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Interlocking Nailing in Comminuted Femoral Shaft Fractures: A Prospective Study in a tertiary care hospital

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ABSTRACT

Background: *Fracture shaft of femur is one of the most common fractures encountered in orthopaedic practice. Fracture shaft of femur is major cause of morbidity and mortality in patients who sustain high energy trauma.* ***Methods:*** *This prospective study was performed at Department of Orthopaedics, Varun Arjun Medical College, Banthra, Shahjahanpur, U.P, India. All patients aged 20 years or above, who presented with comminuted femur fracture and were treated with interlocking nailing was included in the study. Various clinical and radiological parameters were collected during the course of treatment.*

Results*: N=30 patients were included in the study; 76% males. 88% aged 50 years or less. Road traffic accident was the most common mode of injury and 54% of patients had fracture in the middle one-third femur. 76% of the patients presented within 24 hours of injury. 52% of the patient's demonstrated clinical union of the fracture in 12 to 14 weeks and majority showed radiological union in 16 to 18 weeks. Partial weight bearing was started in 38% patients in 10 weeks and full weight bearing in 48% patients in 16 weeks. Majority of the patients stayed in hospital for 10 to 14 days and the functional outcome as measured by Klemm and Borner criteria was excellent in 69% patients.* ***Conclusions****: In our experience, interlocking nailing had very low complication rate and excellent functional outcome in two thirds patients of comminuted femur fracture.*

Keywords: *Femur Fracture, Interlocking nailing, Management, Outcome*

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INTRODUCTION

It is a matter of fact that Fracture shaft of femur is one of the most common fractures in orthopaedic Clinics. Injury is most common among persons younger than 25 years and those older than 65 years.[1] With the ever-increasing road traffic accidents, pedestrian versus accidents, sports injuries, fall form height, industrial accidents, comminuted shaft fractures of femur are becoming common. In high velocity injuries one must have a high index of suspicion for complications or other associated injuries where the bone is subjected to sudden and violent force resulting in severe and extensive commination, jeopardizing the vascularity of bone and surrounding tissues.[2] Fractures are most often due to a bending load applied to the femur with comminution occurring via higher magnitude forces. Torsional loads, in contrast, form a spiral fracture pattern.

Fracture shaft of femur is major cause of morbidity and mortality in patients who sustain high energy trauma. Morbidity arises from limb shortening, mal union, non-union and the so called fracture disease. The muscle gets atrophied and fibrosed, the hip and knee joints lose their range of motion and chronic dependent edema develops. Mortality is infrequent, but can result from an open wound, fat emboli, adult respiratory distress syndrome (ARDS) or

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due to result of multiple organ failure especially in multiple injured patients, deep venous thrombosis (DVT), pneumonia development, long intensive care unit (ICU) stays, infection, hemorrhage nerve palsies and compartment syndrome.[3]

Currently, surgery is indicated for most femur fractures because of the high rate of union, low rate of complications, and the advantage of early fracture stabilization, which decreases the morbidity and mortality rates in patients (especially polytrauma patients) with these fractures.[4] Interlocking nailing of communited fractures with proximal and distal locking screws provides rotational stability and the nail functions as load sharing, rather than bearing the load.[5] Axial loading across fractures with stable pattern is encouraged thus promoting callus formation. If done by closed method i.e. without disrupting the fracture hematoma, the fracture, appropriate equipment and special expertise are required to carry out the procedure.

The aim of the study was to evaluate the operative procedure in management of communited fractures of the shaft of femur by inter-locking nailing.

METHODS

This prospective study was conducted at Department of Orthopaedics, Varun Arjun Medical College, Banthra, Shahjahanpur, U.P, India where we included patients who presented to our emergency ward and reffered to Orthopaedic department.

Study design

We included 30 patients, aged 20 years or above, who presented to our emergency ward with Comminuted fracture of shaft of femur on the basis of inclusion and exclusion criteria. Initial management in the form of fluid therapy, antibiotics and analgesics were given. The patient was admitted and was followed throughout the course of surgery and post-operative period.

Data collection and analysis

We collected demographic information like age and gender of the patient and detailed history was taken. History taking included mode of injury, level of fracture type of fracture, time of presentation after the fracture and time of surgery after admission. Additional information for all patients was collected from their operative and post-operative notes. Mode of anesthesia administered, clinical union of fracture, radiological union of fracture, protected or partial weight bearing, full weight bearing, duration of hospital stay, any complications experienced and functional outcome of surgery was obtained as well.

RESULTS

30 patients fulfilled our inclusion and exclusion criteria during the study period, 76% of which were males. Road traffic accident was the most common mode of injury, accounting for 83% patients (see Table 1). Majority of patients had fracture in the middle one-third femur. 76% of the patients presented within 24 hours of injury. Only 1 patient in our study population was taken for surgery within 24 hours of injury. 66% of patients were taken in for surgery within 1 to 3 days. General anesthesia was the most common mode of anesthesia administered to patients. 55% of the patients demonstrated clinical union of the fracture in 12 to 14 weeks. Similarly, majority of the patients showed radiological union of the fracture in 16 to 18 weeks. Partial weight bearing was started in 38% patients in 10 weeks and full weight bearing in 48% patients in 16 weeks. Majority of the patients stayed in hospital for 10 to 14 days and the functional outcome as measured by Klemm and Borner criteria was excellent in 69% patients. Only 4 patients develop complications in our study.

DISCUSSION

Femur being the longest, strongest, and heaviest tubular bone in the human body and its fractures often result from high energy forces such as motor vehicle collisions.[6] Complications due to Femoral shaft fractures can result in major physical impairment due to potential fracture shortening, malalignment, or prolonged immobilization of the extremity with casting or traction.[7]

Table 1: Baseline characteristics of patients included in the study.

Variable	*n* = 30
Gender	
Male	23 (76%)
Female	7 (23%)
Age	
20 – 30 years	9 (30%)
31 – 40 years	12 (40%)
41 – 50 years	6 (20%)
51 – 60 years	3 (10%)
Mode of injury	
Road traffic accident	25 (83%)
Industrial accident	5 (16%)
Level of fracture	
Upper 1/3rd	7 (24%)
Middle 1/3rd	16 (54%)
Lower 1/3rd	7 (24%)
Type of fracture*	
Type I	7 (26%)
Type II	8 (28%)
Type III	10 (30%)
Type IV	5 (16%)
Time of presentation after injury	
0 – 1 day	38 (76%)
Less than 1 week	8 (16%)
More than 1 week	4 (8%)
Time of surgery after admission	
Less than 24 hours	1 (2%)
1 – 3 days	33 (66%)
4 – 7 days	11 (22%)
More than 7 days	5 (10%)
Mode of anesthesia	
General anesthesia	24 (78%)
Spinal anesthesia	6 (22%)

Table 2: Complications among the patients included in the study.

Complication	*n*
Range of movement	0
Infection	2
Limb length discrepancy (<5mm)	1
Delayed union and Nonunion	0
Re-fracture	0
Fat embolism	0
Pulmonary embolism	0
Deep vein thrombosis	1

Essential initial management consists of evaluating the patient for major injuries and treating them as appropriate, placing an intravenous catheter and providing analgesia, and immobilizing the injured extremity. Patients with open fractures receive antibiotics and tetanus prophylaxis. Little clinical evidence exists to support the use of traction in the preoperative management of midshaft femur fractures. Nevertheless, many orthopedic surgeons advocate immobilizing well aligned fractures, with or without neurovascular injury, in a skin traction device.[8] Those who support the use of traction claim that it reduces patient discomfort, improves fracture alignment, and may resolve problems with arterial flow. A systematic review of studies of traction for proximal femur (i.e. hip) fractures found no clear benefit; comparable studies have yet to be performed in midshaft femur fractures. The use of traction for open femur fractures is controversial. Concern exists that the use of traction in such cases may allow contaminated bone fragments to retract into the wound. In general, stabilization of the fracture site to prevent further hemorrhage, neurovascular damage, or soft tissue injury takes precedence over the theoretical risk of increased contamination. However, decisions about splinting and traction are best made in consultation with the orthopaedic or trauma surgeon who will assume care of the patient. Decisions about definitive treatment for femur fractures must take into consideration the patient's age, concomitant injuries, and underlying comorbidities, as well as resource availability and clinician experience. Among the few patients not treated surgically are those who are too unstable to tolerate the procedure and children, in some cases. Standard treatment of a femoral shaft fracture is an antegrade reamed intramedullary nail.[9] Antegrade intramedullary nailing is associated with a 98 to 99 percent union rate and low risk of infection (1 to 2%), even when used in open fractures. Although reamednailing is accepted as the standard of care, undreamed intramedullary nailing is also associated with low rates of non-union (approximately 1.9%) and infection.[10]

Kuntscher nailing which is a successful procedure for simple transverse fracture of the shaft of femur is not ideal for communited fracture. Kuntscher nail doesn't offer rotational stability and adequate tight fit is not obtained due to the communition of fragments. Hence implant failure, nonunion, retrograde migration of nail are all known complications. Plate osteosynthesis for communited fractures is a bigger procedure, which needs a wide exposure and complications like infection, fibrosis of muscle and devitalization of the communited fragments are common. Prolonged non-weight bearing is a mandatory requirement when femoral shaft fracture is fixed with a plate.

Overall, complication rates for femur fracture are low. The most common complications include infection, abnormal fracture healing, and pain. Less common complications include hemorrhage, neurovascular injury, compartment syndrome, repeat fracture, and hardware failure. Rare but life-threatening complications occur more often in multiple trauma patients and include death, multiorgan failure, and respiratory complications, usually due to acute respiratory distress syndrome and pulmonary or fat embolism.

CONCLUSION

Midshaft femur fractures commonly occur in young adults as a result of high energy trauma and in older patients due to lower energy falls. In this research article, we presented the characteristics of patients who presented with femur fracture, their clinical course throughout their treatment done and the complications. Interlocking nailing had excellent functional outcomes in our patients.

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