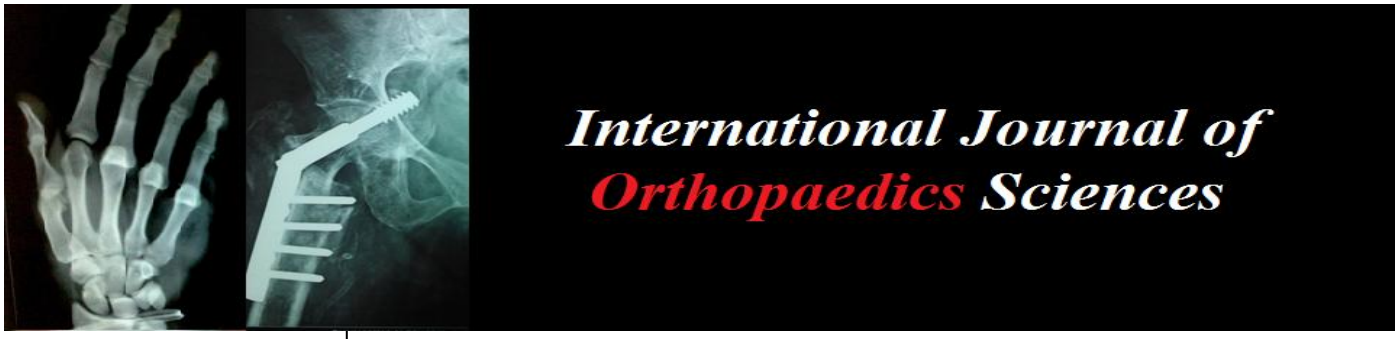

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A prospective study to evaluate surgical management of fracture shaft of humerus using nailing and platting technique

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Abstract
Background: Treatment of fracture of humerus was always a challenge to medical practitioner as recorded by in ancient medical literature but iatrogenic damage during management was always concentration. Present study has been designed with an aim to evaluate surgical management of fracture shaft of humerus using nailing and plating technique.
Method: Patients with fracture shaft of humerus who require surgical stabilisation were selected for fixation with dynamic compression plate or fixation by intramedullary nailing randomly by using sealed envelope method. In dynamic compression plating we used 4.5 mm compression plate in all patients. Regular evaluation of the patient was done by local examination and radio graphic examination functional evaluation, was done by Myo elbow performance scale, Shoulder function (Constant and Murley score) and American shoulder and elbow surgeon score (ASES scare).
Result: Regarding functional status of joints based on score, the Myo elbow performance score was excellent in 12 patients in DCP group, good in 7 seven patients and fair in one patient. In interlocking nail group the score was excellent in 14 patients, good in 4 patients and fair in 2 patients. The p value was more than 0.05 which is not significant statistically. In DCP group the shoulder score (constant and Murley score) was excellent in 13 patients, good in 6 patients and fair in one patient.
Discussion and Conclusion: Based on our observation we can conclude that there is no significant difference in functional outcome between platting and nailing group groups. Regarding complication between two group adhesive capsulitis was common in nailing group and delayed union was more in plating group.

Keywords: Fracture shaft of humerus, dynamic compression plate, interlock nailing and plating, functional outcome

1. Introduction
Shaft of humerus is defined as the region distal to the pectoralis major muscle insertion and distally it continued up to flare of metaphysis [1]. Proximally it is cylindrical and transitions to a triangular shape prior to distal end. The shaft of humerus has various muscle insertion and origin which responsible for displacement and angulations at time injury. Treatment of fracture of humerus was always a challenge to medical practitioner as recorded by in ancient medical literature but iatrogenic damage during management was always concentration. Fracture shaft of humerus accounts for 2-3% of all fractures and include group of fracture where main fracture line lies distal to surgical neck of humerus and proximal to supracondyler redge [2, 3].
Fracture shaft of humerus are mostly treated conservatively, by reduction and immobilisation with success rate of absent 90%. But where there is multiple injuries, segmental fracture of humerus, osteoporosis, morbid obesity, and floating elbow operative stabilization is required.
With the advancement in the field of fixation technique, better understanding of implants, and improved surgical treatment with low rate of complication, surgical management of humerus shaft fracture has become popular [4, 5].
But selections of patient, suitable implant for internal fixation are still challenges. Very few literatures are available to compare the outcome of interlock nailing and plating [5, 6]. Present study has been designed with an aim to evaluate surgical management of fracture shaft of humerus using nailing and plating technique.

Material and Method

This is a prospective comparative observational randomized conducted in the department of orthopaedics Konaseema institute of Medical science Amalapuram Andhra Pradesh from April 2017 to December 2019.

Ethics: Approval from institutional ethics committee was taken before start of this study. A written informed consent was taken from all patients before enrolment of then is this study.

Selection of patients

In this study patients with fracture shaft of humans admitted in the department of orthopaedics and trauma were enrolled for this study based on inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
More than 18yrs Both sexes. Polytrauma Unstable fracture. Fracture with in One week Grade I and 2a Open fractures.	Neglected and pathological fractures Fracture extending beyond shaft Grade 3 compound Fracture

Sample size

Based on above criteria 40 patients were enrolled during two years eight months of study.

Method

During this study period patients with fracture shaft of humerus who require surgical stabilisation were selected for fixation with dynamic compression plate or fixation by intramedullary nailing randomly by using sealed envelope method. In dynamic compression plating we used 4.5 mm compression plate in all patients. The choice of approach depends upon morphology and position of fracture that is posterior approach in lateral position and anterolateral approach in supine position. A fixation of 6 to 8 cortices in both proximal and distal segment was used. In intramedullary nailing group the ante grade nailing was done through minimal invasive approach. The nail entry site was medial to greater tuberosity and lateral articular margin. Locking of proximal and distal part was done.

Patients in both groups were initiated on active elbow and shoulder exercise in post operative period.

Regular evaluation of the patient was done by local examination and radio graphic examination functional evaluation, was done by Myo elbow performance scale, Shoulder function (Constant and Murley score) and American shoulder and elbow surgeon score (ASES scare). All patients were followed weekly for 6 wks and then at 3, 6, and 12 months.

A through clinical examination and radiological examination was done for all patients at each visit. Various parameters like demography, functional outcome, time taken for union and incidence of complication. All infection on of wound noticed was treated with appropriate antibiotic.

Statistical Analysis

Data was collected on excel sheet and analysed by SPSS software version17. For analysis of data percentage and chi-square test was used. The p-value less than 0.05 were considered statistically significant.

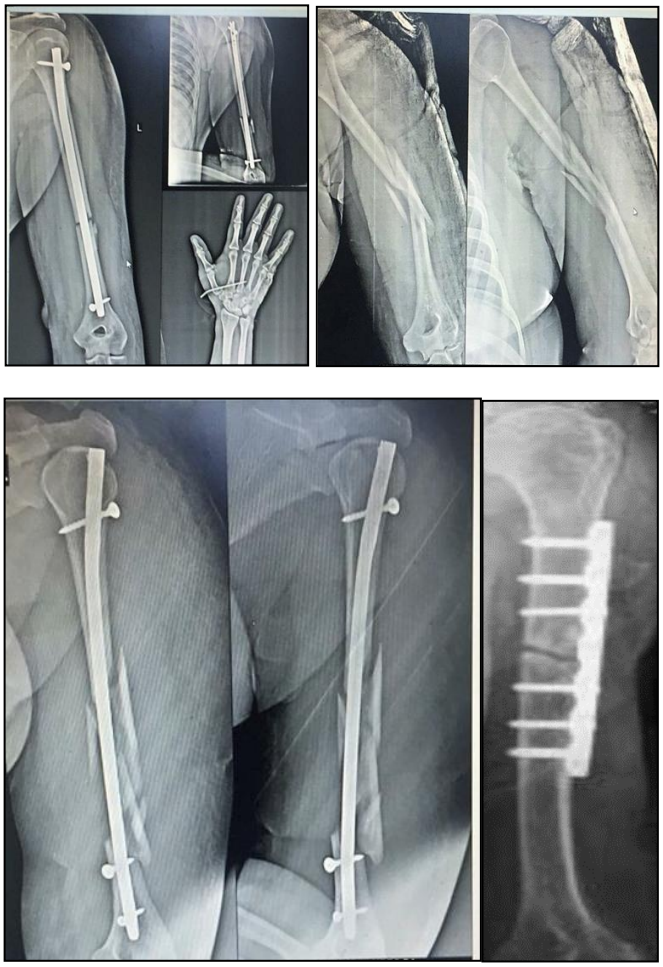

Fig 1.

Result

In present study forty patients with fracture of humerus as per inclusion and exclusion criteria were divided randomly in two groups. One group were treated with DCP and another group were interlocking and nailing group.

Table 1: Demographic variable of the patient

Variables		DCP group	Interlocking nail group	P value
Gender	male	12	11	.749 Chi square statistic 0.1023
	female	8	9	
Side	Right	14	16	.465 Chi square statistic 0.533
	Left	6	4	
Age (years)		44.7 ± 14.66	46.075 ± 12.46	.260
Mode of injury	RTA	11	12	.749 Chi square statistic 0.1023
	Fall	9	8	
AO type	A	12	10	.654 ,Chi square statistic 0.84
	B	2	4	
	C	6	6	
Time required for healing(days)		187.97± 20.04	222.94 ± 24.13	<.00001

As per table one, out of 20 patients in DCP group 12 patients was male and eight were female. In interlocking and nailing group out of 20 patients 11 patients were male and 9 were female. Both groups are comparable to each other with regard to sex distribution as p value was more than 0.05.Regarding side of fracture, in DCP group out of 20 patients 14 has fracture in right humerus and 6 fracture in left humerus. In interlocking nail group out of 20 patients 16 has fracture in right humerus and 4 fracture in left humerus. There is no difference between two group regarding side of fracture. Mean age of Patients in DCP group was 44.7 ± 14.66 years and in interlocking nail group 46.075 ± 12.46 years. The p value was.260 which is not significant statistically. Road traffic accident was frequent in both groups, in DCP group out of 20 patients, 11 patients RTA was the cause of fracture, in interlocking nail group out of 20 patients in 11 patients RTA was the cause of fracture. Both groups were similar to each other with respect to mode of injury as the p value was.749. Regarding comparison between two groups based AO classification, in DCP group 12 patients have type A, 2 patients have type B and 6 patients have type C. Similarly in interlocking nail group 10 patients have type A, 4 patients have type B and 6 patients have type C.

The p value is.654, which is more than 0.05. Time required for healing in DCP group was 187.97± 20.04 days and in interlocking nail group was 222.94 ± 24.13 days, the p value was less than 0.00001.

Table 2: Functional status of joints based on scores

Elbow score (Myo elbow performance score)			
Elbow score	**DCP group**	**Interlocking nail group**	**P value**
Excellent	12(60%)	14(70%)	P›0.05
Good	7(35%)	4(20%)	
Fair	1(5%)	2(10%)	
Poor	0	0	
Shoulder score (constant and Murley score)			
Shoulder score	**DCP group**	**Interlocking nail group**	**P value**
Excellent	13(65%)	11(55%)	P›0.05
Good	6(30%)	8(40%)	
Fair	1(5%)	1(5%)	
Poor	0	0	

AS per table 2 regarding functional status of joints based on score, the Myo elbow performance score was excellent in 12 patients in DCP group, good in 7 seven patients and fair in one patient. In interlocking nail group the score was excellent in 14 patients, good in 4 patients and fair in 2 patients. The p value was more than 0.05 which is not significant statistically. In DCP group the shoulder score (constant and Murley score) was excellent in 13 patients, good in 6 patients and fair in one patient. Similarly in interlocking group the shoulder score (constant and Murley score) was excellent in 11 patients, good in 8 patients and fair in one patient. The p value was more than 0.05 which is not significant statistically.

Table 3: complication in DCP and Interlocking nail group

Intra operative complication		
complications	**DCP group**	**Interlocking nail group**
Fracture site Communition	1	1
Greater tuberosity fracture	0	1
Locking difficulty	1	1
Entrapping of radial number	1	0
Post operative complication		
Non union	1	1
Delayed union	3	2
Superficial infection	1	0
Deep infection	0	1
Adhesive capsulitis (shoulder)	0	2
Adhesive capsulitis (elbow)	0	1
ASES Score	44	45
reoperation	1	0

As per table 3, regarding complication in DCP and Interlocking nail group, regarding intra operative complications, fracture site communition was present in one in both groups. Greater tuberosity fracture was absent in DCP group but present in one patient in Interlocking nail group. Locking difficulty was found one in each group. One patient in DCP group has entrapping of radial number. Regarding post operative complications, non union was present in one patient in each group. In DCP group 3 patients have delayed union and in interlocking group 2 patients have delayed union. Superficial infection was present in only one patient in DCP group and deep infection was present in one patient in interlocking group. Adhesive capsulitis of shoulder joint was present in 2 patients in interlocking group. Adhesive capsulitis of elbow joint was present in 1 patient in interlocking group. Adhesive capsulitis was absent in DCP group. ASES Score was 44 and 45 in DCP and Interlocking nail group respectively. Only one patients out of 40 patient enrolled belonging to DCP group required reoperation.

Discussion

In present prospective study to evaluate surgical management of fracture shaft of humerus using nailing and platting technique, we have enrolled forty patients and divided them in to two groups for two surgical procedures. It is observed that there was male predominance and fracture of right side was more common than left. Mean age of patient were comparable in both group (44.7 ± 14.66 vs 46.075 ± 12.46) which is supported by the finding of Kumar R, Singh P, *et al.* and Seo JB, Heo K, Yang JH, Yoo JS [5, 8]. In present study we have observed that RTA was most common cause of injury and AO type A was most common type of fracture in both group. This is supported by the work of Bergdahl, C., Ekholm, C., Wennergren, D. *et al.* [9] Mean of time required for healing was significantly lower in DCP group than interlocking nailing group this finding is similar to the finding of Raghavendra S, Bhalodiya HP.[5] Elbow score (Myo elbow performance score) was excellent in 70% patient in interlocking nailing group but in DCP group it was excellent

in 60% patients. But the score is good in 35% patient in DCP group. In comparison to that 20% patient in interlocking and nailing group it was good this finding is partially supported by Fırat A, Deveci A, Güler F, Oçgüder A, Oğuz T, Bozkurt M *et al.* [10] In DCP group shoulder score (constant and Murley score) was excellent in 65% patients and in interlocking and platting group it was 55%.The score was good in 30% patients in DCP group and 40% in interlocking nailing group which is supported by the work of Micic I, Kholinne E, Kwak JM, *et al.* and Flinkkilä, Tapio & Hyvönen, Pekka & Siira, Pertti & Hämäläinen, Martti *et al.* [11, 12].

Regarding intraoperative complication fracture site Communition was found in one patient in both groups and greater tuberosity fracture was present in one patient in interlocking nailing group which corroborates with finding of Connors K, Hawken J *et al.*, and Fan Y, Li YW, Zhang HB, *et al.* [13, 14] Locking difficulty was found in one patient in each group and radial nerve trapping was found in one patient in DCP group. Which similar to the work of Raghavendra S, Bhalodiya HP *et al.* and Kumar R, Singh P, Chaudhary LJ, Singh S *et al.* [5, 6] We have observed in this series that one patient in both group has non union. Three patients in DCP group has delayed union where as two patients in interlocking group have delayed union. Superficial infection was present in one patient in DCP group and deep infection was present in one patient in interlocking group. Our finding is supported by the work of Lin, Jinn & Shen, Po-Wen & Hou, Sheng-Mou *et al.* and Puri SR and Biswas *et al.* [15, 16]

Adhesive capsulitis (shoulder and elbow) was present in interlocking group but absent in platting group which is supporeted by the study of Wali MG, Baba AN, Latoo IA, Bhat NA, Baba OK, Sharma S *et al.* and Singisetti K, Ambedkar M.*et al.* [17, 18] Regarding ASES Score both group are comparable to each other. Which is supported by the work of Kumar R, Singh P, Chaudhary LJ, Singh S *et al.* and Fan Y, Li YW, Zhang HB, *et al.* [6, 14]

Conclusion

Based on our observation we can conclude that there is no significant difference in functional outcome between platting and nailing group groups. Regarding complication between two group adhesive capsulitis was common in nailing group and delayed union was more in plating group.

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