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Study of clinical outcome of fracture shaft of humerus treated by intramedullary interlocking nailing and plating in adults

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Abstract

Introduction: Humerus fracture represent approximately 3% of all fractures. Treatment methods are also advancing for these fracture in both operative and non-operative modes, Internal fixation of fracture of shaft of humerus by either plates and screws or intramedullary interlocking nailing leads to full, active, pain free mobilization which results in rapid return of normal blood supply to both bone and soft tissues.

Aims and objectives: Evaluate outcome of fracture shaft of humerus in adult patients treated by Plating and intramedullary interlocking nailing. To compare end results of above two procedures by DASH (Disabilities of the arm, shoulder and hand) scoring system.

Method and Materials: 45 patients were selected of age group 18-70 yrs. All patients were treated operatively with intramedullary interlocking nailing or compression plating and its outcomes were assessed using DASH score and complications were observed with follow up to 6 months clinically and radiological imaging.

Result: Out of 45 cases 25 patients were treated with Dynamic compression plating and 20 patients were treated with Intramedullary inter locking nailing. Time taken for union of fracture was less for plating group. Mean time of union in plating group was 13.4 weeks and for nailing group it was 21.8 weeks. Complications were more in patients were treated with IMN as compare to plating group. Mean DASH score for plating group was 25.70 and for nailing was 46.57.

Conclusion: Here for both the modality of treatment radiological outcome was almost similar but comparing the end result of functional outcome assessed with DASH score revealed better results in patients treated with compression plating. The rate of complications like joint stiffness, postoperative pain, delayed union, non-union were low in patients treated with plating than nailing.

Keywords: DASH (Disabilities of the arm, shoulder, hand) scoring, Intramedullary interlocking nail, compression plating

Introduction

Humerus fracture is common entity now a days. It represent approximately 3% of all fractures [1] There is a bimodal distribution of humeral shaft fractures [2].

Treatment methods are also advancing for these fracture in both operative and non-operative modes, initially they were treated with the help of hanging casts, arm cylinders, collar and cuff slings, then functional cast bracing, U cast, shoulder spica improved results but the long duration of treatment results in increase morbidities like malunion, non-union, stiffness of shoulder and elbow joints to the patients [3, 4]. So now management of this entity shifted more towards operative methods. Internal fixation of fracture of shaft of humerus by either plates and screws or intramedullary interlocking nailing leads to full, active, pain free mobilization which results in rapid return of normal blood supply to both bone and soft tissues [5].

The fixation achieved by plating usually gives satisfactory results. This implant allows direct fracture reduction and stable fixation of the humeral shaft without violation of the rotator cuff. Recently, there has been growing interest in use of intramedullary interlocking nailing. This requires less invasive surgery. IMN (Intramedullary Nails) offers biologic and mechanical advantages over plates and screws. IMN can act as load-sharing devices in fractures that have cortical contact if the nail is not statically locked. A higher risk of delayed union and nonunion has been reported in the literature.

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Material and Method

Hospital based prospective interventional study conducted in Orthopaedics department of Rabindranath Tagore (RNT) Medical College & Maharana Bhupal Hospital Udaipur (Rajasthan), on the basis of OPD and emergency admissions 45 patients who met the inclusion criterias were selected and treated surgically using with either anterograde intramedullary interlocking nailing or plating during the period of 1st October 2017 to 30th October 2018. These patients were divided into two groups treated with both compression plating and Interlocking nailing. Patients were informed about the study, written consent was taken, and then they were evaluated.

Inclusion Criteria

1. Adult patients (>18 yrs) with traumatic fractures shaft of humerus who presented within two weeks of injury.
2. Patients who met the criteria for operative interventions
 - Failure of closed reduction
 - Open fractures includes Gustilo Anderson type I)
 - Segmental fractures
 - Bilateral fractures
 - Floating elbow injuries
 - Fractures associated with neurovascular injuries
 - Follow-up of 6 months were included.

Exclusion Criteria

1. Patient not met the age group criteria
2. Pathological fractures
3. Patients with active infection
4. Periarticular fractures of humerus
5. Open fractures shaft of humerus Gustilo-Anderson grade II and III.
6. Patients had other systemic disorders or not fit for surgical intervention.
7. Patients who lost follow-up.

Surgical Technique: The humeral shaft fracture was temporarily immobilized with a U-slab. Once the patient selected for surgery, pre-operative planning and investigations were done and the patients were posted for surgical intervention.

(A) Intramedullary Interlocking Nailing: Patients were placed in the beach chair position, with affected arm draped free. A small incision was made at the anterolateral corner of the acromion process than the fibre of deltoid muscle was split. The supraspinatus tendon was identified, and split for 1-2 cm in line with its fibres.

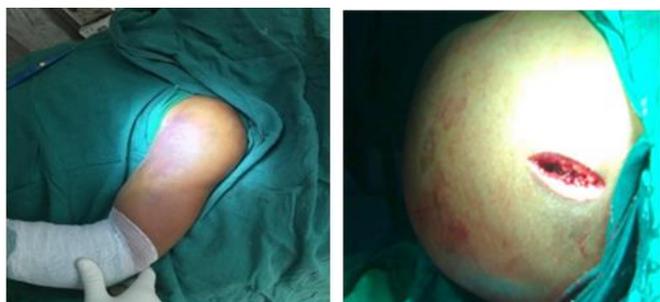


Fig 1(a): Position **(b)** Incision at Entry Point

The entry point was in greater tuberosity, just lateral to the articular margin. Entry was made using bone awl, guide wire inserted after achieving close reduction and then reamer placed over guide wire. Reaming was done and then nail

inserted of size 1 mm smaller in diameter than last reamer used. The nail was proximally locked with screws using zig and free hand technique distally. Any split in rotator cuff was repaired, incision was closed in layers. Standard dressing was applied and placed in broad arm pouch.



Fig 2: (a) Entry of Humerus Nail with Zig (b) Free hand distal locking

Open Reduction and Internal fixation with Dynamic Compression Plate

All the Fractures in proximal and middle third are approached through an anterolateral incision, and fractures involved distal third part were operated through posterior triceps splitting approach. Incision made using anterolateral approach of arm (fig.3 (b)), Open reduction of fracture site was done and plate was applied on appropriate surface of humerus (Fig. 3(a)).



Fig 3(a): Open reduction and fixation with plate (b) Incision anterolateral approach

Transverse fractures are fixed in compression mode and oblique fractures are fixed in neutralization mode with a lag screw across the fracture site through the plate or separately after that closure and suturing done with drain.

Post-operative care: Mobilization begins on post-operative day 2 with active-assisted elbow flexion-extension and forearm pronation-supination exercises taking into consideration pain tolerated by the patient. Resistive exercises and load bearing are started only after evidence of bridging callus on radiograph. Thus a good functional range of motion is achieved within 4-5 weeks.

Patients were followed up on 6th week, 12th week and 24th week and assessed for pain at the fracture site, evidence of union, functional outcome using DASH score.

DASH disability/symptom score = {(sum of n responses/n) - 1} X 25.

The DASH score may not be calculated if there are more than three missing items (more than 27 questions have to be answered)

DASH score	0-25	26-50	51-75	76-100
Rating	Excellent	Good	Fair	Poor

Results

In this study of 45 cases of fracture shaft humerus were treated and outcomes were studied. Out of 45 cases 25

patients were treated with Dynamic compression plating and 20 patients were treated with Intramedullary inter locking nailing. Patients were of age ranges between 18 to 70 yrs. Mean age for nailing group was 40.3 yrs and for plating group was 32.16 yrs. 60% cases were male and 40% cases were female. Out of 45 cases 55.5% cases had involvement of middle third of shaft humerus. In this study of 45 cases time taken for union of fracture was less for plating group. Mean time of union in plating group was 13.4 weeks and for nailing group it was 21.8 weeks. Patients who were treated with plating group had more blood loss than nailing group. In this study complications were more in patients were treated with IMN as compare to plating group. Shoulder and elbow joint stiffness and pain were the main morbidity [6, 7]. DASH score and better functional outcome was seen in plating group as compare to nailing group. Mean DASH score for plating group was 25.70 and for nailing was 46.57.



Fig 4: Radiological outcome after interlocking nailing



Fig 5: Radiological outcome after compression plating



Fig 6: Post-operative complication: (a) wrist drop (b) superficial wound infection

Discussion

The results of both are compared with previous standard series. Our study confirms that ante grade insertion of nail can lead to problems with shoulder function and range of movement probably because of damage to the rotator cuff. The union rates are comparable in both the groups but PLT group having more results in excellent category; while in

Good category results are similar. There were more fair and Poor results in the interlocking nailing group compared to PLT group. The overall functional outcome in our study is better for the PLT group (25.70) as compared to Interlocking Nailing group (46.57) and this difference when compared is statistically significant (p value – 0.025).

A study conducted by Nagesh Desai *et al.* [8], used DASH score to compare these 2 modalities of treatment and their results were functional outcome better in DCP group compared to interlocking nailing group which was statistically significant (P= 0.062). Rate of healing was marginally better in DCP group as compared to I.M nail. concluded that both modalities of treatment i.e. plating and interlocking nailing are good as far as union of fracture is concerned, but considering number of complications and functional outcome, plating offers better result than ante grade interlocking nailing with respect to pain and function of shoulder joint. In Study conducted by Pashupati Chaudhary *et al.* [9] DASH score gradually improved in both nail and plate group but Dash score was significantly higher in plating group at 6, 12,18 and 24 weeks follow up. They concluded that Dynamic compression plating is better for fracture shaft of humerus and Plate osteosynthesis remains the gold standard of fixation for humeral shaft fractures.

Type of Surgery	Mean Dash Scores During Study Period		
	DASH 6wks	DASH 12 wks	DASH 24 Wks
IMN	57.9	54.12	46.57
PLT	39.84	34.78	25.70
P Value	0.056	0.046	0.025
	Considered Significant	Considered Significant	Considered Significant

The results of our studies are comparable to standard studies conducted previously.

Conclusion

In this comparative study of fracture shaft of humerus treated with Intramedullary interlocking nail and Compression plating the radiological outcome was almost similar but comparing the end result of functional outcome assessed with DASH score revealed better results in patients treated with compression plating. The rate of complications like joint stiffness, postoperative pain, delayed union, nonunion were low in patients treated with plating than nailing.

Hence this study conclude plating as a superior method of treatment for fracture shaft of humerus.

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