nadalin S. The advantages of humeral anteromedial plate osteosynthesis in the middle third shaft fractures. *Wien Klin Wochenschr*. 2011;2011;123(3-4):83–7.
- Ambrosio J, Quental C, Pilarczyk B, Folgado J, Monteiro J. Multibody biomechanical models of the upper limb. *Procedia IUTAM*. 2011;2:4–17.
- Zheng YF, Zhou JL, Wang XH, Shan L, Liu Y. Biomechanical study of the fixation strength of anteromedial plating for humeral shaft fractures. *Chin Med J (Engl)*. 2016;129(15):1850–5.
- Oh CW, Byun YS, Oh JK, Kim JJ, Jeon IH, Lee JH et al. Plating of humeral shaft fractures: comparison of standard conventional plating versus minimally invasive plating. *Orthop Traumatol Surg Res*. 2012;98(1):54–60.
- Luthar M, Verma M. Role of minimal invasive plate osteosynthesis in complex humeral shaft fractures. *JDMS*. 2015;14(6):68–71.
- Shao YC, Harwood P, Grotz MRW, Limb D, Giannoudis PV. Radial nerve palsy associated with fractures of the shaft of the humerus: a systematic review. *J Bone Joint Surg Br*. 2005;87(12):1647–52.
- Jupiter JB. Complex non-union of the humeral diaphysis. Treatment with a medial approach, an anterior plate, and a vascularized fibular graft. *J Bone Joint Surg Am*. 1990;72(5):701–7.
- Kumar BS, Soraganvi P, Satyarup D. Treatment of middle third humeral shaft fractures with anteromedial plate osteosynthesis through an anterolateral approach. *Malays Orthop J*. 2016;10(1):38–43.