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Dr. Bruhad Patel
MS Orthopaedics, NHL Medical
College, Gujarat University
Ahmedabad, Gujarat India

Dr. Shivam K Kavi
MS Orthopaedics, Senior
Resident, NHL Medical College,
Gujarat University Ahmedabad,
Gujarat, India

Dr. Ishani Patel
MS Orthopaedics, Assistant
Professor, NHL Medical College,
Gujarat University Ahmedabad,
Gujarat India

Dr. Tarkik K Amin
MS Orthopaedics, Associate
Professor, NHL Medical College,
Gujarat University Ahmedabad,
Gujarat India

Dr. Dhaval R Modi
MS Orthopaedics, Professor,
NHL Medical College, Gujarat
University Ahmedabad, Gujarat
India

Corresponding Author:
Dr. Bruhad Patel
MS Orthopaedics, NHL Medical
College, Gujarat University
Ahmedabad, Gujarat India

Functional outcome of femur interlock nailing in shaft femur fractures in adults

Dr. Bruhad Patel, Dr. Shivam K Kavi, Dr. Ishani Patel, Dr. Tarkik K Amin and Dr. Dhaval R Modi

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Abstract

Introduction: Femoral shaft fractures in adults are almost always the result of high-energy trauma. Both morbidity and mortality can be reduced by prompt reduction and internal fixation of fracture. Nailing can tolerate more torsional and bending forces better than plates. Currently interlocking intramedullary nailing is considered to be best choice of treatment for femoral diaphyseal fractures. In this study, we evaluate the results of femoral shaft fractures managed with an interlocking nail and its outcome of results.

Materials and Methods: This is retrospective study includes 40 cases of diaphyseal fractures of femur shaft treated with closed interlocking intramedullary nailing between March 2022 to Feb 2024.

Result: Final outcome was excellent in 35 out of 40 patients 87.5%, good in 3 patients 7.5%, fair in 1 patient 2.5% and poor in 1 patient 2.5% which is better outcome as compared to Thorsen *et al.* series where recovery rate excellent, good, fair, poor are 63.8%, 17.02%, 14.8%, 4.2% respectively. In our series younger age group patients had a better functional outcome.

Conclusion: From this sample study we concluded the femur interlocking nail is a good implant for the treatment of femoral shaft fractures because of its load sharing, closed insertion, rotational stability, restoration of anatomic length alignment and early mobilization.

Keywords: Shaft femur, interlock nailing, intramedullary nail

Introduction

Femur is one of the principal load-bearing bones of the body. Due to its larger size, rich vascularity and muscular attachments a fracture may lead to a significant blood loss. Fractures can cause prolonged morbidity, extensive disability unless adequately treated and mortality. Morbidity arises from femoral shortening, knee stiffness, malalignment, quadriceps contracture and other complications of fracture. Mortalities are infrequent but can occur due to open wounds fat embolism and multi organ failure especially in polytrauma patients. Femoral shaft fractures in adults are almost always the result of high-energy trauma. Both morbidity and mortality can be reduced by prompt reduction and internal fixation of fracture ^[1].

With tubular anatomy of femur intramedullary nailing appears better than plating. Nailing can tolerate more torsional and bending forces better than plates. Currently interlocking intramedullary nailing is considered to be the best choice of treatment for femoral diaphyseal fractures ^[2]. In this study, we evaluate the results of femoral shaft fractures managed with an interlocking nail and its outcome of results.

Materials and Methods

This is a retrospective study includes 40 cases of diaphyseal fractures of femur shaft treated with closed interlocking intramedullary nailing between March 2022 and Feb 2024.

The inclusion criteria was all Patients of age above 18 years with diaphyseal fractures of femur (Both closed & Grade 1 compound) and both males and females. We excluded the patients of age less than 18 years and Pathological fractures.

The most common mechanism of injury is road traffic accident. Maximum numbers of patients in this study are of young reproductive group and mean age is 30.44 years. In the present study it is seen that femoral shaft fractures are more common in males than females

Intra-operatively reduction of the fracture was achieved through closed means in 85% (34) of cases. Open reduction was performed in 6 patients where closed reduction was not possible.

All patients were evaluated clinically and radiologically. X-rays of entire thigh including hip and knee joints were taken in two planes, anteroposterior and lateral views. Skin traction was applied to the fractured limb and immobilized over Bohler braun frame till surgery.

Patients were operated as early as possible once the general condition of the patient was stable and was fit for surgery and anesthesia. All the patients were operated on a fracture table in supine position under image intensifier. Prophylactic antibiotics and anti-inflammatory drugs were given after surgery. Post operatively no external immobilization was given and patients were advised not to weight bear on affected limb. Patients were encouraged to do knee movements as soon as possible after the surgery. Patients were discharged following suture removal after 10 days.

They were assessed radiologically on 1st postoperative day, at 6 weeks, 12 weeks, and between 4 months to 1year monthly according to fig.1, fig. 2, fig. 3 and fig. 4 respectively. Clinical and radiological union results were evaluated by Thorsen's Criteria (Table-1).

Operative Procedure

In all the cases spinal anesthesia was used and positioned supine on the fracture table. Hip adducted and flexed to about 15°. Incision is centered on the tip of the greater trochanter and extended 4 cm proximally and slightly posterior, distal extension carried out if necessary. Using the C arm image intensifier, entry was made at the lateral aspect of piriform fossa at the junction medial wall of greater trochanter with diamond bone awl. This was confirmed both in the AP and lateral views. Ball tipped guide wire was inserted through the entry point passed up to the fracture site closed reduction achieved using traction and manipulation and guide wire passed across the fracture site. Reaming of the canal done in 1mm increments using flexible intramedullary reamers. Ball tipped guide wire replaced by a straight wire. After assembling the selected nail to jig it is introduced as far as possible manually into the medullary canal with the help of the mounted insertion instruments. Nail entry was confirmed in both AP and lateral planes. Distal locking done using freehand technique under C arm imaging. Locking of the bolts were checked in both the views. Wound closed in layers. Sterile dressing kept.

Discussion

Femoral shaft fractures are usually the result of high energy trauma. An adequate reduction and rigid immobilization by some form of internal fixation is essential in femoral shaft fractures. The rationale for internal fixation is that it restores the anatomical alignment and allows early mobilization of the patient and limb.

The use of a plate to achieve osteosynthesis necessitates wide operative exposure and excessive soft tissue stripping, resulting in increased blood loss and operating time. The risk of infection is increased. Failure of the plate is common and the need for primary bone grafts adds additional morbidity to the procedure.

Introduction of closed locked intramedullary nailing has revolutionized the management of fractures of femur because of its minimal surgical exposure and less demanding surgical skills, facilities and early ambulation.

During the period of March 2022 and Feb 2024, over 40 diaphyseal fractures of femur shaft were treated in the orthopedic department at SVP hospital Ahmedabad.

Most of our patients were of the younger age group, 26(66.6%) patients between 18- 30 yrs., the average age being 30.44 years, which correlate the fact that younger population is at increased risk of femoral fractures. Ours is slightly higher when compared to Thorsen^[3] (1985), Wiss *et al.*^[4] (1986) i.e. 28 and 29 years respectively.

In our patients significant male dominance 34 out of 40 (85%) was seen as compared to 24 (51.06%) females out of 47 patients in the Thorsen³ series. In the series of Arpacio lu Mo *et al.*⁵ 2003 *et al.* showed sex distribution of 35 men and 11 women, whereas in the series of RC Meena⁶ and others, male to female ratio was 8: 1.

Regarding the side of fracture occurrence, left 15(50%) and right 15 (50%) 4 sides are equally predominant but in the series of WISS *et al.*^[4] (1986) and Johnso *et al.*^[7] (1984) right side was more involved. In the series of Arpacioğlu MO *et al.*^[5] 2003, out of 46 patients 31 patients had fracture in the right side, 13 in the left and 2 cases were bilateral.

In 34 out of 40 patients (85%) fractures are of road traffic accidents and more male patients sustained femoral fractures 34(85%) highlighting the fact that males are prone to road traffic accidents. Out of 6 patients in females 4 (66.66%) sustained fractures because of domestic fall. In Thorsen *et al.*^[3] series 65.9% were due to high energy trauma and 34.04% was due to low energy trauma. In the series of RC Meena⁷ & others 2006, out of 108 cases RTA was the mode of injury in 91 cases.

In our series the level of fracture is dominated by middle 24 (60%) patients followed by 12 (30%) distal 1/3rd junction fractures and 4 (10%) proximal 1/3rd junction. Other reported series of conventional nailing, this figure ranged from 60-80% and 50% in the series of Thorsen *et al.*^[3]. Fracture pattern in our study was transverse in 20 (50%) out of 40 patients, 12 (30%) comminuted, 4 (10%) spiral and 4 (10%) oblique. In the study of Thorsen *et al.*^[3] comminuted fractures were the common followed by transverse and then the spiral pattern. In the series of Wiss *et al.*^[4] comminuted fractures predominated.

Admission – operation interval in our study varied from 2-15 days. Mean interval being 5.06 days. The optimal time for nailing of closed femoral diaphysis fractures has been suggested by Brumback *et al.*^[8] (1988) as 7-10 days for elective admissions and immediately for patients with polytrauma to allow prompt mobilization. The mean duration of hospital stay in our study was 16 days average which is high when compared to Wiss *et al.*^[4] series where it was 12 days only and relatively low compared to Gross & Kempf^[9] series (21 days).

Intra operatively reduction was achieved by closed means in 34(85%) cases and 6(15%) needed open reduction due to late operation interval. The reduction of the fractures were good in 34(95%) of patients and acceptable in 4(10%) when compared to Thorsen *et al.*^[3] where 2(5%) patients had poor reduction.

Post operatively two patients out of 40 in this study had superficial infection (5%) and this was controlled by parenteral antibiotics. It is higher as compared to infection rates in Wiss *et al.*^[4] series with 0.9% and in Christie *et al.*^[10] series it was 0.8%.

The average time of radiological union was 18 weeks in the present study whereas in Gross Kempf *et al.*^[9] (1985) and in Thorsen *et al.*^[3] (1985) series it was 18 weeks and 16 weeks respectively.

The average union rate was same in our series compared to the series of the above authors but with *Wiss et al.* [4] (1986) it is 26 weeks which is very high compared to ours.

In our study no patient was permitted to weight bear fully on affected limb before 6 weeks, which is at par with *Thorsen et al.* [3] series (30 days). One of our case developed non-union and 4 cases required dynamization for delayed union compared to 10 cases in *Thorsen et al.* [3] series.

All the patients in this study had no problems relating to malalignment, stiff knee and pain. Shortening less than 2 cms occurred in 2(5%) patients which is very low compared to

Gross and Kempf [9] where 11(21.1%) patients out of 52 had shortening. In our study 35 patients (87.5%) had full range of knee and hip movements. None reported any fatigue due to prolonged walking.

Final outcome was excellent in 35 out of 40 patients 87.5%, good in 3 patients 7.5%, fair in one patient 2.5% and poor in 1 patient 2.5% which is better outcome as compared to *Thorsen et al.* [3] series where recovery rate excellent, good, fair, poor are 63.8%, 17.02%, 14.8%, 4.2% respectively. In our series younger age group patients had a better functional outcome.

Table 1: Thoresen’s criteria

Features	Results			
	Excellent	Good	Fair	Poor
Malalignment of Femur (Degrees)				
Varus/Valgus	<5	5	10	>10
Antecurvatum / Recurvatum	5	10	15	>15
Internal Rotation	5	10	15	>15
External Rotation	10	15	20	>20
Shortening of femur (CM)	1	2	3	>3
Range of motion of knee (Degrees)				
Flexion	>120	120	90	<90
Extension deficit	5	10	15	>15
Pain/swelling	None	Sporadic Minor	Significant	Severe



Fig 1: Pre OP X-ray



Fig 2: Immediate post-OP x-ray



Fig 3: 3 months follow up X-ray



Fig 4: Final follow up X-ray

Conclusion

Interlocking techniques lead to fewer complications of nonunion/malunion, lesser soft tissue dissection, and earlier fracture healing and lesser chances of infection. It provides the advantages of early ambulation, lower rates of infection, delayed union, nonunion and malunion compared to other treatment modalities. Early mobilization of the patient helps in healing of the fracture and prevents joint stiffness. The procedure promotes early union as it does not disturb the anatomy and physiology of vascularity at the fracture site. Minimal hospital stay and early return to activities. From this

sample study we concluded the femur interlocking nail is a good implant for the treatment of femoral shaft fractures because of its load sharing, closed insertion, rotational stability, restoration of anatomic length alignment and early mobilization.

Conflict of Interest

Not available

Financial Support

Not available

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