

# STATIC VERSUS DYNAMIC INTERLOCKING INTRAMEDULLARY NAILING IN FRACTURES SHAFT OF FEMUR

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## ABSTRACT

**Background:** Fractures of shaft of femur are a major cause of morbidity and mortality. The objective of this study was to compare outcome of static and dynamic interlocking nailing in closed femoral shaft fractures.

**Material & Methods:** This descriptive study was carried out at Department of Orthopaedics Surgery, Shaikh Zayed Hospital, Lahore, between September 2006 to September 2007. Fifty patients with transverse or short oblique closed fracture shaft of femur (Winqvist and Hansen type I) were selected and divided into two groups of 25 each. In group A fractures were fixed in static mode i.e. applying both proximal and distal locking screw, while in group B fractures fixed in dynamic mode by applying only proximal or distal locking screw. Data was entered in computer software SPSS version 11 and was analyzed by using 't' test.

**Results:** Out of 50 patients, 42 patients were male and 8 patients were female, with male to female ratio was 7:1 of static interlocking nail and 4:1 of dynamic interlocking nail. The minimum age of patient was 14 years and maximum was 70 years in both the groups with a mean age of 34.82 in group A and 32.55 in group B. The mean follow up of 6 months was carried out and our results showed that all fractures healed radiologically and clinically in 16.11 weeks in group A (static locking) while 19.37 weeks in group B (dynamic locking). One patient (4%) from group B developed shortening of 2 cm. Two patients (8%) developed delayed union from group A and were treated by dynamization. No patient from both the groups developed early postoperative complications like compartment syndrome, hemorrhage, pulmonary embolism or fat embolism.

**Conclusion:** Closed static interlocking intramedullary nailing is the effective way for management of transverse and short oblique femoral shaft fractures because of faster fracture union with lesser complications.

**KEY WORDS:** Intramedullary nailing; Fractures; Femur.

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## INTRODUCTION

Fractures of the shaft of femur are a major cause of morbidity and mortality in patients with lower extremity injuries. Most fractures are sustained in young adults during high velocity injuries such as motor vehicle accidents, auto-pedestrian accidents, motor cycle accidents, falls from heights or gunshots.<sup>1</sup> Fractures of the shaft of femur can be life threatening due to an open wound, fat embolism,

ARDS or resultant multiple organ failure.<sup>2</sup> Even with survival after initial trauma<sup>3</sup> many patients suffer major physical impairment as a result of these fractures. Disability usually results from fracture shortening, fracture malalignment or prolonged immobilization of the extremity by traction or casting in an attempt to maintain fracture length and alignment during early phases of healing. Even minor degrees of shortening and mal-alignment can lead to a limp and post-traumatic arthritis.

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Traction has been the time-honored method of treating femoral shaft fractures<sup>4</sup> and can be divided broadly into skin traction and skeletal traction techniques.<sup>5</sup> Now-a-days traction methods are used as a preliminary phase to other definite methods of

femoral shaft fracture management for example, before application of femoral cast brace or closed intramedullary nailing.

External fixation using percutaneous pins inserted proximal and distal to the fracture gained initial popularity for the stabilization of fractures of the femoral shaft during World War II. This method provided excellent bony fixation and wound access as well as permitted early patient ambulation. Now a-days, this method is only reserved for open fractures.<sup>6</sup>

During the 1960s and 1970s, the treatment concepts of rigid internal fixation of diaphyseal fractures followed by early limb rehabilitation gained wide acceptance<sup>7-9</sup> as compared with those of closed treatment or external fixation. But after the advent of closed interlocking intramedullary nailing techniques, open reduction and plating was no longer considered the preferred method of treatment for femoral shaft fractures.<sup>10-15</sup> Comminuted fractures and fractures below isthmus through middle and distal 1/3rd of femoral shaft impose specific biomechanical considerations for nailing. These fractures are unstable and k-nailing for such fractures shows poor results.<sup>16,17</sup>

Both static and dynamic interlocking nailing is in current practice for transverse shaft fractures, variable results have been reported in various studies.<sup>18,19</sup> Brumback et al<sup>20</sup> reported in 10% of femoral fracture that stabilized with dynamic intramedullary nailing, fixation failed postoperatively. He stated that it may be due to lack of appreciation preoperatively of degree of comminution of the fracture or intraoperatively at reaming, or during insertion of nail.

Many investigators have been concerned that static interlocking nailing might interfere with fracture healing due to decreased load across the fracture site, the effect of stress shielding. In another study of 87 patients treated by static intramedullary interlocking nailing stated that 98% of fractures healed and only 2% required dynamization.<sup>21</sup>

The unpredictability of dynamic intramedullary nailing in term of maintenance of reduction of fracture especially limited control of rotation and controversy whether to use static or dynamic interlocking nailing has prompted us to undertake comparative study of dynamic and static interlocking intramedullary nailing for the treatment of transverse and short oblique fractures in the shaft of femur.

The objective of this study was to compare outcome of static and dynamic interlocking nailing in closed femoral shaft fractures in terms of fracture stabilization, maintenance of length, time to union, complications and functional outcome.

## MATERIAL AND METHODS

This descriptive study of 50 cases was carried out at the Department of Orthopaedics Surgery, Shaikh Zayed Federal Postgraduate Medical Institute & Hospital, Lahore from September 2006, to September 2007.

Patients were divided into two groups, group A and group B of 25 patients each. In group A closed static intramedullary nailing was carried out and group B only the proximal or distal locking was carried out after closed intramedullary nailing. Both male and female of age between 14-80 years having isolated close transverse and short oblique fractures of the femoral shaft presenting within two weeks of injury were included.

All fractures other than open fractures, comminuted fractures with neurovascular injuries, fracture neck of femur, per-trochanteric fractures were excluded and fractures previously treated with internal fixation.

Routine labs, x-rays were done and skeletal traction through proximal tibial pin was applied. When the fracture ends distracted, confirmed by lateral radiographs then patients were operated and close intramedullary interlocking nailing was carried out with the help of image intensifier.

Drain was removed after 24-48 hours. Antibiotics were (1st generation cephalosporin) were given for 72 hours. Patients were mobilized on 3rd postoperative day allowing, partial weight bearing. Patients were followed at 4 weekly intervals with biplane radiograph till the union occurred.

The results were evaluated after 6 months of surgery in terms of radiological fracture union, range of motion at hip and knee joint, need for additional procedures and associated complication were noted i.e. wound infection, screw breakage, delayed union, non union.

Shortening is defined as when the affected limb is physically shorter than the other limb. Shortening was scored according to Hindley scoring system. Radiological healing time is defined as the time at which there is adequate callus formation at the fracture site and fracture line is not visible or at least partially obliterated on x-rays. It was assessed according to Harper staging of bone union.

Data was entered in computer software SPSS version 11. Data was analyzed by using 't' test for mean and standard deviation and Chi-square test for statistical significance and compared in both groups.

## RESULTS

Out of 50 patients, 42 patients were male and 8 patients were female, with male to female ratio

**Table 1: Age Distribution between static and dynamic interlocking nailing of patients with femoral shaft fracture (n=50).**

Age Range (years)	Static Interlocking Nail (n=25)	Dynamic Interlocking Nail (n=25)
14 – 24	5 (20%)	7 (28%)
25 – 34	9 (36%)	6 (24%)
35 – 44	6 (24%)	5 (20%)
45– 54	3 (12%)	5 (20%)
55 – 64	1 (4%)	1 (4%)
>65	1 (4%)	1 (4%)

**Table 2: Complications of static and dynamic interlocking nailing of patients with femoral shaft fracture (n=50).**

Complications	Static Interlocking Nail	Dynamic Interlocking Nail
Anaesthesia	0	0
Infection	0	0
Knee joint stiffness	3	3
Delayed union	2	0
Malunion	0	0
Nonunion	0	0
Shortening	0	1
Implant failure	0	0

**Table 3: Healing time in Static vs Dynamic interlocking nailing of patients with femoral shaft fracture (n=50).**

Healing Time (weeks)	Static Interlocking Nail	Dynamic Interlocking Nail
16 weeks	4 (16%)	13 (52%)
18 weeks	3 (12%)	6 (24%)
20 weeks	4 (16%)	3 (12%)
22 weeks	6 (24%)	2 (8%)
24 weeks	8 (32%)	1 (4%)
Mean±SD	16.11±3.09	19.37±5.13

was 7:1 of static interlocking nail and 4:1 of dynamic interlocking nail. The minimum age of patient was 14 years and maximum was 70 years in both the groups with a mean age of 34.82 in group A and 32.55 in group B (Table 1).

Majority of the patients sustained femoral shaft fractures after a motor vehicle accident (MVA) in which motorcycle accidents account for the most.



Figure 1A



Figure 1B

Figure 1: Transverse fracture distal third of shaft right femur in 18 years male. 1A, lateral view injury film, 1B, immediate post-operative film, fracture fixed with intramedullary nailing with distal lock only and healing at 6 months.



Figure 2A



Figure 2B

Figure 2: short oblique fracture of middle third of shaft left femur in a 20 year female. 2A injury film. 2B post-operative film, fixed with static locking and healing radiographs at 6 months.

The motor cycle accidents were 14 (46%) patients in group A and 19 (76%) patients in group B.

There was no complication in our patients regarding anaesthesia. Two patients among group A developed delayed union which was treated by dynamization. There was no case of mal-union or non union in our studies. There was shortening of 2 cm in old lady belonging to group B and three patients from each group suffered knee joint stiffness (Table 2). The average healing time in group A Mean±SD was 16.11±3.09 weeks and in group B was 19.37±5.13 weeks (Table 3.)

## DISCUSSION

One of the primary advantages of intramedullary nailing is that it can be used as a closed technique. Low infection rates, less hip and knee joint stiffness has been reported using closed intramedullary nailing technique instead of open methods. The device is also load sharing device allowing early patient mobilization. Close intramedullary nailing has, therefore, become the treatment of choice for fractures of femoral shaft.

There are two types of locked intramedullary nailing, static and dynamic. Static locking involves placement of proximal and distal locking screws, which prevent mal-rotation and shortening. Dynamic locking uses locking screws on only one side of the fracture. The controversy about the effect of static interlocking on healing of short oblique and transverse diaphyseal fractures of femur led us to carry out this study.

In our study we have compared interlocking intramedullary fixation of fracture femur either statically locked or dynamically locked. We have focused to evaluate the relative advantages and disadvantages of each technique in terms of function, leg length discrepancy, range of motion at knee and hip and radiological fracture healing time. In our study the maximum patients in both groups were male.

Road traffic accidents were the major cause of injury in both groups, 86% in group A and 96% in group B. These results are closer to the study published by Gururaj<sup>22</sup> and according to which one million people were killed on road during 2000 (75%) in the developing countries of the world about half of them in Asia.

Our results regarding fracture healing are satisfactory. The average time to fracture union in static interlocking nail was 16 weeks and 19 weeks in dynamic interlocking nail with significant p value. This is in accordance with international studies.<sup>23</sup> Two of our patient in Group A developed delayed union which was dynamized and they healed successfully after dynamization.

One old lady belonging to Group B developed shortening of 2 cm. Alho et al<sup>23</sup> reported postoperative shortening of the femur by more than 2 cm in more than half their 15 patients treated by dynamic locked nails.

In our study 3 patients from both groups developed knee joint stiffness. In those, 4 (8%) patients did not follow proper instructions and 2 (4%) had associated ligamentous injuries at the knee as well. This is in accordance with the study of Klempf.<sup>24</sup>

## CONCLUSION

On the basis of our study closed static interlocking intramedullary nailing is the effective way for management of transverse and short oblique femoral shaft fractures because of faster fracture union with lesser complications.

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CONFLICT OF INTEREST  
Authors declare no conflict of interest.  
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