MANAGEMENT OF DIAPHYSEAL FEMUR FRACTURES IN ADULTS WITH INTRAMEDULLARY INTERLOCKING NAIL

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ABSTRACT

Background: Fracture of femur in adult patients presents special problems. Orthopaedic surgeons often encounter diaphyseal femur fractures, because these fractures most often result from high – energy trauma, one must have high index of suspicion for complications. Currently reamed interlocking nailing is indicated for most femur fractures because of high rate of union, low rate of complications and advantage of early stabilisation which decreases the morbidity and mortality rate in patients. The objective was to determine the functional outcome of intra-medullary interlocking nailing in diaphyseal fracture of femur in adults in terms of early rehabilitation and fracture healing.

Patients and Methods: This prospective study was carried out from 1.9.2008 to 31.3.2010 in the Department of Orthopaedics, Social Security Teaching Hospital, Lahore. Twenty five patients aged between 20 – 50 years having fracture diaphysis of femur were included. Patients less than 18 years of age, open grade III fractures and pathological fractures were excluded from the study. Routine preoperative investigations were done. Radiological assessment included AP and lateral radiograph of thigh with hip and knee and chest PA/AP view.

Results: There were 21 males and 4 females with male to female ratio 5.25:1. The age ranges from 20 – 50 years with mean age of 31.2 years. Majority of the fractures were spiral fractures seen in 9 cases. Comminuted fracture seen in 8 cases, oblique fracture seen in 5 cases and transverse fractures were seen in 3 cases. The results obtained were excellent in 13 patients, good in 9 patients, fair in 2 patients and poor in 1 patient. Mean time of fracture healing was observed 14.3 ± 1.3 with range of 12 – 16 weeks.

Conclusion: The most preferred treatment in the management of fracture diaphysis of femur is intra-medullary interlocking nail especially in skeletally mature patients as regards early rehabilitation and fracture healing.

Key words: Rehabilitation, knee range of motion, weight bearing ambulation, fracture healing, radiological fracture healing.

INTRODUCTION

Fractures of femoral shaft are among the most common fractures that orthopaedic surgeons encounter, because these fractures most often result from high energy trauma, they are often associated with concomitant injury of internal organs. Fracture femur results from the drawbacks of fast life and violence and are major source of mortality and morbidity in patients with such injury.[1,2] Comminuted and segmental fractures of femoral diaphysis are often difficult to treat. When intermediate fragment is split or there is comminution of either level of segmental fracture, the interlocking nail is the only best available implant, since the conventional IM nailing does not provide adequate fixation.[3,4]

Intramedullary nail being close to center of femur can tolerate bending and torsional loads better than plates and the locking mechanism provides less tensile and shear than plates. IM interlocking nail is a load sharing device and are less loaded than plates causing less cortical osteopenia of stress shielding which is a feature of the load bearing plates.[5,6] Closed nailing causes no damage to extraperiosteal soft tissues and the biological environment around the fracture is least disturbed. Another important feature of the closed intramedullary interlocking nail is the chance for early ambulation of the patient which reduces the complications of prolonged bed confinement.[7,8]

The purpose of this study was to analyse the effectiveness of interlocking nail in the management of diaphyseal fracture of femur so as to return the patient to functional pre-fracture state as soon as possible.

PATIENTS AND METHODS

This prospective study was carried out from 1.9.2008 to 31st March 2010, in the Department of

Orthopaedics, Social Security Teaching Hospital, Multan Road, Lahore. Twenty five patients of diaphyseal femur fractures were admitted and treated with AO femoral interlocking nail. On admission, all patients were clinically assessed for general condition and skeletal and soft tissue injuries. Patients with fracture of femur between inferior margin of lesser trochanter and upper border of a square containing the distal end of the femur, closed and grade I open fracture were included. Patients less than 18 years of age, any pathological fractures and open grade III fractures were excluded from the study. Routine preoperative investigations were done. Radiological assessment included AP and lateral radiograph of thigh with hip and knee and chest PA/AP view. Radiographs of femur with knee in AP and lateral view and hip in AP view taken are used to access comminution. The diameter of nail is selected by measuring the width of medullary canal at level of isthmus. Interlocking nails used are AO femoral nails. These nails are universal in type i.e. left and right side nails are the same. Length of nail was selected by measuring the normal femur from tip of greater trochanter to knee joint line. They are made up of 316L stainless steel.

RESULTS

The study included 25 cases of diaphyseal fractures of femur treated surgically by intramedullary interlocking nailing. There were 21 (84%) males and 4 (16%) females with male to female ratio of 5.25:1. The age ranges 20 – 50 years with mean age of 31.2 years. Maximum incidence of fracture was between 20 – 30 year age group. Most of the patients were manual labourers and earning member of the family (Table 1). Majority of the fractures were spiral seen in 9 (36%) cases. Comminuted fracture seen in 8 (32%) cases, oblique fracture seen in 5 (20%) cases and transverse fractures were seen in 3 (12%) cases (Table 2). The results obtained were excellent in 13 (52%) patients, good in 9 (36%) patients, fair in 2 (8%) patients and poor in 1 (4%) patient (Table 3). Mean time of fracture healing was observed 14.3 ± 1.3 with range of 12 – 16 weeks.

Table 1: *Age and sex distribution of patients (n = 25).*

Age	*Males*		*Females*	
	No.	*%*	*No.*	*%*
20 – 30	11	44.0	3	12.0
31 – 40	7	28.0	1	4.0
41 – 50	3	12.0	-	-
Total	21	84.0	4	16.0

Table 2: *Type of fractures (n = 25).*

Type	*No.*	*%*
Oblique fracture	5	20.0
Spiral fracture	9	36.0
Comminuted fracture	8	32.0
Transverse	3	12.0

Table 3: *Final outcome of cases (n = 25).*

Result	*No.*	*%*
Excellent	13	52.0
Good	9	36.0
Fair	2	8.0
Poor	1	4.0

DISCUSSION

The treatment of fracture diaphysis of femur has evolved from the old conservative management to the most recent methods of interlocking nails. Interlocking nails have greatly expanded the indications for closed IM nailing of femoral fractures. At the beginning of intra-medullary nail era, this type of fixation gained wide popularity in the fixation of transverse fractures of the middle third of the femur due to no disturbances of periosteal blood supply, fracture haematoma, and rapid healing of fracture with lesser risk of complications like infection, nonunion, and shortening. Early mobilisation post-operatively has been shown to have a significant advantage in terms of both joint mobility and economic impact which is very well attained by the use of interlocking nails. Majority of our patients were in the age group 20 – 30 years which is the prime earning group in this study.

The intramedullary nail, with its location close to center of femur, can tolerate bending and torsional loads better than plates and the locking mechanism provides less tensile and shear stress than plates. The intra-medullary interlocking nail is a load – sharing device. It is less loaded than plates causing less cortical osteopenia of stress shielding, which is a feature of the load – bearing plates. Closed nailing technique is preferred because no damage to extraperiosteal soft tissue occurs and the biological environment around the fracture is minimally disturbed. Another important feature of the closed intramedullary interlocking nail is the chance of early ambulation of the patient which reduces the complications of prolonged bed confinement.[8,9]

Johnson and Greenberg[3] and Winquist and Hansen[10] reported the mean patients' age 27.4 years

and male to female ratio was 4.5:1. However in the present study, mean patients' age was 31.2 years and male to female ratio was 5.25:1. The results of the present study match with the international literature. In our opinion, administration of antibiotic for a period of 10 days (5 days intravenous followed by 5 days orally) drastically reduces the incidence of deep – seated infections.

The functional outcomes of the earlier studies were excellent with good result[11] (96.1%),[12] (90%),[13] (92%),[14] (91%),[15] (97%)[16] (94%). The functional outcome in the present study was around 88% i.e excellent and good results.

One of the most common complication following fracture diaphysis femur has been shortening at the fracture site. Interlocking IM nail has virtually eliminated this complication or at least got down its incidence immensely. In our series shortening of < 1 cm was seen in two patients and between 1 – 2 cm in 2 patients. The incidence of shortening was 3.1% as reported by Veith et al[17] and Umer et al.[18]

Majority of the patients of the present series returned to their pre-fracture functional state and returned to work by the end of 3 months. We had one instance of distal screw missing the hole in our series and one case of backing up of distal locking bolt. There was no incidence of any neuropraxia in our study. Various others workers also reported similar occurrence in their study.[19,20,13]

The incidence of femoral fracture due to road traffic accident is on the increase. With our study, we recommend and re-establish the fact that closed intra-medullary interlocking nailing is the current treatment of choice for closed diaphyseal fractures of femur in adults, especially those with significant comminution, long spiral fractures, and segmental fractures. Intramedullary nails have added advantages over plating in these cases, like restoration of anatomical length and alignment of comminuted fractures, biological fixation resulting in high union rates, strength for femoral shaft fracture in all three planes of loading – bending, compression, and torsion, early joint mobilisation, early muscle rehabilitation, shortened hospital stay, reduces the incidence of complications like infection, cortical osteopenia, mal-union, and non-union. Most importantly early return to work and pre-fracture state. Moreover, the anatomy of femur and the loading conditions by gravitational, muscular, and ligamentous forces are in favour for intramedullary nail fixation. There is no significant change in union rate when compared with age, gender level, and pattern of fracture.

CONCLUSION

In *conclusion* intramedullary interlocking nail offers the patients the added advantage of early joint mobilisation, early muscle rehabilitation shorter hospitalisation and most important early return to work after radiological union of fracture.

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