

# FUNCTIONAL EVALUATION OF FRACTURE SHAFT OF FEMUR TREATED BY ANTEGRADE CLOSED INTERLOCKING NAIL AT B.P. KOIRALA INSTITUTE OF HEALTH SCIENCES, DHARAN

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## ABSTRACT

### Introduction

The management of fractures of the femoral diaphysis has changed considerably in the last 30 years. Since the advent and popularization of intramedullary nailing the treatment of fracture shaft of femur has become a good, safe and reproducible procedure for the successful management of fracture shaft of femur.

### Objective

The objective of the study was to assess the various post-operative outcomes of the interlocking nail of fracture shaft of femur.

### Methodology

This study was prospective cohort study conducted at B.P. Koirala Institute of Health Sciences, Dharan from March 2002 to Feb 2004. Seventy five consecutive patients, having fractures shaft of femur were treated by anterograde closed interlocking nail. Data analysis was done by using EpiInfo 2000 software.

### Results

The most common cause of fractures shaft of femur was road traffic accident (69.3%). The average union time was  $14.9 \pm 1.3$  weeks. There was wound infection in four cases superficial infection in open grade II but no deep infection. There was two cases of pudendal nerve palsy which recovered within 4 months. There were 5 cases of broken interlocking distal screw and 4 cases had more than 1.5 cm shortening of femur

### Conclusions

The antegrade reamed femoral nailing provides excellent results in management of fractures shaft of femur.

## KEY WORDS

Antegrade closed interlocking nail, fractures, shaft of femur



## INTRODUCTION

The management of fractures of the femoral diaphysis has changed considerably in the last 30 years. Despite the introduction of intramedullary nailing by Hey-Groves<sup>1</sup> and later by Kuntscher<sup>2</sup> most femoral diaphyseal fractures were treated non-operatively. Since the advent and popularization of intramedullary nailing the treatment of femoral shaft fractures has become a good, safe and reproducible procedure for the successful management of femoral shaft fractures. Many orthopedic surgeons have been trained well in the nailing of femoral shaft fractures and commonly treat these injuries. However, many femoral shaft fractures are complicated by associated fractures, extensive comminution, extensive contamination, arterial injury, and compartment syndrome. Other problematic situations include existing non-union with broken hardware, deformed nails with acute injury, and associated femoral shaft and femoral neck fractures. The management of these complex femur fractures is not common and demands special techniques to obtain a successful outcome. The objective of the study was to assess the various post-operative outcomes of the interlocking nail of fracture shaft of femur. The following were the outcomes assessed, time of union, range of motion of knee, infection, compartment syndrome, nerve palsy, iatrogenic fracture neck of femur, avascular necrosis of femoral head, malunion, delayed union, implant failure, shortening of limb, pain of hip and knee.

## METHODOLOGY

In a prospective study a total of seventy-five patients of age group (18 to 57) years, of either sex, having fractures shaft of femur were treated by anterograde closed interlocking nail after taking written informed consent. Pre-operative evaluation was done which includes the history regarding the mode of injury. Clinical and radiological assessment fracture pattern were assessed with antero-posterior and lateral radiographic view of the thigh include hip and knee joint, and classified according to the radiological types. The study was conducted at patients admitted in B. P. Koirala Institute of Health Sciences, Dharan from March 2002 to Feb 2004.

The patients with previous deformity of the same limb mentally retarded and neurovascular injuries were excluded. We have considered delayed union to be present if clinical union of fracture did not take place within 24 weeks of the operation.

The patients were put on proximal tibial skeletal traction 1 to 2 weeks followed by anterograde closed interlocking nail. On the first postoperative day, gentle range of motion exercise of knee and hip was started; quadriceps-strengthening exercises within limits of pain tolerance and toe touch axillary crutch walking was started as early as possible (second day). Partial weight bearing axillary crutches was started when early callus formation was evident. Full weight bearing was allowed when callus formation bridged the fracture gap. The postoperative sutures were removed on the 12<sup>th</sup> postoperative day. The

second follow up visit was 6 weeks from the date of surgery. Further visits were at 6 weeks intervals.

## RESULTS

The average age of patients was  $35.5 \pm 10.2$  years with range 18 to 57 years. The male patients (74.7%) were more frequent than females. The most common cause of fractures shaft of femur in this study was road traffic accident (69.3%). Table 1 shows the frequency distribution on mode of injury encountered in this study.

Mode	Number of Patients	Percent
Road Traffic Accidents	52	69.3
Fall From Height	20	26.7
Gunshot Injury	3	4
Total	75	100

The most common types and radiological types of fractures were as shown in table 2 and 3 respectively.

Type	Number of Patients	Percent
Closed	67	89.3
Open grade I	3	4.0
Open grade II	5	6.7
Total	75	100

Radiological Types	Number of Patients	Percent
Comminuted	32	42.7
Oblique	16	21.3
Segmental	3	4.0
Spiral	13	17.3
Transverse	11	14.7
Total	75	100

The average union time in our study was  $14.9 \pm 1.3$  weeks. The average union time with sex comparisons in our study male was  $14.8 \pm 1.3$  weeks and female was  $15.1 \pm 1.4$  weeks. P-value 0.48 There was 0-130° range of motion in fifty-two cases (69.3%), 0-120° motion in eighteen cases (24.0%) and 0-110° motion in five cases (6.7%). There was wound infection in four cases superficial infection in open gr. II but no deep infection. There was no compartment syndrome in our series. Two cases (2.66%) had pudendal nerve palsy secondary to traction both of which recovered within four months. There was no iatrogenic fracture of neck femur and no cases of AVN femoral head in our series. There were six cases of malunion more than 10° of external rotation in our series. There was no case of delayed union. All cases united within 24 weeks of date of operation. There were five cases of broken interlocking distal screw. There were four cases



had shortening more than 1.5 cm. Thirty percent of the patients suffered from hip pain while only 12% of the

patients had knee pain and many patients became pain free after the removal of the nails.

## DISCUSSION

Postoperative complications were mentioned in table 4.

**Table 4: Results of series reporting treated by closed anterograde nailing of fractures shaft of femur.**

Authors	No. of Patients	Time to Union Weeks	Infection	Delay Union	Range of Motion Knee < 120°	Pain		Pudendal Nerve Palsy	Implant Failure	Shortening > 1.5 cm
						Hip	Knee			
Johnson KD et al <sup>5</sup>	24	13.8		4.2						
Thoresen et al <sup>22</sup>	48	16								
Christe et al <sup>23</sup>	117	17		2(1.7%)					2(1.7%)	
JG Seiler <sup>24</sup>	89	13.1	1.10%	1.10%				2(2.3%)		
M.Braten et al <sup>25</sup>	116		0.90%			26%	20%			
Present study	75	14.9±1.3			5(6.7%)	32%	12%	2(2.6%)	5(6.7%)	4(5.3%)

After reviewing the articles, Table 4, various techniques and implants evolved to stabilize these fractures. Early management included ORIF using plates<sup>3,4</sup>, open intramedullary nailing with cerclage wires<sup>5,6</sup>, and external fixation<sup>7,8,9</sup>. These techniques have been largely abandoned because of a considerable complication profile the success of closed intramedullary nailing in the treatment of femoral shaft fractures.

Closed intramedullary nailing has become the standard of care for both closed and open femoral shaft fractures. Chapman<sup>10</sup> reported no infections and good functional results after delayed (10-14 days after injury) closed intramedullary nailing of open femur fractures, but this technique neglected the benefits of early patient's mobilization. Brumback<sup>11</sup> et al reported no infection, Winqvist et al<sup>12</sup> reported 2% infection and Lhowe & Hansen<sup>13</sup> reported 5% infection rate.

Wiss et al<sup>14</sup> reported segmental femoral shaft fractures occur 5% of femoral shaft fractures. In our study segmental femoral shaft fractures occur 4%. Segmental femoral shaft fractures result from high-energy injuries and usually accompanied by massive soft tissue damage.

Bennett et al<sup>15</sup> 1993 reported an ipsilateral fracture of the femoral neck is a significant finding in patients with a femoral shaft fracture, occurring in 2% to 6% of femoral shaft fractures<sup>12,15,16,17</sup>. In our study ipsilateral fracture of the femoral neck with a femoral shaft fracture occur 2.6%. Frequently, the femoral neck fracture is not initially diagnosed; several series have shown that as many as 33%

of associated femoral neck fractures were not initially diagnosed<sup>15,16,18</sup>.

Femoral shaft fractures resulting from gunshot injuries based on the kinetic energy ( $KE=1/2 mv^2$ ) of the projectile. Low-energy injuries usually occur secondary to handgun shots in which the velocity of the projectile is less than 1000 ft/s or from close-range shotguns in which the mass of the projectile factors significantly to increase the kinetic energy imparted to the tissues<sup>19,20</sup>. Femoral shaft fractures resulting from low-energy gunshot wounds can be thought of as type 1 open fracture. Treatment of the open wound does not require a formal irrigation and debridement, and good results have been reported with minimal, local wound care<sup>21</sup>. In our study femoral shaft fractures resulting from gunshot injuries occur 4% and manage as closed reamed nailing.

On the average, the time to union in our series was 14.9± 1.3 weeks which is comparable with Thoresen et al<sup>22</sup> 16 weeks, Johnson et al<sup>5</sup> 13.8 weeks, Christe et al (1988)<sup>23</sup> 17 weeks. We have considered delayed union to be present if clinical union of fracture did not occur within 24 weeks of the operation. In our series there were no cases of delayed union.

There was no deep infection in our series, but there were 4 cases of superficial infection in open grade II fracture cases. All the cases had use antibiotics second-generation cephalosporin that is continued for intravenous 72 hours post-operatively and oral antibiotics for 12 days. This rate much more than that reported by Klemm and Borner (1986)<sup>24</sup>, Kempt et al (1985)<sup>25</sup>, Seiler and Swionthowski (1991)<sup>24</sup> and Braten et al (1995)<sup>25</sup>.

In our series there were 6 cases of united in malunion with 10° of external rotation and 4 cases had shortening more than 1.5 cm. Braten et al<sup>25</sup> reported that 39.1% of the patients with an external rotation deformity of more than 15° were actually symptomatic.

In our series 32 % of the patients suffered from hip pain while only 12% of the patients had knee pain and many patients became pain free after the removal of the nails. Braten et al<sup>25</sup> reported that 26% of patients had hip pain and 20% had knee pain. We had 5 cases (6.7%) of broken interlocking screw, which is not a major complication.

In our series two cases (2.66%) had pudendal nerve palsy secondary to traction which is recovered in 4 months. Seiler and Swiontkowski (1991)<sup>23</sup> reported one peroneal and one pudendal nerve palsy, both of which recovered within 6 months.

## CONCLUSION

An overall analysis of the results in table 4 shows that in comparison to previous studies results of our study were similar. We conclude that anterograde reamed femoral nailing provides excellent results in the management of fractures shaft of femur.

## LIMITATION OF THE STUDY

None

## ACKNOWLEDGEMENT

None

## CONFLICT OF INTEREST

None

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