

## Harsukh Educational Charitable Society

### International Journal of Community Health and Medical Research

Journal home page: [www.ijchmr.com](http://www.ijchmr.com)

doi: 10.21276/ijchmr

Official Publication of "Harsukh Educational Charitable Society" [Regd.]

ISSN E: 2457-0117

ISSN P:2581-5040

RNI No. - PUNENG/2017/75049

Index Copernicus value 2016 = 52.13

## Original Article

### A Clinical Study On Surgical Management Of Fracture Shaft Of Femur With Intramedullary Interlocking Nail

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#### ABSTRACT

**Background** : Orthopedic surgeons often encounter diaphyseal femur fractures, because these fracture most often result from high-energy trauma, one must have high index of suspicion for complications. Currently surgery is indicated for most femur fractures because of high rate of union, low rate of complications and advantage of early stabilization which decreases the morbidity and mortality rate in patients. While the main stay of the treatment has been reamed interlocking intramedullary nailing. **Material and Method**: We studied a total of 20 patients of fracture shaft of femur admitted in the Orthopedic Department of Mahatma Gandhi Medical College and Hospital treated with reamed femur intramedullary interlocking nailing. The common age group was ranging from 20 to 71 yrs with average age group of 36 yrs. 16 patients were males, 4 were females. 13 patients had closed fracture, 5 had Gustillo Anderson Grade I compound and 2 had Grade II compound fracture. In 11 patients fracture was at M/3<sup>rd</sup>, in 5 patients it was at L/3<sup>rd</sup> level and in 4 patients it was at U/3<sup>rd</sup> level. 2 patients were operated by open interlocking nail and other 18 by closed technique using C-arm. **Results** : Injury surgery interval was 6.20 days on an average. Mean time for union was more in patients treated by open procedure (20 weeks) as compared to closed technique (18.35 weeks). We found 1 patient developed superficial infection, which healed completely and 1 had deep infection with nonunion. In our series of 20 patients, 12 patients had excellent results, 6 patients had good results, 1 fair result and 1 poor result. **Conclusions**: Interlocking intramedullary nailing is a very effective and successful method of definitive primary treatment, in most types of fractures of the shaft of the femur. It is effective in controlling rotational and longitudinal forces that act across the fracture site. Interlocking nail provides strong fixation, rotational stability and earliest return to functional status, as the rate of healing is good with this method. It allows early weight bearing and reduced rehabilitation.

**Key words**: Femoral Shaft Fractures; Reamed Femoral Intramedullary Interlocking Nailing

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**This article may be cited as**: Agrawal V. A Clinical Study On Surgical Management Of Fracture Shaft Of Femur With Intramedullary Interlocking Nail . HECS Int J Comm Health Med Res 2018; 4(3):59-62

#### INTRODUCTION

Fractures of the shaft of the femur are commonly encountered in routine orthopedic practice. As femur is the longest weight bearing bone in the body with plenty of surrounding soft tissue envelope, they are usually fractured due to high-energy trauma and fracture may result in prolonged morbidity and extensive disability unless treatment is appropriate. Several techniques are now available for their treatment. They are challenging problems to treat, as there is usually comminution at the fracture site and associated soft tissue injuries. In addition, there can be difficulty in assessing malrotation at the fracture site. They can be life threatening, because of open wounds, hemorrhagic shock, fat embolism, ARDS or multiple organ failure. Further

there may be physical impairment due to fracture shortening, malalignment, and prolonged immobilization, due to traction or casting. This may lead to increased morbidity. The type and location of fracture, degree of comminution, age of the patient and patient's social and economic demands and other factors influence the method of treatment. The technique chosen should cause minimal soft tissue and bone damage. The goal should be to achieve anatomic alignment and early mobilization with functional rehabilitation of limb.

#### Advantages of interlocking nail over the conventional nailing

- For best fitting of intramedullary nail, the concept of reaming was introduced.

- Medullary canal can be broadened at the isthmus with reaming, so that larger and thicker nail can be introduced. Flexible nails due their elastic recoil after negotiating the isthmus, take the shape of the femur.
- Torsional forces are controlled with static locking in interlocking nail.
- The interlocking nail is curved, so that it matches the antero-lateral bowing of femur.
- When the segment is short, additional fixation can be achieved with 2 locking screws in the neck of the femur for P3<sub>rd</sub> fracture (Reconstruction nail) and the same for the D3<sub>rd</sub> fracture.

**Thus interlocking femur provides**

1. Near anatomical reduction.
2. Rigid fixation along the axial line of forces.
3. Minimum or no dissection at fracture site.
4. Rotational stability.
5. Minimal scarring.
6. Maintenance of limb length.
7. Minimal blood loss.
8. Low infection rate

So the aim of fracture treatment is to obtain union of the fracture, in as near anatomical position, with minimal impairment of function. The spectrum of injury is so great that no single method of treatment is relevant to all diaphyseal fracture femur.

**MATERIAL AND METHODS**

This is a report of 20 cases of unstable fractures of the femur, treated at the Orthopedic Department of Mahatma Gandhi Medical College and hospital with closed reamed intramedullary interlocking nail. This includes a prospective study of 20 cases. These cases of unstable fracture shaft femur were treated by femur interlocking nail, which is locally available and is based on AO design nail with proximal locking jig and two proximal and distal holes and one oblique proximal locking hole. Data is collected from the patients attending the orthopedic department with fracture shaft of femur and satisfying the inclusion criteria.

**Inclusion criteria**

- Fracture involving the diaphysis of femur
- Grade I,II Gustillo Anderson compound fracture
- Segmental fracture
- Comminuted fracture (**Winquest Hansen classification**)

**Exclusion criteria**

- Grade-III Gustillo Anderson compound fracture

**Preoperative assessment:**

Preoperatively the length of nail was measured clinically and radiographically.

**Clinically** –The length was measured from the tip of greater trochanter to the joint line and 20-30 mm was deducted(on the normal side). Nails of 1 size above and below the measured length were kept ready.

**Radiographically** –The length was measured from the tip of the greater trochanter to the upper border of patella. Diameter of nail was determined from the breadth of the medullary canal at isthmus

after subtracting 15% of radiological magnification. Routine preoperative investigation assessment included.

**RESULT**

This is study of 20 cases of fracture shaft femur treated with interlocking intramedullary nail. We found that fracture of femur is most common in 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> decade of life, with mean age of 35.85 years (table 1). Male predominance was seen in our series i.e. 16 of our patients were male (80%) and 4 were female (20%) (table 2). Vehicular accident in 17 patients was observed to be the main cause of fracture in our series (85%) (table 3). In our study comminuted fractures were 10 (50 %), Transverse fractures were 4(20 %) whereas fractures with butterfly fragments were 3(15 %).There were 2 oblique (10 %) and 1 spiral (5 %) fractures (graph 1). We found Winquist type II as a commonest in 10 patients (50 %), type I in 8 (40 %) and type III in 2 patients (10 %) (graph 2). In one patient there was intraoperative fracture during nail insertion. One developed internal rotational deformity of 10 Degree ,in the same patient there was postoperative vulval oedema (table 4). One patient developed superficial infection, one developed deep infection (osteomyelitis). There was delayed union noticed in two patients and one of our cases had nonunion. Restriction of range of movement was present in 7 patients; Shortening was present in 2 patients (table 5). In our series of 20 patients, 12 patients had excellent results (60 %), 6 patients (30%) had good results, 1 fair result (5%) and 1 poor result (5%) (table 6).

**Table-1: Age Distribution**

Age in years	No. of patients	Percentage
11-20	1	5
21-30	9	45
31-40	4	20
41-50	3	15
51-60	2	10
61 & above	1	5
Total	20	100%

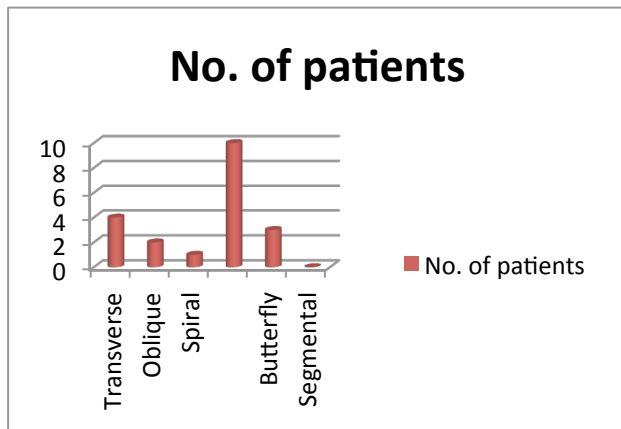
**Table-2 : Sex Distribution**

Sex	No. of patients	Percentage
Male	16	80
Female	4	20

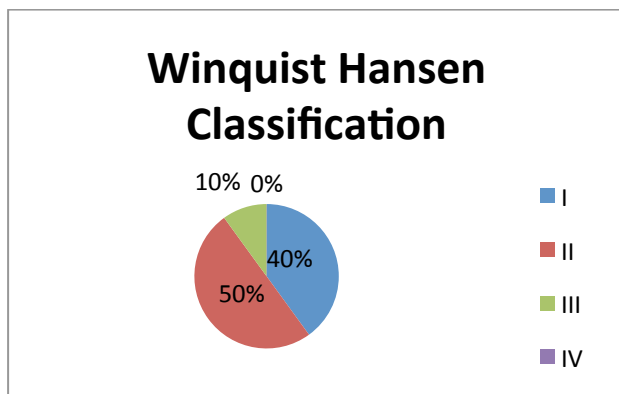
**Table – 3: Mode of Injury**

Mode of Trauma	No. of patients	Percentage
Vehicular accident	17	85
Fall	2	10
Agricultural sector	1	5
Sports injury	0	0

**Graph 1: Pattern of fracture**



**Graph 2 : Winquist Hansen Classification**



**Table – 4: Intraoperative complications**

Complications	No. of patients	Percentage
Bending of nail	-	-
Open reduction with bone grafting	-	-
Impaction of nail	-	-
Breakage of nail	-	-
Breakage of locking	-	-
Intraoperative Fracture ARDS	1	5 %
Rotational deformity	1	5 %
Vulval oedema	1	5 %

**DISCUSSION**

Our study showed that the fracture of femur is most common in 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> decade of life, with mean age of 35.85 years which is the Prime earning group in the Indian families. In the study of Wiss et.al mean age was 29 year<sup>3</sup> and series of Thoresen mean age of 28 years<sup>4</sup>. Another study done by White et al observed mean

age of 28<sup>5</sup>. In most of the studies and in ours too the incidence was significantly higher in males wch similar with study done by Wiss – Fleming et.al<sup>3</sup> & Alho et al.<sup>6</sup> This observation by various authors implies that fracture shaft femur is usually a result of high energy trauma. So it is commonly associated with other injuries.

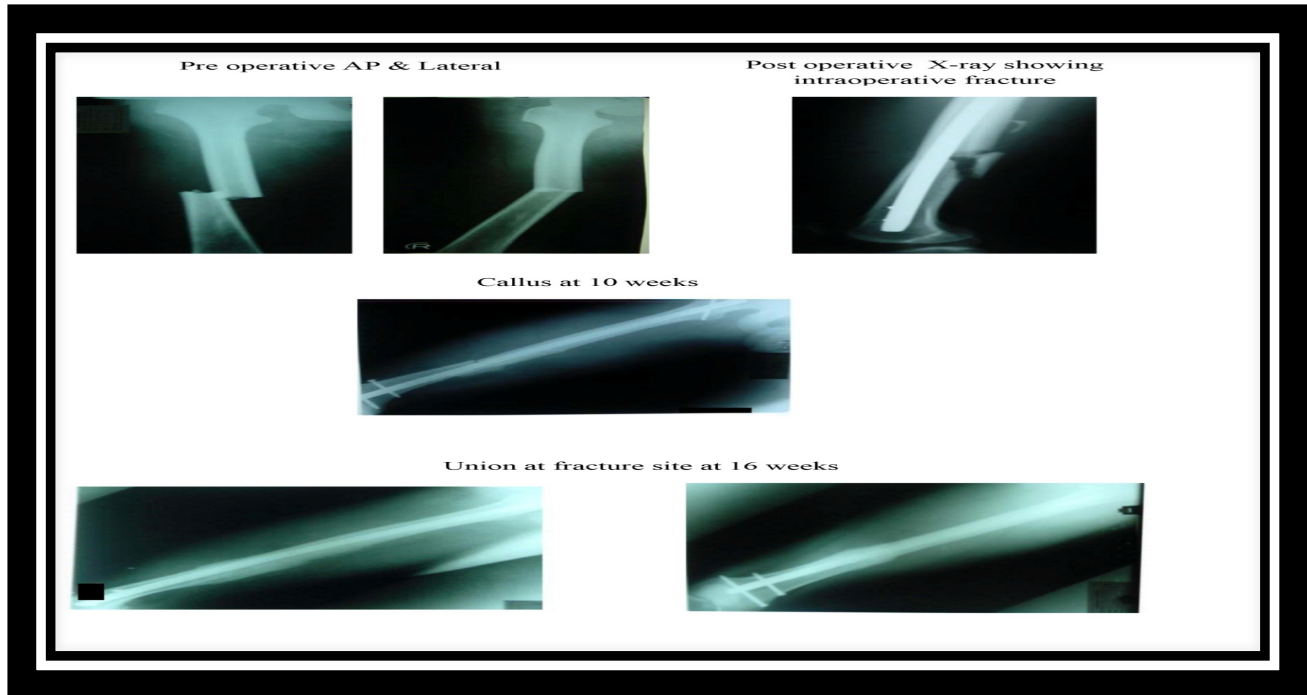
**Table-5: Late Complication**

Late Complication	No. of Patients	Percentage
Nail bending	-	-
Breakage of screws	-	-
Breakage of nails	-	-
Superficial infections	1	5%
Deep infections (osteomyelitis)	1	5%
Delayed union	2	10 %
Non union	1	5%
Implant Failure	-	-
Restriction of movement at Knee joint(in degrees)		
Full (>120)	13	65 %
120	5	25%
90	1	5%
<90	1	5 %
Rotational deformity	-	-
Varus\Valgus Deformity	-	-
Shortening	2	10%
• 1cm	1	5%
• 2cm		
• 3 cm	-	-
Death -	-	-

**Table – 6: Comparison of Results**

Series	Excellent	Good	Fair	Poor
Alho et al <sup>6</sup>	63.40	19.50	15.40	1.60
Thoresen et al <sup>4</sup>	63.80	17.00	14.90	4.25
Our series	60	30	5	5

In our study comminuted fractures were 10 (50 %), Transverse fractures were 4(20 %) whereas fractures with butterfly fragments were 3(15 %). In the study of Thoresen et.al<sup>4</sup> comminuted fractures were the commonest followed by the transverse and then the spiral pattern. Another study done by Wiss et al comminuted fractures predominated.<sup>3</sup> Our series showed that the one patient developed superficial infection, one developed deep infection (osteomyelitis). There was delayed union noticed in two patients and one of our cases had nonunion. Restriction of range of movement was present in 7 patients; Shortening was present in 2 patients. The incidence of infection following open nailing was reported by Wiss et al<sup>3</sup> as 8.3% and by Johnson K et al<sup>7</sup> as 13%. The incidence of infection was drastically low in closed interlocking.The functional outcome in our present study was90% for excellent and good results.



### CONCLUSIONS

Interlocking intramedullary nailing is a very effective and successful method of definitive primary treatment, in most types of fractures of the shaft of the femur. It is effective in controlling rotational and longitudinal forces that act across the fracture site. Interlocking nail provides strong fixation, rotational stability and earliest return to functional status, as the rate of healing is good with this method. It allows early weight bearing and reduced rehabilitation.

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**Source of support:** Nil

**Conflict of interest:** None declared

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