

**ORIGINAL RESEARCH**

# A study of management of diaphyseal fractures of humerus by closed intramedullary interlocking nail in adults at BIMS, Belagavi

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## ABSTRACT

**Title:** "A STUDY OF MANAGEMENT OF DIAPHYSEAL FRACTURES OF HUMERUS BY CLOSED INTRAMEDULLARY INTERLOCKING NAIL IN ADULTS AT BIMS, BELAGAVI"

**Introduction:** Fractures of the humeral shaft are commonly encountered in our hospital.

Conservative management with hanging arm cast is preferred by some authors.

Shoulder & elbow stiffness, non-union and mal-union are commonly seen with this treatment. Open reduction and internal fixation with plate and screws require extensive soft tissue stripping, radial nerve mobilization with high rates of radial nerve palsy.

An interlocking intra medullary nail system has the advantage of stability and early functional recovery with fewer complications because of less soft tissue trauma and provides stable fixation hence interlocking nail system has been used.

**Objectives:** To document the clinical outcome and complications associated with the use of intramedullary interlocking nail in acute diaphyseal fractures of humerus in adults in a consecutive series of patients at BIMS, Belagavi during the period of February 2022 to January 2023.

**Methods:** 30 cases of acute humeral shaft fractures in adults more than 18 were treated by closed reduction and internal fixation by Intra Medullary Interlocking Nail between February 2022 to January 2023 at our institution and followed for a minimum of 6 months. Outcome was assessed by using criterion done by ROMMEN *et al.* series.

**Results:** All patients were followed up for an average of 3 to 4 months. Our series consisted of 30 patients, 19 male and 11 females. Mean radiological union in weeks was 13.6. There was one nonunion and one delayed union in our study.

**Conclusion:** Based on our experience and results, antegrade technique is safe & reliable technique for treating acute humeral shaft fractures. The advantages of intramedullary nailing are minimal surgical exposure, better biological fixation, minimal disturbance of soft tissues and early mobilization of neighboring joints. Interlocking nailing also avoids complications like lack of rotational control, migration of nail and requirement of supplementary bracing.

**Key words:** Intra medullary interlocking system, humeral shaft fracture, Rommen's *et al.* grading

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## INTRODUCTION

General incidence of humeral shaft fractures remain in the area to 1% to 2% of all fractures<sup>1</sup> occurring in the human body and 14% of all fractures of the Humerus<sup>2</sup>. For thousands of years some form of external splintage was the only option for management of fractures. It is obvious that little has changed in the treatment of diaphyseal humeral fractures since ancient times, as humeral fractures heal within a short time.

During the treatment patients are mobile whereas shoulder and elbow joints compensate for some malalignment. However, patients in modern times demand faster union rates and earlier return to preinjury activities while preserving functionality and motion of nearby joints.

Many authors preferred conservative management with hanging arm cast<sup>3,4</sup>. Patients in our setup have the habit of sitting cross legged. Supporting the elbow on

their thighs after casting. By this the purpose of gravity setting the fracture in alignment fails. Shoulder and elbow stiffness, non-union and mal-union are commonly observed with such conservative methods<sup>5</sup>, especially in patients having certain risk factors like alcoholism or obesity<sup>6</sup>. Open reduction and internal fixation with plate and screws requires extensive soft tissue stripping. It also requires mobilization of radial nerve during surgery with high rates of radial nerve palsy<sup>7</sup>. Cortical osteopenia with its complications are commonly seen after plate fixation<sup>8</sup>. Use of only intramedullary nails, have the disadvantage of rotation of two fracture fragments. Instability with proximal migration of nail, with subsequent stiffness of shoulder<sup>9</sup>. An interlocking intramedullary nail system has the advantage of stability and early functional recovery with fewer complications<sup>10</sup>. Since fracture treatment in general, strives for complete and early recovery of the limb function with solid union, intramedullary fixation of humeral shaft has gained in popularity. Because of less soft tissue trauma and stable fixation, interlocking nail system have dramatically broadened the indications for humeral medullary nailing and antegrade nailing is the most commonly used method. Though the healing time of fractures in conservative and surgically managed patients are same, the later, maintain nearly normal life style during most of this healing period, without limitation by splints, casts or braces and can return to their work sooner<sup>5</sup>. This makes the patient to earn his livelihood earlier and indirectly reduces his economic burden. Thus, interlocked nailing of humerus is an attractive treatment option for patients with fracture of the

humeral shaft where operative fixation is required. This study is an attempt to determine the efficacy of interlocked intramedullary nailing in the treatment of humeral shaft fractures.

## MATERIALS AND METHODS

Our prospective study consists of 30 cases of traumatic diaphyseal fracture of humerus admitted to BIMS Hospital attached to Belagavi Institute of Medical Sciences, Belagavi between February 2022 to January 2023

### 1) INCLUSION CRITERIA

- Acute diaphyseal fracture of the humerus.
- Age above 18 years.
- Osteoporotic bone.
- Segmental diaphyseal fractures.
- Compound fractures of Gustilo's Type I.

### 2) EXCLUSION CRITERIA

- Compound fractures of Gustilo's Type II & III.
- Fractures involving lower 3rd shaft of Humerus.
- Age less than 18 years.
- Medically unfit for surgery.
- Fractures with neurovascular deficits.

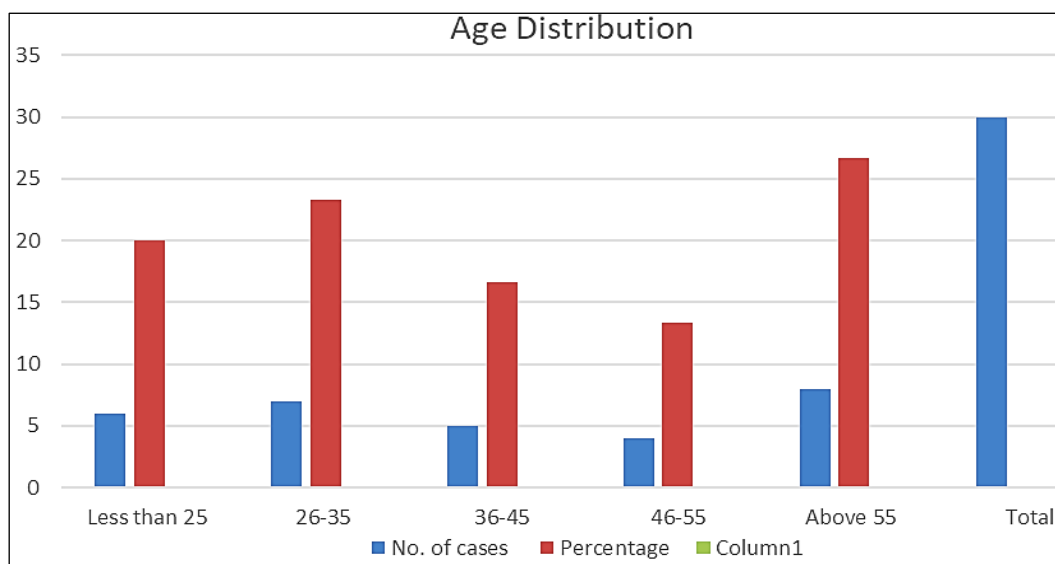
## RESULTS

The present study consists of 30 cases of fracture of the diaphyseal of the humerus treated surgically by closed reduction and internal fixation using intramedullary interlocking nail by antegrade technique using image intensifier between February 2022 to January 2023. All the patients were available for follow-up.

**Table-1: Age Distribution: (Graph-1)**

Age Group (in years) No. of cases Percentage

Age Group (in years)	No. of cases	Percentage
Less than 25	6	20
26-35	7	23.33
36-45	5	16.66
46-55	4	13.33
Above 55	8	26.66
Total	30	100

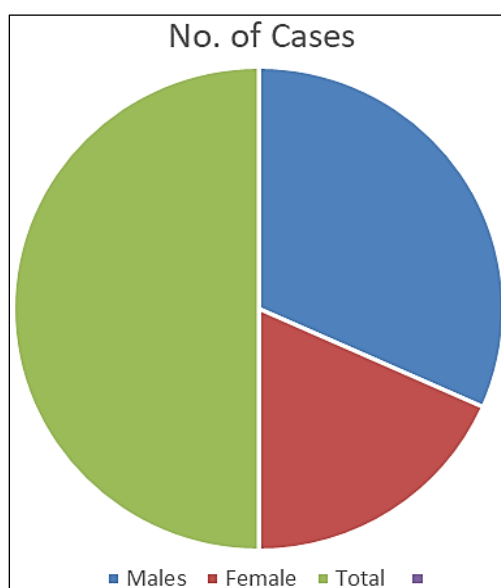


**Graph 1:** Age distribution

**Table2: Sex Distribution: (Graph-2)**

Sex	No. of Cases	Percentage
Males	19	63
Female	11	37
Total	30	100

The present series has 63% males and 37% females, and the ratio of male: female being 1.7:1



**Graph 2:** Sex distribution

**DISCUSSION**

Conservative management is successful in achieving more than 90% of union<sup>8</sup> and is still preferred for isolated low energy humeral shaft fractures. It is also used as initial treatment for displaced spiral and oblique humeral fractures<sup>8</sup>. In transverse and short oblique fractures, the contact area of the fracture fragments are very small and fracture instability is relatively high, thus leading to a high number of delayed and non-united fractures. Another major

disadvantage of conservative treatment is the stiffness of the adjacent joints especially shoulder, requiring prolonged rehabilitation. Operative stabilization is known to improve the healing, fracture alignment and functional result in patients with high energy humeral shaft fractures<sup>9</sup>. Plate osteosynthesis is an accepted surgical option. The main disadvantage of plate osteosynthesis is that they need large tissue dissection with extensive soft tissue stripping, with its inherent complications. It also requires the mobilization of the

radial nerve both during insertion and removal, with high rate of secondary radial nerve palsies. Plate osteosynthesis is of limited use in patients with osteoporosis, where a strong bone-implant interface is difficult to achieve. In external fixation, there is lack of comfort to the patient and makes nursing care more difficult. Schanz screws may perforate muscle bellies of the deltoid and triceps muscles and hinder the free movements of the shoulder and elbow joint.

Flexible intramedullary nails with the techniques of Rush, Ender and Hackethal can be inserted proximally or distally. Rush pins and Ender's nails internally splint the fractured humeral shaft and secure the axial alignment. These are associated with problems like rotatory instability, nail migration, non-union and poor joint function<sup>9</sup>. Their routine use is not recommended. Locked intramedullary nails used in our series were of medium diameter and introduced with reaming. These nails allow load sharing between the implant and the fractured bone. They infrequently require bone grafting. They avoid extensive soft tissue dissection required for plating thus leading to increased rates of union. Ante grade interlocked nail has now become the implant of choice for humeral shaft fractures with surgical indications<sup>8</sup>. In this study 30 cases of humeral shaft fractures were treated by antegrade, interlocking intramedullary nailing to determine clinical outcome and complications of nailing.

## SUMMARY

Over a period of 1 year between February 2022 to January 2023, 30 cases of humerus diaphyseal fractures in adults treated by closed intramedullary interlocking nailing by ante-grade technique at Department of Orthopaedics, BIMS, Belagavi were included in the study. The aim of the study was to document the clinical outcome and complications associated with use of intramedullary interlocking nailing by ante-grade technique in diaphyseal fractures of the humerus.

- The average age of the patients was 42.1 years, ranging from 18 to 69 years. 22 (73.3%) of the patients were in 3rd, 4th & 5th decades.
- There were 19 males and 11 females, with a male: female ratio of 1.7:1
- RTA was the main cause of injury in 18 (60%) of the patients.
- Right (15 cases) and left (15 cases) side was involved equally.
- Most of the fractures were located in the middle third of the diaphysis of the humerus accounting for 20 (66.66%) followed by upper third by 10 (33.33%).
- Most of the cases were closed type - 28 (93.33%) and 2 (6.66%) patients were open fractures of Gustilo's Type I.
- Most of the fractures were Type A-27 (90%) followed by Type B-1 (3.33%) and Type C-2 (6.66%) of AO Classification.

- 4 (13.33%) patients of the study population had associated injuries.
- Fractures in 28 (93.33%) patients united well and 1 (3.33%) of the case ended in delayed union and required the additional procedure of bone marrow injection; where the union was seen at the end of the 7th month. 1 case (3.33%) ended in non-union where union was seen after managing with ORIF with plate.<sup>83</sup>
- With regard to functional outcome, 24 (80%) of the cases had excellent outcome, 1 (3.33%) had good and 5 (16.6%) had poor outcome. The poor outcome in these patients were due to shoulder impingement by the proximal end of the nail. But the nail was kept in situ till the fracture united. The functional outcome improved after removal of the nail and physiotherapy at the end of the 8th month in these patients.
- Bone marrow injection in a case of delayed union has hastened fracture union in our study.

Thus, the study concludes that closed intramedullary interlocking nailing by ante-grade technique is a safe and reliable technique to fix acute humeral diaphyseal fractures. It provides early fracture consolidation, higher union rates, with advantage of early mobilization of the involved limb.

## CONCLUSION

Based on our study and results, we conclude the following

- Humeral shaft fractures are common in the age group of 20 to 35 years and more common in males.
- All closed humerus diaphyseal fracture extending between 2cm from the surgical neck to 3cm proximal to the olecranon fossa can be treated with closed intramedullary nailing. It is an outstanding method of treating comminuted and unstable humeral diaphyseal fractures.
- Middle third of the bone is the most vulnerable part for fractures, where transverse or short oblique fractures occur.
- Excellent results were seen in patients with associated injuries when humeral diaphyseal fractures were fixed with intramedullary interlocking nail as shown in the reduction in operative time and early rehabilitation.
- Bone healing occurs without much problem, as soft tissue and periosteal dissection is minimal with nailing & closed nailing does not disturb the fracture hematoma, it decreases the time required for callus formation.
- Complications like delayed union can be treated with bone marrow injection at fracture site to augment fracture union.
- Certain technical aspects like burying the proximal end of the nail at the entry portal and selecting proper length of the nail is essential in

avoiding impingement and to gain better shoulder function.

- Hence, we conclude that closed interlocking nailing by ante-grade technique is a safe and reliable method for treating humerus diaphyseal fractures.

## References

1. Brinker MR, O'Connor DP. The incidence of fractures and dislocations referred for orthopaedic services in a capitulated population. *J Bone Joint Surg Am.* 2004;86-A(2):290–297.
2. Lovald S, Mercer D, Hanson J, *et al.* Complications and hardware removal after open reduction and internal fixation of humeral fractures. *J Trauma.* 2011;70(5):1273–1277;discussion 1277-1278.
3. Balfour G.W, Mooney V and Ashby M.E. Diaphyseal fractures of the humerus treated with a readymade fracture brace, *JBJS*, Vol-64-A, No.1, Jan 1982, P:11-13.
4. Bray T.J. Techniques in fractures fixation chapter-8, New York, Gover Medical publishing, 1993.
5. Zatti G, *et al.*, Treatment of closed humeral shaft fractures with intramedullary elastic nail, *Journal of Trauma, Injury, Infection and critical care*, Vol-45 No.6, Dec 1998, P:1050.
6. Lin J, *et al.*, Treatment of humeral shaft fractures by retrograde locked nailing. *CORR*, No.342, Sept 1997. P:147-155.
7. Rommens P.M, Verbruggen J and Bross PL, Retrograde locked nailing of humeral shaft fractures-a review of 39 patients, *JBJS*, Vol-77-B No.1, Jan 1995, P:84-89.
8. Zuckerman J D and Koval K J, Fractures of the shaft of the humerus in Rockwood C SJr *et al.* (Eds), *Fractures in adults*, 4th ed, Vol-1 Philadelphia, Lippincot-Raven 1996. P:1025-1054.
9. Brumbak R.J. *et al.*, Intramedullary stabilization of humeral shaft fractures in patients with multiple trauma, *JBJS*, Vol-68-A, No.7. Sept 1986, P: 960-970.
10. Haberneck H and Orthner E, A locking nail for fracture of the humerus, *JBJS*, Vol-73-B, No.4, July 1991, P:651-653.