

Management of Supracondylar Femoral Fractures by Retrograde Nailing Technique: A Retrospective and Prospective Study

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Abstract

Objectives: The goal of our study is to study the management of supracondylar fractures of femur by retrograde intramedullary nailing and its clinical and functional outcome. **Methods/ Statistical Analysis:** The study was done on patient with distal femur fractures. The patient ranged from 18–85yrs of age. Patient below 16yrs of age and Pathological fractures were excluded. All the patients were treated according to a protocol. Investigations were done, patient's general condition was assessed and fitness for surgery was taken. Patients were managed by closed reduction and internal fixation under C-arm or by open reduction and internal fixation using tourniquet. Patient was followed with clinical and x-ray findings. **Findings:** Closed fractures managed by closed technique have a better result with significance. When compared between the shortening and surgical technique, the open reduction techniques are associated with more shortening compared to closed reduction technique and this appears to be statistically significant in our study. **Conclusion:** Retrograde intramedullary nail is a dynamic instrument and still persists as a major option for treatment of distal femoral fracture despite recent advances in the management of fracture.

Keywords: Closed Reduction, Distal Femur Fracture, Open Reduction, Retrograde Intramedullary Nail

1. Introduction

Among the femur fractures, supracondylar fracture is not common as that of the hip fractures and the incidence lies around 37/100000¹. Because of our modern life style and high velocity means of transportation, these injuries are being seen with increasing frequency. These injuries are complicated because of associated comminution, soft tissue damage, extension of the fracture into knee joint, neurovascular damage and injury to the extensor mechanism in distal femur and difficult to manage². In early 1960s, there was a hesitancy seen towards the operative management of supracondylar fracture because of the complications like malunion, non-union, infection, inadequate fixation, lack of proper instruments, implant and as well as antibiotics. So the traditional management was followed by the principle^{3,4} which comprised of skeletal

traction, manipulation of fracture and external immobilization in the form of casts and cast bracings⁴. But unfortunately, many problems were encountered by the conservative management like deformity, knee stiffness, shortening, angulation, prolonged bed rest, joint incongruity, quadriceps wasting, malunion, knee instability and post-traumatic osteoarthritis⁵.

In the past two decades, the open reduction and internal fixation has gained good result in the management of distal femur fractures. There are various implants like condylar blade plate, DCS, screw, plate, interlocking nail antegrade or retrograde and external fixator are used in the operative management. Each implant has its own advantage and disadvantage and different treatment outcome⁶.

The purpose of this study is to follow the patient with distal femur fracture including both supracondylar and

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intercondylar fracture operated with retrograde femoral nail to evaluate the pre and post-surgical outcomes of pain freedom, function, mobility for short and long term with due consideration to any complication arising as a result of indirect outcome of the surgical intervention.

2. Materials and Method

The study was done on patient with distal femur fractures including supracondylar and “T – Y” shaped intercondylar fractures. The patient ranged from 18–85yrs of age. All patient was admitted and operated at LLR and Associated Hospitals, G.S.V.M. medical college, Kanpur from Nov-2007 to Sep – 2009.

2.1 Patient Selection

All distal femur fractures fulfilling selection criteria as mentioned below were studied.

2.2 Inclusion Criteria

Fractures of the distal femur extending 15cms proximally from the distal articular surface were studied. This includes supracondylar and intercondylar fractures of femur.

2.3 Exclusion Criteria

Patient below 16yrs of age and Pathological fractures were excluded.

All the patients were treated according to a protocol which consisted of:

Standard Antero posterior and lateral plain X-ray including knee joint was taken. All the patients were examined for any neurovascular injury. Below knee skin traction/upper tibial skeletal traction was applied and the limb kept on Bohler Braun Splint. Pre-operative CT scan was taken to plan the surgery. Open wounds were taken to theatre for wound debridement within 5hrs of admission. Investigations were done, patient's general condition was assessed and fitness for surgery was taken. Poly trauma patients were fixed as soon as their general condition allowed for surgery. Patients were managed by closed reduction and internal fixation under C-arm or by open reduction and internal fixation using tourniquet. CPM (Continuous Passive Movement) for 3–5 days was immediately given in the post-operative period. Partial weight bearing was allowed when clinical and the radio-

logical signs of union were seen. Full weight bearing was allowed only after 14–18 weeks after judging by radiological union. Patient was followed with clinical and x-ray findings.

All the patient was treated by retrograde femoral nail. Operative procedure comprises of closed reduction and internal fixation by supracondylar nail or open reduction and internal fixation by supracondylar nail, depending on the duration and fracture pattern with/without using tourniquet.

Supracondylar nail made of stainless steel was used in all the patients. Nail of varying lengths was used ranging from 16cm to 40cm depending on the individuals and the fracture patterns.

3. Results

In this study, 50 patients with distal femur fracture including supracondylar and intercondylar fracture were studied. In the present study group, the maximum number of patient were male (86%), belonging to middle age group of 30–39yrs followed by 40–49yrs and 20–29yrs. In our study, the most common cause of distal femur fracture was high energy trauma. The major mode of injury among male was road accident and in female the injury was due to fall. In the present study, 78% suffered from closed fractures and 22% suffered from open fractures (Table 1). Thirty-three cases of supracondylar fracture had articular involvement with mean union of 5.32 months with mean range of movement of 4.55–121.97. Among the 17 intercondylar fracture patients, entire patients had articular involvement with mean union of 5.76 months and the mean range of motion is 8.24–115 (Table 2). This shows that the supracondylar fracture has a higher range of movements when compared to the intercondylar fracture. The relation between the closed and the open reduction surgical procedure showed that low range of motion is seen among the open reduction group than the closed reduction group (Table 3). In our present study 26% of patients had associated lower limb injuries along with distal femur fractures. Out of this 26% of patients, 9 had both bone fracture with a mean union of 6.5 months and mean range of motion of 7.2–114.4 degrees, 2 had trochanter fracture, 1 had patella and 1 had both lower limb shaft fracture. In the present study 54% of open fracture patients developed shortening with average of 2.4cm when compared to 33% of closed frac-

ture patients with mean shortening of 2.25cm. Likewise 58% of patients treated with open reduction technique developed a shortening of 2.6cm when compared to 27% of patients treated with closed reduction technique with shortening of 2.15cm (Table 4). Out of 17 patients with intercondylar fracture, 4 patients had loosening of locking screws and one patient had bending of screws. Among the 33 supracondylar fracture patients, one had loosening of locking screws, one had bending and 3 cases had superficial infection over the locking screws. Our study shows that there was no statistical significant difference in union time (i.e., type of fracture and also with articular extension or not) and reduction technique. But closed fracture managed by closed technique have a better result with significance (Table 5). When compared between the shortening and surgical technique the open reduction techniques are associated with more shortening compared to closed reduction technique and this appears to be statistically significant in our study (Table 6).

Table 1. The type of fractures

Types	Open # (%)	Closed# (%)
Male	10(20%)	33(66%)
Female	1(2%)	6(12%)
Total	11(22%)	39(78%)

Table 2. Articular involvement

Types	No. of Cases (%)	No. of Males	No. of Females	Union Time (Mean)	Range of Motion (Mean)
Supracondylar#	33(66%)	28	5	5.32±2.61	4.55-121.97
Intercondylar#	17(34%)	15	2	5.76±1.16	8.24-115

Table 3. The relation between surgical procedure and outcome

Procedure	No. of Cases (%)	No. of Males	No. of Females	Union Time (Mean)	Range of Motion (Mean)
Open Reduction	17(34%)	16	1	5.53±1.23	9.12 – 112.94
Closed Reduction	33(66%)	27	6	5.59±2.62	4.14 – 122.76

Table 6. Relationship between shortening and surgical technique

	No. of Cases	Cases of Shortening	Mean Shortening	P Value	Inference
Open Reduction	17	10	2.6+/-1.3	<0.05	Significant
Closed Reduction	33	9	2.15+/-0.7		

Table 4. Association of shortening between the fractures and surgery

# Types and Techniques	Cases with Shortening	Mean Shortening
Open #	6	2.4cm+/- 1.3
Closed #	13	2.25cm +/-1.2
Open Reduction	10	2.6cm +/- 1.3
Closed Reduction	9	2.15cm +/- 0.7

Table 5. Relationship between following values

	Closed #	Open #	Total
Closed Reduction	27	6	33
Open Reduction	11	6	17

Sensitivity = 71.05%, Specificity – 50.00%.

4. Discussion

We evaluated the management of distal femur fracture by retrograde nailing technique and its outcome in 50 patients. In our study most of the patients were male belonging to third to fifth decade of life and the common cause of the fracture was road accidents followed by fall at home or at work. In female, the common cause of fracture

was fall at home. This finding is similar to other study⁷. In the present study only 11 patients presented with open fractures and all cases were presented with a worse clinical picture because it was further worsened by infection and complications. Incidence of open fractures were increased due to life style changes and this was positively correlated with some previous studies⁸⁻¹⁰.

A study done earlier¹¹ showed that the patients with distal femur fracture was associated with extremity injury and other system injury which was similar to our study. The mean union time and the mean range of motion was found to be slightly higher in our study when compared to other studies based on the retrograde nailing^{12,13}. There was no significant difference in union time and reduction technique between the open and closed fractures. There was no significant difference between the intercondylar fracture and supracondylar fracture in union time and reduction technique^{13,14}.

Previous studies showed a mean range of motion of 104 and 100 degrees. But in our study the mean range was slightly higher when compared to the above said two studies. This was because most of the patients were operated by closed technique and we started early post-operative physiotherapy. In a similar study the range of motion was greater in those patients with shaft fracture than in those with supracondylar and intercondylar fracture which correlates with our study¹⁵.

When compared to the previous study our study also shows the same result that open fractures have less range of movements and takes more time to unite than the closed fracture. This can be due to injury to soft tissue, contamination and infection of the wound, exposure of the fracture site results in disturbance of fracture haematoma ultimately leads to delayed union and post traumatic fibrosis around fracture site lead to decreased range of motion at knee. But there was a statistical significant difference between closed and the open fracture group which shows that closed fractures are of much significant than the open fractures. But it was not of much significance because of small study group and small duration of follow up. When compared with the previous study our study showed more range of motion in extra articular fracture than the intra articular fracture and found to be statistically significant. This was because if there was any postoperative incongruity of articular surface that would result in arthritis and reduced joint motion¹².

There was no statistical significance in mean union time and mean range of motion among the patients with

associated fracture and the patients not associated with fracture. Our study also used the same length of nail in about 90% of patient similar to other study¹⁶. In the present study there was no non-union which was very well supported by other studies. The common reason for pain in the post-operative period were distal end protruding in the knee joint, prolonged knee stiffness in poly trauma patient, loosening of locking bolts impinging over the skin, improper insertion of nail and superficial infection at the site of locking bolts. This was positively correlated with other studies^{17,18}. In our study only superficial infection was seen in two patients who were very well responded to the antibiotics similar to other studies^{12,19,20}. Previous studies showed that there is 2cm shortening, broken distal locking screws and asymptomatic nail protrusion into the knee joint. But in our study loosening of locking screws, bending of the screws, proximal locking screw pull out and superficial infection over the locking screws were seen²⁰.

5. Conclusion

Cases managed by retrograde nailing had well to excellent results in distal femur fracture without intra articular extension. Early physiotherapy and mobilisation should be the goal after operative procedure. It is a better option for fracture involving lower one third of femur fracture and supracondylar and intercondylar fractures with a union rate of 100% with no infection or malunion. It consumes only minimal time and it can be reached easily with minimal dissection. In conclusion retrograde intramedullary nail is a dynamic instrument and still persists as a major option for treatment of distal femoral fracture despite recent advances in the management of fracture.

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