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TREATMENT OF FEMORAL SHAFT FRACTURES WITH INTERLOCKING NAILING: A PROSPECTIVE STUDY

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Abstract:

Context; Fracture shaft femur usually results from a high velocity injury in young adults. Though interlocking nailing is the regular treatment for this fracture, there are many variations to the procedure according to the type of fracture. We did a prospective study of 35 patients with shaft femur fractures with a special emphasis on comminuted fractures and the associated complications.

Materials and methods: 35 adult patients who sustained shaft femur fractures and treated with interlocking nailing were included in this study. We excluded compound fractures, pathological fractures and non unions. Patients were followed up for a period of six months. Radiological union and functional status were assessed.

Results: We achieved 100% union with no malalignment. Shortening was present in two patients and knee stiffness in four patients.

Conclusion: With a few precautions in comminuted fractures, excellent results can be obtained in both simple and comminuted fractures of shaft femur with interlocking nailing.

Key words: *Shaft femur fracture, interlocking nail, comminuted fractures.*

Introduction

Fracture shaft of femur causes considerable morbidity to the patients. It shows bimodal distribution with high energy injury due to road traffic accidents in young individuals and low energy injury due to falls in elderly.[1] The fracture can be transverse, short oblique, spiral or comminuted. The standard treatment for this fracture is fixation with intramedullary interlocking nail. Since these are load sharing implants, patients can bear weight immediately after surgery. We evaluated functional status and radiological union in 35 patients with fracture shaft of femur treated with intramedullary nail.

Materials and methods

A prospective study of 35 patients with fracture shaft of femur admitted into Dr. Pinnamaneni Siddhartha Institute of Medical Sciences during the year 2013 was done. Patients with pathological and compound fractures were excluded. Skeletally immature patients and polytrauma victims were also excluded.

The patients' age varied from 20-65 years with an average of 35 years. Seven patients were female and 28 patients were male. Four patients sustained injuries due to fall at residence and the rest due to road traffic accidents. Six patients had associated clavicle, tibia, both bone forearm and patella fractures. Right femur was involved in 20 patients and left femur in 15 patients.

The pattern of 35 fractures was shown in table 1.

Transverse	16
Oblique	5
Spiral	3
Comminuted	11

Table 1: Fracture pattern in our study

Eleven comminuted fractures were classified according to Winquist and Hansen classification, as shown in table 2.

Winquist and Hansen grade I	1
Winquist and Hansen grade II	2
Winquist and Hansen grade III	5
Winquist and Hansen grade IV	3

Table 2: Distribution of comminuted fractures

All patients were operated with intramedullary nailing within one week from the date of injury. Patients were followed up for six months.

Technique

Patient was placed in supine position on fracture table. A five centimeter incision was given proximal to greater trochanter. Under C-arm guidance, entry point was made in pyriform fossa with a bone awl. A ball tipped guide wire was inserted up to fracture site and fracture was reduced. Closed reduction was not possible in five cases, and hence open reduction was done. Guide wire was passed to the level of femoral condyles. The path was reamed in non comminuted fractures, ball tipped guide was exchanged with a smooth wire and an appropriate nail was passed. Unreamed nailing was done in grade III and grade IV comminuted fractures. All fractures were statically locked. Circlage wiring was done in one case.

Post-operative rehabilitation

There was no sciatic or pudendal nerve neuropathy. Knee range of motion was started on first post-operative day. Partial weight bearing was allowed as soon as patient tolerated. Weight bearing was delayed up to 12th week in comminuted fractures.

Results

Radiological union was assessed at six weeks, 12 weeks, 18 weeks and 24 weeks. Union was achieved in 12-24 weeks in all cases, the average being 17 weeks. Adequate callus was not seen at fracture site in two cases of oblique fractures. Dynamisation was done at 12 weeks in both the cases, after which they united. Time required for union is shown the table 3:

No. of weeks required for union	No. of patients
16	27 (77%)
20	5 (14%)
24	3 (9%)

Table 3: Time required for union

Less than 5^{o} of varus malunion was seen in two cases and less than 10^{o} of external rotation was seen in one patient.

Functional status of the patients was assessed at the end of 24 weeks. All of them were walking comfortably, without pain. Limping was seen in two cases due to shortening of 2-3 cm. Both were grade IV comminuted fractures. Shoe rise was given for both patients. Varus and rotational malunions were inconsequential to the patients as they were less than 10^{o}.

Hip range of motion was complete in all cases. Knee flexion was shown in table42.

Flexion of knee	No. of patients
130^{o}	24 (69%)
110^{o} -130^{o}	7 (20%)
90^{o} -110^{o}	4 (11%)

Table 4: Knee flexion at six months follow-up

There were no cases of implant breakage. One patient had superficial infection and it subsided with antibiotics.

The complications were grouped in the table 5:

Complications	No. of patients
Shortening <3 cm	2
Knee flexion <110°	4
Malrotation >10°	0
Deep infection	0
Implant breakage	0

Table 5: Complications noted at six months follow-up

The outcome was graded as shown in table 6:

	Fracture union	Knee flexion	Coronal or rotational deformity	Shortening
Excellent	Four months	130°	<5	0
Good	six months	110° -130°	5° -15°	<2 cm
Fair	nine months	90° -110°	15° -30°	2-4 cm
Poor	Non-union	<90°	>30°	>4 cm

Table 6: Grading of results after interlocking nailing

If any patient developed deep infection which needed secondary procedure, it was graded as poor.

According to this, patients in our study were graded as shown in table 7:

Grade	No. of patients
Excellent	24 (69%)
Good	7 (20%)
Fair	4 (11%)

Table 7: Grading of patients in our study

Fig 1. Oblique fracture of the shaft

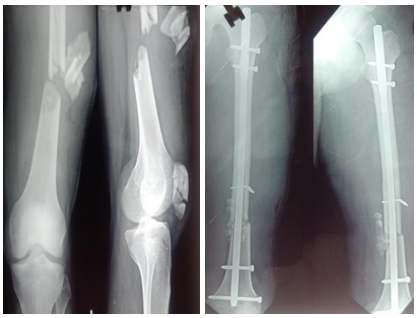

Fig 2: Winquist and Hansen grade IV fracture with associated patella fracture

Fig 3: Follow-up x-ray showing union of the fracture

Discussion

Shaft femur fractures occur commonly in young individuals. Since femur is surrounded by strong musculature in all compartments, the implant should be able to withstand the deforming muscular forces until the fragments unite.

The use of unlocked Kuntshner nail is largely abandoned as it cannot control rotational malalignment. Rotational stability is effectively achieved with interlocking nail. The static locking also provides much needed axial stability in comminuted fractures. Hence, fixation with intramedullary interlocking nails has become standard treatment for shaft femur fractures from 5cm distal to lesser trochanter to 10 cm proximal to the distal articular surface of femur.

Out of 35 shaft femur fractures we studied, 24 (68%) were simple and 11 (32%) were comminuted fractures. All fractures in our series united within 24 weeks. Dynamisation was needed in only 5% of cases. Shortening of 2-3 cm was seen in two grade IV comminuted fractures. We could not accurately estimate the original length of comminuted femur during nail insertion; hence this shortening was present since the time of surgery. More importantly, there was no shortening of femur post surgery. There was no gross malunion even in comminuted fractures as they were statically locked. Loss of knee flexion up to 30° was seen in patients with two associated patella fractures and in two distal third femoral shaft fractures. Flexion of the knee in rest of the patients was more than 110°. All patients with simple fractures started partial weight immediately after surgery without any complications.

78 patients with shaft femur fracture were treated with closed interlocking femur by Sahu et al[2]. Most of the fractures united within

16weeks. They had to dynamise 12% of cases to promote union. Their non union rate was 5%.

Similarly Md. Shafi et al[3] also dynamised 20% of their 50 patients at six weeks. They noted that over distraction at fracture site during surgery was the cause for doing this secondary procedure. Non union in the series was 2%.

In a study with 73% of complex fractures out of 30 by Bashir et al[4], shortening of more than 2 cm was noted in 6% of cases, which was similar to our study.

Md. Gharehdaghi et al[5] operated on 136 patients, of whom 20% were open fractures. Their series also contains many comminuted fractures, though exact number was not given. They liberally used open reduction in 40% of fractures. They achieved relatively good results with 96% union rate. They had non union in 4%, external rotation in 4%, shortening in 3% and angulation in 2% of cases. All cases of malunion and shortening were seen in fractures reduced by closed method.

Shaft femur fracture treated with intramedullary nailing in elderly people was studied by Decoster et al[6] and they found that it was equally effective in these population. The union rate was 100%, without any loss of alignment. They suggested the usage of larger diameter nails in this age group.

Ajit swamy et al[7] achieved fracture union in all 47 patients they treated with this fixation with no gross shortening or malrotation or knee stiffness.

In a case series of 89 patients with 81% of comminuted and 26% of compound fractures, Umer et al[8] achieved a union rate of 96% with 2% of deep infection, 4% of rotational deformity of more than 10°, 4% of limb length discrepancy of more than 2 cm and 4% of knee stiffness. This shows that nailing is the preferred procedure for compound comminuted fractures also. They had one case of 15° valgus when distal fragment was very small. They recommended open reduction in such cases. Based on their cases of non union, they suggested dynamisation of fractures when there are no signs of bridging callus by three months.

C.H.Chin et al[9] studied IM nailing in a series of 23 femora, out of which 21 were comminuted. They encountered considerable rotational malalignment in 13% and coronal angulation in another 13% of cases. Union was 100% in their series.

Wolinsky et al[10] studied fixation with IM nail in 551fractured femora. They reported union rate of 99%, with negligible 1% rate of infection and 2.5% rate of broken implants. There were no gross malalignments.

Yogesh Sharma et al[11] measured rotational malalignment in femoral shaft fractures, treated with closed intramedullary nailing with post-operative CT scans. They noted rotational malalignment of more than 15° in 33% of patients.

Conclusions

Average time required for union in shaft femur fractures treated with IM nailing is 16 weeks. Non union occurs in 0-5% of cases.

Over distraction of fracture site should be avoided during surgery.

The risk of malalignment, malrotation and shortening is high in comminuted fractures. If necessary, open reduction with circlage wiring should be done.

Malalignment is also common in distal one third fractures as the medullary canal is wide.

Rotational and coronal alignment should be checked in all cases before locking the nail.

Static locking is preferable in all cases as some fracture lines may not be visualized on pre-operative X-rays.

Dynamisation should be delayed up to 12 weeks in comminuted fractures to prevent shortening.

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