

## A Prospective Study on Segmental Fractures of Femur Treated With Inter Lockingnails

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**Abstract:** Fracture femur is one of the common fractures that can be treated by many devices. The same fracture when presenting with segmental fracture pattern poses certain difficulties in reduction all the methods of fracture fixation. In the wake of increased road traffic accidents increasing high velocity accidents, there are femur fractures which show segmental pattern with different displacements, rotational deformities, comminution and butterfly fragments. Our study is designed s a prospective , observational study to know the fracture union in segmental fractures of femur treated with interlocking nails.

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### I. Introduction

The present scenario of global incidence of femoral shaft fractures, as well as their burden on society, continues to be significant. The femur is one of the commonly fractured long bones. It has become a fracture found in all age groups. The femur fractures now a days commonly occur in road traffic accidents and also due to falls by individual from heights.

Being a long and weight bearing bone, near anatomical fixation can aid in regaining normalcy for the patients. Certain cases are challenging to manage, not only during surgical correction, in pre operative stage also. There can be life-threatening complications because of hemorrhagic shock, fat embolism, acute respiratory distress syndrome<sup>1,2</sup> or multiple organ failure.

<sup>3,4</sup>The thick musculature encasing femur provides an ideal milieu for fracture healing, but often it simultaneously opposes fracture reduction. Deforming gravitational and muscular forces have troubled trauma surgeons for centuries and have too often forced to compromise of a less than satisfactory reduction for earlier or better function.

Intramedullary nailing has become , the most preferred method for the management of femoral shaft fractures in most of the scenarios.<sup>5</sup>Intramedullary nails provided excellent fixation for the fractures of the femur, allow knee and hip motion, including early ambulation.

. In multiply injured patients, reamed nailing can be safely integrated with the Damage Control Orthopedics or Early Total Care concept and can be performed in the majority of patients, even when additional severe chest and head injuries are present. Initial resuscitation should focus on general stabilisation before definitive femur fixation. Plate osteosynthesis<sup>6</sup> of the femur can be an option in selected patients. the concept of alignment should be placed high & open nailing should be tried in those cases where adequate results cannot be achieved by closed methods.

The fractures of femur at single level of upper third and the lower third which is difficult to reduce by the closed technique can be treated better with the open technique with lesser complications.

The shaft of the femur is slightly twisted and curved with convexity forward, and the anterior curve does not change with development. The shaft is nearly cylindrical in the middle third. Above and below it is flattened anteroposteriorly and widened, especially towards the lower end.

Most modern I.M. nails are prebent, to accommodate the bow. So, care should be taken that the starting point is in line with the medullary canal. The shaft of the femur is almost cylindrical in most of its length and bowed with a forward convexity.

Working Length: It is the distance from the point where the nail and bone are fixed proximally, to where they were fixed distally. The concept of working length<sup>7</sup> is important because the strength of the nail-fracture construct is a function of the working length. The rigidity in torsion is inversely proportional to working length and the rigidity in bending is inversely proportional to working length squared.

Partial working length is defined as the length of sound narrow femoral isthmus centrally and a sound medullary canal distal to the fracture. Interlocking intramedullary nails designed for static maintenance of length, also provide the highest degree of rotational stability, by rigidly locking the nail to bone through the use of screws. Interlocking nails have longer working length. Hence can be used in proximal and distal fractures also.

Younger patients are involved in high-energy mechanisms, most commonly motor vehicle collisions. Elderly patients can sustain osteoporotic femur fractures from ground-level falls<sup>8</sup>. Acute respiratory distress syndrome, pneumonia, hospital length of stay, and intensive care unit length of stay were lowest in the group fixed within 24 hours, even in patients with concomitant head or chest trauma. Fixation between 2 and 5 days was associated with a significantly increased incidence of acute respiratory distress syndrome, pneumonia, and fat embolization syndrome in patients with concurrent chest trauma<sup>9</sup>.

Considering the fracture type, numerous classifications exist in the literature on the subject, based on fracture location and geometry, comminution, the seriousness of injuries on soft tissue, and the absence of associated injuries. However, in practice, none of these classifications are broadly accepted. The AO classification, which defines 27 diaphyseal femoral fracture patterns based on the location of the fracture (proximal, mid-shaft or distal), its anatomy (transverse or oblique) and the degree of comminution, does not have implications on therapy or prognosis<sup>10</sup>. The treatment of segmental multilevel fractures of the femur is problematic. Open methods of

Fracture fixation which strip the soft tissue attachments from the bone cause devascularisation of the middle segment. Mechanical fixation using 2 separate plates results in a stress riser. The use of closed intramedullary nail addresses some of the problems in this difficult group of fractures, preserving the soft tissue envelope and eliminating stress risers<sup>11</sup>. Unrestrained patients may have multiple potential mechanisms and, with associated injuries, recollection of the traumatic event can be extremely difficult. In some cases, major ligamentous injuries occur in the knee in association with femoral fractures.

These can often be missed, thus it is essential to maintain a high index of suspicion for knee pathology after fractures of the femoral shaft<sup>12</sup>.

#### Classification

Two common classification systems are used to describe diaphyseal femur fractures.

The Orthopaedic Trauma Association Classification

32A - Simple

A1 - Spiral

A2 - Oblique, an angle less than 30 degrees

A3 - Oblique, an angle less than 30 degrees

32B - Wedge

B1 - Spiral wedge

B2 - Bending Wedge

B3 - Fragmented Wedge

32C - Complex

C1 - Spiral

C2 - Segmental

C3 - Irregular

Winqvist and Hansen Classification<sup>[4]</sup>

Type 0 No comminution

Type I Insignificant comminution

Type II greater than 50% cortical contact

Type III less than 50% cortical contact

Type IV Segmental, with no contact between proximal and distal fragment.

Our study is designed as a prospective observational study for segmental fractures of femur treated with inter locking nail.

## **II. Materials and Methods**

Our study has involved 58 cases of fractures of diaphyseal fractures of femur showing segmental fracture pattern, from Govt. General Hospital, Vijayawada from August 2018 to November 2019. The inclusion criterion are (1) All adult fractures of femur, (2) Diaphyseal fractures with segmental pattern (3) intact skin, (4) intact blood supply. The Exclusion criterion are (1) Paediatric fractures (2) Open fractures (3) Vascular deficits (4) Neural deficits.

All the patients with the inclusion criterion are subjected to thorough skeletal evaluation to rule out concomitant injuries and for Pre anaesthetic check up to establish their fitness to undergo surgical procedure.

The evaluation is done with good quality AP and Lateral view Radiographs. As the femur fractures are known for haemodynamic instability, cases are initially stabilized with iv fluids, and supported with thick POP slab and absolute limb elevation.

Once the safety in taking up the patient for fracture fixation is established, the cases are posted for elective fracture fixation. The skin is thoroughly scrubbed and draped with the lower limb on traction attached fracture table. The standard approaches are used for entry point and minimal incision for fracture reduction. The traction attachment is used to apply traction where ever necessary rather than traction throughout the procedure.

An incision for the entry point is given from the tip of the greater trochanter to five to seven cm proximally. The pyriformisfossa is reached by splitting the muscle fibres in the same direction. The entry point is kept with a curved bone awl close to the medial wall of the greater trochanter and at the junction of anterior two thirds and posterior one thirds to keep the entry inline with the medullary canal. A guide wire is passed through the entry point. As the guide wire is maneuvered through the most proximal fragment, traction is gradually increased to achieve reduction at the first segment of the fracture. The difficult reductions are encountered in case of bulky muscles. Manipulations to achieve the reduction are necessary. In cases of irreducibility, a cannulated reamer can be introduced to reduce deflected fragments. The guide wire can be advanced over the reamer once reduction is achieved. In case of further irreducibility, a smaller incision is given in the laterals aspect to correct resistant deflections and over riding. The technique can be used to reduce the most distal segment. Once reaming with lower size diameter reamer is completed the fracture reduction can be assessed for rotational deformities also, with AP and Lateral view image intensifier projections. The fracture segments not reduced in terms of rotational alignment can be reduced by inserting the Steinmann pins in the same incisions used for reducing the fractures. Reaming is done in 0.5mm increments upto 1mm diameter larger than the chosen nail, using a soft tissue protector.

A nail of chosen length and diameter is mounted on a driving-targeting device using a nail holding screw and nail is introduced over guide wire and impacted using a mallet. Once the medial-lateral and rotations displacements are corrected an assistant will hold the fragments in apposition while the definitive inter locking nail is getting introduced, at each segment the fracture gap is assessed and the traction is reduced accordingly.

The interlocking is done in static mode with self tapping screws. All the wounds are thoroughly lavaged at all incision site to evacuate blood clots, and sutured after perfect haemostasis, in layers. The patient is carefully monitored for heamo dynamic stability. iv antibiotics are given for the first five days. The limb is adequately elevated. The patient is encouraged to do active ankle and, toe movements, quadriceps drill as soon as patient tolerates them.

The suture removal is done on tenth post operative day and discharged. The Post operative visits are spaced four weeks apart.

### **III. Results**

Our study is designed as a prospective observational study for segmental fractures of femur treated with inter locking nail. Our study has involved 58 cases of diaphyseal fractures of femur showing segmental fracture pattern. The fracture distribution as per the pattern is as follows.

	Transverse	Oblique	Butterfly fragments	Total
Proximal Segment	15	19	24	58
Distal Segment	6	38	14	58

The patients are observed at each followup visit for callus formation at any of the segments. They are encouraged to actively move the Knee, Ankle and Toes without bearing weight. The patients are allowed to non weight bearing toe touching from third week onwards. The weight bearing is allowed only after callus is appeared at any of the fragments. The time taken to appreciate callus at any of the fragments is eight weeks. The fragments which are transverse are the earliest sites in our study to show callus. Three cortices union on two views is late to occur at butterfly fragments and at oblique fragments.

### **IV. Discussion**

The fracture reduction in case of segmental fracture poses difficulty, especially in case of fracture femur. Early attempts to reduce and fix fracture in a safe scenario is ideal to ease the surgical difficulties. Even when the minimal incisions are given, the fractures with oblique patterns, butterfly fragments are late to show union. The fracture fixation should be done as far as possible to preserve the blood supply and to achieve reduction without causing further damage to the soft tissue planes. The interlocking nail facilitates preservation of blood supply. The interlocking nail maintains the length of the limb and prevents rotational deformities at the same time the active movements can be advised to the patients. The fracture patterns that usually show delay in callus appearance are oblique fragments and butterfly fragments. The same should be carefully reduced by

maneuvering or by using bone levers and correction of rotational deformity by using joy stick maneuvers. The weight bearing is better advised at least one segment presents with callus on followup radiographs.

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