

Functional outcome of close intramedullary static reamed interlocking nail in femoral shaft fracture

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Abstract

Objectives: The aim and objectives of this study is to evaluate the functional outcome of intramedullary static reamed interlocking nail in femoral shaft fractures.

Study Design: Descriptive case series.

Setting and Duration: Department of Accident & Emergency and Orthopaedics Jinnah Post Graduate Medical Centre from 1st July 2007 to 30th June 2008, Karachi.

Methodology: Thirty patients with femoral shaft fracture on the basis of inclusion criteria were admitted from accident & emergency and out patient department during 1st July 2007 to 30th Dec 2007. All these cases were operated under general or spinal anesthesia with statically locked reamed intramedullary nails and followed for up to six month and results were analyzed in term of wound condition, union, limb shortening, weight bearing and hip and knee range of motion.

Results: Thirty patients of femoral shaft fracture were operated with the mean age of 28.7 years. Ninety percent patients were male (90%) and right limb was involved in (46.7%) and left limb in (53.5%) cases All patients were allowed full weight bearing at 16th week and thereafter. At the end of our study most of our patient's (93.8%) regained knee range of motion from 0-135 degree. 25 patients underwent union in 90-150 days. One patient had non union and two had delayed union.

Conclusions: This study concluded that Intramedullary interlocking nail is treatment of choice for femoral shaft fracture fixation which results in a short hospital stay, a rapid return of motion in all joints, prompt return to working and relatively short total disability time.

Keywords: Femur shaft fracture, closed Intramedullary interlocking nail, functional outcome

Introduction:

Fractures of femoral shaft are among the most common fractures that an orthopedics surgeon encountered.^{1,2} The femur is the longest, strongest and one of the principle load bearing bones in the human body.^{3,4} Femoral shaft fractures often results from high energy forces and are common among individuals younger than 25 years and those older than 65 years.^{5,6} The incidence of femoral shaft fractures is reported as 1 fracture per 10,000 people.^{6,7} The femoral shaft fracture is a major cause of morbidity and mortality in patients with lower extremity injuries, can also lead to a major physical impairment due to frac-

ture malalignment, shortening and prolonged immobilization of extremity.^{8,9} The treatment of femoral shaft fractures has always been focus of interest and undergone significant evolution over the past century.^{10,11} The close intramedullary static reamed interlocking nailing technique was introduced in 1940s by Kuntschner.^{12,13} This technique gain popularity in 1970s and standard method for treatment of the majority of femoral shaft fractures. This technique reduces hospital stay, early rehabilitation of patient, less chance of infection, nonunion, rotational deformities and less preoperative complications.^{14,15} As interlocking nail is done under image intensifier

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so the hazards of radiation, remain the challenge to be solved. There is a need of better understanding of problems associated with femoral shaft fractures and analyze their treatment with intramedullary nailing with awareness of advantages, disadvantages and limitation of this technique.¹⁵⁻¹⁸

Patients and methods:

All patients were selected on the basis of inclusion criteria:

1. Clinically and radiologically diagnosed case of femoral shaft fracture.
2. Skeletally mature patients (epiphysis has been united)
3. Closed femoral shaft fracture and Open Gustillo fracture type I and type II.

All cases were admitted through accident & emergency and out door patient department from 1st July 2007 to 30th December 2007. These patients were proceed through detail history, clinical examination and investigation. Preoperative measure includes investigation like hemoglobin, leukocyte, platelets count, blood sugar, serum creatinine, electrolytes, ECG, chest X-ray, X-ray of full pelvis, full length femur and ipsilateral knee AP and lateral view. Skeletal traction was given through pin in proximal tibia if to be operated after 48 hours. Anesthesia assessment was carried out by senior anesthetist. Prophylactic antibiotic was given, which was switched to oral after 48 hours of operation. Oral antibiotics were given for 5 days. Post operative rehabilitation parameters Includes patient mobilization in bed on operative day. On 1st postoperative day patient can sit up in chair. Patient was discharge on 3rd postoperative day if no immediate post operative complication occurs. Mobilization with the help of crutches or walker, non weight bearing, along with range of motion exercises at hip, knee and ankle joint was allowed at 0-4 week. Hamstring and quadriceps muscles strengthening exercise also allowed. Partial weight bearing was allowed at 4-6 week. Full weight bearing was allowed after clinical and radiological evidence of union.

OPD follow up was carried out at 2nd week for

removal of sutures and then at 4th, 8th, 12th, 16th, 24th, weeks for assessment of union, infection, range of motion and limb shortening.

Results:

The data was entered and analyzed into statistical packages for social sciences (SPSS version 10.0). A total of 30 patients with femur fracture were diagnosed on clinical and radiological examination by taking x-ray AP and lateral view manage with intramedullary static reamed interlocking nail, were included in this study. The average age of the patients was 28.73 ± 6.41 years (95% CI: 26.34 to 31.13). Similarly the average hospital stay of the patients was 8.77 ± 1.28 days (95% CI: 8.29 to 9.24). Out of 30 patients, there were 27 (90%) male and 3 (10%) were females with 9:1 male to female ratio. Road traffic accident was responsible for 22 (74%), 4 (13%) patients were caused by fall from height, one patient (3%) by gunshot and three patients (10%) other causes of fracture. Right limb was affected in 14 (46.7%) patients while 16 (53.3%) had affected left limb. Almost 48 hours duration delay was noted in between the time of injury and definite treatment at our hospital. All patients reported the hospital after 6 hours of injury.

Out of 30 patients no one had other major injury, moderate to minor injuries were found in 10 (33.3%) patients, of which 3 (10%) patients had head injury, 2 (6.7%) pelvic, 1 (3.3%) spine and 4 (13.3%) patients and other musculoskeletal injuries. Regarding the type of fracture, close fracture was found in 19 (63.3%) patients and open fracture was observed in 11 (36.6%) patients of which 7 (23.3%) were Gustillo type II. The different patterns of fracture were found. The linear fracture was seen in 23 (76.7%) patients of which 16 (53.3%) were oblique, 5 (16.7%) spiral and 2 (6.7%) transverse. While comminuted fracture was observed in 7 (23.3%) patients, Winquist -I found in 4 (13.3%), Winquist -II in 2 (6.7%) and Winquist -III in 1 (3.3%) patients. The commonest location of fracture in femoral shaft was middle zone 17 (56.7%) followed by subtrochanteric 9 (30%) and supracondylar zone 4 (13.3%). Out of 30 patients only one (3%) patient had more than 2 cm limb short-

ening while 27 (97%) had less than 2 cm or no shortening.

All patients were followed up till union of fracture or otherwise. At the 2nd week, mild pain was observed in 27(73.3%), moderate pain in 6(20%) patients and severe pain was observed in 2(6.7%) patients. Pain was significantly reduced at 12th week and thereafter no pain was observed in any patient ($p=0.0005$) (Table 1). The wound was clean in 26(86.7%) patients and 4(13.3%) had superficial infection at 2nd week while all patients wound were clean at 4th week. Deep infection was not found in any case. The partial weight bearing was allowed after 4th week and full weight bearing was allowed after clinical and radiological evidence of union. 29 (96.7%) patients were started partial weight bearing in 4th week while 1 (3.3%) patient was not allowed weight bearing in 4th week. 26 (86.75) patients were full weight bearing in 12th week while 4 (13.3%) patients were not allowed. All patients were allowed full weight bearing at 16th week and thereafter (Table 2). Radiological evidence of union was observed in all 30(100%) patients at 24th week.

Table 1: Condition of pain according to follow-up visit (n=30)

Follow-Up Visit	Pain			
	No pain	Mild	Moderate	Severe
2nd Weeks	0(0%)	22(73.3%)	6(20%)	2(6.7%)
4th Weeks	5(16.7%)	16(53.3%)	9(30%)	0(0%)
8th Weeks	23(76.7%)	5(16.7%)	2(6.7%)	0(0%)
12th Weeks	30(100%)	0(0%)	0(0%)	0(0%)

After 12 weeks pain was not found in patients

Friedman Test; $\chi^2 = 143.57$ $DF=6$ $p=0.0005$

Kendall's $W= 0.79$ (Kendall's Coefficient of Concordant)

Table 2: Weight bearing according to follow-up visit (n=30)

Follow-Up Visit	Weight bearing		
	Non	Partial	Complete
2nd Weeks	30(100%)	NA	NA
4th Weeks	1(3.3%)	29(96.7%)	NA
8th Weeks	1(3.3%)	29(96.7%)	0(0%)
12th Weeks	0(00%)	4(13.3%)	26(86.7%)
16th Weeks	0(00%)	0(0%)	30(100%)
20th Weeks	0(0%)	0(0%)	30(100%)
24th Weeks	0(0%)	0(0%)	30(100%)

NA = Not Allowed

Friedman Test; $\chi^2 = 177.49$ $DF=6$ $p=0.0005$

Kendall's $W= 0.98$ (Kendall's Coefficient of Concordant)

The mean range of motion in term of flexion and extension at hip were $121^\circ \pm 1.78^\circ$ and 11.1 ± 1.5 at 24th week respectively. Flexion and extension significantly increase and were close to the normal range of flexion and extension at 24th week of follow up (Friedman test; $p<0.01$) (Table 3).

The average abduction was $9.3^\circ \pm 4.5^\circ$ at 2nd week and average abduction was $36.4^\circ \pm 5.1^\circ$ at 24th week which shows abduction was significantly increase and closed to the normal range of abduction. (Friedman test; $p= 0.0001$).

The average adduction was $10.3^\circ \pm 3.5^\circ$ at 2nd week and average adduction was $24.2^\circ \pm 4.5^\circ$ at 24th week which also shows adduction was significantly increase and close to normal range of adduction at 24th week of follow-up visit. (Friedman test; $p= 0.0001$).

Average internal and external rotation in extension of hip joint was significantly increase and closed to the normal range of internal and external rotation in extension. The range of flexion and extension at knee is almost normal at 24th week of follow-up visit.

Discussion:

Fracture of shaft of femur represents about 5-10% of all fractures presenting in emergency.¹⁹ The basic principle in the treatment of fracture of femur are restoration of normal anatomy and alignment, maintenance of length, immobilization until bony union occurs and restoration of normal function after union.²⁰ The invention of intramedullary interlocking nail made a revolution in the management of femur fracture.²¹⁻²³ Intramedullary nailing is biomechanical the ideal method of internal fixation for weight bearing long bones. A closed nailing concept was first given by Kuntscher in 1940. The introduction of locked nailing systems has now made it possible to provide excellent stabilization of almost all femoral shaft fractures.²⁴ The incidence of femoral shaft fracture is varying from country to country. In western studies there are similarities with our study, of having road traffic accident as compare to gunshot injuries.²⁵ In international literature immediate debridement, irrigation of

Table 3: Comparison of range of motion in term of Flexion and extension (n=30 each follow-up)

	Mean ± SD	Median(IQR)	Mean Ranks
Flexion			
2nd Weeks	79±5.1	80(0)	1.30
4th Weeks	101±6.2	99(9)	2.48
8th Weeks	112±5.4	100(9)	3.53
12th Weeks	113±2.3	110(10)	4.02
16th Weeks	114±1.8	110(10)	4.83
20th Weeks	116±1.9	120(10)	5.46
24th Weeks	121±1.78	120(10)	5.89
Extension			
2nd Weeks	00 ± 00	00(00)	0.0
4th Weeks	4.17 ± 2.6	9(4)	1.27
8th Weeks	8.67 ± 2.5	10(2)	2.67
12th Weeks	9.00 ± 2.1	10(3)	3.75
16th Weeks	10.33 ± 1.5	10(3)	4.83
20th Weeks	10.4 ± 2.5	10(2)	4.93
24th Weeks	11.1 ± 1.5	10(2)	5.63

Extension at 2nd week is constant (all observation were zero).

Friedman Test applied for repeated observation

Flexion (Normal Range: 0° – 120°)

Chi-Square = 108.82 df=6 p= 0.0001

Extension (Normal Range: 5° – 20°)

Chi-Square = 94.97 df=6 p= 0.0001

the wound and its primary closure with stabilization of fracture is routine. Due to this protocol they obtain better results especially rate of infection is low as compare to Asian studies.^{26,27} Our study is comparable to other international studies.

Most of our patients were locals and they were on regular follow ups in our out patient department throughout the study period.

Conclusion:

From this study results we concluded that intramedullary interlocking nail is the treatment of choice for femur shaft fracture. It provides early mobilization of patient and decrease hospital stay. Early rehabilitation and early return to work make it more important and economical for patients.

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