



Treatment of extra-articular distal femur fractures by Retrograde Nail Versus distal femoral locked plate: A comparative study

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Abstract Background: Extra articular distal femoral fractures are among challenging orthopaedic injuries. Anatomical locked plating and retrograde nailing are two commonly use methods for fracture fixation in such patients. Purpose of this study was to compare Anatomical 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 20 patients of extra articular distal femur fractures were operated in the department of orthopaedic surgery, DR.M.K.SHAH M.C.R.I. Patients were divided in two groups by random allocation. Patients of group A (10 patients) were treated by distal femoral locked plating and group B (10 patients) by retrograde distal femoral nailing using standard technique. The patients were follow up monthly for six months thereafter in 12 & 18 months. On every follow-up, radiological sign of healing, range of movement of knee, initial complications like infection & knee pain were noted and functional outcome scoring was done as per Neer's score. **Results:** The mean duration of surgery in retrograde nailing group was 68 ± 12.2 minutes while it was 81 ± 11.6 minutes in plating group which was statistically significant. Average fracture union time was better in retrograde nailing (15.2 ± 1.2 weeks) than plating group (18 ± 1.4 weeks) as assessed both clinically and radiologically (p-value=0.0001). The average knee flexion was good in nailing (104.8 ± 9.4) than plating (91.4 ± 8.9) (p-value=0.0042). Postoperative Neer's score was higher in retrograde nailing (86.2 ± 10.6) than the plating group (63.8 ± 9.4) which was statistically significant. **Conclusion:** In our study functional results trended toward better outcomes in retrograde femoral nails than plates in terms of knee flexion, early weight bearing, time to union, blood loss, operative time.

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

Introduction

Extra articular distal femur is more prone to fracture in nowadays due to modern life-style with high velocity transportation. The incidence of Extra articular distal femur fractures is 1 around 37/ 100000 patients per year (1). In older people with weak bone due to pre existing osteopenia, there will be distal femur fractures from low energy trauma even after a simple fall at ground. Earlier treatment of choice for extra-articular distal femur fracture was conservative which include closed reduction with skeletal 2, 3 traction with or without subsequent cast bracing (2,3) Internal fixation has advantage of early ambulation and early knee range of motion exercise which reduce chance of knee stiffness(4,5). Instead of some advantages of internal fixation, it is criticized for some pre and post operative complications like technical difficulties, implant failure and infections. In the 1980s, distal femur fractures were most commonly treated with an anatomical distal femur non-locking plate. Most commonly use method for the treatment of extra-articular distal femoral fractures still remains debatable. 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 treatment using retrograde nailing and distal femur locking compression plate.

Materials and Methods

This study was conducted in patients aged group in between 18-70 years having type-A distal femur fracture come to orthopaedic OPD and trauma centre, DR. M. K. Shah M.C.R.I, Ahmedabad during the study period from January 2021 to December 2022. It was open ended prospective randomized study. Following were the inclusion and exclusion criteria for the selection of patients in study groups.

Inclusion Criteria

- Age 18-70 years
- 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
- Floating knee
- Gustilo type III open injury
- Patient not giving consent for study
- Patient unfit for Surgery.

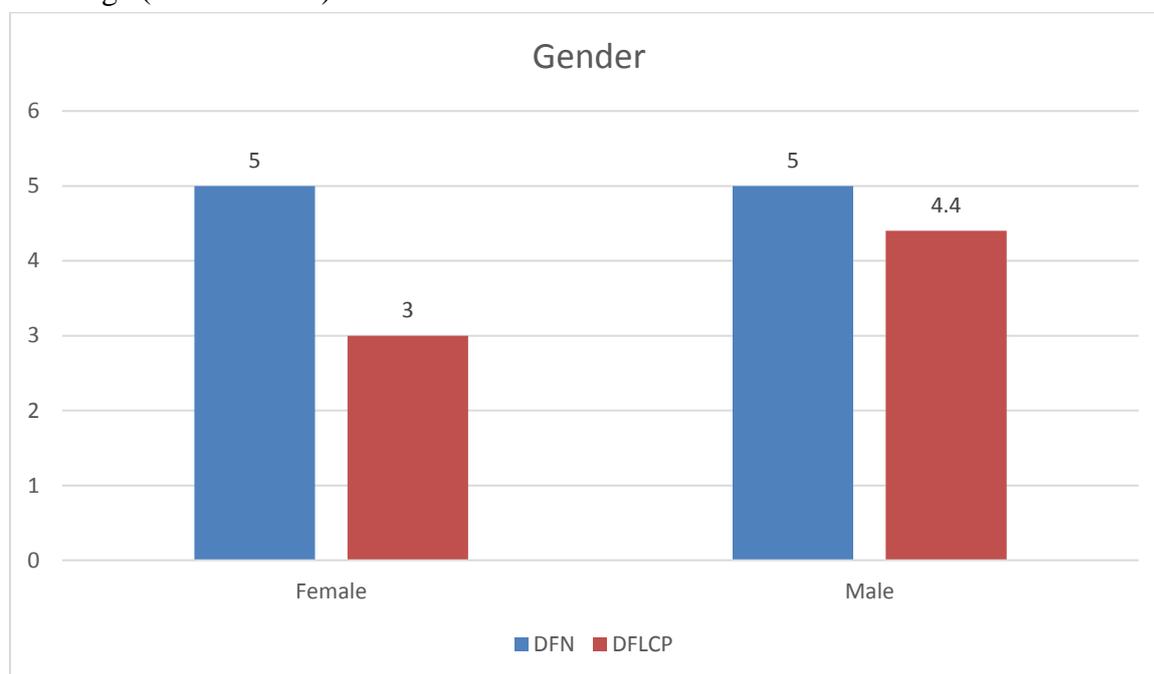
At the time of admission to ward history was taken relating to the age, sex, occupation, mode of injury, past and associated illness. In the ward, patient was treated with below knee skin traction and limb elevation over bohler splint till the time of surgery. Total 20 patients were selected for study and Patients were randomised in to groups-DFN and Group-DFLCP by giving random number. Group-DFN were treated by distal femoral nailing and Group-DFLCP were treated by distal femoral locking plate.

All the patients were operated at operation theatre of orthopaedic department, Dr. M.K. Shah M.C.R.I, Ahmedabad. In Group-DFN, patients were positioned in supine on radiolucent table

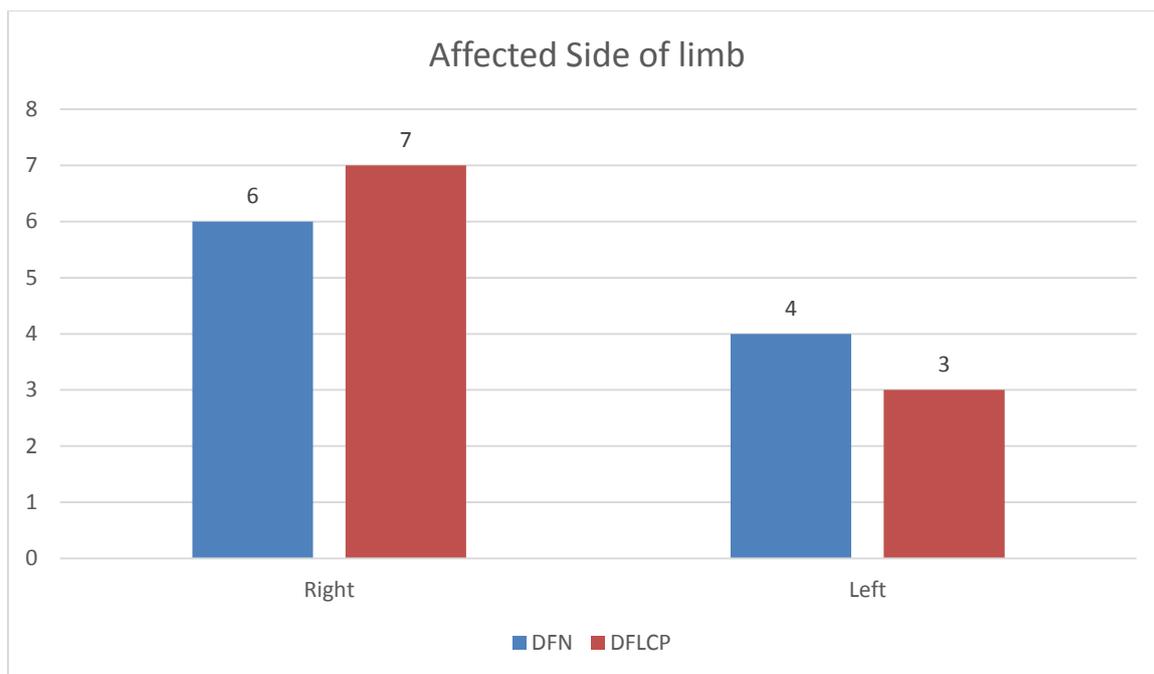
with small bolster below to knee to maintain slight flexion of knee. A small 2-4 cm size incision was made beginning from lower pole of patella and just medial to patellar tendon. Guide pin was placed in center of intercondylar notch just superior to Bluemansaat's line under guidance of IITV AP and lateral xray view. The medullary canal was prepared by reamer and nail of adequate size was inserted. All the cases were statically locked with 2 distal screws and nail was buried 2-3 mm deep to the distal articular cartilage of femur. In the group DFLCP, All patients were positioned supine on a radiolucent table. Open reduction and internal fixation done with distal femoral locking plate using lateral approach.

Results

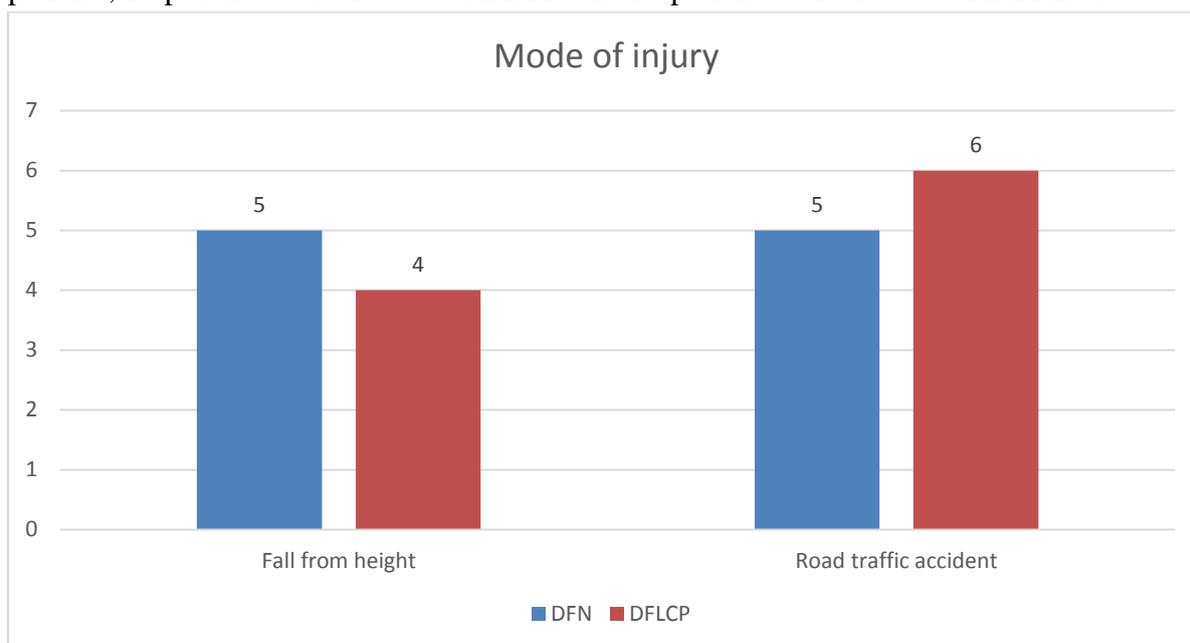
In this present study, 20 cases of extra articular distal femoral fracture were treated at Dr. M. K. Shah M.C.R.I Ahmedabad. All cases were treated with distal femoral nailing or by distal femoral locking compression plating. The age of patients varied from 18 to 70 years with mean age (45.95 ± 15.39).



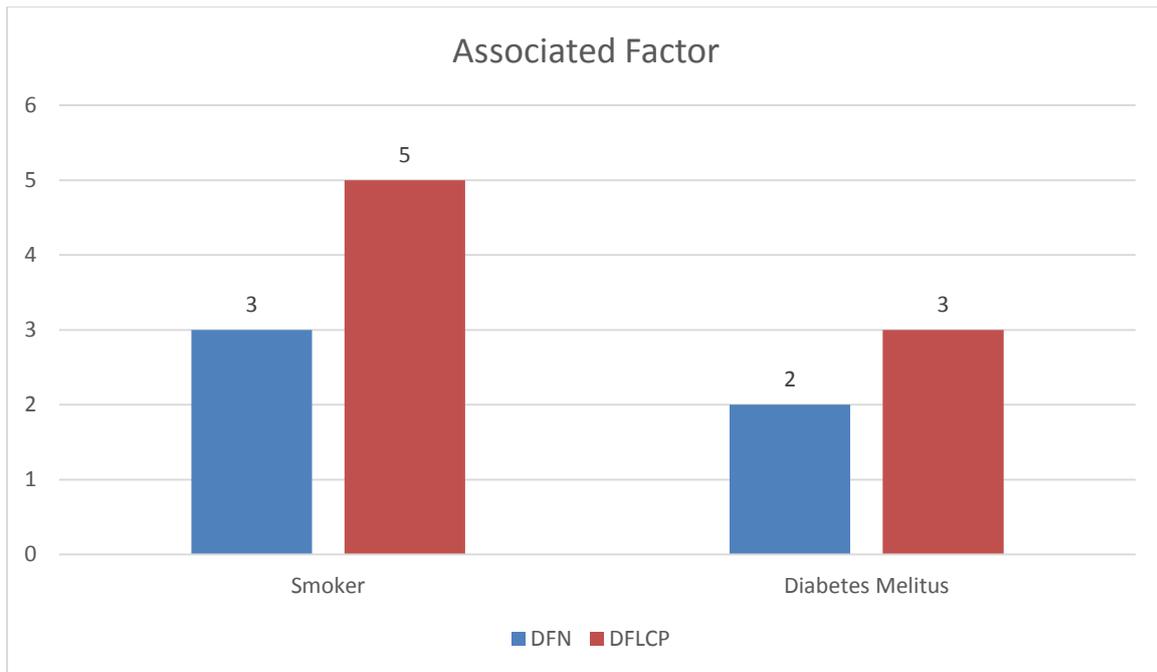
In our study, Out of 8 female patients, 5 female were treated with DFN and 3 female were treated with DFLCP. Out of 12 male patients, 5 male were treated with DFN and 7 male were treated with DFLCP.



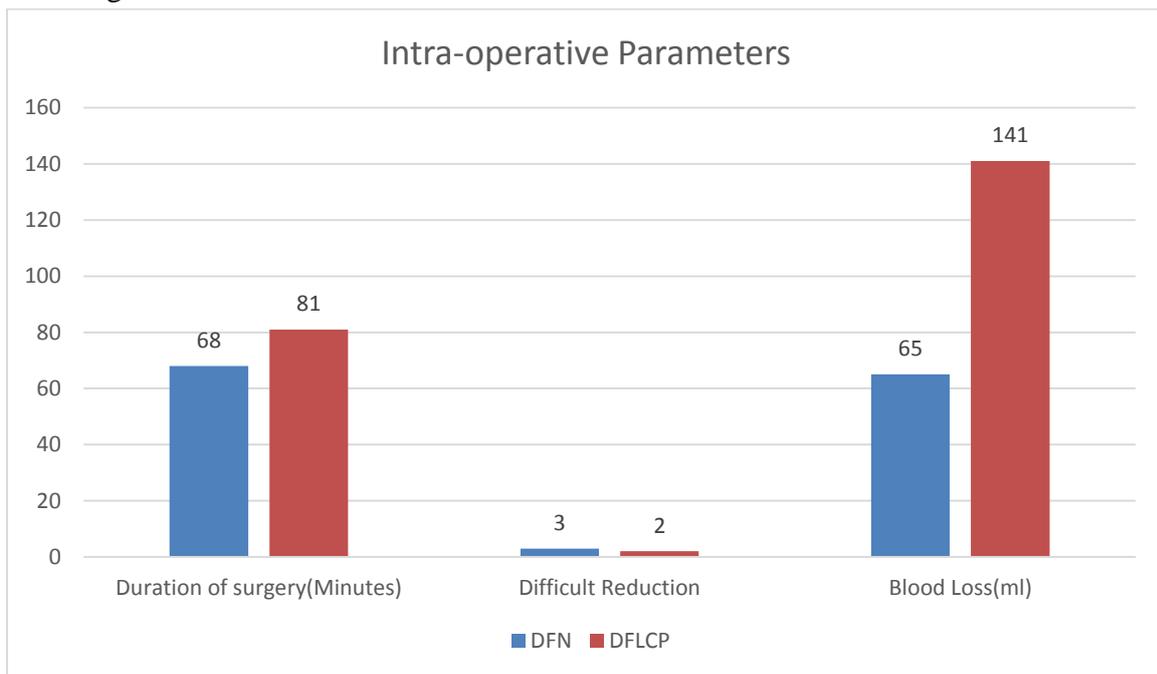
In these studies, most of the people were injured with their right leg than left. Out of 20 patients, 10 patients were treated with DFN and 10 patients were treated with DFLCP.



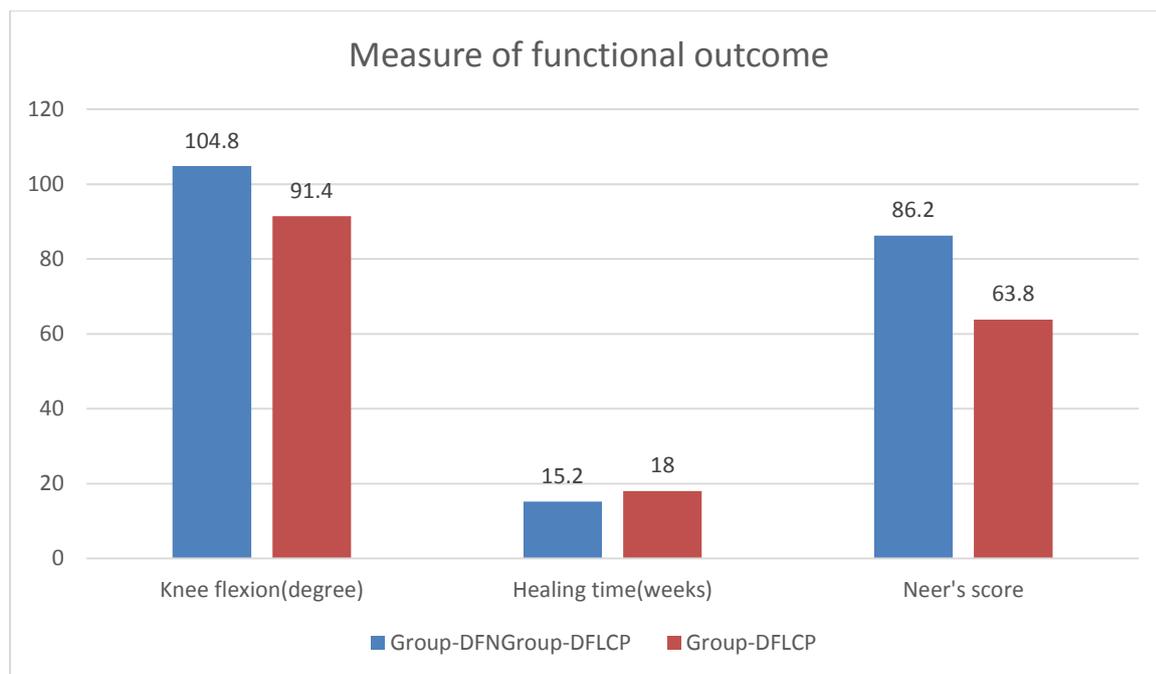
In the present study, more patients were injured due to road traffic accidents as compared to fall from height.



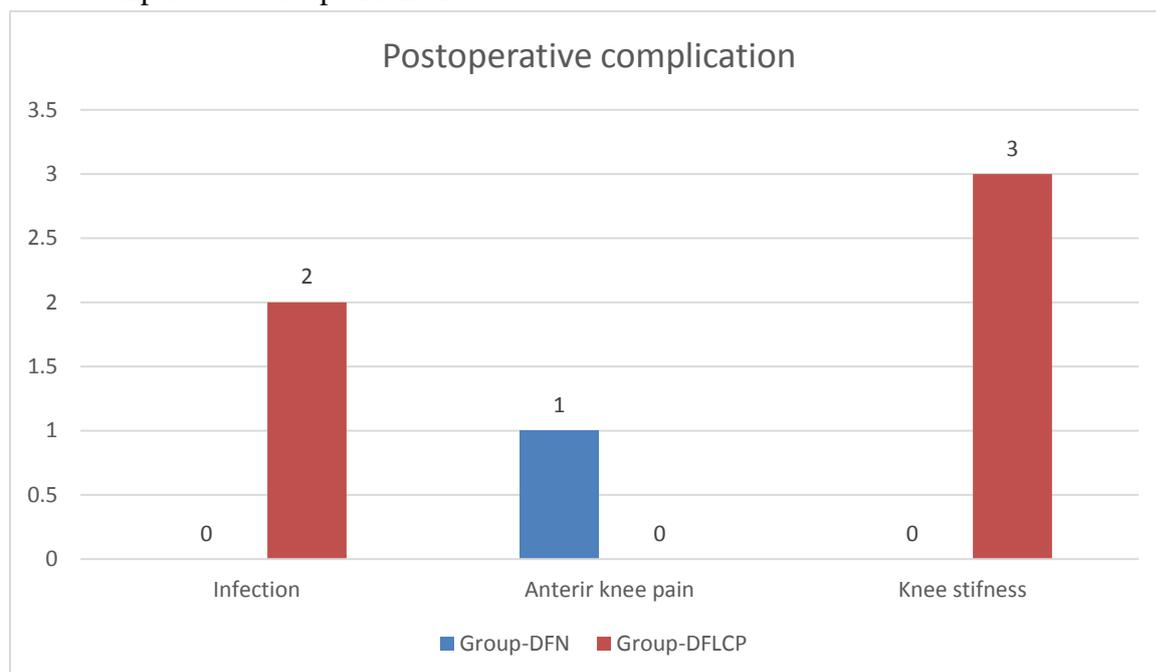
During this study, we observe that, 8 patients have addiction of smoking where 5 patients was suffering from diabetes melitus.



In our study, During DFN surgery duration of procedure, difficulty in reduction and blood loss was lesser compare to DFLCP surgery.



In Post-operative follow-up, patients of group DFN have higher knee flexion and Neer's score compared to Group- DFLCP.



During post-operative period, the Most commonly observe complication was knee stiffness Group -DFLCP which was not seen Group- DFN. In Group DFN ONLY 1 patient was observed with knee stiffness which was gone after few days physiotherapy and analgesic. Mean duration of surgery was 68 ± 12.2 (range 44-92 min) minutes in nailing group comparing to 81 ± 11.6 (range 58-104 min) minutes in plating group which was statistically significant. Average blood loss in nailing group was only 65 ± 10.8 ml (range 43-87 ml) while it was 141 ± 10.3 ml (range 120-162 ml). Difficulty in reduction was faced in 3 cases of nailing and 2 cases of plating.

Average healing time was better in case of nailing (15.2 ± 1.2 weeks) than plating (18 ± 1.4 weeks) (P-value= 0.0001). All fracture were united by 5 months except 2 cases which took 7 months. The mean knee flexion gained was higher in case of nailing than plating and it was found to be statistically significant. Neer's score was 86.2 ± 10.6 (range 65-100) in nailing group while it was 63.8 ± 9.4 (range 45-83) in plating group.

The common postoperative complications are infections and knee stiffness which were higher in case treated with plating (50%). Anterior knee pain was more commonly associated with nailing.

Functional outcome according to neer's scoring system between two groups, group- A (DFN) and group-B (DFLCP) was near to to similar.

Discussion

We found that retrograde femoral nailing for extra articular distal femoral fracture is excellent tool as it provide rigide fixation and early mobilisation. In intra medullary nailing as it is load sharing device and by applying closed means without disturbing the fracture hematoma

Biological fixation is a main advantage. We used Neer's scores because it more focus on important patient outcome variables like pain, function as associated with activities of daily routine life, range of movement, return to work. However, no rating scale is validated is to be superior to other.

Several studies have been conducted for comparison of biomechanical analysis between locked plating and intramedullary implant for distal femur fracture, but comparative studies between these implants In patients have been very few. (6-11).

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 distal femur fracture. Neer [12], Hospital for Special Surgery Score (HSS) [13, 14], Hammer Score [15], Lysholm Gillquist Scoring System (LGSS) [16] 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-0.659). 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. Hoskins *et al.* [15] concluded IMN might 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 extrarticular distal femoral fractures though range of motion was more in case of retrograde distal femoral nail group and it was statistically significant. Multi-center studies with high numbers of patients and with longer duration of follow up will be required to draw useful conclusions.

References:

- 1) Arneson TJ, Melton LJ, Lewallen DG. Epidemiology of diaphyseal and distal femoral fracture in Rochester, Minnesota, Clin Orthop 1988;234:188-94.
- 2) Connolly JF. Closed management of distal femoral fractures. Instr Course Lect. 1987;36:428-437.
- 3) Gates DJ, Alms M, Cruz MM. Hinged cast and roller traction for fractured femur. A system of treatment for the third world. J Bone Joint Surg Br. 1985;76(5):750-756.
- 4) Gurkan V, Orhun H, Doganay M, Salioglu F, Ercan T, Dursun M, *et al.* Retrograde intramedullary interlocking nailing in fractures of the distal femur. Acta Orthop Traumatol Turc. 2009; 43:199-205.
- 5) Smith WR, Ziran BH, Anglen JO, Stahel PF. Locking plates: tips and tricks. J Bone Joint Surg Am. 2007; 89(10):2298-307.
- 6) Bliemel C, Buecking B, Mueller T, *et al.* Distal femoral fractures in the elderly: biomechanical analysis of a polyaxial angle-stable locking plate versus a retrograde intramedullary nail in a human cadaveric bone model. Arch Orthop Trauma Surg. 2015;135(1):49-58. doi:10.1007/s00402-014-2111-8.
- 7) Cegoñino J, Aznar JMG, Doblaré M, Palanca D, Seral B, Seral F. A Comparative Analysis of Different Treatments for Distal Femur Fractures using the Finite Element Method. Comput Methods Biomech Biomed Engin. 2004;7(5):245-6. doi:10.1080/10255840412331307182
- 8) Heiney JP, Barnett MD, Vrabec GA, Schoenfeld AJ, Baji A, Njus GO. Distal Femoral Fixation: A Biomechanical Comparison of Trigen Retrograde Intramedullary (I.M.) Nail, Dynamic Condylar Screw (DCS), and Locking Compression Plate (LCP) Condylar Plate. J Trauma. 2009;66(2):443-9. doi:10.1097/TA.0b013e31815edeb8

- 9) Putineanu D, Com S, Ciobota N-D. Comparative study of mechanical fixation of extreme distal femur fractures with plates and condylar intramedullary nails. UPB Scientific Bulletin, Series D: Mechanical Engineering. 2011;73(2):59-70.
- 10) Wähnert D, Hoffmeier K, Fröber R, Hofmann GO, Mückley T. Distal femur fractures of the elderly—Different treatment options in a biomechanical comparison. *Injury*. 2011;42(7):655-9. doi:10.1016/j.injury.2010.09.009
- 11) Zlowodzki M, Williamson S, Cole P, Zardiackas L, Kregor P. Biomechanical Evaluation of the Less Invasive Stabilization System, Angled Blade Plate, and Retrograde Intramedullary Nail for the Internal Fixation of Distal Femur Fractures. *Journal of Orthopaedic Trauma*.(152)The Archives Of Bone And Joint Surgery. Abjs. Mums. Ac. Ir Volume 10. Number 2. February 2022 Locked Plating Versus Nailing For Distal Femur Fractures 2004;18(8):494–502
- 12) Neer II CS, Grantham SA, Shelton ML. Supracondylar Fracture of the Adult Femur. *The Journal of Bone & Joint*. 1967; 49A:591-613.
- 13) Gao K, Gao W, Huang J, Li H, Li F, Tao J, *Et al*. Retrograde Nailing Versus Locked Plating Of ExtraArticular Distal Femoral Fractures: Comparison Of 36 Cases. *Med Princ Pract*. 2013; 22:161-66.
- 14) Hoskins W, Sheehy R, Edwards ER, Hau RC, Bucknill A, Parsons N, Griffin XL. Nails or plates for fracture of the distal femur? *Bone Joint J*. 2016; 98-B:846-50
- 15) Shetty A, Shetty SK, Ballal A, Hegde A. Retrograde Femur Nailing Versus Locking Plate Fixation for ExtraArticular Distal Femur Fractures: a Comparative Study of Functional and Radiological Outcomes of The Two Techniques. *IJCR*, 2016, 5(3).
- 16) Markmiller M, Konrad G, Südkamp N. Femur-Liss And Distal Femoral Nail For Fixation Of Distal Femoral Fractures: Are There Differences In Outcome And Complications? *Clin Orthop Relat Res*. 2004; 426:252-57.
- 17) Demirtas A, Azboy, Ozkul E. Comparison of retrograde intramedullary nailing and 2 bridge plating in the treatment of extra-articular fractures of the distal femur. *Acta Orthop Traumatol Turc*. 2014; 48(5):521-26.
- 18) Gupta SKV, Govindappa CVS, Yalamanchili RK. Outcome of retrograde intramedullary nailing and locking compression plating of distal femoral fractures in adults. *OA Orthopaedics*. 2013; 1(3):23.
- 19) Hoskins W, Sheehy R, Edwards ER, Hau RC, Bucknill A, Parsons N, Griffin XL. Nails or plates for fracture of the distal femur? *Bone Joint J*. 2016; 98-B:846-50.
- 20) Lujan TJ, Henderson CE, Madley SM, Fitzpatrick DC, Marsh JL, Bottlang M. Locked plating of distal femur fractures leads to inconsistent and asymmetric callus formation. *J Orthop Trauma*. 2010; 24:156-62.
- 21) Herrera DA, Kregor PH, Cole PA, Levy B, Jonsson A, Zlowodzki M. Treatment of acute distal femur fractures above a total knee arthroplasty: Systematic review of 415 cases (1981-2006) *Acta Orthopaedics*. 2008; 79(1):22-27.