

Diaphyseal Femoral Intramedullary Nailing: Closed or Open Intervention?

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Abstract

Background: Intramedullary nailing is the mainstay of treatment femoral shaft fractures. In this we tried to compare the results of open and closed nailing in the shaft of femur bone.

Methods: In three years time 272 femoral shaft fractured patients were admitted out of which 162 were closed type and 110 patients in whom open nailing was tried. The mean age of patients was 35.6 yrs. Statistical analysis was done by using student "t" test.

Results: 246 patients healed within six months, while others required axial compression; complete union occurred in 95.6% of cases. Most common complication observed was limited range of mobility. Nonunion was observed more in open method, while closed method showed high rate of malunion.

Conclusions: We concluded our study with the fact that concept of alignment should be placed high & open nailing should be tried in those cases where adequate results cannot be achieved by closed methods.

Keywords: Open Nailing, Closed Nailing, Nonunion, Malunion

INTRODUCTION

The femur is the strongest, largest and heaviest long bone in the body. Femoral shaft fractures are the most common injuries which the orthopaedic surgeons come across, which are the result of severe trauma in young age. Patients who have low mineral density got their shaft fractured even by low impact trauma.¹⁻⁶

The treatment of femoral shaft fractures still remains a problem, and a subject of controversy among orthopaedics surgeons. Knowing the advantages and disadvantages of different methods or technique we can reduce the morbidity, disability and period of stay in the hospital.^{2,3} Intramedullary fixation has gained wide acceptance, in the treatment of femoral shaft fractures.

Orthopaedics surgeon come across the complications of delayed union or nonunion following intramedullary nailing.⁷⁻¹⁵ Orthopaedic Trauma Association (OTA1996)¹⁶ have classified femoral shaft fractures into three main types (simple, wedge, and complex). The femoral shaft fracture

in multiply injured patient can be stabilized temporarily with an external fixation, and later with an intramedullary nailing.^{17,18} Today the most common method for femoral nailing is to place a cannulated nail.¹⁹

The purpose of this study was to assess the results of IMN surgery in adults in the fracture of the femoral shaft by open and closed methods.

MATERIAL AND METHODS

This study was conducted in the department of Orthopaedics, Government Medical College, Nagpur. During a period of three years we admitted 272 patients out of which (31.2%) had open fractures. AP view of the pelvis and AP and lateral views of the knee and the entire femur was taken to detect longitudinal cracks and non-displaced proximal and distal fragments.

The patients were aged 16-68 years (mean age: 35.8 years). The patients were operated, within two days of admission, except for 12 cases which were not having stable general

condition and operated after 14 to 16 days as per improvement in general condition. Open reduction was done, in 110 cases and closed nailing was performed in 162 cases. Patients who suffered from associated multiple injuries were treated by external fixators followed by nailing. Continuous radiographic assessment using digital x-ray was done. Follow up of patients was done, which ranged from one and half year to two years. On the basis of reduction performed we compared the results of both techniques. Ethical clearance was obtained from the ethical committee of Govt. Medical College, Nagpur. Statistical analysis was performed using student “t” test.

RESULTS

Out of the total number of patients, 246 healed up their fractures in a time period of six months. Axial compression (dynamization) was required in nine patients, and took approximately one year for complete healing. Mean hospital stay was 12.16 days (5-34 days). Complete union occurred in 262 patients. Range of knee flexion was full in over 90% of cases, 8% showed knee flexion from 0-120 degree and 2% showed 0-30 degrees of knee flexion.

Full weight bearing was earlier and were in more patients in whom closed method was applied as compared to open method ($p < .005$) (Table 1).

Table 1: Complications associated with closed and open method of intramedullary nailing

Complication	Closed nailing method	Open nailing method	P value
Nonunion	4 patients	8 patients	<0.005
Rotational deformity	13 patients	1 patient	<0.05
Malunion	8 patients	6 patients	>.005
Duration of union	Less	More	>0.1

DISCUSSION

About five decades back, initial treatment of fractures in poly-traumatized patients was conservative, because operative treatment considered being high risk procedure. In the last twenty years there have been some major changes in the surgical management of lower limb long-bone fractures. There are a number of reasons for the alteration in the management of femoral diaphyseal fractures.

Controversy still exists with regard to timing for internal fracture stabilization.²⁰⁻²⁴ Early IMN earlier than 24 hours post injury in some studies been associated with reduced pulmonary complications and mortality.²⁵⁻²⁹

The literature has now been clear that reamed nailing is the preferred and successful technique for closed and less severe open lower limb fractures. To nail the femur in fractures below the lesser trochanter is the treatment of choice (Figures 1 & 2).³⁰⁻³⁸

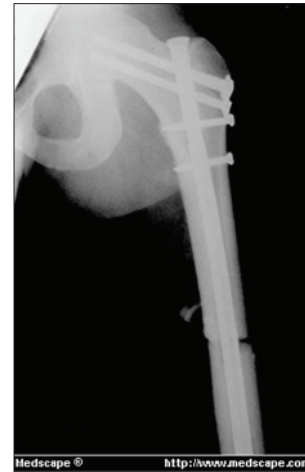


Figure 1: Femoral Intramedullary nailing

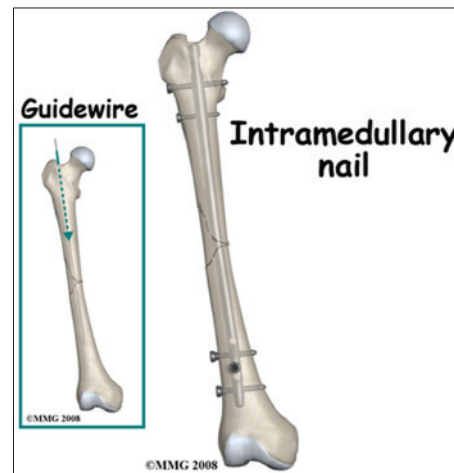


Figure 2: Schematic view of femoral shaft intra-medullary nailing

First generation interlocking nails using oblique or transverse screws are superior to unlocked nails. In lower two third of femur, two cross-locking screws are essential for adequate stability.

In mid-shaft fractures one screw proximally and one distally is adequate. Proximal and distal third fractures of femur are prone for malangulations. IM nailing allows early mobilization with minimal scarring of thigh musculature and early functional recovery; early weight bearing with minimal scarring can be expected with intramedullary nailing. Rapid mobilization leads to economic benefits to the patient. Enormous complications have been cited in the literature for intramedullary nailing.³⁹

In a systematic overview by (Bhandari, 2000) 7% non union rate was reported.¹⁸

But in our study the rate of nonunion was about 4.2%, this is due to better treatment strategy and careful selection of operative procedure and surgeon's experience.

Various authors performed and compared the outcome of their techniques in interlocking femoral nailing (Table 2).

Table 2: Techniques in interlocking femoral nailing

Authors with year of study	Number of subjects	Infection %	Malunion %	Nonunion %	Nerve palsy %
Kempf et al. 1985 ⁴¹	52	2.1	21.1	7.6	-
Wiss et al. 1991 ⁴²	112	0	14	1.8	-
Klemm & Borner. 1986 ⁴³	266	2.6	3.0	1.5	0.3
Christie et al. 1988 ⁴⁴	120	0	2.5	1.6	2.5
O'Brien et al. 1991 ⁴⁵	63	4.8	12.7	4.8	-
Grosse et al. 1993 ⁴⁶	115	2.6	1.7	3.5	1.7
Nowotarski & Brumback 1994 ³⁰	39	2.5	0	5.1	5.1

From the above table it is clear that malunion was maximum in the study performed by Kempf et al⁴⁰ and while in our study it was found to be 4.6%. Nonunion in our study was 4.2%, while in the studies performed by Kempf et al⁴⁰ 7.6%, Wiss et al⁴¹ 1.8% Klemm & Borner⁴² 1.5% Christie et al.⁴³ 1.6% O'Brien et al.⁴⁴ 4.8% Grosse et al⁴⁵ 3.5% Nowotarski & Brumback³⁰ 5.1%

CONCLUSION

Open or closed femoral intramedullary nailing should be based on type of fracture and its pattern of injury, equipments and instruments available and most certainly the experience of surgeon. Closed intramedullary nailing is for treatment of diaphyseal femur fractures in patients with poly-traumatic injuries. Open nailing should be tried in case where an adequate reduction cannot be achieved by closed methods.

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