



Orthopaedics

COMPARATIVE STUDY BETWEEN INTRA-MEDULLARY INTERLOCKING NAILING VS PLATE OSTEOSYNTHESIS IN MANAGEMENT OF DIAPHYSEAL HUMERUS FRACTURES

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ABSTRACT **Back Ground And Objective** The aim of this study was to compare the union rate, surgical complications and functional outcome of humeral diaphyseal fractures treated with intra-medullary interlocking nailing and dynamic compression plate fixation **Methods:** This study was conducted on 40 cases of humerus shaft fractures treated by a dynamic compression plate and intra-medullary interlocking nailing. Patient was operated using standard fracture table under image intensifier control. **Results:** The average age of the patient was 38years. Most common mechanism of injury was due to RTA/fall . Most common fracture was at the mid shaft of the humerus with transverse type. 5 patients had radial nerve injury pre-operatively following the fracture mostly at distal third shaft of humerus, recovered in weeks time after exposure and plate fixation. In DCP no much of radiation exposure as the fracture site is completely opened . Where as in IMIL nailing radiation exposure was at max. Total complications intra-operatively radial nerve entrapment was more during plating and difficult reduction in fracture during nailing. Post operatively No complication for 75% patients treated with plating and 45% with nailing. In DCP group radial nerve injury 5%, shoulder pain 5%, shoulder stiffness 5%, superficial infection 10 %. In nailing group delayed wound healing was seen in a patient with uncontrolled DM 5%,non-union 10%, shoulder impingement 35%, shoulder stiffness 5%. The mean union time for fracture healing in plating group was around 16 weeks and that of nailing was 19weeks. The functional outcome was assessed using DASH score by AAOS which was found to be at a average score of 16 for plating group and 18 for nailing group at the end of 6 months after surgery. At long term both the group had similar functional outcome. **Conclusion:** Union rates and healing time are similar in both the groups. Mainly based on site of fracture plating is usually preferred for middle and distal 3rd humeral shaft fractures where the chances of radial nerve injury is more the fracture has to be exposed. For proximal 3rd and mid shaft with no deficits can be managed by nailing as a better option . Radiation exposure is definitely more in nailing . ultimately based on functional outcome plating had more excellent results as nailing group had shoulder stiffness and pain . as always nail is a load sharing device and in upper limb its no much of significance as in lower limbs . therefore plating is a better option for treating humerus shaft fractures.

KEYWORDS :

INTRODUCTION

Fractures of the humeral shaft are relatively common injuries. There is a wide array of good options for their treatment and controversy over the best methods for many situations. Appropriate decision making for operative and non-operative treatment depends on a thorough understanding of the regional anatomy, fracture pattern and classification, and factors unique to the injured patient. (chapman)

A fracture of the humeral shaft is a common event, occurring over 70,000 times a year in North America, and representing between 3% and 5% of all fractures (1,2,3). Most will heal with appropriate conservative care, although a small but consistent number will require surgery for optimal outcome (1,4,5). Given the extensive range of motion of the shoulder and elbow, and the minimal effect from minor degrees of shortening, a wide range of radiographic malunion can be accepted with little functional deficit (6). Current research in this area focuses on defining the incidence and health care resources required to treat this injury, refining the indications for surgical intervention, decreasing the surgical failure rate through new implants and techniques, and minimizing the duration and magnitude of disability postinjury (3,7,8,9).

The successful treatment of a humeral shaft fracture may not end with bony union: in the current emphasis on patient care the treating orthopaedic surgeon may be in an ideal position to intervene and improve a patients life beyond what is traditionally recognized as the surgeons' role. Recognition of the injury as an osteoporotic fragility fracture in an elderly patient should prompt a referral for diagnostic investigations of, and potentially treatment for, an underlying osteoporotic condition. Similarly, fractures resulting from abusive domestic relationships or drug/alcohol addiction may represent opportunities to intervene. As with most orthopaedic injuries, the successful treatment of a humeral shaft fracture demands a knowledge of anatomy, surgical indications, techniques and implants, and patient function and expectations. (rockhood)

AIMS AND OBJECTIVES OF THE STUDY

To compare the study between intra-medullary interlocking nailing vs plate osteosynthesis in management of diaphyseal humerus fractures

To compare surgical management of humerus shaft fractures using plating and nailing using following parameters

- UNION RATE
- FUNCTIONAL OUTCOME,
- SURGICAL COMPLICATIONS

MATERIAL & METHODS

METHODOLOGY

40 patients are selected randomly each one is selected for either plating or IM-IL nailing based on pick a chit system

Study Design: Randomized , Comparative study

MATERIALS AND METHODS

The present study will be carried out in YENEPOYA MEDICAL COLLEGE HOSPITAL after obtaining the Ethical committee clearance. A structured, pre-prepared case Performa will be used to enter the clinical history, physical examination findings and investigations findings. Those who will meet the inclusion and exclusion criteria will be included in the study

Intra operative radiation exposure is calculated using Dosimeter

Functional outcome is calculated using DASH scoring system

Union rates in both nailing and plating groups

Comparing the outcomes in both the studies

Source Of Data:

Patients attending YENEPOYA MEDICAL COLLEGE HOSPITAL AND ASSOCIATED HOSPITALS

Sample Size: 40 PATIENTS, 20 IN EACH GROUP (RANDOMIZED)

Inclusion Criteria

- Diaphyseal fractures of humerus
- Transverse
- Oblique
- Comminuted
- Spiral

- Simple fractures
- Fractures shaft humerus associated with radial nerve palsy.
- Ages 16 to 60 years

Exclusion Criteria

- Fracture of proximal end and lower end of humerus
- Compound fractures
- Patients with pre-existing shoulder and elbow problems
- Pathological fractures
- Fracture Non – Union
- Patient with neglected fracture
- Patient medical unfit for surgery

The patients who met the inclusion and exclusion criteria were included in the study after taking informed consent.

After taking history and thorough clinical examination patient was evaluated for injured site and any associated injuries. The status of radial nerve injury was recorded.

Roentgenogram of the arm with shoulder and elbow was taken in both antero-posterior and lateral views.

Additional roentgenograms were taken if any other injury was suspected.

The humeral shaft fracture was temporarily immobilized with a U-slab and arm pouch



U-Slab Application

Patients admitted in Yenepoya Medical College Hospital, Derelakatte, Mangalore from feb-2014 to oct-2015 with diaphyseal humerus fractures were treated with open reduction and internal fixation with DCP and intramedullary interlocking nail fixation.

40 patients were prospectively randomised into two groups for comparative study. 20 patients were treated by surgical management in each for dynamic compression plating and interlocking nailing respectively. Once the patients were randomized, pre-operative planning and investigations were done and the patients were posted for open reduction and internal fixation with DCP or interlocking nailing.

In plating group, 4.5mm narrow DCP was the plate of choice. The patients with proximal 3rd shaft fractures antero-lateral surgical approach was used. And for distal third humerus shaft posterior triceps splitting approach was used. Midshaft humerus were treated either of these approaches depending on fracture pattern and radial nerve palsy following injury. In this study group 13 patients had midshaft humerus fractures. 6 patients had distal 3rd humerus shaft fracture out of which 5 had radial nerve palsy following injury. 1 patient with proximal third humerus shaft was treated with plating. All the patients taken under the study had minimum of 6 months follow up.

In nailing group standard humerus IMIL nail were used of sizes 7,8,9 mm sizes and all the patients were treated using antegrade humerus nailing by splitting the rotator cuff. None of the patients were treated with retrograde nailing. In this group, 10 were midshaft humerus fractures, 9 were proximal 3rd humerus fractures. 1 patient with distal 3rd was treated with nailing. All the patients taken under the study had minimum of 6 months follow up.

Fracture classification was done according to AO classification system to A1,A2,A3,B1,B2,B3,C1,C2 and C3. The patients had sustained following fracture patterns based on classification. That is , A1- 3 patients; A2-9; A3- 11; B1- 7; B2- 4; B3- 1; C1- 4; C2- 0; C3-1.

All the patients of both groups were followed up for suture removal at 10th post op day; at 1 month, 3 month and 6 months postoperatively. At

each visit patient was assessed clinically regarding pain at fracture site, radiological union status shoulder, elbow movements, radial nerve palsy recovery, DASH scoring at end of 6th month Immediate post-op patients were put on U-slab, following suture removal they were put on alkathine- Functional brace to the arm, to aid early mobilization of shoulder and elbow. Depending on stability of the fracture site.



Assessment Of Functional Outcome

The functional outcome was measured by the “Disabilities of Arm, Shoulder and Hand” (DASH) Questionnaire at nine months or at full recovery whichever was earlier.

The Dash scoring system is a very useful tool to measure function of the upper limb developed by the American Academy of Orthopaedic Surgeons (AAOS) and has been validated by various studies

The DASH questionnaire has thirty questions the answers of which are graded from one to five points.

The functional score is calculated by the formula

$$\text{DASH DISABILITY / SYMPTOM SCORE} = \left\{ \frac{\text{sum of n responses}}{1} \right\} \times 25 \text{ N}$$

Where 'N' is the number of responses. s. The best possible score is '0' and the worst possible score is '100'. The functional outcome decreases as the score increase

The result was then graded as Excellent, Good, Fair and Poor as follows

Excellent – 0 to 20 Points.

Good – 21 to 40 points.

Fair – 41 to 60 points.

Poor – Greater than 60 points.

The time taken for radiological union and the functional outcome in both groups were then compared

In our study mean DASH scoring for plating and nailing group was 23.5 and 31.95 respectively. with average good outcome in both groups. Slightly better in plating group.

Data Analysis

Fractures of the humeral shaft account for roughly 3% of all fractures; most can be treated nonoperatively. Charnley stated, “It is perhaps the easiest of the major long bones to treat by conservative methods.” The range of motion afforded by the shoulder and elbow joints, coupled with a tolerance for small amounts of shortening, allow radiographic imperfections that cause minimal functional deficit and are well tolerated by the patient. (Campbell)

Plate osteosynthesis remains the “gold standard” of fixation for humeral shaft fractures. Plating can be used for fractures with proximal and distal extension and for open fractures. It provides enough stability to allow early upper extremity weight bearing in polytrauma patients and produces minimal shoulder or elbow morbidity (Campbell)

Paris and Colleagues between 1987 and 1997 in Marseilles, France conducted a study of 156 humeral shaft fractures in adults treated by plate fixation, there were 21 cases of multiple trauma and 24 multiple fractures, 8 cases of floating elbow and open fracture in 16. The union rate was 94.2%, sepsis rate was 1.5%. Good or very good outcome was achieved in 86.6% of the cases. Postoperative radial nerve paralysis occurred in 8 cases (5.1%), only 1 patient suffered persistent severe sequelae. There were also 8 nonunions and 3 delayed unions.

Dykes and Daryll in 2001 compared efficacy of plate versus intramedullary nails for humeral fracture and Concluded plating results in better functional outcome and nailing should be reserved only for special situations

Bhandari M, Devereaux PJ, McKee MD, Schemitsch EH, in April 2006, Compression plating versus intramedullary nailing of humeral shaft fractures--a meta-analysis. Interpreted that Plate fixation of humeral shaft fractures may reduce the risk of reoperation and shoulder impingement. The cumulative evidence remains inconclusive, and a larger trial is needed in order to confirm these findings

In our study, Patients admitted in Yenepoya Medical College Hospital, Derelakatte, Mangalore from feb-2014 to oct-2015 with diaphyseal humerus fractures were treated with open reduction and internal fixation with DCP and intramedullary interlocking nail fixation.

40 patients were prospectively randomised into two groups for comparative study. 20 patients were treated by surgical management in each for dynamic compression plating and interlocking nailing respectively

Patients The average age of patients in each study group ranged from 18 to 60 years . with 44 as average in plating group and 46.15 as average in nailing group. In these , 26 were male and 14 were female patients . 19 patients had sustained injury following RTA, 19 patients during domestic / fall at work place, 2 patients fractured their humerus while playing sports.

Main indication for fracture fixation was to mobilize the limb at earliest. 7 patients had associated injuries.

Most of the patients were treated within 7 days of injury . Average being 2.9 and 2.15 days in plating and nailing groups respectively.

In plating group, 4.5mm narrow DCP was the plate of choice. The patients with proximal 3rd shaft fractures antero-lateral surgical approach was used. And for distal third humerus shaft posterior triceps splitting approach was used .Midshaft humerus were treated either of these approaches depending on fracture pattern and radial nerve palsy following injury. In this study group 13 patients had midshaft humerus fractures. 6 patients had distal 3rd humerus shaft fracture out of which 5 had radial nerve palsy following injury. 1 patient with proximal third humerus shaft was treated with plating . 1 patient had radial nerve palsy post-operatively recovered in a month. All the patients taken under the study had minimum of 6 months follow up.

In nailing group standard humerus IMIL nail were used of sizes 7,8,9 mm sizes and all the patients were treated using antegrade humerus nailing by splitting the rotator cuff. None of the patients were treated with retrograde nailing. In this group, 10 were midshaft humerus fractures, 9 were proximal 3rd humerus fractures. 1 patient with distal 3rd was treated with nailing. 2 patients with nailing had non-union, both were elderly and diabetic. Did not follow up on time. All the patients taken under the study had minimum of 6 months follow up.

Exposure to radiation was definitely more in nailing group has no much C-arm used for plating Fracture classification was done according to AO classification system to A1,A2,A3,B1,B2,B3,C1,C2 and C3. The patients had sustained following fracture patterns based on classification. That is , A1- 3 patients; A2- 9 ; A3- 11; B1- 7 ; B2- 4 ; B3- 1 ; C1- 4 ; C2- 0 ; C3-1.

In our study functional outcome was calculated by DASH SCORING . mean DASH scoring for plating and nailing group was 23.5 and 31.95 respectively. with average good outcome in both groups. Slightly better in plating group.

In 40 cases, Excellent results were seen in 40%; good-45% ; fair 15% in plating group. In nailing group, excellent results in 20% ; good-50%; fair-20%; poor-5%.

CONCLUSION

Humerus shaft fractures are one of the common fractures affecting present generation and treatment modality has to be decided carefully.

Humerus shaft fractures should be treated with surgical management depending on fracture. all the displaced fractures have to be treated with either plating or nailing. Both the modalities of treatment i.e. dynamic compression plating and interlocking nailing are good as far as union of the fracture is concerned, but considering the functional outcome and rate of complications, we are of the opinion that dynamic

compression plating offers better result than interlocking nailing with respect to pain and function of the shoulder joint. As the patients who underwent nail fixation to their humerus constantly complained of shoulder pain.

Plating is one of the best option for the patients with radial nerve palsy following injury. Which is essential to free the nerve from entrapment in the fracture fragments and its always must to expose radial nerve while treating distal 3rd humerus fractures.

We prefer plate osteosynthesis as a ideal treatment option for midshaft and distal 3rd shaft fractures. And nailing is ideal fixation for proximal 3rd shaft as the injury to nerve or nerve entrapment during closed reduction are rare in proximal shaft fracture . Nailing also has risk of radiation exposure to both surgeons and patients.

As the humerus corresponds to femur in lower limb. Nail is a load sharing device, so its very essential for weight bearing femur. As humerus is in upper limb load sharing device is not necessary. therefore we here by conclude that Plating is the best option when your considering both the surgical managements

The fallacies in our study are, the sample size is small and we have not taken retrograde interlocking nailing in to consideration

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