



Outcome of Patients with Distal Femoral Fractures Treated by Retrograde Intramedullary Nailing

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Abstract

Introduction: Fracture of the distal end of femur may result following direct impact as seen in cases of assault, road traffic accidents and after fall from height. Due to strong muscles surrounding femur these fractures are usually displaced. Retrograde intramedullary nailing has been considered a good surgical option with minimal complications and better outcome in patients with distal femur fracture. The purpose of the present study was to find out the outcome of distal femoral fractures treated with retrograde nailing.

Aims and Objectives: To study the outcome of distal femoral fracture cases treated by retrograde intramedullary nailing.

Materials and Methods: This study was conducted in the department of orthopedics of a tertiary care medical college situated in an urban area. All patients admitted with distal femoral fractures and treated with retrograde nailing were included in this study depending upon a predefined inclusion and exclusion criteria. Detailed history was taken in all patients also clinical examination and relevant imaging was done. All patients were treated by retrograde nailing. Patients were followed up at least for 1 year. The outcome was assessed using Tegner Lysholm Scoring Scale.

Results: Out of 25 cases with distal femoral fractures there were 18 (72%) males and 7 (28%) females with a M:F ratio of 1:0.38. The most common cause of fracture was found to be road traffic accidents (68%). Individuals with high BMI were found to be prone for fractures. The difference of fracture risk between individuals with normal and high BMI was found to be statistically significant ($P < 0.005$). At the end of 1 year follow up 84% patients had excellent outcome while Good and fair outcome was seen in 8%, 4% respectively. Only 1 patient had poor outcome and had a Tegner Lysholmscore of less than 65.

Conclusion: Retrograde intramedullary nailing was found to be very effective method of treatment with excellent outcome in patients with distal femoral fractures. The studied cases were found to have satisfactory functional outcome during 1 year follow up period.

Keywords: Distal Femoral Fractures, Retrograde nailing, Functional Outcome, Tegner Lysholm Scoring Scale.

Introduction

Femur is one of the strongest bone of the body with a good blood supply. Moreover, it is surrounded by strong muscles making it less prone for fractures as compared to other bones of the body. Unfortunately, the same mechanism which protects it against fractures (strong surrounding muscles) is responsible for displacement of fractured fragments should the fracture occur^[1]. Femoral fractures occur after a significant force is applied from a direct impact, such as seen in road traffic accidents, or an indirect force transmitted at the knee. In older individuals with osteoporosis considerably less severe trauma may result in femoral fractures. Patients of femoral fracture may give a history of precipitating event (RTA, direct impact of fall) followed by severe pain, swelling and deformity^[2]. A relatively trivial trauma may cause femoral fractures in individuals with pathological conditions such as osteoporosis, osteopetrosis, pagets disease and pre-existing simple bone cyst. Femoral fractures following a trivial trauma or fall should arouse the suspicion of pathological fracture^[3]. The diagnosis can be confirmed on the basis radiography (antero-posterior and lateral views) of femur. Management of femoral fractures depend upon the site and type of fracture, age of the patient and presence of vascular compromise. Immediately after the injury and till a definitive surgical procedure can be undertaken the affected part may be immobilized using traction device^[4].

Since most of these fractures are displaced the management usually consist of procedures like plate osteosynthesis (following open reduction) but this procedure is associated with considerable chances of surgical trauma and vascular injuries^[5]. The other method which has been in use for management of these fractures include less invasive stabilization system (LISS) but many studies have reported it to be associated with a high rate of complications such as postoperative rotational and axial malalignment, proximal screw pullout, delayed union, non-union and prolonged period of non-weight bearing^[6].

These complications associated with plate osteosynthesis and less invasive stabilization system has led many orthopedic surgeons to use medullary interlocking for management of complex femoral fractures^[7]. Intramedullary nailing for femoral fractures is reported to have excellent results and allows for early weight-bearing. Intramedullary nailing can either be introduced in antegrade or retrograde fashion^[8]. Antegrade nailing has the distinct disadvantage to be associated with the complications such as leg length discrepancy, rotational malalignment, anterior cortical perforation and neurovascular injury^[9]. Because of the disadvantages associated with antegrade nailing many orthopedic surgeons are using retrograde femoral nailing specially in obese patients and pregnant females. Retrograde intramedullary nailing has a distinct advantage of promoting fracture healing, having better alignment results as compared to antegrade nailing and early rehabilitation. However, like any other procedures there are some complications associated with retrograde nailing also and may include complications such as infection, septic arthritis, deep vein thrombosis, implant failure and malunion^[10].

We conducted this prospective study of 25 patients with femoral fractures who have been treated by retrograde nailing. The study was undertaken to know outcome of patients of femoral fractures treated by retrograde nailing and complications associated with this procedure.

Materials and Methods

This was a prospective study conducted in the department of orthopedics of a tertiary care medical college located in an urban area. In this 2 years prospective study, 20 patients, above the age of 18 years, who had been admitted in orthopedics department for femoral fractures and who were treated by retrograde interlocking nailing were included depending upon a predefined inclusion and exclusion criteria. Written informed consent was obtained from all the patients. Fractures were classified according to AO/ASIF system. A

detailed history, particularly the mechanism of injury leading to femoral fracture, was sought from all the patients. A detailed clinical examination was done in all the cases. Pre-operative evaluation of all the cases was done. Complete blood count, bleeding time and clotting time, HBsAg and HIV was done in all cases. Retrograde nailing was done using nails having 2 distal and 2 proximal screws. Patients were positioned in supine position with the affected limb flexed to 60 degrees. Under image intensifier guidance the nails were introduced by transpatellar approach near intercondylar notch anterior to Blumensaat’s line. Guide wire was passed through the proximal fragment of the fracture after reduction and medullary canal was

reamed until cortical contact was appreciated. All fractures were reduced and locked by closed method.

Postoperatively non-weight bearing mobilization was allowed within 24 hours and gradual weight bearing was allowed. Follow up X-rays were done to note presence of bridging callus. Patients were followed up at 1month, 3months, 6months, 9 months and 1 year. During follow up examination X-rays were done to confirm the union. Also detailed history and any new symptoms during follow up was noted so as to exclude complications. Functional outcome of the patients was determined using Tegner Lysholm Scoring Scale^[10].

Table 1: Tegner Lysholm Scoring system

Tegner Lysholm Scoring Scale			
Limp		Support	
None	5	None	5
Slight or Periodical	3	Stick or crutch	2
Severe or constant	0	Weight-bearing impossible	0
Pain		Instability	
Inconstant and slight during exertion	25	Never giving way	25
Marked during severe exertion	20	Rarely during athletics or other severe exertion	20
Marked after walking more than 2 kms	10	Frequently during athletics or other severe exertion (or incapable of participation)	15
constant	0	Occasionally in daily activities	10
Locking		Often in daily activities	5
No locking, No catching	15	Every step	0
Catching but no locking	10	Swelling	
Locking occasionally	6	None	10
Frequently	2	On severe exertion	6
Locked joint on examination	0	On ordinary exertion	2
Stair climbing		Constant	0
No problem	10	Squatting	
Slightly impaired	6	No problems	5
One step at a time	2	Slightly impaired	4
Impossible	0	Not beyond 90°	1
		Impossible	0
Total Score = 100. Outcome			
<65= Poor 65-83		Fair	84-90 Good >90 Excellent

The data was tabulated and analyzed. Minitab version 17 was used to analyze the collected data. Description of categorical variables like age, sex, age groups and body mass index were presented as numbers. Analysis was computed to determine functional outcome in studied cases.

Inclusion Criteria

- All the patients presenting with distal femoral fractures and treated by retrograde nailing.
- Age above 18 years.
- Patient who had given informed consent.

Exclusion criteria

- Age less than 18 years
- Patients who refused consent.
- Patients with Pathological fractures, meniscal tears or ligamentous injuries of knee which may affect functional outcome of the patients.

Results

This was a prospective study of patients admitted with supracondylar femur fracture (Fracture of distal femur). 25 patients were included in this study on the basis of inclusion and exclusion criteria. Out of these 25 patients there were 18 (72%) males and 7 (28%) females with a M:F ratio of 1:0.38.

The analysis of the age group of the patients showed that the most common affected age group was found to be between 26 – 30 years (32%). Pathological fractures of femur were seen in elderly but those cases were excluded from the study.

Table 2: Age distribution of the studied cases

Age	N	%
=/<20 years	3	12%
21-25 years	5	20%
26-30 years	8	32%
31-35	2	8%
36-40	5	20%
> 40 years	2	8%
Total	25	100 %

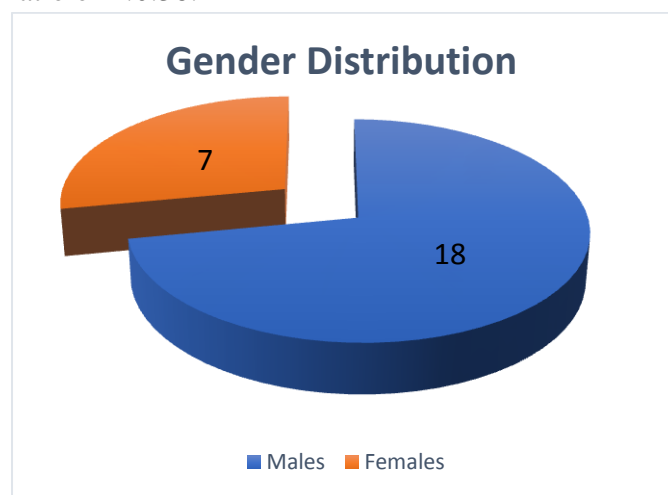


Figure 1: Gender Distribution of the studied cases.

Overweight and obesity was found to be one of the striking feature associated with patients with distal femoral fractures. The analysis of BMI of the studied cases showed that amongst 25 studied cases 7 patients were obese (BMI => 30) and 9 patients were overweight (BMI=> 25 but < 30). Rest of the patients had BMI less than 25.

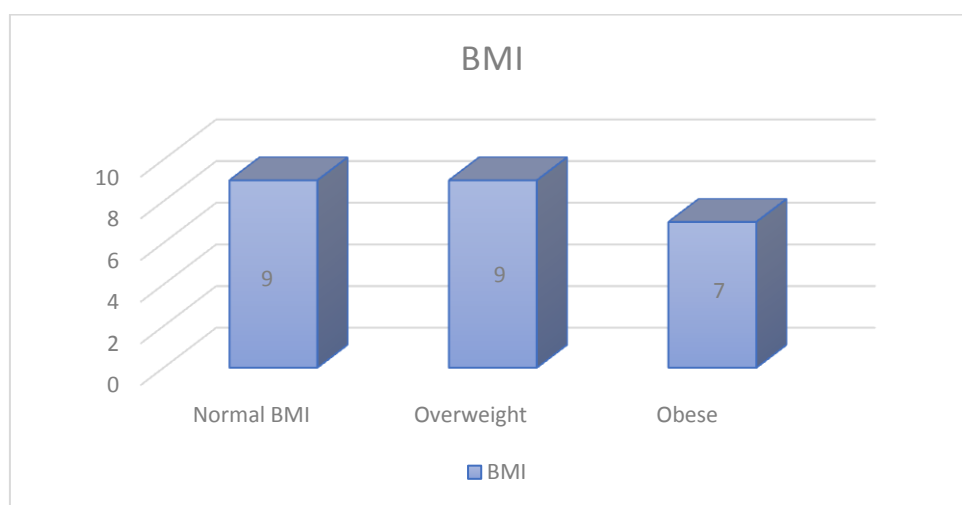


Figure 2: Body mass index of the studied cases

Mean BMI of the patients who were either overweight or obese was found to be 27.46 +/- 2.12 while mean BMI of the patients with a

normal BMI was found to be 22.12 +/- 2.74. The difference was found to be statistically significant (P < 0.005).

Table 3: Comparison of patients with normal and increased BMI

	No Of Patients	Mean BMI	Difference
Cases with Normal BMI	9	22.12 +/- 2.74	P < 0.005 Significant
Cases with increased BMI (overweight/obese patients)	16	27.46 +/- 2.12	

The analysis of the patients on the basis of mechanism of injury showed that majority of patient sustained fracture following motor vehicular accidents (68%) followed by fall from height (20%) and direct blow or assault (12%).

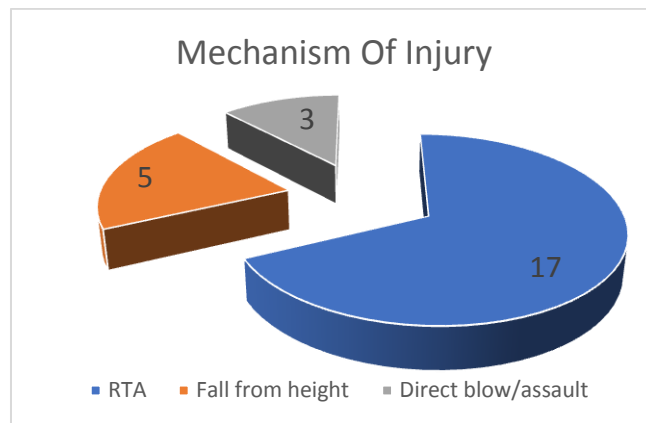


Figure 3: Mechanism of Injury in the studied cases

The classification of fractures on the basis of imaging showed that out of 25 studied cases 18 patients had simple fractures of distal femur whereas 5 patients has wedge fractures. Remaining 2 patients had complex fractures of distal femur.

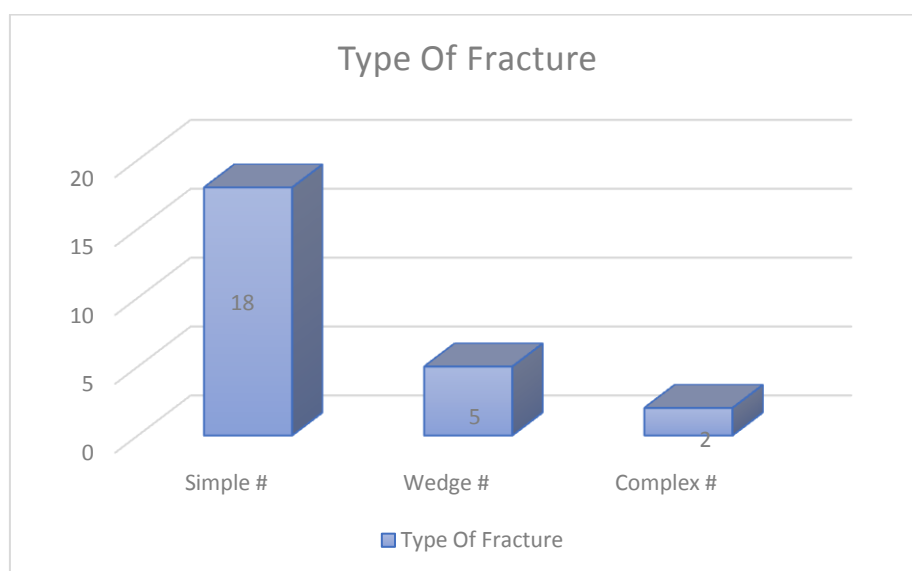


Figure 4: Type of fracture in the studied cases

All patients were treated by retrograde nailing. A small midline incision from inferior pole of patella to the tibial tubercle was given. Patellar ligament was splitted and palpation of intercondylar notch was done. Cannulated drill was used over the guide wire with a sleeve to create portal for entry. Reduction of fracture was achieved by manual traction. In many cases external fixators were used to achieve reduction. After reduction nails were locked in anteroposterior and lateral planes. The

entry wound was closed after suction and washing of the area under drain. Regular knee exercises were started as soon as the patient was comfortable.



Figure 5: Anteroposterior and lateral views before and after retrograde nailing

After the procedure patients were advised partial weight bearing with crutches as soon as there was a radiological evidence of presence of bridging callous. Later they were advised physiotherapy and knee, hip and ankle exercises. The average mean time for fracture union in studied cases was found to be 22.3 weeks. Patients were followed at 1 month, 3 months, 6 months, 9 months and 1

year. During follow up examination the recovery was assessed by using Tegner Lysholm Scoring Scale. At the end of 1 year follow up 84% patients had excellent outcome while Good and fair outcome was seen in 8%, 4% respectively. Only 1 patient had poor outcome and had a score of less than 65.

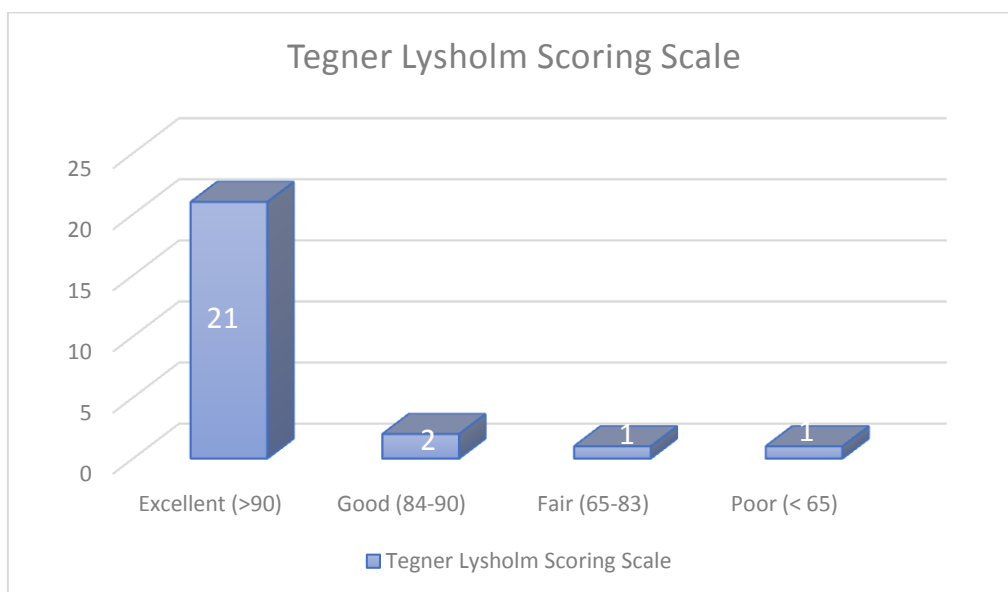


Figure 6: Tegner Lysholm Scoring Scale of the studied cases

There were no cases with significant valgus or varus deformity during follow up period also there were no cases with implant failure. All patients

had satisfactory outcome except 1 patient who was found to be having limping, persistent pain and stiffness.

Discussion

This was a prospective study of patients presenting with distal femoral fracture. All the patients were treated by retrograde nailing. The results were satisfactory in all the cases except in 1 patient who had persistent pain and limping. In our study majority of the affected patients were found to be males. This may be due to the fact that males are more likely to be involved in road traffic accidents and falls. M kumar et al conducted a study of 50 cases with femoral fractures^[11]. Out of these 50 cases there were 387 males and 12 females. Similar male preponderance was reported by Werner T.W et al^[12] and Dee le JC et al^[13] in their studies of patients having femoral fractures.

In our study we found that individuals who were either overweight or obese had a higher incidence of femoral fractures as compared to the individuals who had a normal BMI. The risk of fractures increases with increasing BMI. There are various reasons for predisposition of fractures in individuals with obesity. It is found that obesity and excessive body fat produces cytokines which may stimulate bone resorption thereby reducing bone strength and making an individual prone for fractures. After similar trauma an individual with a high BMI is more likely to get a fracture than a person with normal BMI. Khosla S in their study of relationship between body composition and bone mass in women found that both lean body mass and fat body mass had important effect on bone mass^[14]. The authors concluded that obesity had a dominant effect on bone mineral density. Similar correlation between obesity and increased risk of fractures was reported by HSU YH et al^[15] and Ensrud KE et al^[16] in their studies.

In our study all the patients were treated by retrograde nailing and were followed up for at least 1 year. All cases except 1 patient were found to have satisfactory outcome. Many studies have reported excellent outcomes of patients with femoral fractures and treated by retrograde nailing. Giddie et al in their study of 54 patients with a distal femur fracture treated with retrograde

femoral nailing reported satisfactory outcome^[17]. The authors concluded that retrograde femoral nail fixation provides a good method of fixation allowing immediate mobilization of patients. Neubauer T et al studied femoral fractures (AO/ASIF - type 32) in 40 patients with 41 fractures. The purpose of the study was to investigate in a retrospective analysis the results of retrograde nailing in distal femoral fractures and selected cases of femoral shaft fractures. The authors found that patients treated by retrograde nailing had good long term functional outcome specially in daily activities. The authors concluded that retrograde nailing represents a reliable fixation method for extra-articular and simple intra-articular fractures of the supracondylar area^[18]. In femoral shaft fractures retrograde inserted nails offer a valuable alternative, especially when the proximal femoral approach is obstructed. Andrzejewski et al in their comparative study of antegrade and retrograde intramedullary (IM) nailing in cases of fractures of the femoral shaft found that the mean time to bone union was 180 days in Group R (retrograde nailing) and 219 days in Group A (antegrade nailing)^[19]. The authors concluded that the mean time to bone union was significantly less in retrograde nailing group as compared to antegrade nailing group. Similar conclusions were reported by et al Rikki WM et al^[20].

Conclusion

Retrograde intramedullary nailing is a very effective method of treatment with excellent outcome in patients with distal femoral fractures. It is associated with a stable intramedullary fixation, less soft tissue damage, early bone union and minimal complication rates.

Conflict of interest: none

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