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Comparative study of clinical outcome in management of fracture shaft of humerus by compression plating vs interlocking nail

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Abstract

Introduction: Fractures of shaft of humerus is becoming common these days and there is debate about the choice of operative intervention in humerus shaft fractures requiring surgical intervention. The modes of treatment are also advancing, so this comparative study was conducted to assess the clinical outcome of this fracture managed by two most common methods antegrade interlocking nail fixation and dynamic compression plating.

Aim of the study was to compare the results of open reduction and internal fixation with DCP or closed interlocking nailing in fractures shaft of humerus.

Material and Methods: It was a prospective study, consisted of 32 patients with closed acute humeral shaft fractures were treated with either interlocking nailing or plating procedure divided in two groups randomly of 16 each. Study was conducted in department of orthopaedics KVG Medical College and Hospital, Sullia, D K, Karnataka. Results were evaluated and analyzed using Rodriguez-Merchan Criteria different parameter; age, male v/s female, mode of trauma, functional outcome and complications etc.

Results: The average age of patient was 33 years, with male to female ratio 6:3, more common on right side 61.33%, road side accident in 63.33% cases as common mode of injury, middle third as common region 55.53%, most common AO type A3 52% cases, group A interlocking nailing shows 20% cases as excellent result and 45.67% cases showing satisfactory results. In group B, dynamic compression plating shows 85% cases excellent result with 20% cases shows satisfactory results. Preoperative radial nerve palsy was seen in 3 cases in our study.

Conclusion: No single treatment is superior in all cases for a particular fracture and each case has to be individualized. In the present study it was concluded that compression plating is better than interlocking nail for management of fracture shaft humerus.

Keywords: Interlocking nail (ILN), dynamic compression plate (DCP)

Introduction

Fracture of humeral shaft are commonly encountered by Orthopaedic surgeons, which is 1-3% of all fractures^[1]. There is debate about the choice of operative intervention in humerus shaft fractures requiring surgical intervention. Treatment methods are evolving as advances are made in both non operative and operative procedures. It is generally agreed that most fractures of humeral shaft are treated best non-operatively^[2, 3, 4].

Recent advances in internal fixation techniques and instrumentation have led to an expansion of surgical indications. Nonunion, malunion, limitation of joint motion and degenerative arthritis are commonly seen in conservative methods, hence arose the need of operative intervention.

The present study covers the comparative study of clinical outcome in management of fracture shaft of humerus by compression plating vs interlocking nailing.

AIMS

To compare the results of clinical outcome by open reduction and internal fixation with DCP (Dynamic compression plate) or close interlocking nailing in fractures shaft of humerus.

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Materials and Methods

Design: Prospective study

Study Area: Dept. of Orthopaedic KVG Medical College and Hospital Sullia, D K, Karnataka.

Study Population: Patients with closed humeral shaft fracture presented to KVG Medical College and Hospital Sullia, D K, Karnataka.

Duration: 1 year 6 month (July 2017-Dec 2018)

Sample Size: 32 patients with closed humeral shaft fracture were treated with either interlocking nailing or plating procedure divided in two groups randomly of 16 each.

Inclusion Criteria

Humeral shaft fractures which required operative intervention and were treated with interlocking nailing or plating procedures. Patients more than 18yrs of age of either sex.

Exclusion Criteria

Patients less than 18yrs of age. All cases of compound fracture, polytrauma patients Segmental fracture. Pathological fracture and patients who were initially managed with external fixator.

All the fractures were managed and stabilized initially with POP slab. After that radiographs were taken and after pre anesthetic evaluation and informed written consent patient posted for intramedullary nailing or DCP accordingly based on odd and even IP no of the hospital.

Surgical technique of interlocking nailing: For interlocking nails under general anesthesia or brachial block patient was placed in semi inclined position, a 2cm incision was given lateral to acromion in the direction of deltoid fibres and entry point made, guide wire passed in to the proximal fragment under C arm control and subsequently passed to distal fragment. Sequential reaming done over the guide wire. Then nail of appropriate size placed with jig and guide wire taken out. Proximal locking was done through the jig. Distal locking was done by free hand technique, fracture compression given by back thumping around elbow. Wound closed in layers - anti septic dressing done - arm sling applied.

Surgical technique of DCP: Under G.A or brachial block patient was placed supine for anterolateral approach and lateral position was used for posterior approach. The approach was decided based on the level of fractures shaft of humerus. For upper third and middle third fractures an anterolateral approach and for middle third and lower third fractures posterior approach was used. Biceps and brachialis retracted medially and Radial nerve was identified and explored wherever required. Fracture reduced and DCP plate of appropriate size fixed with screws.

After through wash suturing done and wound closed in layers and arm sling applied. Postoperatively limb was elevated over pillow Broad spectrum I/V antibiotics, anti-inflammatory and analgesic were given. After suture removal on 10th postoperative day Physiotherapy of shoulder and elbow advised.

Patients were followed up once in six Weeks interval till union. On every visit anteroposterior and lateral view of radiograph were taken.

Rodriguez-Merchan criteria (1995) [12] were used to compare the postoperative results of interlocking nailing and plating procedures at follow-up. (Table 4)

Results

32 patients of fracture shaft humerus admitted in orthopaedics

department of KVG Medical and Hospital, Sullia, Karnataka. Out of 32 patients, 16 were grouped as A and given interlocking nail as treatment and 16 were treated with the D.C.P and grouped as B. The youngest patient in our study was 17 years and oldest was 62 years. Average age was 33 years. 78% of fractures occurred between age group of 19-50 years as this age has more outdoor activities. There is male preponderance in our study with male female ratio 6:3 due to more involvement in outdoor activities. Injury was more common on right arm because of protective reflex to avoid trauma.

The most common mode of injury was road traffic accident in 19 cases (62.5%). 9 (28.12%) cases occurred because of fall from height and 3 (9.37%) cases, because of other mode of injury. 55.53% cases had fracture in middle third, and most common AO type A3 52%.

In this study majority of the patients were operated within four days (81.25%) in group A and (75%) in group B. With average union time in group A was 11 weeks; average union time in group B was 12.5 weeks. With early complications are more in group B like superficial infection 6.67%, radial nerve Neurapraxia 6.25%. with late complications like shoulder pain 66.67% delayed union in 13.33% cases and shoulder stiffness in 66.67% cases in group A compared with 20% / 20% / 10% in group B respectively (Table-2). There was statistical significant ($p < 0.05$) decrease in abduction and rotation possible at shoulder joint at final follow up in group A patients (Tables-3-4).

Complication

Preoperative radial nerve palsy was seen in three cases (9.3%) in our series. All cases of preoperative radial nerve palsy recovered completely following stabilisation, indicating a Neuropraxia type of injury. No postoperative radial nerve palsy was seen in the interlocking nailing group. Postoperative radial nerve palsy was seen in one case in the plating group (6.25%). Other late complications are showing in table-2.

Discussion

In the study of comparison of compression plating v/s interlocking nail in fractures shaft humerus conducted in department of orthopaedics KVG Medical College and Hospital, Sullia. Youngest patient in our study had age of 17 years and oldest has age of 62 years. Average age was 33 years. 78% of fractures occurred between age group of 19-50 years as this age has more outdoor activities. There is male preponderance in our study with male female ratio 6:3 due to more involvement in outdoor activities. Injury was more common on right arm because of protective reflex to avoid trauma. Similar trend was seen in a series of Lal *et al.* [5] in which mean was 39.5 years and Chacha *et al.* [6] average being 36.3 years. In this study male/ female ratio being 7:3 similar to study series of Reddy *et al.* [7] were also m/f ratio was 7:3.

The study shows the more involvement of right side with road side accidents as mode of injury 63.33% cases, fall from height 33.33% cases and 3.33% cases due to railway injuries. Loomer *et al.* [8] observed that injuries was as a result of motor vehicle accidents in 50% of cases. In this study 93.33% were closed fractures and 6.67% were compound of Gustilo Anderson type 1. P.M Rommens [9] found 7% rate of open fracture. No patient of group A had superficial infection in comparison with 1 patient in group B which is not statistical significant (p value 0.015); 1 patients in group B has postoperative Neurapraxia of radial nerve with no patient in

group in A which is not statistical significant (p value 0.150) this patient recovered from Neurapraxia within 12 weeks of conservative management and no exploration was needed in this case.

Infection, nonunion and radial nerve palsy are general concerns suggested in the plating group [10, 11, 12].

Complication, abduction at shoulder joint in degree and rotation at shoulder in degree and grading of result according to Rodriguez-Merchan [12] criteria calculated and shown in the following pic. (Table 5-7)

Table 1: Results

GENDER	NUMBERS
MALE	18
FEMALE	14
SIDES	NUMBERS
LEFT	38.67% (14)
RIGHT	61.33% (18)
INTERVENTION	NUMBERS
NAILING	16
PLATING	16

Table 2: Showing Late Complication

COMPLICATIONS	GRP A CASES	GRP A %	GRP B CASES	GRP B %	CHI-SQUARE	P value	RESULTS
Shoulder pain	11	68.75	4	25	6.15	0.13	significant
Instability	0	0	0	0	-	-	-
Malunion	0	0	0	0	-	-	-
Delayed union	3	18.75	2	12.5	0.237	0.626	Non Significant
Non union	1	6.25	0	0	1.03	0.310	Non Significant
Deep infection	0	0	0	0	-	-	-
Elbow stiffness	0	0	0	0	-	-	-
Shoulder stiffness	9	56.25	0	0	12.5	0.0001	Highly Significant

Table 3: Showing Abduction Possible At Shoulder Joint

COMPLICATIONS	GRP A CASES	GRP A %	GRP B CASES	GRP B %	TOTAL	%
> 164	4	25	15	93.75	19	59.37
140-164	6	37.5	1	6.25	7	21.87
<140	6	37.5	0	0	6	18.75
Total	16	100	16	100	32	100

Table 4: Showing rotation at shoulder joint

ROTATION AT SHOULDER JOINT	GRP A CASES	GRP A %	GRP B CASES	GRP B %	TOTAL	%
>89	5	31.25	11	68.75	16	50
60-89	9	56.25	4	25	13	40.62
<60	2	12.50	1	6.25	3	9.38
Total	16	100	16	100	32	100

Table 5: Criteria for Evaluating Fictional Results (Rodriguez-Merchan Criteria).

Rating	Elbow range of movement	Shoulder range of movement	Pain	Disability
Excellent	Extension 5° Flexion 130°	Full range of movement	None	None
Good	Extension 15° Flexion 120°	<10% loss of total range of movement	Occasional	minimum
Fair	Extension 30° Flexion 110°	10–30% loss of total range of movement	With activity	Moderate
Poor	Extension 40° Flexion 90°	>30% loss of total range of movement	Variable	severe

Table 6: Results of Interlocking Nail (Rodriguez–Merchan Criteria)

Rating	No of Patients	Percentage
Excellent	3	18.75
Good	7	43.75
Fair	5	31.25
Poor	1	6.25

Table 7: Results of Plating (Rodriguez–Merchan Criteria)

Rating	No of Patients	Percentage
Excellent	4	25
Good	10	62.50
Fair	1	6.25
Poor	1	6.25

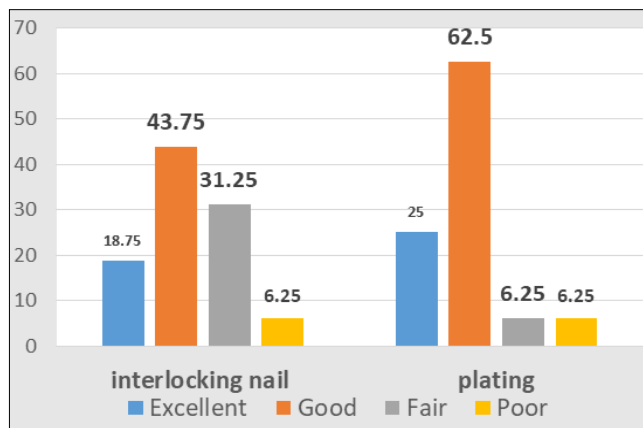


Fig 1: Comparison of results in treatment of fracture shaft of humerus Interlocking nail Vs Plating



Fig 2: Radiograph of good results with interlocking nailing



Fig 3: Radiograph of good results with Plating



Fig 4: Radiograph of poor results with Nonunion of interlocking nail



Fig 5: Radiograph after exchange nailing with antibiotic beading

Conclusion

In conclusion, no single treatment option is superior in all circumstances for a particular fracture and each case has to be individualised. There is significant decrease in movements of shoulder joint; shoulder stiffness and persistent shoulder pain in patients treated with interlocking nailing. Plating has been shown to have better overall results compared to the interlocking nailing in treatment of closed humeral shaft fractures. A tendency for earlier union is seen with the plating group.

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