

A CLINICAL STUDY OF SURGICAL MANAGEMENT OF FRACTURE SHAFT FEMUR IN ADULTS WITH INTRAMEDULLARY INTERLOCKING NAIL

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ABSTRACT

BACKGROUND

Orthopaedic surgeons often encounter diaphyseal femur fractures, because these fracture most often result from high-energy trauma, one must have high index of suspicion for complications. Currently surgery is indicated for most femur fractures because of high rate of union, low rate of complications and advantage of early stabilization which decreases the morbidity and mortality rate in patients. The main stay of the treatment has been reamed interlocking intramedullary nailing, one of the frequently performed procedure for diaphyseal fracture of femur.

MATERIALS AND METHODS

We studied a total of 40 patients of fracture shaft of femur admitted in the Orthopaedic Department of Government General Hospital, Kurnool, treated with reamed femur intramedullary interlocking nailing. The common age group was ranging from 20 to 71 yrs. with average age group of 36 yrs. 32 patients were males, 8 were females. 26 patients had closed fracture, 10 had Gustillo Anderson Grade I compound and 4 had Grade II compound fracture. In 22 patients fracture was at M/3rd, in 10 patients it was at L/3rd level and in 8 patients it was at U/3rd level. 4 patients were operated by open interlocking nail and other 36 by closed technique using C-arm.

RESULTS

Injury surgery interval was 6.20 days on an average. Mean time for union was more in patients treated by open procedure (20 weeks) as compared to closed technique (18.35 weeks). We found 2 patients developed superficial infection, which healed completely and 2 had deep infection with nonunion. In our series of 40 patients, 24 patients had excellent results, 12 patients had good results, 2 fair results and 2 poor results, and functional evaluation was done using Thoresen et al classification system.

CONCLUSION

Interlocking intramedullary nailing is a very effective and successful method of definitive treatment in most types of fractures of the shaft of the femur. It is effective in controlling rotational and longitudinal forces that act across the fracture site. Interlocking nail provides strong fixation, rotational stability and earliest return to functional status, as the rate of healing is good with this method. It allows early weight bearing and reduced rehabilitation.

KEYWORDS

Femoral Shaft Fractures; Reamed Femoral Intramedullary Interlocking Nailing.

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BACKGROUND

Fractures of the shaft of the femur are commonly encountered in routine orthopaedic practice. As femur is the longest weight bearing bone in the body with plenty of surrounding soft tissue envelope, they are usually fractured due to high energy trauma and fracture may result in

prolonged morbidity and extensive disability unless treatment is appropriate. Femoral fractures are challenging problems to treat, as there is usually comminution at the fracture site and associated soft tissue injuries. In addition, there can be difficulty in assessing malrotation at the fracture site. They can be life threatening, because of open wounds, haemorrhagic shock, fat embolism, ARDS or multiple organ failure. Further there may be physical impairment due to fracture shortening, malalignment, and prolonged immobilization, due to traction or casting. This may lead to increased morbidity.

So the aim of fracture treatment is to obtain union of the fracture, in as near anatomical position, with minimal impairment of function. The spectrum of injury is so great

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that no single method of treatment is relevant to all diaphyseal fracture femur.

The type and location of fracture, degree of comminution, age of the patient and patient's social and economic demands and other factors influence the method of treatment. The technique chosen should cause minimal soft tissue and bone damage. The goal should be to achieve anatomic alignment and early mobilization with functional rehabilitation of limb.

Many modalities of treatment have evolved over the years for this fracture. The method studied in this dissertation is technique of fracture fixation using Intramedullary Interlocking Nail.

This is a report of 40 cases of unstable fractures of the femur, treated at the Orthopaedic Department of Government General Hospital, Kurnool with closed reamed intramedullary interlocking nail between. This includes a prospective study of 40 cases.

These cases of unstable fracture shaft femur were treated by femur interlocking nail, which is locally available and is based on AO design nail¹ with proximal locking jig and two proximal and distal holes and one oblique proximal locking hole.

Data is collected from the patients attending the orthopedic department with fracture shaft of femur and satisfying the inclusion criteria.

Inclusion Criteria-Fracture involving the diaphysis of femur.

Grade I, II Gustillo Anderson compound fracture Segmental fracture, Comminuted fracture.

Exclusion Criteria- Grade-III Gustillo Anderson compound fracture.

We studied a total of 40 patients of fracture shaft of femur admitted in the Orthopaedic Department of Government General Hospital, Kurnool, treated with reamed femur intramedullary interlocking nailing. The common age group was ranging from 20 to 71 yrs. with average age group of 36 yrs. 32 patients were males, 8 were females. 26 patients had closed fracture, 10 had Gustillo Anderson Grade I compound and 4 had Grade II compound fracture. In 22 patients fracture was at M/3rd, in 10 patients it was at L/3rd level and in 8 patients it was at U/3rd level. 4 patients were operated by open interlocking nail and other 36 by closed technique using C-arm.

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	Results			
	Excellent	Good	Fair	Poor
Malalignment of femur (degrees)				
Vaurs or valgus	5°	5°	10°	> 10°
Antecurvatum or recurvatum	5°	10°	15°	> 15°
Internal rotation	5°	10°	15°	> 15°
External rotation	10°	15°	20°	> 20°
Shortening of femur(cm)	1 cm	2 cm	3 cm	>3 cm
Range of motion of knee (degrees)				
Flexion	> 120°	120°	90°	< 90°
Extension deficit	5°	10°	15°	> 15°
Pain or swelling	None	Sporadic, Minor	Significant	Severe

Table 1. Classification System for the Results of Treatment (Thoresen et al)

Type	Number of Patients	Avg. Healing Time Wks.
CRIF	34	18.35 wks.
ORIF	4	20 wks.

Table 2. Healing Time in ORIF and CRIF

Series	Excellent	Good	Fair	Poor
Alho et al	63.40	19.50	15.40	1.60
Thoresen et al	63.80	17.00	14.90	4.25
Our series	60	30	5	5

Table 4. Comparison of Results

Late Complication	Number of Patients	Percentage
Superficial infections	2	5%
Deep infections	2	5%
Delayed union	4	10%
Non union	2	5%

Table 3. Complications

DISCUSSION

The treatment of fractures of the shaft femur has been revolutionized by advent of Kuntscher's nail.³ in 1940. The scope of femoral shaft nailing has been broadened with reaming and interlocking of intramedullary nails. Since then unacceptable rates of malunion and non-union shown by

various methods of conservative treatment has fallen dramatically.

Age Distribution- We found that fracture of femur was most common in 2nd, 3rd and 4th decade of life (80%) with mean age of 36 yrs. ranging from 20 to 71 yrs.

Sex Distribution- Males were predominantly prone to fracture shaft of femur due to high incidence found in motor vehicular accidents. 80% (32 patients) of our patients were males.

Fracture Pattern- Our study had comminuted (50%) as a commonest fracture pattern where as 20% were of Transverse and 15% were fracture with Butterfly fragment were noted

Open and Closed Fractures- Our study included 14 compound fractures, (35%) out of which 10 were Gustillo Anderson Grade I (25%) and 4 were Grade II(Grade I fractures were treated with interlocking nail after wound healing.

Grade II fractures were treated with debridement and antegrade open interlocking nail in same setting. Total 2 patients were treated with open technique. Debridement and open interlocking was done within 24 hrs, at our institution. The bone united with exuberant callus formation at 21wks.

A biological technique of minimal open reduction was used. There was minimal handling and devitalisation of soft tissue and muscle attachments of the fragments were meticulously preserved.⁴

Closed and Open Nailing- Closed nailing is definitely superior to open nailing.

We had both cases of Gustillo Anderson compound Gr II injuries operated after 48 hrs of injury with open nailing. There was no evidence of infection in our study.

Reaming- Intramedullary nailing of femoral shaft fracture without reaming results in a significantly higher rate of nonunion compared with intramedullary nailing with reaming

All our cases were reamed irrespective of open or closed fractures. There were 4 cases of infection. In one patient, hematoma with fluctuation, was observed on 2nd postoperative day. Hematoma could be due to excessive reaming. To avoid chances of infection, some hematoma was aspirated.⁵ The fracture united at 16 wks.

Healing Time- 95% of patients in our series achieved union (38 patients). The average time for healing of the fracture in our series was 18.53 wks. Different time period for union was shown when fracture was treated with open and closed nailing procedure. We found slower union in open nailing (20 wks.) as compared with closed nailing (18.35 wks.).

Commencement of non – weight bearing (NWB)-

In our series non-weight bearing crutch walking was begun early in 36 cases (90%) between 1st -3rd postoperative day, except in 4 patients (10)

Partial weight bearing (PWB)- In our series partial weight bearing with walker was started between 3-10 days in 36 cases (90%). One patient had ipsilateral lateral malleolus fracture. He was allowed to bear partial weight after 24 days and the other patient had humerus fracture who started partial weight bearing after 21 days.

Average time for partial weight bearing in our study was 6.45 days.

Full Weight Bearing- In our series 4 patients started full weight bearing at 10th week. 18 patients were able to bear full weight at 12th week. 8 patients at 14th week and 4 at 16th week. Average time of full weight bearing was 12.4 weeks. 2 patients who developed deep infection (osteomyelitis) at 12 wks and later non union, was unable to bear full weight.

Dynamisation- In our series, (table 14) we performed dynamisation of 4 cases, at average 13.7 wks. after primary procedure. In both cases union occurred at 9 wks on an average after dynamisation and one case with final 1cm shortening. Interval between injury and surgery in our series was between 3 to 10 days. Average 6.20 days (Table-15). The compound fractures (Grade II) were thoroughly debrided and open interlocking was done in the same setting. Head injury patients were operated after fitness was given by Neurosurgeons.

Operative Time- The operative time ranged from 2-3 hrs (Avg.170.5 min). In our earlier patients maximum time was required for distal locking. However, with increasing familiarity with technique and implant distal locking was done earlier later on.

Intraoperative Complications- Intraoperative fracture was there in one of our cases, as reduction was not held properly during nail insertion.

Rotational Deformity- In one patient there was internal rotation deformity of 10° observed on immediate postoperative period. It was corrected after 5 days. Rotational control of unstable fractures can be very well achieved with locked intramedullary fixation

Knee Range of Movement- We had excellent knee range of movement in our cases. Early resumption of range of movement exercises were started after surgery as per patient tolerance. Seven patients had restricted range of movement of knee. Five patients had 120° range of movement. One had compound Gustillo Anderson Gr II fracture shaft femur which was united with exuberant callus formation. This could be the cause of restricted range of motion (90°) due to Quadriceps adhesions. One

had nonunion, with range of movement less than 90°. Average knee range of movement in our study was 120 degrees which is similar to those in other series.

Shortening- In all, there was shortening in 4 patients (10%). 1cm shortening was noted in 2 patients (5%) and 2 patients had 2cm shortening (5%). For a patient with 2 cm shortening, shoe raise was given and now patient is managing well, without any difficulty in daily activities. Interlocking nail has decreased incidence of the problem of shortening at the fracture site, which was seen when conventional nailing was used for unstable comminuted fractures. Johnson⁶ reported shortening of 1-2 cm in 13% of cases. Lhowe.⁷ reported 7% cases with 1-2 cm shortening

Infection- In our series, in 2 patients there was deep infection. He presented after 3 months of surgery with chronic osteomyelitis of femur. So implant removal was done before fracture union and debridement was done. Cultures taken from the infection site came positive for staphylococcus aureus. Daily dressing was started with thigh supported in a brace. Two patients developed superficial infection. Wound was debrided and antibiotics were given. Wound healed completely.

Nonunion- In this series there was two cases of infected nonunion, (5%) operated with closed technique. Nail was removed before union with debridement.

Delayed Union- In this series delayed union was seen in 4 patients. Two cases dynamised at 14th week. It was united well by 22 weeks. In other 2 patients dynamisation was done at 14th week and complete union was seen at 24th weeks

Summary and Conclusion- Interlocking intramedullary nailing is a very effective and successful method of definitive primary treatment, in most types of fractures of the shaft of the femur. Interlocking nail is effective in controlling rotational and longitudinal forces that act across the fracture site. Interlocking nail provides strong fixation, rotational stability and earliest return to functional status,

as the rate of healing is good with this method. It allows early weight bearing and reduced rehabilitation. It allows resumption of knee range of movement exercises at early stage; so it is possible to give good knee range of movement at the end. This is helpful especially in polytrauma patients, for early mobility and to reduce morbidity and mortality. Reaming and interlocking expands the scope of nailing, to include all segments of femoral shaft. Closed nailing is preferred over open nailing, due to its faster rate of healing. During nail insertion, the reduction should be held properly, to avoid distal cortical break. Rotational alignment should be confirmed, before fixing the interlocking bolts to avoid malrotation.

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