

Research Article

Study on Surgical management of fracture shaft of Humerus by interlocking nail

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Abstract

Background: Operative management of fracture shaft of humerus can be with plate osteosynthesis or with intramedullary nailing. In this study we have tried to analyze the outcome in terms of time for consolidation, union rates, functional results and complications of humeral shaft fractures managed with closed antegrade interlocking nailing. Study was conducted Navodaya Medical college Hospital and Research Centre, Raichur

Methods: A series of 25 patients with acute fractures of shaft of humerus were treated with antegrade interlocking nailing during September 2010 to September 2012. There were 15 males and 10 females with an average age of 39.07 years (21-65 years). All the patients were followed up for an average period of 7.76 months and results were analyzed.

Results: 24 (96%) fractures united with an average consolidation time of 13.625 weeks (10-16 weeks), 1(4%) fractures ended in nonunion. Nail impingement was seen in 2 (8%), shoulder stiffness in 1 (4%). Functional results were excellent in 21(84%), moderate in 2(8%) and poor in 2(8%).

Conclusion: Closed antegrade interlocking nailing offers a safe and reliable method of fixing fractures of humeral shaft, with early fracture consolidation and higher union rates. It provides early rehabilitation and reduces the hospital stay.

Keywords: Fracture shaft of humerus; Interlocking nailing

1. Introduction

Fractures of shaft of humerus are no exception and are commonly encountered by orthopaedic surgeons, representing between 3% - 5% of all fractures.¹ The two modalities of internal fixation in fracture shaft of humerus are plate osteosynthesis and intramedullary nailing. Intramedullary nail is a better implant biomechanically. Nails are subjected to smaller bending loads and are less likely to fail due to fatigue. They act as load sharing and stress shielding devices. Cortical osteopenia that occurs right adjacent to the ends of plates is rarely seen with intramedullary nails; thus, refracture after implant removal is seen less often.² This treatment method has been the subject of controversy since its inception because of concern of damage to medullary circulation, possibilities of fat embolism and a lack of understanding of the biomechanical principles of intramedullary interlocking nail fixation. So, we took up this study to evaluate the end results of twenty five cases, identify the advantages, difficulties, complications, pit falls, and to prepare guidelines for the treatment of fracture shaft of humerus.

2. Material and Methods

This study was a prospective study, conducted at Department of Orthopaedics, Navodaya Medical college Hospital and Research Centre, Raichur over a period of 2 years i.e., from September 2010 to September 2012. Study was initiated after approval from Institutional Ethical Committee. Informed consent from each patient was taken. 25 adult patients with traumatic fractures of humeral shaft treated with closed antegrade intramedullary interlocking nailing were studied with the objective to study the functional outcome after interlocking nail for fracture shaft of humerus, the time of union and the union rates and to study the complications after treatment of fracture shaft of humerus with interlocking nail. Patients having fractures classified into type II and type III compound by Gustilo Anderson and/or those having associated radial nerve palsy were excluded from the study. All the cases were treated by closed intramedullary interlocking nailing in antegrade manner. Assessment of the patient was done on the basis of clinical and radiological union, range of motion at shoulder and elbow joints and subjective complaints like pain in the shoulder and elbow joints. Shoulder and elbow functions were graded excellent, moderate or poor depending upon the loss of range of motion in any direction, subjective complaints like pain were also taken into account.

3. Results

Our study had 25 cases of fractures of shaft of humerus treated by closed antegrade intramedullary interlocking nailing. All the patients were followed for a minimum period of 6 months. The following observations were made. Age range of our patients was from 21 years to 65 years with an average of 39.08 years. The majority of patients 15(60%) were males and only 10(40%) were females. Right side was involved in 13(52%) patients and left side in 12(48%) patients. Road traffic accidents was the commonest mode of injury accounting for 17(68%) patients, the remaining 8(32%) patients presented with the history of fall. In our study, 17(68%) patients had fracture at middle third of shaft of humerus, 4(16%) patients had fracture at proximal third of shaft of humerus and 4(16%) patients had fracture at distal third of shaft of humerus. 14(56%) patients had transverse fracture, 6(24%) patients had oblique fracture, another 4(16%) patients had comminuted fracture and 1(4%)

patient had spiral fracture. (Table 1) Most of the patients were operated within a week of trauma on an average, time interval was 6.5 days. The delay in surgery was due to late presentation and managing associated injuries.

Table – 1: Frequency distribution of cases according to type of fracture

Pattern of Fracture	Number of Patients	Percentage
Transverse	14	56
Oblique	6	24
Comminuted	4	16
Spiral	1	4

The period of fracture union ranged from 10 weeks to 16 weeks with an average period of 13.625 weeks, except one case which went for non union. As regards to functional assessment of patients, shoulder function was excellent in 21(84%) patients, moderate in 2(8%) patients and poor in 2(8%) patient. Elbow function was excellent for all patients. The overall functional results were excellent in 84% cases (21 patients), moderate in 8% cases (2 patients) and poor in 8% cases (2 patients). Following complication were noted during the study-

- **Impingement:** - 2(8%) patients had nail impingement of proximal end, as it was not buried completely into the bone. There was restriction of shoulder movements terminal 20° of abduction. They had moderate functional outcome.
- **Joint stiffness:** - 1(4%) patient ended up with shoulder stiffness mainly abduction was affected and range was upto 0-80°. They were complaining of severe pain, the cause of which was unknown and had poor functional outcome.
- **Non union:** - 1(4%) patient was fixed in distraction at the fracture site. On follow up there were no signs of fracture union. The fracture ended in non union.

4. Discussion

The management of fractures of humeral shaft is always a challenging problem to Orthopaedic surgeon, as they are very frequently associated with multiple injuries, leading to complications like shortening, malunion, infection, delayed union and non union etc. The aim of treatment in these fractures is to achieve length and alignment and produce favorable environment for bone and soft tissue healing. Most of the acute humeral shaft fractures can be successfully treated by conservative methods. Operative treatment may be considered to avoid complications such as malunion, delayed union, rotational deformity, shoulder and elbow stiffness, limb length discrepancy, psychological problems and long hospital stay. Operative stabilization is required in certain fractures, including those among patients with unsatisfactory closed reduction, and multiple injuries. Plate osteosynthesis has yielded high success rate but it needs extensive dissection with the risk of radial nerve damage and refracture after implant removal. Intramedullary nailing has the advantages of less soft tissue trauma and less chances of radial nerve injury, but the use of unlocked flexible nails had been complicated by poor rotational stability and slipping out of the nails causing joint irritation. Locked nailing overcomes these deficiencies and has produced satisfactory clinical results. Results of present study are comparable with other studies. Most of the operative methods for stabilization of humeral shaft fractures have acceptable rates of union. We attribute, early fracture consolidation and higher union rates to closed nailing technique, which preserves fracture hematoma. The most frequent criticism of antegrade humeral nailing has been its potentially deleterious effect on shoulder function. This can be due to impingement of proximal nail tip or proximal locking screw, due to adhesive capsulitis or due to rotator cuff tears. In most of the studies with antegrade nailing, 85% to 100% of patients regained their normal shoulder function.

Table 2: Comparison of commonest level of injury in various studies

Study	No. of patients	Commonest site affected	No. of cases	Percentage
Griend <i>et al</i> ³	36	Middle third	23	63.9
Rommens <i>et al</i> ⁴	39	Middle third	14	35
Rodriguez ⁵	20	Middle third	10	50
Present study	25	Middle third	17	68

Table 3: Comparison of commonest type of fracture in various studies

Study	No. of patients	Maximum fracture type	No. of cases	Percentage
Bell <i>et al</i> ⁶	38	Comminuted	20	51.3
Griend <i>et al</i> ³	36	Transverse or short oblique	20	55.6
Rommens <i>et al</i> ⁴	39	Transverse	20	51.25
Rodriguez ⁵	20	Transverse or short oblique	10	50
Tingstad <i>et al</i> ⁷	83	Transverse or oblique	53	64
Present study	25	Transverse	14	56

Table 4: Comparison of union rate obtained in various studies

Study	No. of patients	Type of reduction	Delayed union	Non union	Overall union
Bell <i>et al</i> ⁶	38	AO plating	-	1(3%)	33(97%)
Rodriguez ⁵	20	IM nailing	1(5%)	-	19(95%)
Rommens <i>et al</i> ⁴	39	Retrograde IM nailing	-	1	38(95%)
Jinn Lin ⁸	48	IM nailing	-	-	100%
Tingstad <i>et al</i> ⁷	83	AO plating	-	5(6%)	78(94%)
Shyamsunder <i>et al</i> ⁹	37	IM nailing	-	3	31(91.8%)
Present study	25	IM nailing	-	1	96%

Table 5: Comparison of mobility of shoulder and elbow joints in various studies

Study	No. of patients	Excellent range of mobility	Percentage
Bell <i>et al</i> ⁶	38	38	97
Griend <i>et al</i> ³	36	30	85.4
Rommens <i>et al</i> ⁴	39	38	96
Rodriguez ⁵	20	19	95
Gongol and Mracek ¹⁰	32	31	97
Bhat <i>et al</i> ⁹	37	31	91.89
Present study	25	21	84

5. Conclusion

Based on our experience and results we conclude that closed antegrade intramedullary nailing with an interlocking nail is a safe and reliable method of treating fractures of shaft of humerus. Essentially all closed and Grade I open fractures of shaft of humerus extending between 2cms from surgical neck to 3 cms proximal to the olecranon fossa can be stabilized with interlocking nail. It is excellent method of managing comminuted and unstable fractures of shaft of humerus. In short, closed antegrade interlocking nailing is an excellent least invasive surgical option available to manage fractures of shaft of humerus with early fracture consolidation and better union rates. It decreases the hospital stay, provides early rehabilitation and lessens the morbidity. It is ideal in patients with polytrauma and osteoporosis.

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