

# A ONE YEAR REVIEW OF VARIOUS COMPLICATIONS IN FRACTURE SHAFT OF FEMUR MANAGED WITH CLOSED INTRAMEDULLARY INTERLOCKING NAIL

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## ABSTRACT

**Objective:** To determine the frequency of complications in fractures shaft of femur managed by close antegrade intramedullary interlocking nail.

**Methodology:** It was a descriptive cross sectional study of one year duration from March 2010 to March 2011 held at department of Orthopedics and Traumatology, Lady Reading Hospital Peshawar. Forty four consecutive patients with femoral shaft fracture fulfilling the inclusion criteria were managed with closed antegrade interlocking nail. Complications in terms of infection, angulation, rotation, non-union, shortening and knee stiffness were measured.

**Results:** The mean age of the patients was  $33.70 \pm 14.53$  years. Twelve patients (27.3%) were females and 32 (72.2%) were males. Thirty five (79.5%) had road traffic accident, 3 (6.8%) sustained fractures due to fall from a height and 6 (13.6%) were due to fire arm/bomb blast injury. Thirty five (79.5%) had close and 9 (20.5%) had open fracture. There were four cases (9.1%) of infection; (two superficial and two deep wound infection). 40 patients (90.9%) regained full range of motion ( $0^\circ - >130^\circ$ ) in knee and 4 patients (9.1%) had  $0^\circ - 120^\circ$  range of motion. There was only one case (2.3%) of up to 2.5cm limb shortening. 42 (95.4%) patients achieved union. Two (4.5%) patients had non-union. These patients were treated by standard protocol of exchange nailing after reaming and ultimately achieved union. Three cases (6.8%) had angulation of  $> 10^\circ$  (dorsal or ventral). None of our patients in this study had rotation deformity.

**Conclusion:** Most common early complication with closed antegrade intramedullary nailing was infection and late complication was non-union.

**Key Words:** Femoral shaft femur, Intramedullary interlocking nail, Angulation, Time of union.

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## INTRODUCTION

Fractures of the shaft of femur, in patients with lower extremity injuries, are a major cause of morbidity and mortality<sup>1</sup>. They result from high-energy

trauma and therefore can be life threatening and a cause of severe permanent disability<sup>2</sup>. Fractures of the shaft of the femur make at least 5% of all fractures presenting in emergency<sup>3</sup>.

Close intramedullary nailing has become standard of treatment for femoral shaft fractures<sup>4</sup> from just below the lesser trochanter to 10 cm above the knee joint in adolescents and adults<sup>5, 6</sup>. Although, treatment options ranges from strictly nonsurgical methods i.e., closed reduction with casting or traction followed by casting to surgical stabilization using intramedullary devices, external fixator or plating with screws but all have results inferior to intramedullary interlocking nails<sup>7, 8</sup>. Close intramedullary interlocking nailing allows early mobilization with minimal scarring of thigh musculature; results in early functional recovery<sup>5</sup> with lesser complication rates<sup>7</sup>. As fracture site is not open, the chances of union are greatly increased<sup>7</sup>. As a general principle,

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in cases of polytrauma there is absolute indication for fixations of long bones, such as femur, with close intramedullary interlocking nails, which allows early recovery of the patient<sup>9</sup>. However, non union, rotational mal-alignment, infection, limb length discrepancy and knee stiffness are possible complications, although lesser in percentage than with other methods of management in femoral shaft fractures<sup>1,7</sup>. The incidence of post operative complications with close intramedullary interlocking nailing reported in previous studies is 2.94%<sup>7</sup>.

Radiation exposure, cost of procedure and nonavailability of equipment (image intensifier, full range of nails, power reamers etc) are few of the reasons of non-popularity of this treatment option in Pakistan<sup>1</sup>.

Closed intramedullary interlocking nailing in adults for femoral shaft fractures has been performed for the last 20 years but there is a lack of data regarding its complications and there has been no study on the frequency of the complications of this procedure in our region. Therefore it was decided to conduct a study to know the frequency of various complications of closed interlocking intramedullary nailing in our setup to have a comparison of outcome with other studies around the world.

## METHODOLOGY

This was a Descriptive study of forty four cases of femoral shaft fractures treated with antegrade close reamed intramedullary interlocking nail from March 2010 to March 2011 at Orthopaedic Department of Lady Reading Hospital Peshawar, that were followed for a minimum of six months and were evaluated for results and complications in terms of infection, angulation, rotation, non-union, shortening and knee stiffness in our department. All patients

of age more than 15 years with either Close femoral shaft fractures or open femoral shaft fractures type I, II & III A, on Modified Gastillo and Anderson classification were included in study (Table 1). Patients with age less than 15 years, pathological fractures, multiple fractures, recurrent fractures, open femoral shaft fractures type IIIB and IIIC on Modified Gastillo and Anderson classification were excluded.

All patients presented to Accident and Emergency department with history of trauma to thigh and confirmed to have femoral shaft fracture by radiology, fulfilling the inclusion criteria were identified. After explaining the cost and complications of the procedure informed consent was taken from the patient. After initial resuscitation and stabilization of fracture site these patients were admitted to ward.

In the ward, these patients were assessed via detailed history, and thorough examination. Then after Pre-operative evaluation and fitness for anesthesia, these patients were operated on the earliest possible list. After giving general or spinal anesthesia, Interlocking intramedullary nailing was performed on these patients under image intensifier. Post operatively all patients were advised a check X-ray after recovery from anesthesia. Per-operative and post-operative antibiotics were used in all patients. In all cases 2 gm of 1st generation Cephalosporin pre-operatively followed by 1 gm twelve hourly for 03 days postoperatively and Oral Quinolones for further five days were given. Post-operative analgesia in the form of Diclofenac sodium was used in all cases.

All patients had check x-ray and were mobilized with Crutches or Zimmer frame with only touch-down weight bearing on the 1st postoperative day. Passive range-of motion exercises of knee joint were started on 2<sup>nd</sup>-3<sup>rd</sup> postoperative day. Patients were

**Table 1: Modified Gastillo Anderson classification of open fracture**

GA type	Definition
I	Open fracture, clean wound, wound <1 cm in length
II	Open fracture, wound > 1 cm in length without extensive soft-tissue damage, flaps, avulsions
III	Open fracture with extensive soft-tissue laceration, damage, or loss or an open segmental fracture. This type also includes open fractures caused by farm injuries, fractures requiring vascular repair, or fractures that have been open for 8 h prior to treatment
IIIA	Type III fracture with adequate periosteal coverage of the fracture bone despite the extensive soft-tissue laceration or damage
IIIB	Type III fracture with extensive soft-tissue loss and periosteal stripping and bone damage. Usually associated with massive contamination. Will often need further soft-tissue coverage procedure (i.e. free or rotational flap)
IIIC	Type III fracture associated with an arterial injury requiring repair, irrespective of degree of soft-tissue injury.

discharged on 3<sup>rd</sup> post op day after change of dressing and checking all vitals and post op Hb%. All the patients were allowed partial weight bearing in the 6th weeks of their operation. All the patients except 7 were allowed full weight bearing in the 12th weeks of their operation. These 7 patients were allowed weight bearing between 15-17 week postoperatively.

The patients were then followed up in Out-Patient Department at 14 days, 1 month, 3 month and 6 month post operatively. The follow up on each visit included clinical examination of the patient; x-ray of femur in both antero-posterior and lateral view including hip and knee joints and blood complete picture with ESR along with Pus/Swab for culture and Sensitivity in cases of wound infection. All the findings were documented on a semi structured proforma on each visit.

## RESULTS

Out of 79 patients received with shaft of femur fractures during our study time, 35 were excluded from our study on failing to meet inclusion criteria

18 (40.9%) patients in our study were below the age of 25 years and 23 (52%) patients were in 25-50 years age group. Two (4.5%) were between 50 and 75 years. Only 1 (2.3%) patient was above 75 years age. Average age was 33.70years + 14.53. We had twelve (27.3%) female patients; thirty two (72.2%) patients were male. Male to female ratio was 2.67: 1. Out of 44, 35 (79.5%) patients were injured due to road traffic accident, 3 (6.8%) patients sustained fractures due to fall from a height and 6 (13.6%) were due to fire arm injury/bomb blast injury. Out of 44 patients 35(79.5%) had close fracture and 9(20.5%) had open fracture. One patient (2.3%) had Modified Gastillo Anderson Type I open fracture, one (2.3%) had Modified Gastillo Anderson Type II and 7 (15.9%) patients had Modified Gastillo Anderson Type IIIA open fracture (Figure 1). In this study left limb was affected in 27 (61.36%) cases, while right limb was affected in 17 (38.64%) patients.

Thirty one (70.4%) patients were operated within first week of their arrival. Ten (22.7%) were fixed in second week of their arrival, 3 (6.8%) were fixed in third week of their arrival to the hospital. Average delay in surgery was 6.68 days. Average hospital stay of the patients was 14.2 days (5-42 days).

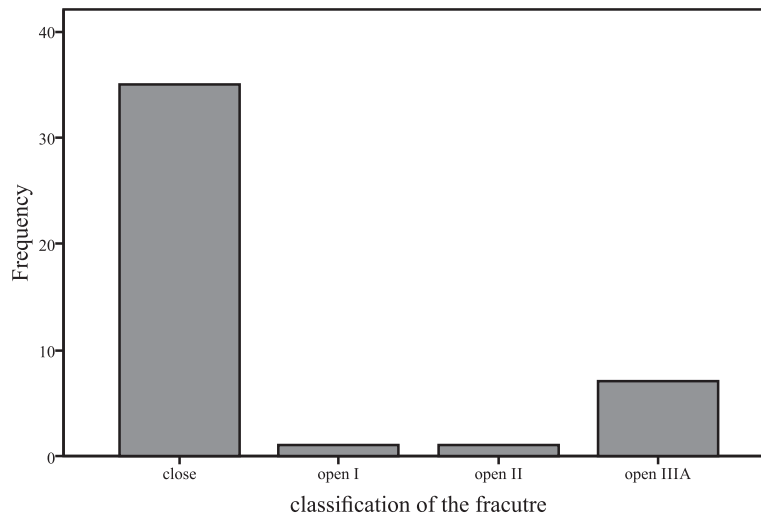
Out of 44 patients, 42(95.4%) achieved union. All 42 unions were achieved between 90-180 days (13-29 weeks). Two (4.6%) patients had no evidence of callus formation by end of 29th week postoperatively. Both underwent exchange nailing after reaming

There were four cases (9.1%) of infection in this study. 2 in close fracture and 2 in open fractures with IIIA Gastillo Anderson type. In all four cases Pus C/S was done and staphylococcus aureus was isolated in all patients. Two patient (4.5%) developed superficial infection that was treated successfully by intravenous antibiotic for one week and orally for one week according to results of Pus C/S. Two patients (4.5%) developed deep wound infection, which need debridement and dressing along with intravenous antibiotics for longer period of time according to results of Pus C/S. All four patients cleared the infection (Table 2).

In this study 40 patients (90.9%) regained full range of motion ( $0^{\circ}$  -  $>130^{\circ}$ ) in knee of affected limb within 180 days (6 months) after surgery. 4 patients (9.1%) had  $>120^{\circ}$  -  $<130^{\circ}$  range of motion in knee of affected limb. There was only one case (2.3%) of up to 2.5cm limb shortening. It was managed by shoe raise which produced acceptable results to both patient and surgeon. Two (4.5%) cases of non-union were observed in whom no callus was visible on radiographs by end of 29<sup>th</sup> week postoperatively. These patients were treated by standard protocol of exchange nailing after reaming. Three cases (6.8%) had angulation of  $>10^{\circ}$  (dorsal or ventral) measured with goniometer on x-rays; none had angulation more than  $20^{\circ}$ . All three patients were asymptomatic and didn't require any corrective surgery. None of our patients in this study had and rotation deformity.

**Table 2: Complications in fracture shaft of femur managed with closed intramedullary interlocking nail**

Complications	Follow up visits			
	2 weeks	1 month	3 month	6 month
Infection	4 (9.1%)	4 (9.1%)	2 (2.5%)	0
Knee stiffness	-	-	-	4 (9.1%)
Angulation	3 (6.8%)	3 (6.8%)	3 (6.8%)	3 (6.8%)
Non-union	-	-	-	(2.5%)
Limb shortening	1 (2.3%)	1 (2.3%)	1 (2.3%)	1 (2.3%)
Rotation	0	0	0	0

**Figure 1: Classification of the fracture**

## DISCUSSION

Femoral shaft fractures mostly result from very strong energy forces and the main treatment aim is to restore the anatomy, provide rigid and stable fixation and make sure early mobilization of the adjacent joints<sup>2</sup>.

Young people are more active and that is the reason they are more prone to high energy traumas which can lead to femoral diaphyseal fractures and this is evident from our study as 18 (40.9%) were below the age of 25 years and 23 (52%) patients were in 25-50 years age group. This is an active period of life; therefore people are exposed to more trauma and accidents. Two (4.5%) were between 50 and 75 years. Only 1 (2.3%) patient was above 75 years age. Average age was  $33.70 \pm 14.53$  years. The age wise distribution of patient in our study is in line with Edinburgh study<sup>10</sup> and other studies<sup>1, 4, 5, 8</sup>.

Only 27.3% of our patients were females which is less in contrast with European studies<sup>10</sup> where female percentage is more than studies and the fact that more female go out of houses and are also more at risk of high energy trauma and so overwhelming male dominance is not seen although male are more prone to have femoral shaft fractures even in western world. Male dominance in number of patients depict the fact that our society is a male dominant society and are more exposed to accidents, traumas and other mishaps leading to injuries and is in line with studies of Shafi et al<sup>1</sup>, Durrani et al<sup>4</sup> and Ali et al<sup>5</sup>.

It is obvious from various national and inter-

national studies that road traffic accident is most common cause of femoral shaft fractures<sup>4, 6, 10</sup> and the pattern remains the same in our study as well.

Fracture patterns inflicted in our study are more or less in line with epidemiological study done in Edinburgh<sup>10</sup>. 35(79.5%) had close fracture and 9 (20.5%) had open fracture.

The average hospital stay of the patients in our study and average delay in operation were longer in our study (14.2 days and 6.68 days respectively). This is in contrast to study by Gharehdaghi et al<sup>8</sup>. The reason of delay in our study is that Lady Reading Hospital is main tertiary care hospital in our province and the recent wave of bomb blasts and terrorist activities led to even further burden on our hospital and unit. Because of this reason our patients had to wait longer to be on operation list.

Infection rate (9.1%) in our study was on higher side when compared to studies of our region<sup>8</sup> and international studies<sup>11-13</sup> but in line with studies of our setup<sup>5</sup> and the reason most probably is poor sterilization of instruments, poor operation theatre facilities and poor scrubbing technique.

Vast majority of our patients (90.9%) achieved full range of motion in knee of affected limb within 180 days (6 months) after surgery, a result similar to study of Ali et al<sup>5</sup>. All patients were able to flex the knee for more than 120°. These findings are in line with findings of other studies which also showed that knee stiffness incidence is less in patients treated with interlocking nail<sup>14-19</sup>.

There was only one case (2.3%) of up to 2.5cm limb shortening. This incidence is in line with other studies<sup>5, 8</sup>. It was managed by shoe raise which produced acceptable results to both patient and surgeon.

In our study 42 (95.5%) patients achieved union. Two (4.5%) cases of non-union were observed. These patients were treated by standard protocol of exchange nailing after reaming and ultimately achieved union. Numerous studies have documented union rates of 94-100% after reamed locking nails in femoral fractures<sup>1, 4, 5, 8</sup>.

Three cases (6.8%) had angulation of  $\geq 10^\circ$  (dorsal or ventral). Although this is slightly higher than other studies<sup>1, 8</sup> yet all patients were asymptomatic and didn't require any corrective surgery.

## CONCLUSION

It is concluded from our study that closed ante-grade intramedullary interlocking nailing is associated with few complications.

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#### CONTRIBUTORS

SSA conceived the idea, planned and wrote the manuscript of the study. MG helped in the write-up of the manuscript. IUB supervised the study. All the authors contributed significantly to the research that resulted in the submitted manuscript.