



Surgical Management of Fracture Shaft of Humerus in Adults Using Flexible Nails – By Retrograde Technique

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Abstract

Background and Objective: *The fractures of the shaft of humerus are one of the commonest fractures found and can be treated by different methods. The present study is undertaken to know the functional outcome following the use of flexible nails for humeral shaft fractures in adults.*

Materials and Methods: *It is a prospective study which was carried out from August 2012 to July 2014 J.J.M.Medical College, Davangere. In this study period 20 cases of fracture shaft of the humerus were treated by closed reduction and internal fixation using flexible nails.*

Results: *In our series, majority of the patients were males(70%), middle aged, with road traffic accidents(70%) being the commonest mode of injury, involving middle third(60%). Average follow up ranged from 6-18 months,60% united in 14-18 weeks duration, 3patient had delayed union,1 patient had non-union, 1 patient had implant breakage. 95% recovered with full range of elbow movements. The average ASES score was 50. 70% had excellent results,10% had good and 20% had poor results*

Conclusion: *Flexible intramedullary nailing done by retrograde technique produces equally good results comparable to any plate osteosynthesis or interlocking intramedullary nailing. Another added advantage of flexible nail fixation is it requires very minimal operative instrumentation.*

Key Words: *Humeral shaft fractures, Flexible nails, Closed reduction and Internal fixation*

1. INTRODUCTION

Incidence of fracture of the humerus shaft is between 3% and 5% of all fractures^{1,2}. 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 deficit³.

The emphasis has changed from splinting and prolonged immobilization, to internal fixation and early mobilization, with return to normal function as early as possible. Attitude toward internal fixation of fractures has changed over the past few decades. With the formation of the AO group in 1958, the base for evolution of internal fixation in skeletal surgery was set. Internal fixation

techniques were tried in all types of diaphyseal fractures, and with increasing frequency in fracture shaft of humerus. The two modalities of internal fixation in fracture shaft of humerus are plate osteosynthesis and intramedullary nailing.

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 post injury^{2,4,5}

The successful treatment of a humeral shaft fracture may not end with bony union. In the current emphasis on a holistic approach to patient care the treating Orthopedic surgeon may be in an ideal position to intervene and improve a patient's life beyond what is traditionally recognized as the surgeon's role. As with most orthopedic injuries, the successful treatment of a humeral shaft fracture demands a knowledge of anatomy, surgical indications, techniques and implants, patient functions and expectations⁶.

With this background, this study is to evaluate the results of retrograde intramedullary flexible nailing in humeral shaft fractures.

2. OBJECTIVES

- 1) To study the duration of union in the above mentioned fractures.

- 2) To study the functional outcome following the use of flexible nailing
- 3) To study the complications of flexible intramedullary nailing of humeral shaft fractures.

3. METHODOLOGY

It is a prospective study which was carried out from August 2012 to July 2014 at J.J.M. Medical College, Davangere. In this study period 20 cases of fracture shaft of the humerus were treated by closed reduction and internal fixation using flexible nailing.

The following protocol was observed for patients with humerus fractures on arrival.

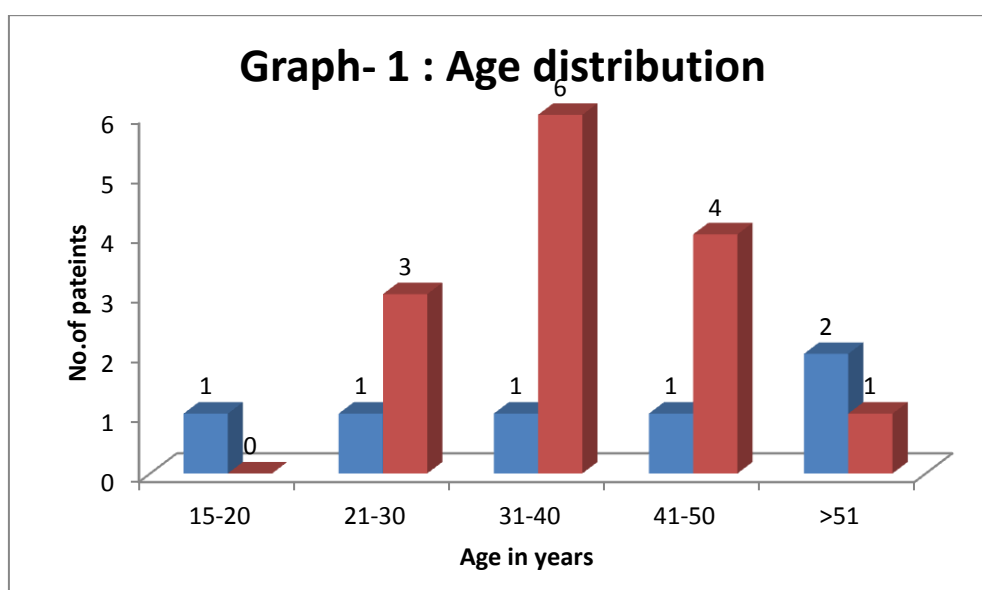
- 1) General and systemic examination as well as local examination of the patient
- 2) Thorough assessment of patient to rule out head/chest/abdominal/spinal or pelvic injury

Ethics: procedure followed in accordance to ethical standards of experimentation as per JJM Medical college ethical clearance committee

4. RESULTS

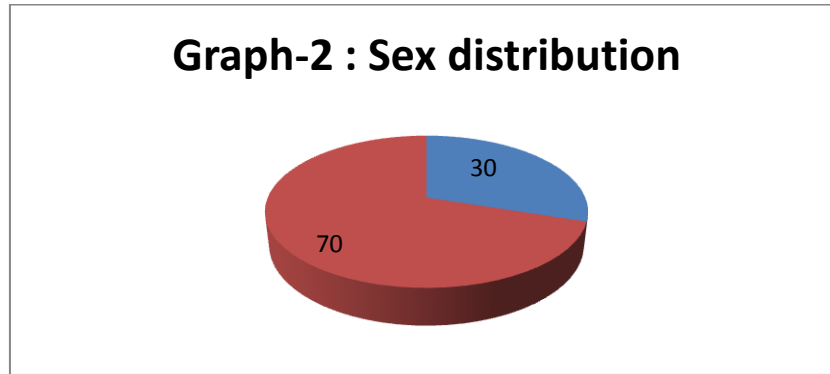
4.1 AGE DISTRIBUTION

Age of these patients ranged from 18 to 60 years with 35% patients in 4th decade. The average age was 40 years.



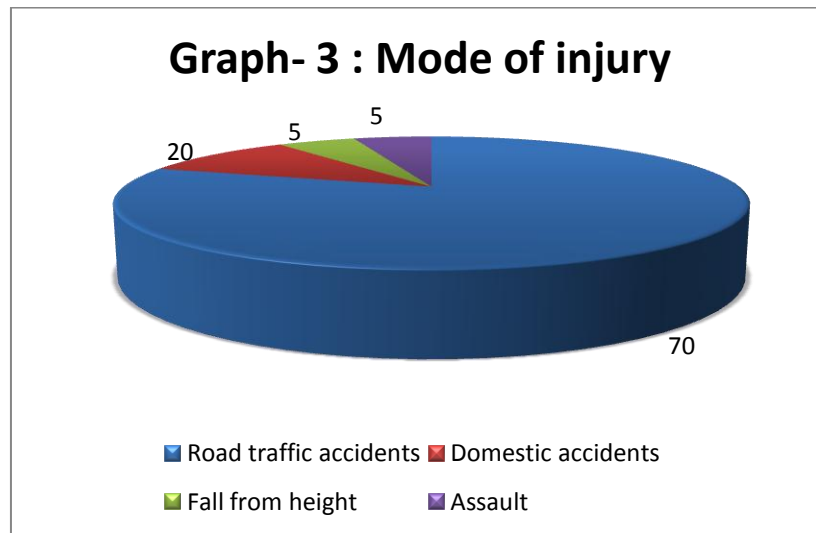
4.2 SEX DISTRIBUTION

Majority of the patients, 70% were males and 30% were females.



4.3 MODE OF INJURY

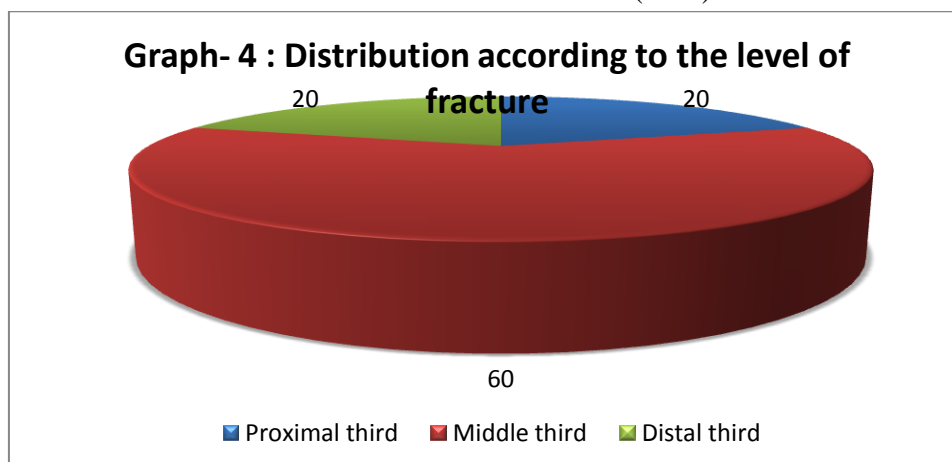
We found that road traffic accident was the most common cause of injury being responsible for 70% of cases followed by domestic accidents 20%, Fall from height 5% and assault 5%



4.4 FRACTURE CHARACTERISTICS:

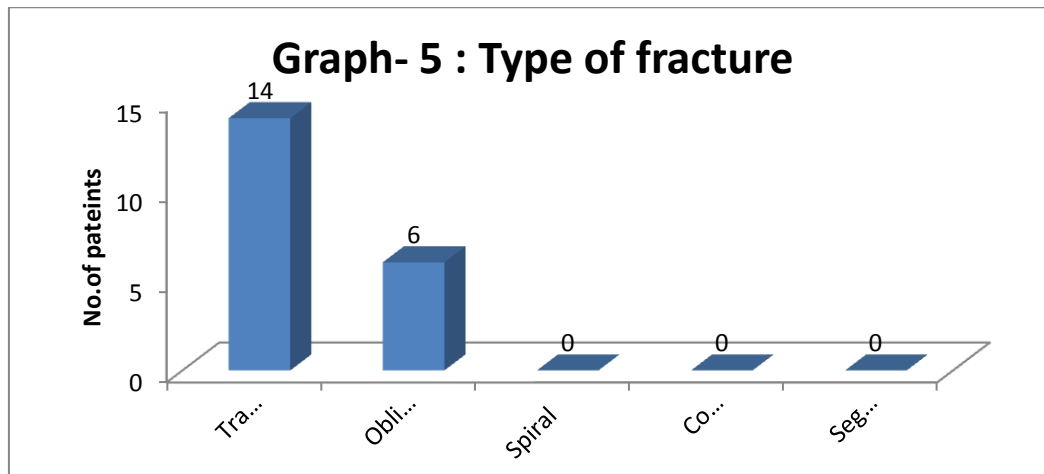
Level of fracture

Most of the fractures were located in the middle third of the shaft (60%).



Type of fracture:

Majority of fractures (70%) were transverse type. In (30%) fractures were oblique type.

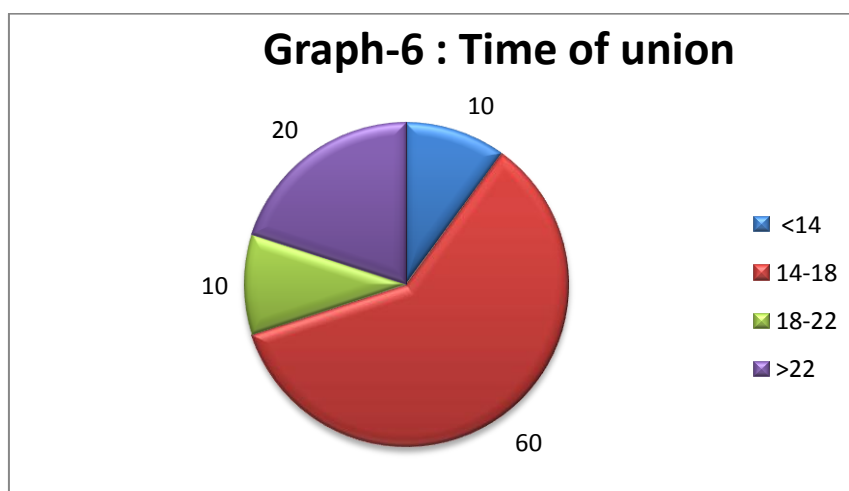


Statistics of surgery:

20 cases were operated under general anaesthesia. Retrograde posterior approach was used in all cases. Tourniquet was not used in any of our cases, as it comes in the way of surgery. The follow up ranged from 6 months to 18 months.

Duration of fracture union:

The fracture was considered to be united when clinically there was no pain and no subjective complaints, radiologically fracture line was not visible and full unprotected function of the limb was possible. 60% united on an average period of 14-18weeks



Range of mobility of the shoulder and elbow joints:

19(95%) patients recovered full range of motion of shoulder and elbow joint while 1 (5%) patient recovered good range of motion (within 10-15% of full range).

ASES SCORE

The American shoulder and elbow surgeons (ASES) shoulder score is for 13 activities of daily living requiring full shoulder and elbow movement. The maximum possible score is 52 points. The average ASES score obtained was 50.

Total period of hospitalization:

The number of days in the hospital ranged between 15 days and 45days.

COMPLICATIONS

Intra operative: There were no intraoperative complications. Post operative:

- 1) Delayed union:** there was 3 case of delayed union. This pt also had shoulder and elbow stiffness which improved with exercises.
- 2) Nonunion:** There was 1 case of nonunion. Nonunion was due to inadequate reduction

of fracture fragments and early weight bearing by the patient

- 3) Implant breakage: One case had nail breakage at the fracture site but fracture united uneventfully

ROMMENS ET AL SERIES GRADING¹⁹

EXCELLENT:

Solid union - anatomic reconstitution Less than 10% loss of range of motion, no significant subjective complaints.

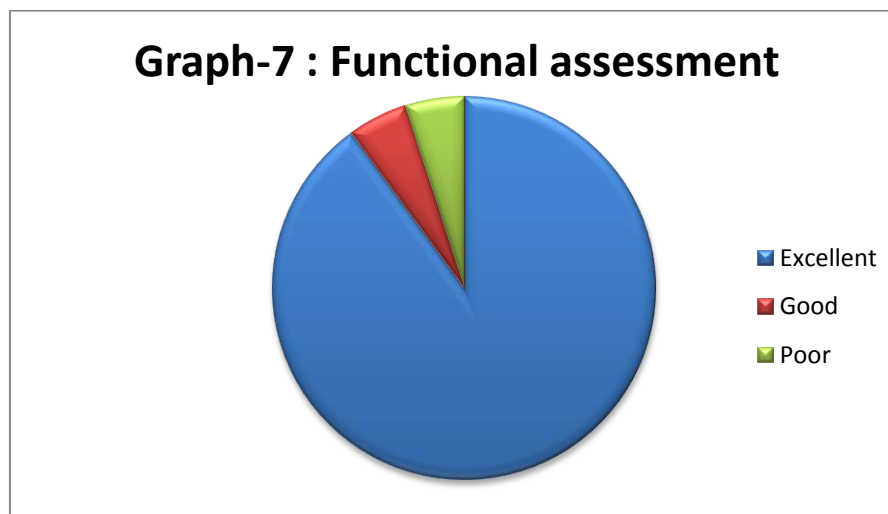
GOOD

Solid union - anatomic reconstitution, 10-30% loss of range of motion, Minimal subjective complaints

POOR:

Non anatomic results or nonunion, greater than 30 degree loss of range of motion, Moderate subjective complaints.

14(70%) patients had excellent results, 2(10%) patients had good results, 4 (20%) patient had poor result.



DISCUSSION

We evaluated our results and compared them with those obtained by various other studies utilizing different modalities of treatment. Our analysis is as follows.

SERIES	AVG AGE	SEX RATIO(M:F)	TYPE OF FRACTURE	MODE OF INJURY	METHOD OF TREATMENT	RANGE OF MOTION
WILAIRATNA V, PRASONGCHIN P ⁷	29	16:5	-	RTA	-	-
GONGOL T, MRACEK D ⁸	47		-	-	FUNCTIONAL BRACE	31
JAMES ET AL ⁹	49.7	6:4	TRANSVERSE AND OBLIQUE	-	-	-
TINGSTAD EM ET AL ¹⁰	-	44:38	TRANSVERSE AND SHORT OBLIQUE	RTA	AO PLATING	-
STRONG GT, WALLS N ¹¹	-	111:138	TRANSVERSE	RTA	-	-
PRESENT STUDY	38	14:6	TRANSVERSE	RTA	FLEXIBLE NAILING	16

Fracture union:

16 (80%) fractures out of our 20 cases united with 1(5%) cases of nonunion. Of these cases , 3(15%) cases of delayed union.

Table: Fracture Union Rate Obtained In Various Studies

Series	Total no of patients	Delayed union	Nonunion	Overall results
Klenerman L ⁵ (1966)	98	8(8.2%)	-	98(100%)
Bell MJ et al ¹² (1985)	34	-	1(3%)	33(97%)
Griend RV, Tomasin J, Ward et al ¹³ (1999)	36	5(14.6%)	1(3%)	35(97%)
Gongol T, Mracek D ⁸ (2002)	32		1(3.1%)	31(96.9%)
Present study	20	3(15%)	1(5%)	16(80%)

ASES SCORE:

The average ASES score obtained was 50 in our series. This is comparable to the ASES score of 48 obtained by McCormack RG et al when treating humeral shaft fractures with DCP and a score of

47 when treating with interlocking intramedullary nail fixation.

Overall results:

We had 14 patients with excellent result and 6 patients had poor result

Table : Overall Results Obtained In Various Studies

Study	Year	No of patients	Method of treatment	Excellent/good results (%)
Heim D et al ¹⁵	1993	127	DCP	87.3
McCormack RG et al ¹⁴	2000	44	DCP & Intramedullary nail fixation	95.7
Tingstad EM et al ¹⁰	2000	44	AO plating	94
Gongol T, Mracek D ⁸	2002	32	Functional brace	93.8
Present study	2014	20	Flexible nailing	70

The results obtained by various authors using various modalities of treatment have varied from 75% good or excellent results to 100% good or excellent results. Our study had an 70% excellent result.

CONCLUSION

- ❖ Fracture shaft of humerus in adults is fairly common with an overall incidence of about 3 % in all fractures.
- ❖ The mode of injury is usually a direct trauma following road traffic accident.
- ❖ As the fracture might accompany complications like radial nerve palsy, a detailed neurovascular examination is a must at presentation.
- ❖ Majority of the fractures were transverse and oblique in the middle third and all of them were closed injuries.

- ❖ Though rigid fixation of fracture shaft humerus can be obtained using DCP/LC-DCP/LCP¹⁷, it requires extensive exposure of fracture site and also disturbing the biology of fracture. Thus flexible nail fixation using retrograde technique requires very minimal soft tissue dissection and as it is a closed technique, the biology of fracture is also not disturbed. Thus early fracture union can be anticipated.
- ❖ Interlocking intramedullary nail¹⁸ also gives stable internal fixation but has its

own disadvantage of rotator cuff problem when done by antegrade technique.

- ❖ Another added advantage of flexible nail fixation is it requires very minimal operative instrumentation.
- ❖ Thus flexible intramedullary nailing¹⁹ done by retrograde technique produces equally good results comparable to any plate osteosynthesis or interlocking intramedullary nailing.

SUMMARY

- In this study, twenty cases with twenty fractures of shaft of humerus in adults were surgically managed by closed reduction and internal fixation using flexible nails between August 2012 to July 2014 at J. J.M.Medical College, Davangere.
- All patients were evaluated clinically and radiologically before and following surgery, for an average period of follow up was 7 months.
- The age of the patient in this study, ranged from 20 years to 60 years average being 40 years.
- There were 6 female patients as compared to 14 male patients in this study.
- 12 patients had fracture of left humerus shaft and 8 patients had fracture of right humerus.
- All fractures were closed.
- 16 cases sustained fracture following road traffic accident, 2 cases had domestic trauma, 1 sustained fall from height and 1 case of assault.
- In this study, 12 fractures were situated in middle third of shaft, 4 fractures in the upper 3rd, and 4 fractures in the lower third of shaft of humerus.
- Different fracture patterns were seen, 14 were transverse, 6 oblique.
- There were 4 cases of associated chest injury, 1 head injury, 2 cases of hand injury, one case both bone leg fracture.

- The fractures united in 15 patients, 3 cases of delayed union and 1 cases of nonunion, 1 case of implant breakage.
- The fracture was additionally supported by humerus brace postoperatively for 10 days. Post operatively patients were rehabilitated with active exercises of all the joints of the involved upper limb as soon as possible.
- Good or full range of mobility of shoulder and elbow joints was present in all patients.
- By the analysis of the data collected in the present study, closed reduction and internal fixation with flexible nailing for humeral shaft fracture is one of the modality of treatment for fracture shaft of humerus in adults..

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