

Evaluation of functional outcome in patients treated with locking compression plate for distal femur fractures

Dr Kevin Paul Sebastian ^(✉), Dr Sanoj P. Poullose, Dr. Akhil K. Thomas
Dr. Shery Valsan

Department Of Orthopedics /Jubilee Mission Medical College/India
kevinpaulsbstn@gmail.com

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Abstract— Distal femur fractures are always a challenge to an orthopedic surgeon. They may be unstable and comminuted. Thin cortex, wide medullary canal, relative osteopenia and short distal segment adds to the complexity. The present study assessed the functional outcome of using locking compression plate fixation for fractures of distal end of femur in patients admitted to JMMC orthopedics department satisfying the inclusion and exclusion criteria from December 2017 to may 2019. Twenty cases were taken in this study. Serial follow up was done at 4, 8, 12, 24 weeks and functional outcome was assessed at the end of 24 weeks using NEERS criteria. 18 patients were treated with open reduction and internal fixation. 2 of the fractures were stabilized via MIPPO technique. No patients had implant failure and none of the cases were complicated by deep infection. 5 of the 20 patients had ‘Excellent’ Neers scores and 14 had ‘Good’ scores. Only one patient had ‘Fair’ score.

Conclusion: Locking compression plate fixation is a safe procedure for supracondylar fractures of distal femur with good functional outcome. It can be done on a routine basis with a minimum risk of complications.

Keywords— Functional Outcome, LCP, Open Reduction Internal Fixation, Prospective Study, Supracondylar Fracture.

1. Introduction

Distal femur fractures constitute a diverse group of injuries accounting for about 4% to 7% of all femoral fractures affecting the knee. These occur in two distinct populations - young patients who are victims of high energy trauma¹ and elderly patients who fall victim to low energy trivial domestic accidents. Another injury group surfacing with similar injury pattern is peri-prosthetic fracture².

Six decades ago, in the early 1960s, there was a great disinclination towards open procedures for these fractures because of high incidence of infection, inadequate fixation techniques and lack of proper instruments which led to non-union and malunion. With the advent of techniques of open reduction and internal fixation, the A.O. group revolutionized the treatment of distal femur fractures by introducing various fixation devices like 95° angled blade plate, dynamic condylar screw with side plate, condylar

buttress plate and the locking compression plate. It is now ratified by most surgeons that supracondylar femoral fractures are best treated with open reduction and surgical stabilization. This helps in anatomic reduction of the articular surface, restoration of limb alignment and early mobilization, thus bringing these patients back to life.

Locking compression plate has an upper hand here, because it combines conventional compression plating and locked plating techniques which enhances the plate osteosynthesis. Precontoured built of LCP minimizes soft tissue problems and acts as internal-external fixator. In elderly as well as young patients this is of prime concern since prevention of osteoarthritis requires restoration of articular congruency of the joint. Further, minimal soft tissue injury occurs when fracture is stabilized via MIPPO³ technique.

The purpose of this study is to evaluate the functional outcome of fracture lower end of femur treated using locking compression plate.

2. Patients and method

Patients with fractures of distal end femur (distal 15cm) admitted to JMMC orthopedics department were taken up for the study after taking the required consent, from December 2017 to may 2019 (18 months) A pre structured and pre tested functional evaluation scoring system- NEER'S SCORING SYSTEM⁴ was used to assess the functional outcome. Based on the prevalence of functional outcome observed in earlier publications⁵, with 95% confidence level and 20% relative allowable error minimum sample size was 17. But a total of 20 samples are taken up for this study. It will give more than 95% confidence level.

INCLUSION CRITERIA:

Patients of age 18 yrs and above, both males and females.

Patients with fractures of distal end of femur(distal 15cm) after taking required consent.

Closed and Compound fractures of distal end of femur including Gustillo and Anderson⁶ types I, II, IIIA & IIIB.

Patients with co-morbid diseases like controlled diabetes mellitus, hypertension, asthma and other medical conditions.

EXCLUSION CRITERIA:

Patients aged below 18 years.

Compound fractures associated with vascular injuries.

Compound fractures associated with bone loss.

- Pathological fractures.
- Peri-prosthetic fractures.
- Patients unfit for surgery.
- Patients not willing for surgery

3. Results

In our study, 20 distal femoral fractures were treated. All cases were fresh, 10 patients were males and 10 patients were females. Ten of them were right sided injuries and the other 10 were left sided injuries. The mean age was 54 years ranging from 18-84 years. 12 of the fractures were caused by road traffic accidents and 8 were due to fall. 19 of the cases were closed fractures and the remaining one was a type II compound fracture.

Of the 20 distal femur fractures, 1 was AO type A1; 5 were AO type A2, 6 were AO type A3, 4 were AO type C2 and remaining 4 were AO type C3 fractures.

Table 1: Fracture type and frequency

TYPE	n	%
A1	1	5
A2	5	25
A3	6	30
C2	4	20
C3	4	20

None of patients had any other long bone fractures.

18 patients were treated with open reduction and internal fixation and 2 of the fractures were stabilized via MIPPO technique.

No patients had implant failure and none of the cases were complicated by deep infection. 2 of the patients had superficial skin infection.

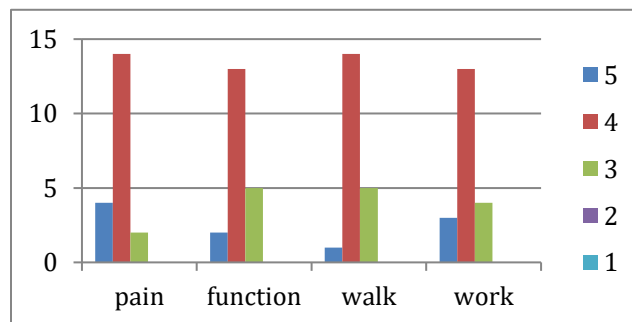


Fig.1 NEERS FUNCTIONAL SCORES (70 UNITS)

In our observation, 4 out of 20 patients had no pain (20%), 14 patients had intermittent pain and knee stiffness (70%) and 2 patients had pain with fatigue.

In our study, 2 out of 20 (10%) patients were able to return to their function as before injury. Mild restriction was noted in 13 (65%) patients and restriction with stair climbing was seen in 5 (25%) patients.

In our observation, one patient regained full range of knee movements. 70% patients gained knee flexion of 100° and 25% patients gained up to 80°.

In our observation, 3 (15%) patients worked as before injury, 13(66%) patients continued same work with mild handicap and 4 (9%) patients modified their work.

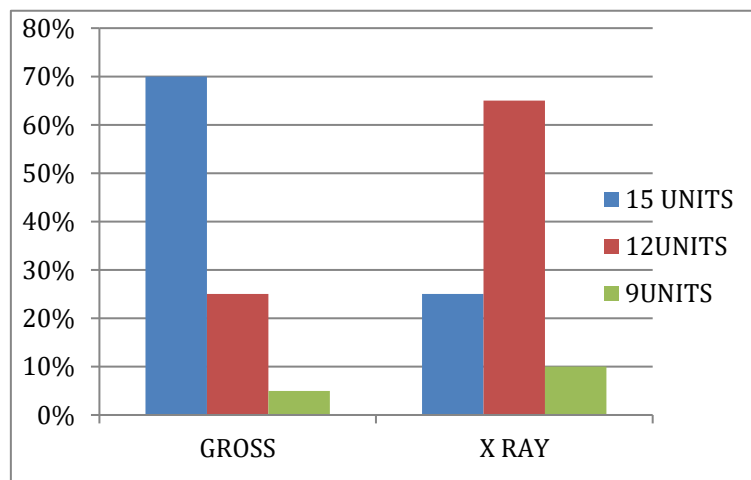


Fig.2 NEERS ANATOMICAL SCORES (30 UNITS)

In our study, 14 (61%) patients had thickening only, another 5(25%) patients had 5 mm shortening, and 1 (5%) patient developed 20mm shortening.

Out of 20, 5 patients (25%) had near normal radiographs, 2 (9%) had 10 degrees angulation and another 13 (65%) patient had 5 degrees of valgus angulation.

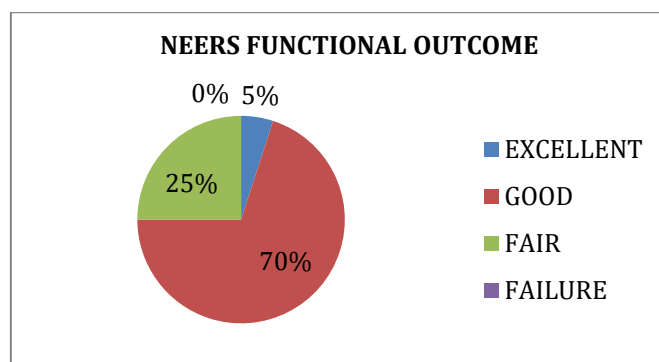


Fig 3. Neer's Functional outcome.

Overall results were excellent in 5 (24%) out of 20 cases and were good in 14 (71%) cases and one had fair result. The overall average knee score in our study was 80.

To obtain the association of study variables with groups, Fisher's exact test was applied. The association of distal articular involvement with functional outcome was significant. Extra articular fractures gave better functional outcome. The association of method of surgery with functional outcome also was significant in this study ($P < 0.05$). Reduction of fracture via MIPPO technique gives better functional outcome. Other factors like age, mechanism of injury or compounding of the injury did not have significant association with outcome in this study.

4. Discussion

In our study of 20 patients the mean age was 54 years, ranging from 18 to 84. There was no sexual predominance in fracture distribution. Most of the injuries were caused by road traffic accidents affecting mostly males. We had 12 (60%) RTA injuries and 8 (40%) falls. Gupta et al⁵ conducted a prospective study on 40 patients treated with LCP and reported the mean age of patients was 27.50 yrs. and had a male predominant fracture distribution.

Majority of fractures in our study belonged to type A₃ fracture which was 30%. Other patterns like A₂ 25%, C_{2&3} 20% each were also observed. This signifies that when distal femoral fractures are caused by high energy trauma they are associated with severe comminution (A_{2,3} & C_{2,3}) and are unstable. Similar pattern distribution was observed by Yeap and Deepak⁷ who reported 4 patients of A₁, 2 of A₃, 1 of C₁, 1 of C₂ and 3 of C₃ type fractures.

Local complications were present in 10% (2/20) of our patients. They included superficial infection in two patients. It was promptly treated with appropriate antibiotics and wound care.

In our study we had 2 cases of acceptable valgus malalignment (10%) which was associated with C₃ type.

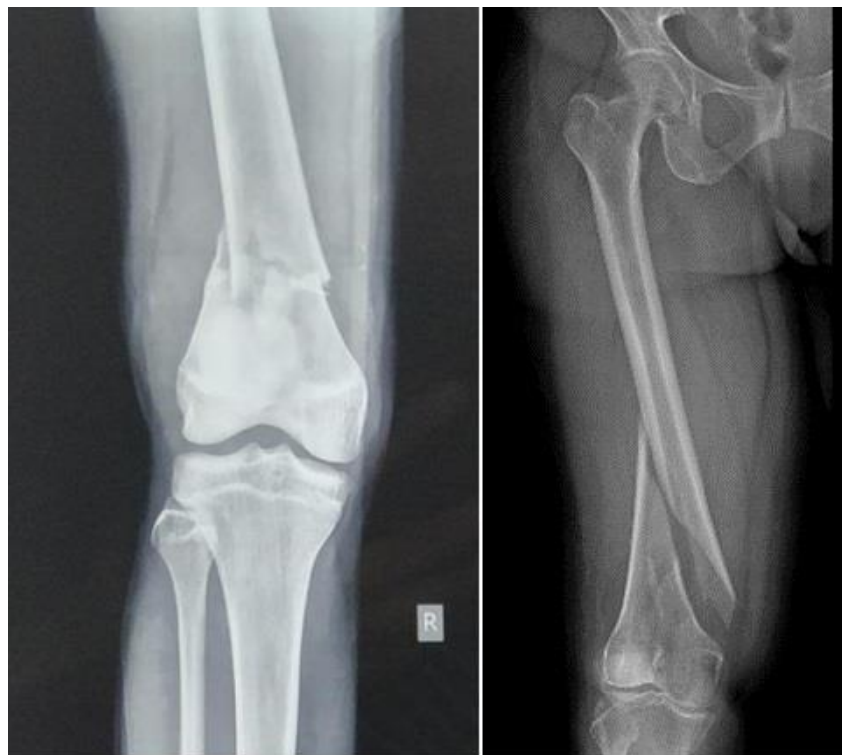


Fig.4

Malalignment occurred as a result of severe comminution. Yeap and Deepak⁷, did not report any malunion/ malalignment. Comparing to other studies which have used various fixations: K. Kolb, P. Grutzne, , H. Koller, C. Windisch, F. Marx and W. Kolb⁸ in their study on distal femoral fractures fixed with DCS reported malalignment in 5 cases out of 41 cases ie 12.1% cases had malunion. 2 patients developed varus and 3 developed valgus malalignment.

In our study, the 15 patients had knee ROM 100^o and above. It was attributed to the stable and sturdy construct and the early range of motion achieved with DF-LCP. The knee flexion scores in comminuted fractures were less compared to simple fractures, which shows that comminuted fractures lead to intra-articular stiffness and decreased range of motion. Yeap and Deepak⁷ reported flexion range from 40^o to 140^o.



Fig.5

Comparing to other studies which have used various fixations: Kolb, P. Grützne, H. Koller, C. Windisch, F. Marx and W. Kolb⁸ in their series of patients with distal femoral fractures reported average range of motion of 120 degrees. P Kanabar, V Kumar, PJ Owen⁹ in their series of 17 patients operated with MIPPO or LISS of distal femur reported average range of motion of 0-100 degrees.

Evaluation according to Neer's score showed a mean Neer's score of 81 with a range of 60 to 92. Out of our 20 patients in the study, 5 patients (25%) had excellent results, 14 patients (70%) had Good and 1 patient (5%) had Fair results. Yeap and Deepak⁷, using Schatzker scoring system reported four excellent results, four good, two fair and one failure.

The good outcome seen in our study can be attributed to more of Type A fractures, which usually show favorable results. Most of the series above have equal or higher number of Type C fractures. We had only 5% of open fractures, which are much higher in other case series. Also the small sample size can be used only as Level III evidence in Evidence based medicine.

5. Conclusion

The LCP condylar plate is the treatment of choice in the management of distal femoral fractures, especially Type A fractures where we have found higher Neer scores.

LCP prevents compression of periosteal vessels. It may not completely solve the problems associated with any fractures like non union and malunion, but is a valuable tool in management of these fractures.

LCP remains the implant of choice for type C fractures also, though there were complications like knee stiffness and valgus/varus malalignment encountered in a few cases. They show better results than Dynamic condylar screw and Angle Blade Plate. This is ideal to prevent metaphyseal collapse and to maintain limb length in severely comminuted fractures.

LCP has a lesser chance of complications like plate or screw breakage and is of great use in elderly patients with severe osteoporotic bone.

Closed reduction and plate fixation by MIPPO is a soft tissue friendly approach in the treatment of fractures around knee preserving the blood supply to bone.

Non-requirement of bone graft decreases the morbidity associated with donor site.

Careful selection of patients and more over strict adherence to the basic principles of fracture fixation will go a long way in reducing the complications of fracture fixation using locking compression plates.

To conclude, Locking Compression Plate is an important armamentarium in treatment of fractures around knee especially when fracture is severely comminuted and in situations of osteoporosis. This study is only a Level III evidence, so a larger number of randomized control trial with higher statistical significance needs to be done to know the efficacy and choice of implants in distal femur fractures.

6. References

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Authors

Dr Kevin Paul Sebastian is permanent member of KOA (Kerala Orthopedic Association), currently working as an assistant professor at KMCT medical college, Calcut, Kerala.

Dr Sanoj P. Poullose is permanent member of KOA (Kerala Orthopedic Association) and IOA, currently working as an assistant professor at Jubilee Mission Medical College, Thrissur, Kerala.

Dr. Akhil K. Thomas is permanent member of KOA (Kerala Orthopedic Association) and IOA. Currently he is a consultant orthopedic surgeon at baby memorial hospital, Kannur, Kerala.

Dr. Shery Valsan is permanent member of KOA (Kerala Orthopedic Association). Currently he is a consultant orthopedic surgeon at Carihtas hospital, Kottayam, Kerala.