



# International Journal of Orthopaedics Sciences

ISSN: 2395-1958  
IJOS 2018; 4(4): 627-630  
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www.orthopaper.com  
Received: 09-08-2018  
Accepted: 13-09-2018

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## Surgical management of fracture shaft of femur with intramedullary interlocking nail

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**DOI:** <https://doi.org/10.22271/ortho.2018.v4.i4h.74>

### Abstract

**Background:** Diaphyseal femur fractures, most often result from high-energy trauma, and 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.

**Methods:** We studied a total of 40 patients (32(80%) male, 8(20%) Female) of fracture shaft of femur admitted in the Orthopaedic Department of Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga treated with reamed femur intramedullary interlocking nailing. The common age group was ranging from 20 to 71 yrs (mean age - 36 yrs). 26(65%) patients had closed fracture, 10(25%) had Gustillo Anderson Grade I compound and 4(10%) had Grade II compound fracture. In 22(55%) patients fracture was at M/3<sup>rd</sup>, in 10 (25%) patients it was at L/3<sup>rd</sup> level and in 8(20%) patients it was at U/3<sup>rd</sup> level. 4(10%) patients were operated by open interlocking nail and other 36(90%) by closed technique using C-arm. Average Injury to surgery interval was 6.20 days.

**Results:** Mean time for union was more in patients treated by open procedure (20 weeks) as compared to closed technique (18.35 weeks). 2 patients developed superficial infection, which healed completely and 2 patients developed deep infection with non-union. In our series of 40 patients, 24(60%) patients had excellent result, 12(30%) patients had good result, 2(5%) patients had fair result and 2 (5%) patients had 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 provides strong fixation, rotational stability and earliest return to functional status, as the rate of healing is good with this method.

**Keywords:** femoral shaft fractures; reamed, intramedullary, interlocking nailing

### 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 [1] or multiple organ failure [2]. 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.

So the aim of fracture treatment is to obtain union of the fracture, in as near anatomical position, with minimal impairment of function and early mobilization with functional rehabilitation of limb. The spectrum of injury is so great that no single method of treatment is relevant to all diaphyseal fracture femur. The type and location of fracture, degree of comminution, age of the patient and patients social and economic demands and other factors influence the method of treatment. The technique chosen should cause minimal soft tissue and bone damage. Many modalities of treatment have evolved over the years for this fracture.

Internal fixation is done by different methods like:

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- Dynamic compression plate and screws<sup>[3]</sup>
- Intramedullary nailing with or without<sup>4</sup> interlocking

Among all different methods of internal fixation, intramedullary fixation with interlocking has become popular during the last few decades.

**Methods**

This is a prospective study of 40 patients of unstable fractures of the femur, treated at the Orthopaedic Department of Darbhanga Medical College & Hospital with reamed intramedullary interlocking nail between June 2015 to May 2017. The common age group was ranging from 20 to 71 yrs (mean age - 36 yrs). 26(65%) patients had closed fracture, 10(25%) had Gustillo Anderson Grade I compound and 4(10%) had Grade II compound fracture. In 22(55%) patients fracture was at M/3<sup>rd</sup>, in 10 (25%) patients it was at L/3<sup>rd</sup> level and in 8(20%) patients it was at U/3<sup>rd</sup> level. 4(10%) patients were operated by open interlocking nail and other 36(90%) by closed technique using C-arm. Average Injury to surgery interval was 6.20 days.

The inclusion and exclusion criteria were as mentioned below.

**Inclusion criteria**

- Fracture involving the diaphysis of femur
- Grade I,II Gustillo Anderson compound fracture
- Segmental fracture
- Comminuted fracture (Winquest Hansen classification<sup>[5]</sup>)

- Giving consent of surgery

**Exclusion criteria**

- Grade-III Gustillo Anderson compound fracture
- Not giving consent for surgery

The patients were admitted in emergency. The history was taken followed by general and local examination was done. Neurovascular status was noted. X rays and routine investigation were done. The fracture was temporarily immobilized in Thomas splint or skeletal/skin traction was given. Pre-operative planning was done. After pre-anaesthetic check-up, under Spinal anaesthesia patient was shifted on traction table in supine position, where feet are placed in padded boot. Sometimes lateral position<sup>[6]</sup> is also used. Fracture was reduced under image intensifier. Entry point was made at pyriformis fossa<sup>[7]</sup>. Guide wire was inserted, reamed and then intramedullary nail was inserted. First distal locking was done, followed by proximal locking.

Postoperatively, limb elevation was given, third-generation cephalosporin and aminoglycosides were given intravenously for 5 days and oral antibiotics continued till 7<sup>th</sup> postoperative day. Check X-rays were taken.

Patients were discharged after stitch removal and followed up at every 4 week till radiological union was seen. At every follow up clinical examination was done to assess status of the surgical wound, pain, tenderness, range of motion of hip, knee and ankle, fracture stability and clinical union.





Immediate post-op X-ray



X-ray after one month

## Results

Mean time for union was more in patients treated by open procedure (20 weeks) as compared to closed technique (18.35 weeks). 2 patients developed superficial infection, which healed completely and 2 patients developed deep infection with nonunion. For evaluation of results in our series Thoresen *et al* classification system<sup>[8]</sup> was used. We had 40 patients of which 24(60%) patients had excellent results, 12(30%) patients had good result; 10 patients had range of motion 120° and shortening of 2 cm was observed in 2 patients. We had 2 (5%) fair result of a patient, with compound Gr. II injury with range of motion 90°. 2(5%) poor result had non-union, with range of motion < 90°.

## Discussion

The scope of femoral shaft nailing has been broadened with reaming and interlocking of intramedullary nails. Since then unacceptable rates of malunion and non-union shown by various methods of conservative treatment has fallen dramatically. Femoral shaft fracture can be treated with intramedullary nailing or plating. The intramedullary interlocking nail fixation has lesser degree of complications as compared to other modalities of treatment methods.

Closed nailing is definitely superior to open nailing<sup>[9, 10]</sup> We had four cases of Gustillo Anderson compound Gr II injuries operated after 48 hrs. of injury with open nailing. The operative time ranged from 2-3 hrs (Avg. 170.5 min). The complications associated with this study are superficial inf. (5%), deep inf. (5%), delayed union (10%), non-union (5%), shortening (10%). Christie *et al.*<sup>[11]</sup> had 1 superficial infection, 14 patients had prolonged wound discharge with no osteomyelitis. Lhowe, Hansen<sup>[12]</sup> had reported 67 open fractures treated by immediate nailing with 5% wound seroma and 5% wound infection. Christie *et al.*<sup>[11]</sup> reported delayed union in 2 patients (i.e.1.7%) in 117 patients. Klemm, Borner<sup>[13]</sup> had 0.7% delayed union in 293 fractures. Rothwell<sup>[14]</sup> in his study showed 6% of non-union rate. Alho *et al.*<sup>[15]</sup> had 0% rate with Grosse-Kempf nail in 120 patients. White *et al.*<sup>[16]</sup> has 1.1% of nonunion with Brooker-Willis nail. Christie *et al.*<sup>[11]</sup> reported 2 patients (1.7%) with more than 2 cm shortening both had spiral fractures, which were dynamically locked, study of 117 patients. Johnson<sup>[17]</sup> reported shortening of 1-2 cm in 13% of cases. Lhowe<sup>[18]</sup> reported 7% cases with 1-2 cm shortening. Alho *et al.*<sup>[15]</sup> reported 63% excellent results, 19.5% good results, 15.4% fair results and 1.6% poor result in 120 patients. Thoresen *et al.*<sup>[8]</sup> reported 63.8%

excellent results, 17% good results, 15% fair results and 4.25% poor results in his study of 48 cases.

## Conclusion

- 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.
- 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.
- Reaming and interlocking expands the scope of nailing, to include all segments of femoral shaft.
- Closed nailing is preferred over open nailing, due to its faster rate of healing.
- In compound fractures, the risk of osteomyelitis in relation to interval between injury and the timing of debridement, considering our limited number of cases.

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