

A Retrospective Study of 100 Cases of Fracture Shaft Femur Treated by Closed Intramedullary Nailing

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SUMMARY

A retrospective study was performed to evaluate long-term functional and radiological results of closed intra-medullary nail in adult patients with fracture shaft of femur. One hundred and eleven patients were treated during forty eight months period (January 1997 - December 2000). One hundred patients were available for follow up, with a mean follow up period of 23 months range (18-48 months). Sixty nine patients were male, thirty one were female, with mean age of 42.6 ± 17.5 years. Most of the patients presented with injury after road traffic accidents (69%). Eighty two percent of fractures were closed and 18% were open. In all patients after initial emergency treatment, fractures were reduced under image intensifier on a fracture table and closed intra-medullary nailing was performed. All the fractures healed radiologically between 12-16 weeks and all patients with united fractures were back to their work without any complaints with full active range of movements at knee joint within 16-18 weeks. Only 4% of cases had superficial infection, treated with antibiotics and 3% of cases had revision of surgery due to delayed or non-union. The authors concluded that closed intra-medullary nailing is an effective treatment for fracture of femoral shaft and follow up data of the patients clearly demonstrate the efficacy of closed intra-medullary nailing in terms of radiological healing and functional outcome of the patients.

INTRODUCTION

Fracture shaft of femur is among the most common fractures encountered in orthopaedic practice. Since femur is the largest bone of body and one of the principal load bearing bones in lower extremity, fractures may result in prolonged morbidity and extensive disability unless treatment is appropriate.¹

Before the turn of 20th century, treatment of femoral shaft fractures involved splinting or encasing the thigh with a variety of materials. The advent of skeletal radiography at the end of 19th century clearly demonstrated the clinical inadequacy of these traditional treatment. Several techniques, like external fixation, plate fixation and intramedullary nail are now available for their treatment, and orthopaedic surgeon must be aware of advantages, and disadvantages of each of these to select the proper treatment for each patient.²

Interlocking intramedullary nailing is currently considered to be the treatment of choice for most femoral shaft fractures. Regardless of the method of treatment chosen, the following principles are agreed upon; restoration of alignment, rotation and length; preservation of blood supply to aid union and prevent infection; rehabilitation of the extremity and thereby the patient.¹

PATIENTS AND METHODS

From January 1997 to December, 2000, 113 closed intramedullary nailing for fracture shaft of femur were carried out on 111 patients in the Orthopaedic Department of Shaikh Zayed Hospital, Lahore. We retrospectively reviewed the hospital charts, radiographs and follow up notes of all these patients. Eleven patients were lost during follow up.

All patients were over 14 years of age at the

time of injury and were followed up for a minimum period of 18 months. Patients were enrolled if:

- i. The injury was an acute fracture that had been treated initially at our institution.
- ii. Intramedullary nail fixation had been maintained until the fracture was united.

Among 100 patients, 69% were male and 31% were female. The mean age at the time of surgical procedure was 40 years range (15-77). The mean follow up time was 23 months (19-53) 82% of fractures were closed, 08% type-I open and 10% type-II open according to Gustilo and Andersons classification for open fractures.³

Types of fractures were assessed according to AO/ASIF (Association for study of Internal Fixation) classification of fracture shaft of femur (Diagram 1) and types of procedures were selected accordingly.

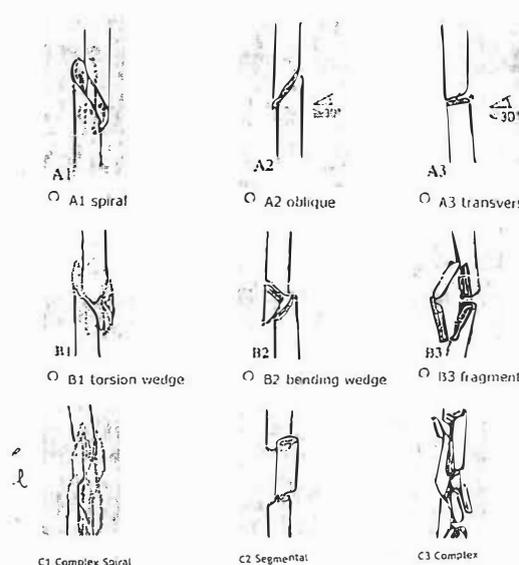


Diagram 1: Classification of femur fracture.

All the operations were done in lateral position on a fracture table under C-arm control by closed technique. All the procedures were carried out by senior consultants or were supervised by them.

Wounds were closed in layers over suction drain. Intravenous antibiotics were continued for two days when the drains were removed and isometric exercises of quadriceps and passive ranges of motion of knee and hip started. Patient was

mobilized with the help of crutches with non weight bearing on operated hip.

Patients were discharged with advice of non weight bearing crutch ambulation and a regular follow up.

Follow up included review about joint pain, joint stiffness, difficulty in weight bearing and disability. Clinical and radiological assessment of fracture healing were done by serial clinical and radiological examination.

One hundred patients were available for regular follow up, with average period of 23 months (18-48 months).

Patients were initially evaluated monthly for four months and then quarterly onwards. X-rays were taken on each visit and patients were evaluated for range of motion of knee and hip joints (both active and passive) and inquired about the pain during range of motion exercises. Patients were allowed gradual weight bearing after the x-rays revealed the bony union.

RESULTS

Both functional and radiological results were evaluated in all patients.

Functional results were evaluated for full weight bearing and range of motion of knee and hip joints.

Radiological results were evaluated for full fracture healing and maximum anatomical restoration.

The commonest cause of fracture was road traffic accident making about 69%, while other important causes are direct blow 15%, fall from height 9%, sports injuries 3% and miscellaneous are making 4% of the bulk.

The different types of fractures according to AO/ASIF classification are:

- Spiral A1-15%, oblique A2-18% and transverse A3 - 22%.
 - Torsion wedge B1-10%, bending wedge B2-12% and fragment B3-5%.
 - Complex spiral C1-5%, segmental C2-5% while complex C3 constitute about 8% of fractures.
 - The decision about locking and nailing without locking was made according to fracture geometry.
- The patients were operated by different

surgeons after preoperative planning, skeletal traction and roentgenographic evaluation. All open wounds were managed by intravenous antibiotic, irrigation and debridement pre-operatively. Four types of nail were used.

- i. Variwal interlocking nail (Biomet).
- ii. Variwal reconstruction nail.
- iii. Interlock nail (True - Dynamic - Germany).
- iv. K-nail

Nailing without locking was done in 21% of cases, proximal locking in 24% of cases and distal locking in 33% of cases, while 22% of cases were statically locked (Table 1).

Table 1: Types of Intramedullary Nailing

	Male	Female	Percentage
Without locking	15	6	21%
Proximal locking	17	7	24%
Distal locking	22	4	33%
Static locking	15	7	22%
Total	69	31	100%

In our series, the complications rate was remarkably low (Table 2). Only 4% patients had superficial infection, which was treated with I/V antibiotics.

Three percent of the patients developed delayed or non-union and retrospective radiological evaluation of patients revealed that these patients had either big butterfly fragment which was markedly displaced or had marked comminution at fracture site.

These fractures were treated with revision nailing augmented with bone graft. We concluded, the closed I/M nailing is of value of long term success provided that risk factors are reduced and done at good centers under supervision of experienced surgeons. Table 3 showing mean time of radiological healing and functional outcome.

Figures No. 1 to 14 show the radiographs of three patients taken at the time of admission, immediate postoperative period and at a later date showing healing.

Table 2: Complications

Complication	Number	Percent
Infection	4	4%
Knee joint stiffness	5	5%
Hip joint stiffness	1	1%
Nonunion	2	2%
Delayed union	1	1%
Malunion	0	0
Shortening	2	2%
Refracture after nailing	1	1%
Revision of nailing due to complication	4	4%

Table 3: Follow up Data

Evidence or Radiological Healing	Mean weeks	Full Mobilization	Mean weeks
Type A	12		14
Type B	14		16
Type C	16		18

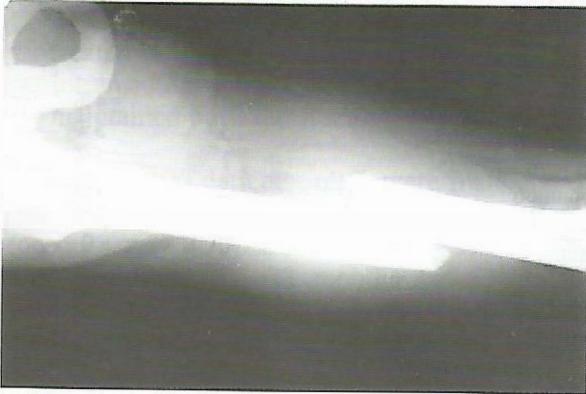
DISCUSSION

Intramedullary nailing has revolutionized the way in which femoral fractures are being treated. One of the primary advantages of intramedullary nailing is that it can be used as a closed technique. Low infection rates have been reported using these methods instead of open methods.³ The device is also a load sharing device, allowing early patient mobilization.⁴ Intramedullary nailing has, therefore, become the treatment of choice for fractures of femoral shaft.^{5,6}

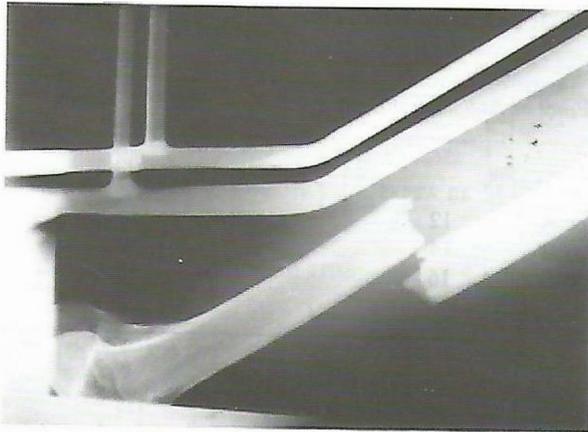
Refracture of diaphysis of large bone has been reported after treatment with skeletal traction and fixation with plate⁷⁻¹⁰ and it is most likely to occur within three months after removal of the plate.^{11,12} Refracture may occur through a screw hole either before or after removal of the plate (Stress riser) or through site of the original fracture after removal of the plate (Stress Shielding).¹³⁻¹⁵ We found no

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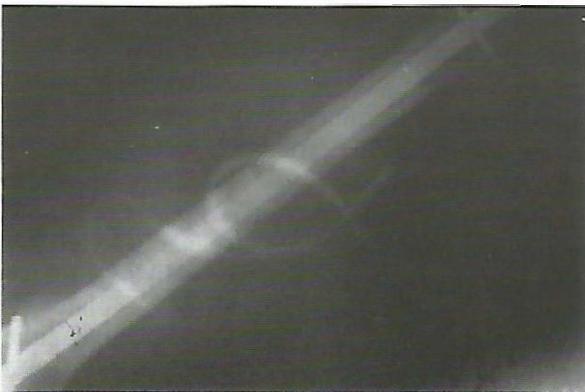
CASE 1



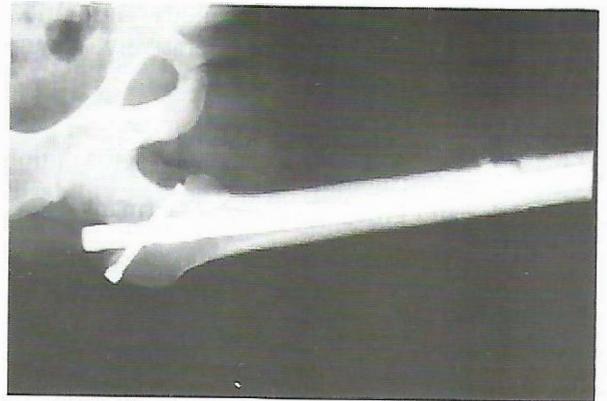
A, Transverse fracture midshaft femur (AP View).



B, Transverse fracture midshaft femur (lateral View).



C, Static I/M nail (Postoperative AP view).



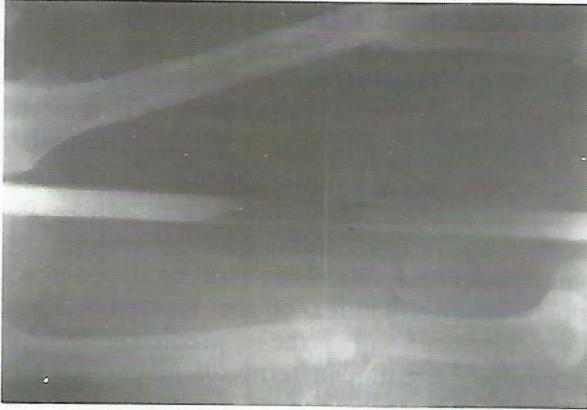
D, Fracture in healing phase with callus formation (AP view)



E; Fracture in healing phase with callus formation (AP and lateral view).

reported data on the rate of refracture after intramedullary nailing of the femur, which led us to assume that this complication rarely occurs. Refracture of the femur has not been reported among the complications of intramedullary nailing of fractures in many large series in which this technique was used.⁶ We believe that, unlike the deleterious effects of stress-shielding and stress-rises that have been reported with fixation with a plate and screws, the clinical effects of stress-shielding and stress-risers are less important with the use of intramedullary nails. The present retrospective view demonstrated clinical evidence that closed intramedullary nailing is much better choice than plate and screws and other methods of

CASE 2

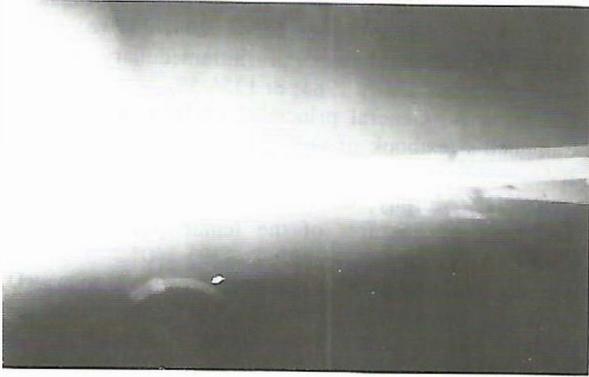


A, Transverse fracture lower 1/3rd shaft femur (AP and lateral view)



C, Fracture healed with visible callus formation.

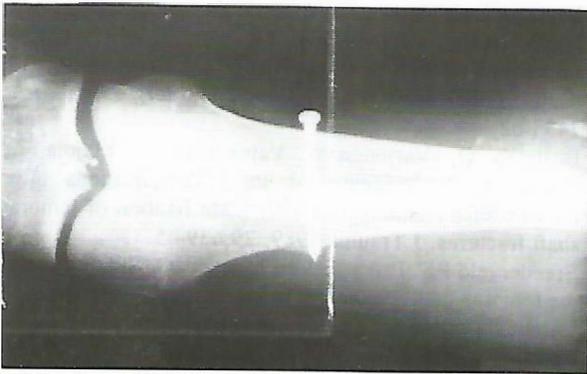
CASE 3



B1, Immediate postoperative. I/M nail with distal locking.



A, Showing fracture midshaft femur with big butterfly segment (AP view)



B2, Immediate postoperative femur with distal locking.

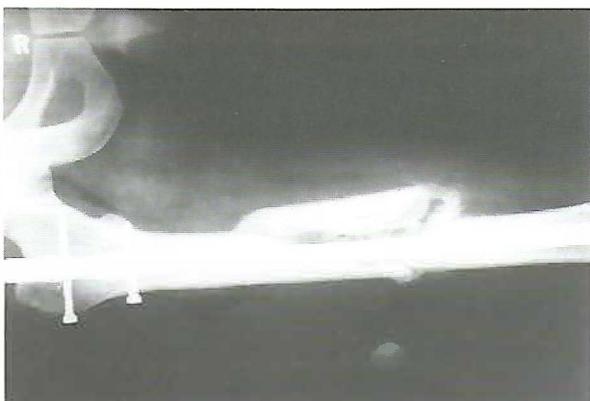


B, Fracture midshaft femur with butterfly segment.

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C, Immediate postoperative (AP view). Static I/M nail in healing phase



D, Healing in progress with callus formation (AP view).



E, Healing in progress with callus formation (Lateral view).

treatment for fracture femur. Currently its the treatment of choice for fracture femur in adults, if done in ideal circumstances.

In retrospect, we believe that the need for second surgery for bone grafting was due to comminution at fracture site or a big butterfly fragment displaced more than 1cm, that resulted in delayed union or non-union of fracture.

In summary this study represents our experience with closed intramedullary nailing. We recommend closed intramedullary nailing for the treatment of all fractures of the femoral shaft in adults because of the predictability of intramedullary fixation in terms of maintenance of length and because of the minimum risk of late refracture.

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