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Distal femoral locked plating versus retrograde nailing for extra articular distal femur fractures: A comparative study

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Abstract

Background: Distal femoral fractures are among challenging orthopaedic injuries. Precontoured locked plating and retrograde nailing are two trending methods of fracture fixation in such patients. Purpose of present study was to compare precontoured distal femur locked plating and retrograde intramedullary nailing for treatment of extra articular type A distal femur fractures.

Materials and Methods: A prospective randomized study including 32 patients of extra articular distal femur fractures, was conducted in the department of orthopedic surgery, KGMU Lucknow. Patients were divided in two groups by random allocation. Patients of group I (18 patients) were treated by distal femoral locked plating and group II (14 patients) by retrograde distal femoral nailing using standard technique.

Results: The mean age of group I and group II was 48.00 ± 15.65 & 40.43 ± 14.39 years respectively. The female – male ratio for both groups was matched ($p=0.075$). The time of full weight bearing was significantly ($p=0.004$) less in nailing group. Bone union was seen earlier in group II (DFN) and it came to be statistically significant (p value-0.0006). Knee pain was present in 42.86% of patients in group II and it came out to be statistically significant ($p<0.001$). Flexion Score in group-II was significantly better ($p=0.029$).

Conclusion: In our study functional results trended toward better outcomes in distal femoral nails than plates in terms of knee flexion, early weight bearing, less union time but incidence of knee pain is significantly higher in nailing group as compare to plating group.

Keywords: distal femur fractures, internal fixation, retrograde nailing, distal femoral locking plates

Introduction

Distal femoral fractures are defined as- “Fractures up to 15 cm from distal femoral articular surface. There are various methods of conservative and operative management of these fractures ranging from traction and plaster immobilization to the internal fixation by 95 degree angle blade plate, cancellous screws, dynamic condylar screw and plate, condylar buttress plates, distal femoral locking plate and retrograde intramedullary nail^[1, 7]. Internal fixation has advantage of early ambulation and early knee range of motion exercises which reduces chances of knee stiffness^[5, 6]. Despite of certain advantages of internal fixation, it is criticized for technical difficulties, implant failure and infections. In the 1970s and early 1980s, distal femur fractures were most commonly treated with an anatomical (non-locking) distal femur plate. In recent years, the treatment of distal femoral fractures has evolved although these fractures remain complex to treat and carry an inconsistent prognosis. Distal femoral locking plates has shown promising results in both intra and extra articular fractures of distal femur specially in osteoporotic bones^[2, 6]. Retrograde intramedullary nail shares many assets of locking plate and have been claimed to have high healing rates in distal femur fractures^[5]. In this prospective study, we evaluated and compared the clinical, radiological and functional outcome of extra particular type a distal femur fracture stabilization using retrograde nailing and locking compression plate.

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Materials and Methods

This study was conducted in patients aged > 18 years having type A distal femoral fractures reporting to Orthopaedic OPD and Orthopaedic Emergency unit of trauma centre, KGMU, Lucknow during the study period from September 2016 to August 2017. It was an open ended prospective e randomized study. Following were the inclusion and exclusion criteria for the selection of patient in study groups.

Inclusion criteria

- Age >18years
- Type A distal femur fractures
- Closed or Gustilo type I and II open fractures
- Patient able to walk without assistance before injury

Exclusion criteria

- Pathological fractures
- Gustilo type III open fractures
- Patients with vascular injury
- Floating knee
- Patients not giving consent for study

On admission to ward, a detailed history was taken, relating to the age, sex and occupation, mode of injury, past and associated medical illness. The patients were kept on skeletal pin traction or below knee skin traction application and limb put over bohler-braun cradle till the time of operation. Patients were randomised into two groups using the random number table generated using the Microsoft XL. Total 32 patients of extra articular distal femoral fracture were selected for the study according to inclusion criteria and were randomized in two groups. Group 1 patients were treated by distal femoral locking plate while Group 2 patients were treated by distal femoral nailing.

All patients were operated at elective or emergency operation theatres of Department of Orthopaedic Surgery, KGMU by the team of Orthopaedic surgeons who had no preference for nailing or plating. Patients in the group 1 (locked plating) were positioned supine on a radiolucent table. Open reduction and internal fixation was done using standard lateral approach. In group 2 patients (Retrograde nailing), patients were kept supine on radiolucent table with knee in slight flexion. A 5-cm incision was made starting from lower pole of patella and just medial to the patellar tendon. The inter condylar notch was palpated and guide pin was placed just above and medial to the femoral attachment of posterior cruciate ligament and confirmed by means of anterior-posterior and lateral fluoroscopy. The medullary canal was reamed and the nail of appropriate size was reinserted. All the cases were statically locked with at least 2 distal locking screws and nail was buried 3mm deep to the distal articular cartilage of femur.

Results

Total 32 patients of extra articular distal femoral fractures were divided in two groups (Group I- 18 patients, Group II- 14 patients). The mean age of group I was 48.00 ± 15.65 years, while the mean age of group II was 40.43 ± 14.39 years. The female – male ratio was 21.9: 78.1% and for the two groups it was matched ($p=0.075$)

In both groups in majority of cases mode of causation was road traffic accident (RTA) which was found to be 72.2% cases in group I and was 78.6% for group II. The left and right side of fracture in both the groups was found to be approximately in same proportion (55.6:44.4, 64.3:35.7 respectively).

No significant difference in mean follow up time (9.33 months for group I and 8.71 months for group II) was found between the groups ($p=0.534$) (Table 1). In the intergroup Comparison of Flexion Score, group-II showed significantly higher flexion as compare to plating group ($p=0.029$) (Table 2). In the intergroup Comparison of Pain Score, the mean pain Score in group-II was significantly more than the group-I ($p<0.001$) (Table 3). No significant difference in mean function score was found between the groups ($p=0.084$) (Table 4).

The time of full weight bearing was significantly ($p=0.004$) less in retrograde nailing group. In this group 58.3% subjects were able to bear full weight after 6 weeks while none of the LCP group was able to bear full weight after 6 weeks. The gait status was normal in 66.7% cases in group I, as compared to 78.6% cases of group II. No significant difference ($p=0.457$) was found in proportion of gait type between the two groups.

The mean union time in group I (LCP) was 16.33 ± 8.77 weeks and in group II (DFN) was 11.00 ± 5.92 . Bone union was seen earlier in group II (DFN) and it came to be statistically significant (p value-0.0006).

Functional outcome according to Neer's scoring system between two groups, group I (LCP) and group II (DFN) was statistically insignificant (p value- 0.134). Mean Neer's score was more in LCP group but it was statistically insignificant (p value-0.63). In our study in both groups no shortening or malalignment was observed which may be due to smaller sample size.

In spite of taking extra precaution to prevent injury to patella and femoral cartilage throughout the retrograde nailing as well as confirming distal extent of nail under image, knee pain was present in 42.86% of patients in group II and it came out to be statistically significant ($p<0.001$).

Discussion

Functional outcome came out to be similar in our study in both groups. Numerous rating scales have been used to determine the functional outcomes after surgical treatment of supracondylar fractures of femur. Neer^[8], Hospital for Special Surgery Score (HSS)^[9, 10], Hammer Score^[11], Lysholm Gillquist Scoring System (LGSS)^[12] are some of the rating scales which are commonly used. We used Neer's scores because it emphasizes on important patient outcome variables such as pain, functions as related to activities of daily living, range of motions, return to work, gross anatomic alignment and radio graphic evaluation of union and mechanical alignment. However no rating scale is validated to be superior to other.

Mean Neer's score was more in LCP group but was statistically insignificant ($p=0.63$). Functional outcome according to Neer's scoring system between two groups, group I (LCP) and group II (DFN) was statistically insignificant (p value-0.134). Past studies too have discovered similar functional outcome despite using different scoring system. Demirtas A. *et al.*^[13], in their study, using Sanders criteria, announced equivalent patients with excellent to good and fair to bad results. Concordant findings were also narrated by Markmiller M. *et al.*^[12], with Lysholm Gillquist Scoring System, Gao K. *et al.*^[9], and Gupta SKV *et al.*^[14], employing the Hospital for Special Surgery Score (HSS). Paradoxically, in a recent study, Hoskins *et al.*^[15], revealed a significant difference in the quality of life in favour of IMN using EuroQol-5 dimensions score at six months although there was weak evidence that the trend continued for one year.

Bone union was evident by callus formation and bridging trabeculae and no or minimal pain at fracture site. Luzan TJ *et al.* [16] concluded in his study that locking plates used to bridge fractures of the distal femur led on average to less callus formation than IM nails and early union. In a systematic review of 29 case series with 415 patients, 5.3% nonunion rates with LP as opposed to 1.5% in nailing were proclaimed by Herrera DA *et al.* [17], Gao K. *et al.* [9] study showed union disturbance rate in the LP group was higher than in the RN group. However, further analysis revealed that clinical outcome may largely depend on surgical technique rather than on the choice of implant.

Newer biological methods of fixation have reduced the union and infection problem in distal femur fractures. The treatment still remains a challenge to orthopaedic surgeon. Both distal femoral locking plates and distal femoral nailing yields almost equivocal results with some difference in terms of knee pain and union time. [20, 25]

Distal femur nail has many same advantages as locking plates such as percutaneous placement without disruption of blood supply and direct fracture reduction and being an intramedullary load sharing device allows early load bearing. But persistent knee pain, development of knee arthrosis remain a setback for nailing. Hartin *et al* [18] studied the blade plate and the IM nail used in the treatment of supracondylar femoral there study showed a trend for patients undergoing retrograde nailing to report more pain. Leggon *et al.* [19] found a trend of more knee pain with retrograde distal femoral nailing in patients of distal femur fracture.

Hoskins *et al.* [15] concluded IMN may be a superior treatment compared with anatomical locking plates for fractures of the distal femur. The findings were concordant with other data from pilot randomized studies which favour treatment of these fractures with an IMN supports the need for a definitive randomized trial.

Conclusion

In our study functional results trended toward better outcomes in nails than plates in terms of mean union time and range of motion at knee joint. Distal femoral locking plate is a good implant for distal femur fracture giving comparable results to retrograde nailing. There is no significant difference in overall functional outcome of distal femoral nailing and distal femoral plating done for extra articular distal femoral fractures though range of motion was more in case of retrograde distal femoral nail group and it was statistically significant.

Multicenter studies with high numbers of patients and with longer duration of follow up will be required to draw useful conclusions.



Case 1: At 24 weeks after nailing



Case 2: Pre-operative X RAY



Case 2: At 24 Weeks After palting



Case 1: Preoperative X ray

Table 1: Intergroup Comparison of Follow Up time

| Group | N | Follow up time (month) | | | | t-value | p-value |
|----------------|----|------------------------|-------|------|------|---------|---------|
| | | Min. | Max. | Mean | SD | | |
| Group-I(LCP) | 18 | 5.00 | 12.00 | 9.33 | 2.57 | .629 | .534 |
| Group-II (DFN) | 14 | 3.00 | 13.00 | 8.71 | 3.00 | | |

Table 2: Intergroup Comparison of Flexion Score

| Group | N | Flexion | | | | t- value | p- value |
|----------------|----|---------|------|--------|-------|----------|----------|
| | | Min. | Max. | Mean | SD | | |
| Group-I (LCP) | 18 | 90 | 135 | 113.89 | 15.01 | - 2.297 | .029 |
| Group-II (DFN) | 14 | 100 | 135 | 125.00 | 11.44 | | |

Table 3: Intergroup Comparison of Pain Score

| Group | N | Pain score | | | | t- value | p- value |
|----------------|----|------------|-------|-------|------|----------|----------|
| | | Min. | Max. | Mean | SD | | |
| Group-I (LCP) | 18 | .00 | 16.00 | 3.89 | 4.78 | 6.787 | <.001 |
| Group-II (DFN) | 14 | 4.00 | 20.00 | 15.14 | 4.49 | | |

Table 4: Intergroup Comparison of Function Score

| Group | N | Function score | | | | t- value | p- value |
|----------------|----|----------------|-------|-------|------|----------|----------|
| | | Min. | Max. | Mean | SD | | |
| Group-I (LCP) | 18 | 16.00 | 20.00 | 18.67 | 1.94 | 1.790 | .084 |
| Group-II (DFN) | 14 | 2.00 | 20.00 | 16.43 | 4.85 | | |

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