

Original Research Article

Effect of early protected weight bearing in fractures of shaft of femur

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ABSTRACT

Background: Fracture shaft of femur is a common and major musculoskeletal injury and in most of the cases the patients are immediately brought to hospitals for specialist orthopaedic management. The purpose of this study was to evaluate the effectiveness of early protected weight bearing in fractures of shaft of femur.

Methods: This was observational study conducted on 35 patient's hospital with transverse fracture mid-shaft of femur, between March 2007 and July 2011. Patients with high velocity trauma, with transverse fracture of mid shaft of femur amenable to closed reduction and interlocking intramedullary nailing and otherwise healthy individuals were included in this study. The preoperative parameters were recorded included age, gender, side of the fracture and medical history. All patients were operated on second day of admission.

Results: A total of 35 consecutive cases were included, 34 patients were males and 1 was female. In 74% cases closed intramedullary nailing given excellent healing of fracture, in 14% cases healing was good, in 6% cases it was average and 6% cases poor healing was observed.

Conclusions: Our study demonstrate that this method provides anatomical reduction and maintenance of femur length and early ambulation which promotes fracture healing by a stable internal fixation allowing micro motion at fracture site enhancing callous formation.

Keywords: Fracture shaft of femur, Closed reduction, Intramedullary nailing, Early guarded weight bearing

INTRODUCTION

Auto crashes account for many fractures. Femur is the largest and strongest bone and has good blood supply. Because of this and its protective surrounding muscles, the shaft requires a large amount of force to fracture.¹ Advancement in mechanization and acceleration of travel has been accompanied by an increase in the number and severity of fractures. Fracture shaft of the femur results from the drawbacks of fast life and violence which is a major cause of morbidity in lower extremity injuries and continues to pose vexing problems for the orthopaedic surgeons.²

A major mechanism of mid-shaft fracture femur fractures is impact with the dashboard of the vehicle in a frontal

collision, especially for unrestrained drivers who submarine or slide forward in the seat.³ Tensing the quadriceps and hamstrings muscles during a crash applies significant additional compression to the femur.² The anterior bow of the femur causes the external compressive force from contact of the knee to the dash board, and internal muscle forces to bend the femur, resulting in bending and transverse or oblique fractures. The evaluation and management of patients with femoral shaft fractures continue to evolve on the basis of improved understanding of the local anatomy, impact of treatment, and biomechanics of fracture fixation. Femoral nailing has advanced continuously over past 60 years. The transition from open nailing techniques to closed techniques using a remote entry site at the proximal femur paralleled the availability of image intensification.

Intramedullary reaming allowed placement of larger implants allowing improved rotational control and resistance to bending. The introduction and popularity of interlocking nails allowed for improved rotational control, better maintenance of femoral length, early weight bearing, use of smaller implants and improved control of comminuted and segmental fractures.⁴ Femoral shaft fractures are observed across all age groups and attributable to a variety of mechanisms. There tend to be an age and gender-related bimodal distribution of fractures injuries occurring most frequently in young males after high energy trauma and in elderly females after falls from standing. The mechanisms in young patient tend to be motor vehicle crashes, pedestrian struck by vehicles or fall from height.⁵ Several methods of fracture treatment exist for fractures of shaft of femur, includes closed and non-operative treatment, external fixation, plate fixation and intramedullary nailing.⁶ Antegrade femoral nailing can be one of the most predictable procedures in orthopaedic traumatology. It is the most common treatment for femoral shaft fractures in adults.⁷ The aim of this study was to evaluate the effectiveness of early protected weight bearing in fractures of shaft of femur.

METHODS

This was an observational study conducted on 35 patients with transverse fracture mid-shaft of femur, between March 2007 and July 2011. Patients between the ages of 20 to 40 yrs were considered for this study. Patients with high velocity trauma, with transverse fracture of mid shaft of femur amenable to closed reduction and interlocking intramedullary nailing and otherwise healthy individuals were included in this study. Patients with pathological fractures, comminuted fractures, segmental fractures, open fractures, any other associated fractures in any other bones, head injury, abdominal or chest injuries, history of fracture in same femur, patients less than 20 years and more than 40 years were excluded from this study. The preoperative parameters were recorded included age, gender, side of the fracture and medical history. All patients were operated on second day of admission in orthopaedic ward of Pushpagiri Medical College, Thiruvalla.

Surgical procedure

Each patient was given a single dose of antibiotic, cefuroxime 1.5gm IV 1 hour prior to start of operation. None were given methylprednisolone preoperatively as prophylaxis for fat embolism syndrome as steroids are known to produce delayed or nonunion in long bone fractures. The method of anesthesia was regional or general. Patients were transferred to radiolucent fracture table where reduction is accessed intra-operatively by radiologic method using C-arm. The standard operative method recommended by previous studies was used. Operative time– the length of operation from skin incision to skin closure was recorded. The final reduction and fixation of fractures was assessed fluoroscopically.

All fractures were fixed with same type of implant from a single manufacturer in the dynamic locking mode, with 2 screws in the distal fragment and 1 screw in the proximal dynamic hole. Appropriate prophylaxis against infection (Inj. Cefuroxime 1.5 gm IV q 12 hourly) was routinely given to the patients. Plain AP and Lateral radiograph is taken on the first post-operative day and analyzed. Reduction was considered good if there was sufficient cortical contact with less than 2mm gap and without rotational malalignment. The patient's wound were examined on second postoperative day and made to sit up in bed with limbs hanging down. They were made to do quadriceps isometric and isotonic exercises at regular intervals along with in bed mobilization of all joints of lower limbs. They were made to do partial weight bearing ambulation with a thigh lacer corset between 5th and 7th day of surgery. Antibiotics were routinely continued for 10 days. Patients were discharged from hospital on 10th postoperative day after suture removal.

Follow-up

All the patients were follow-up at four weeks, six weeks, eight weeks, twelve weeks, sixteen weeks, twenty weeks, six months and one year post operatively. Plain anteroposterior and lateral radiographs were taken at each visits and assessed for fracture union, patient's ambulatory status and implant failure.

Statistical analysis

All statistical analysis was performed using SPSS version 20 program. Chi square test was applied and p value of <0.05 is statistically significant.

RESULTS

The fractures are more common in the patients of age group between 26-30 years (Figure 1). Out of 35 consecutive cases, 34 patients were males and 1 was female (Table 1).

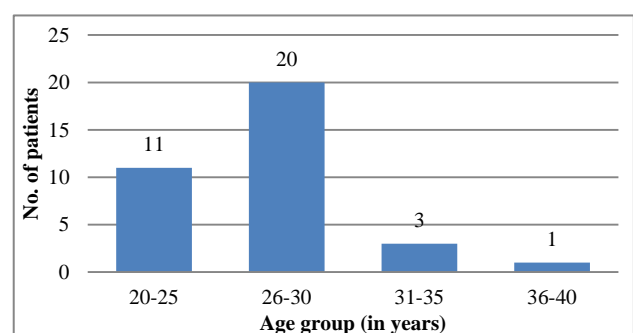


Figure 1: Age distribution of patients.

The mode of injury of the patients was described in Table 2. Road traffic injury was the most common cause of injury in 30 patients. Results of functional outcome were evaluated by Kalus W. Klem and Martin Borner criteria. In 74% cases closed intramedullary nailing and early

guarded weight bearing given excellent healing of fracture, in 14% cases healing was good, in 6% cases it was average and in 6% cases poor healing was observed as shown in Table 3.

Table 1: Sex distribution.

Gender	No. of patients	Percentage (%)
Male	34	97
Female	1	3
Total	35	100

Table 2: Mode of injury of the patients.

Mode of injury	No. of patients	Percentage (%)
Road traffic accident	30	85
Fall from height	3	9
Fall due to slip	2	6
Total	35	100

Table 3: Results of functional outcome.

Criteria	Excellent	Good	Fair	Poor
Non-union/delayed union	None	None	None	Yes
Radiographic alignment	Normal	-	-	-
Angular deformities	None	<5°	5-10°	>10°
Muscle atrophy	None	<2 cm	2-5 cm	>5 cm
Hip movements	Full range	Slight loss	>25%	-
Knee movements	Full range	Slight loss	>25%	-
Study results	26 cases (74%)	5 cases (14%)	2 cases (6%)	2 cases (6%)



Figure 2: Immediate postoperative radiograph.

All patients showed early radiologic evidence of callous formation between 4 and 6 weeks. During the follow-up period 3 patients had superficial infection, which was minimal and well controlled by antibiotics. None required

debridement or implant removal due to deep infection. None of the patients required a secondary procedure for delayed or non-union.



Figure 3: Union of fracture.

DISCUSSION

The treatment strategy for fracture shaft of femur in adult remains intramedullary interlocking nailing. The goals of treatment include attainment of length, alignment, union and early mobilization. Most femur fractures are fixed within 24 to 48 hours. Neglected fractures of the shaft of femur, although a rarity in the developed world is not an uncommon entity in the developing countries, especially in the rural areas. The main reason for this phenomenon is poor socioeconomic status, illiteracy and widespread prevalence of quacks and traditional bone setters.^{8,9} On occasion, fixation will be delayed until other life-threatening injuries or unstable medical conditions are stabilized. To reduce the risk of infection, open fractures are treated with antibiotics as soon as you arrive at the hospital. The open wound, tissues, and bone will be cleaned during surgery. Skeletal traction is a pulley system of weights and counterweights that holds the broken pieces of bone together. It keeps your leg straight and often helps to relieve pain.

Currently, the method most surgeons use for treating femoral shaft fractures is intramedullary nailing.¹⁰ These fractures present a unique challenge to the orthopaedic surgeon as most of these patients have significant morbidity and functional disability. Although closed interlocking intramedullary nailing is now the standard method of treatment of most of the fresh fractures of the shaft of femur, but in the neglected cases this line of treatment is not feasible due to soft tissue interposition, bone overriding and fibrous tissue formation around the fracture site.¹¹⁻¹⁴ During this procedure, a specially designed metal rod is inserted into the canal of the femur. The rod passes across the fracture to keep it in position. An intramedullary nail can be inserted into the canal either at the hip or the knee. Screws are placed above and below the fracture to hold the leg in correct alignment while the bone heals. Intramedullary nails are usually

made of titanium. They come in various lengths and diameters to fit most femur bones.

In our present study, we evaluated the effectiveness of early protected weight bearing in fractures of shaft of femur. This was a observational study conducted on patients of either sex with an average age of 20 to 40 years with the diagnosis of neglected fracture shaft of the femur. All the patients underwent a single stage open interlocking intramedullary nailing. No external bone graft was used, only the callus removed from fracture site was reinserted. The patients were followed up for a period of 1 year with plain anteroposterior and lateral radiographs. There was no implant failure in our case series. This was probably due to partial weight bearing started only after radiological evidence of callus at the fracture site. The high union rate in our study can be attributed to the preservation of fracture hematoma, using closed technique, early surgical intervention, early mobilization and early weight bearing. The present study it is concluded that closed intramedullary nailing is superior to any other modalities of treatment in fracture shaft of the femur in adults and early guarded weight bearing fastens union of fracture by about four weeks. Our results are comparable to the studies of Maruthi et al and Nitin et al.^{15,16}

CONCLUSION

Closed reduction and internal fixation with intramedullary interlocking nail and early guarded weight bearing is an excellent option in treating transverse fractures of midshaft of femur. This method provides anatomical reduction and maintenance of length of femur and early ambulation which promotes fracture healing by a stable internal fixation allowing micromotion at fracture site enhancing callous formation.

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