

A COMPARATIVE STUDY OF FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF EARLY DYNAMIZATION VS STATIC FIXATION WITH INTERLOCKING INTRAMEDULLARY NAILING OF FRACTURES OF THE SHAFT OF FEMUR

Orthopaedics

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ABSTRACT

The femur is longest and largest bone of the body with abundant blood supply. In recent times due to increase in availability of the high speed vehicles and consequently increased number of the high velocity road traffic accidents has led to a dramatic increase in number of the complex fractures of the femur. The treatment modality of choice for this fracture is interlocking intramedullary nailing. The purpose of the present study was to explore the impact of dynamization in femoral shaft fractures as compared to Static fixation. The study included treatment of 60 patients of Fracture of Femoral Diaphysis fixed with Interlocking Intramedullary Nail of Femur. We found that in both static and the dynamic groups, 22 (73.33%) and 24 (80%) patients respectively, which is the major chunk of our cases had Excellent results according to the Thoresen Scoring System. 5 (16.67%) and 4 (13.33%) patients respectively had Good results. We conclude that Dynamization is a simple, attractive, effective, technically easy, day care method that can be tried to achieve union in femoral shaft fractures.

KEYWORDS

Femur Shaft Fractures, Interlocking Nail, Dynamization

INTRODUCTION

The femur is the longest and largest bone of the body with abundant blood supply. In recent times due to increase in availability of the high speed vehicles and consequently increased number of the high velocity road traffic accidents has led to a dramatic increase in number of the complex fractures of the femur. It can be caused by both high and low energy trauma. Low energy injuries occur mostly due to falls and are more common in elderly patients with weaker bones, often female and osteoporotic. The treatment modality of this fracture is a matter of discussion. Most of them are treated surgically. The art of managing a femur fracture is a persistent balance of the often conflicting goals of anatomical alignment of the limb and early functional rehabilitation of limb. The aim is to provide a stable fixation with minimum additional soft tissue injury. Intramedullary interlocking nail is currently considered the “gold standard” for the treatment of femoral shaft fractures. Opinions regarding need for routine dynamization vary widely^[1]—there are those who advocate dynamization^[2,3], On the other hand, there are those who believe that routine dynamization is unnecessary^[4,5]. The purpose of the present study is to explore the impact of dynamization in femoral shaft fractures as compared to Static fixation.

MATERIAL AND METHODS

This study was carried out between January 2019 and June 2020 in Mahatma Gandhi Hospital, Jaipur. The study includes treatment of 60 patients of Fracture of Femoral Diaphysis fixed with Interlocking Intramedullary Nail of Femur.

INCLUSION CRITERIA

- Isolated Fracture of diaphyses of femur
- Age Group: 15 and above
- Unilateral or bilateral fracture
- Closed fractures
- Gustilo type I, II (Open)

EXCLUSION CRITERIA

- Skeletal immaturity
- Malignancies and other Pathological fractures
- Patient not fit for GA/SA due to any reason
- Gustilo type III

For the study patients were randomly divided into two groups [Group A - Static; Group B- Dynamic] by Random Number tables in sequence of their presentation.

Radiographic evaluation was done using standard AP and lateral

radiographs of the entire Femur, including the hip and knee joint. The limb, then was immobilized in a Thomas splint with skin traction. The patient was then taken up for surgery after relevant investigations and as soon as the patient was fit for surgery.

The Radiological outcome was evaluated based on the '**Radiological Union Scale in Tibial Fractures [RUST Score]**'. The individual cortical scores were added (Anterior, Posterior, Medial and Lateral) to provide a RUST value for a set of Radiographs of 4 (definitely not healed) to 12 (definitely healed).^[6,7] The Functional outcome based on the '**THORESEN SCORING SYSTEM**' included evaluation of the Fracture alignment after fixation, Femoral Shortening, Range of motion at the Knee Joint and clinical presence of Pain and/or Swelling.^[1,8]

CASE ILLUSTRATION – 1 (Fig. 1)

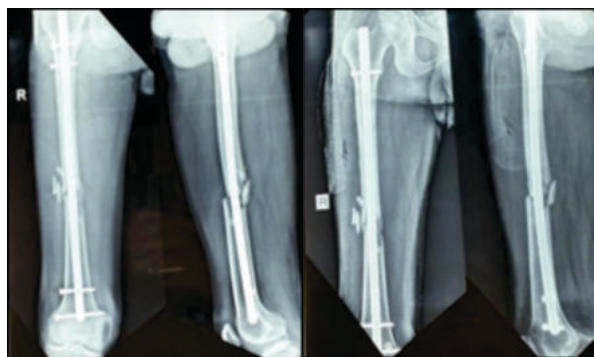


(Fig. 1.1) Pre-Op X-Ray

(Fig. 1.2) 16 weeks



(Fig. 1.3) 24 weeks

CASE ILLUSTRATION -2 (Fig. 2)

(Fig. 2.1) Immediate Post-Op

(Fig. 2.2) 6 week follow up



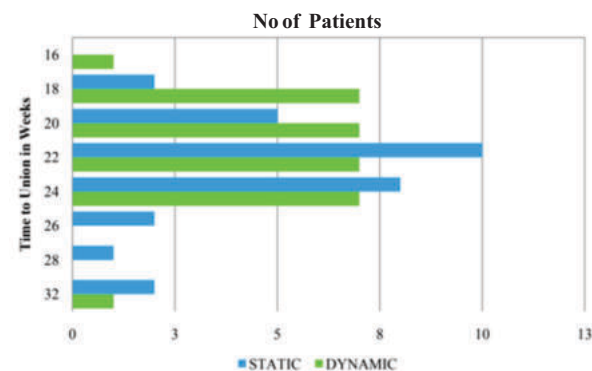
(Fig. 2.3) 24 weeks

RESULTS

To compare the radiological outcomes of static and dynamic interlocking intramedullary nailing we used the RUST Scoring System. The individual cortical scores were added to provide a RUST value for each patient. The mean RUST score for Static Group was 11.133 while for the Dynamic Group was 11.233.

The Functional outcomes of static and dynamic interlocking intramedullary nailing were studied with the use of Thoresen Scoring System (**Table -1**). In our case series, majority of the patients in both the groups had full range of motion at the knee joint. 1 patient from the static group had a flexion deficit of 90°, 2 had an extension deficit (ED) of 10°. In the dynamic group 1 patient had a range between 10-120°, 1 had ED10° and another had ED15°. We found that in both static and the dynamic groups, 22 (73.33%) and 24 (80%) patients respectively, which is the major chunk of our cases had Excellent results according to the Thoresen Scoring System. 5 (16.67%) and 4 (13.33%) patients respectively had Good results, 2 (6.67%) patients in each of the groups had Fair results while just 1 patient in the Static group had a Poor result (**Fig. -4**).

It was observed that the Mean time to union in Static group was 23 weeks while it was 21.2 weeks in the Dynamic group (**Fig. -3**).



(Fig. 3 – Time to Union in Weeks)

It was observed that the mean time to union for stable diaphyseal fractures of the shaft of Femur i.e. Type 0, Type 1, Type 2 (Main

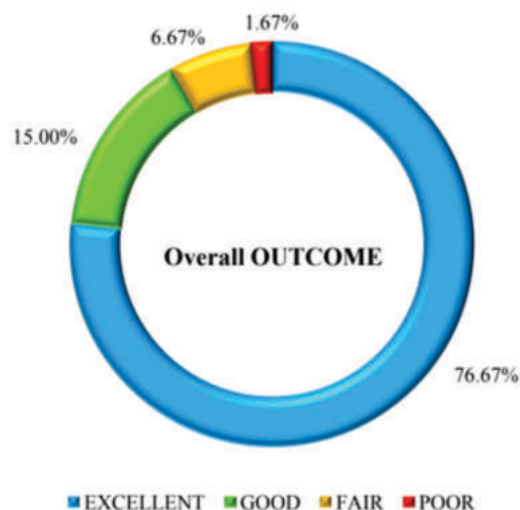
proximal and distal fragments having more than 50% cortical contact) was shorter for the Dynamic group (20.5 weeks) as compared to the Static group (22.5 weeks). On the other hand the mean time to union for unstable fracture patterns Type 3 and Type 4 (Main proximal and distal fragments having Less than 50% cortical contact), the finding was opposite with the fractures of the Static group uniting faster (24.4 weeks) as compared to the Dynamic group (26.6 weeks). (**Table -2**)

Table 1 – Functional Outcome

	STATIC		DYNAMIC	
	No.	%	No.	%
EXCELLENT	22	73.33	24	80.00
GOOD	5	16.67	4	13.33
FAIR	2	6.67	2	6.67
POOR	1	3.33	0	0
Total	30	100.00	30	100.00

Table 2 - Time To Union As Compared To Winquest And Hansen Classification

Winquest and Hansen Classification	TIME TO UNION (Weeks)	
	Static Locking	Dynamic Locking
Type 0, Type 1, Type 2	22.5	20.5
Type 3, Type 4	24.4	26.6



(Fig. 4 – Functional Outcome)

DISCUSSION

The treatment of fractures of the shaft femur has been revolutionized by advent of Kuntscher's nail in 1940. The scope of femoral shaft nailing has been broadened with reaming and interlocking of intramedullary nails. The rationale for internal fixation is that it restores the anatomical alignment and allows early mobilization of the patient and limb. There are two types of locked intramedullary nailing, static and dynamic. Static locking involves placement of proximal and distal locking screws, which prevent malrotation and shortening. Dynamic locking uses static locking screws on only one side of the fracture. This procedure accelerates the bone healing, since the removal of interlocking screws results in an increased contact area and enhanced compression forces at the fracture site, as well as in a better distribution of the weight-bearing forces^[9]. These mechanical factors promote the osteogenesis at the fracture site, thus accelerating the fracture healing^[10].

In accordance with these observations by other international authors, our study observed faster union times with dynamic interlocking nailing in stable fracture patterns (20.5 weeks) as compared to unstable fracture patterns (26.6 weeks) thus suggesting dynamic locking method to be better for stable fractures and static locking to be better for unstable fractures.

CONCLUSION

Nailing with dynamic interlocking reduced the mean time to union.

Effectiveness of Dynamization was better in reducing time to union when used for stable fracture patterns having >50% cortical contact between the main proximal and distal segments. The Physiologic loads that act on the fracture site, combine the advantages of both static and dynamic interlocking without compromising fracture stability. Dynamization is a simple, attractive, effective, technically easy, day case method that can be tried to achieve union in femoral shaft fractures.

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