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A comparative study of the outcomes of fixation of fractures of distal femoral nailing versus plating

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ABSTRACT

Background: Distal femur fractures have been historically very difficult to treat as they are often comminuted, unstable, more common in elderly or patients having multiple injuries. Hence, we conducted this study to assess the feasibility and the functional outcome of 30 cases of supracondylar fractures of femur, treated with locking compression plates and retrograde intramedullary supracondylar nails.
Methods: All patients of distal femoral fractures were admitted and history was elicited to reveal the mechanism of the injury and the severity of the trauma, site of the incident, circumstances about which the injury occurred, premorbid medical history and preinjury functional status. Post-operatively patients were discharged with advice to continue physiotherapy as advised and to come for follow up after 3 weeks and later 3 months, 6 months,18 months and 24 months.
Results: Among the 30 cases of supracondylar fracture fixed by supracondylar nail 14 had good scores and one was scored as excellent, whereas those fixed by locking compression plate 14 were scored as good and 1 case was scored as fair. There were no intances of surgical wound infections during the immediate postoperative period.
Conclusions: From the observations and results of our study, it can be concluded that the supracondylar nail is more ideal when compared to the distal femoral locking compression plate as it has less operative time, less blood loss, more range of movement, less soft tissue stripping and faster radiological union when compared to the distal femoral locking compression plate.

Keywords: Distal, Femur, Fracture, Locking compression plate, Intramedullary nailing, Supracondylar nailing, Non-union, Malunion, Retrograde nail, Infection

INTRODUCTION

Supracondylar fractures of the femur refer to injuries affecting the lower 15 cm of the femoral shaft, involving both the intercondylar (articular) region and the metaphyseal area of the distal femur.[1] Although they are less prevalent than proximal femoral (hip) fractures, distal femoral fractures account for about 7% of all femoral fractures. When hip fractures are excluded, their incidence rises to approximately 31%, with an estimated annual occurrence of 37 cases per 100,000 individuals. In elderly populations, these fractures usually follow low-energy mechanisms such as minor falls, attributable to osteoporosis and diminished soft tissue resilience. In contrast, younger males—particularly those under 40—often sustain such injuries due to high-energy trauma, which may result in complex fracture patterns, including open and comminuted types.

These injuries are historically difficult to treat due to their frequent instability, complexity, and the presence of associated systemic injuries or advanced patient age. Their proximity to the knee joint further complicates efforts to fully restore joint function, often leading to long-term

morbidity. Complications such as infection, malunion, and delayed union remain significant concerns.[2]

Management of distal femoral fractures remains a demanding task for orthopedic surgeons and typically requires an individualized approach. Decisions must factor in the specific fracture configuration, patient age, bone quality, and soft tissue condition.[3,4] Although multiple internal fixation options exist, no universal consensus has emerged regarding the most effective implant for all fracture types. This study aims to evaluate and compare the clinical and functional outcomes of 30 patients with supracondylar femoral fractures, treated using either distal femoral locking plates or retrograde intramedullary nails. The analysis focuses on patient demographics, fracture features, the advantages and drawbacks of each technique, and the related complication profiles.

METHODS

This prospective study was carried out between 2021 and 2024 at Mallareddy Institute of Medical Sciences. A total of 30 patients diagnosed with supracondylar femur fractures were enrolled. Of these, 15 patients underwent fixation using distal femoral locking compression plates, while the remaining 15 were treated with retrograde supracondylar intramedullary nailing.

Inclusion criteria

Patients presenting with supracondylar fractures of the femur, both male and female patients aged above 18 years, fractures classified as either simple or comminuted, and cases managed surgically with either locking plates or retrograde nailing were included.

Exclusion criteria

Open (compound) supracondylar fractures, fractures accompanied by ipsilateral femoral neck or leg fractures, pathological fractures of the distal femur, patients below 18 years of age, individuals with congenital deformities affecting the femur, patients treated non-operatively due to other medical contraindications, fractures associated with neurovascular injuries, and periprosthetic fractures in the distal femur region were excluded.

Upon hospital admission, a comprehensive clinical history was recorded from either the patient or relatives. This included the mechanism of injury, environmental context of the trauma, existing health conditions, and pre-injury functional status. A thorough clinical examination was performed to assess the patient's systemic health and limb status, focusing on swelling, deformity, skin integrity, crepitus, abnormal movement, neurovascular integrity, and signs of compartment syndrome.

Prior to surgery, all patients underwent a complete medical evaluation, including anesthetic assessment to determine operative fitness. The interval between injury and surgery ranged from several hours to ten days, averaging three days. Surgery was deferred in patients requiring stabilization for polytrauma or other systemic conditions.

All surgeries were performed under spinal anesthesia. Postoperatively, patients were discharged with a structured rehabilitation plan and scheduled for follow-ups at 3 weeks, 3 months, 6 months, 18 months, and 24 months. At each visit, standard radiographs were taken to evaluate fracture union. Functional assessment included range of motion measurements and scoring based on Neer's functional outcome system.

Statistical analysis of the quantitative variables like mean, median was done using IPSS software. Ethical approval for the study was obtained from the Institutional Ethics Committee.

Partial weight-bearing was initiated after six weeks, provided radiological signs of union were present. Full weight-bearing was permitted by the twelfth week, following confirmation of satisfactory bony consolidation on imaging.

RESULTS

Type of injury and fracture pattern

All patients enrolled in the study sustained unilateral distal femoral fractures, with no recorded cases of neurovascular injury or associated trauma. Out of 30 cases, 18 fractures were the result of high-velocity road traffic accidents, while 12 were caused by falls from height (Figure 1). Fractures were classified according to the Müller AO system, with 11 cases as type A1, 8 as type A2, and 11 as type A3 (Figure 2). Patient ages ranged from 30 to 75 years (Figure 3).

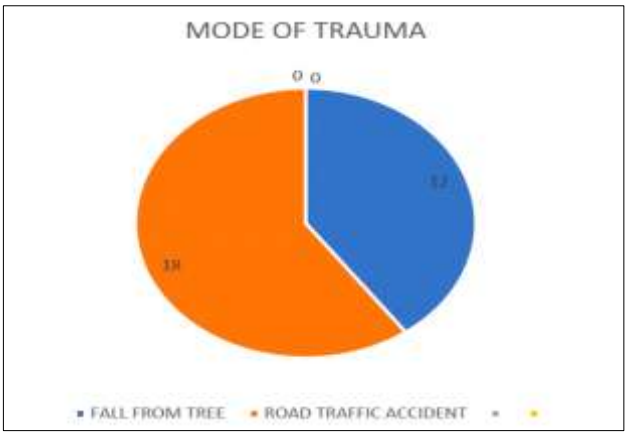

Figure 1: Mode of trauma.

Fracture healing time

Radiological evidence of fracture union was noted in all patients between 11 to 20 weeks postoperatively (Figure 4). On average, fractures treated with retrograde

supracondylar nails united in 14.8 weeks, whereas those fixed with locking compression plates healed in 15.9 weeks, suggesting slightly faster consolidation with nailing.

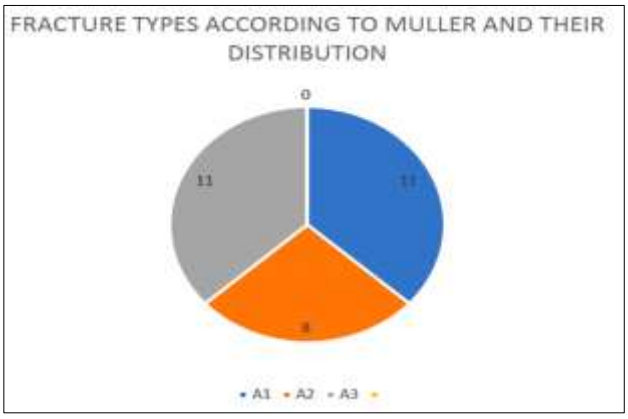

Figure 2: Fracture classification in our study.

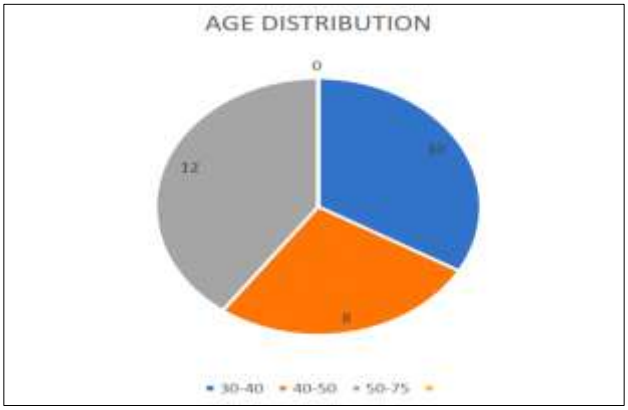

Figure 3: Age distribution of patients in our study.

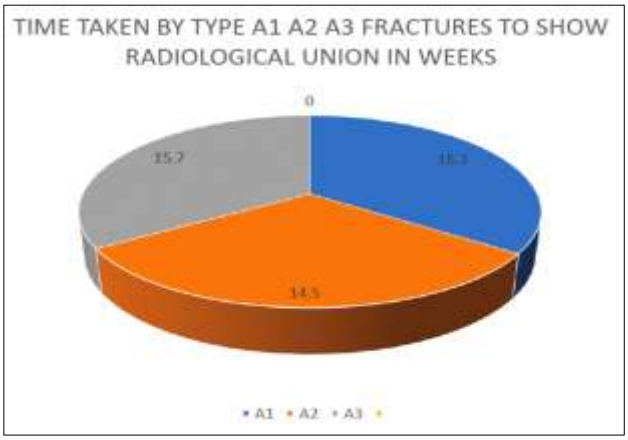

Figure 4: Time taken by type A1, A2 and A3 fractures to show radiological union in weeks.

Postoperative range of motion

Functional mobility was evaluated by assessing active knee flexion. Patients treated with supracondylar nailing tended to achieve better flexion outcomes, particularly in type A1 and A3 fractures (Figure 5).

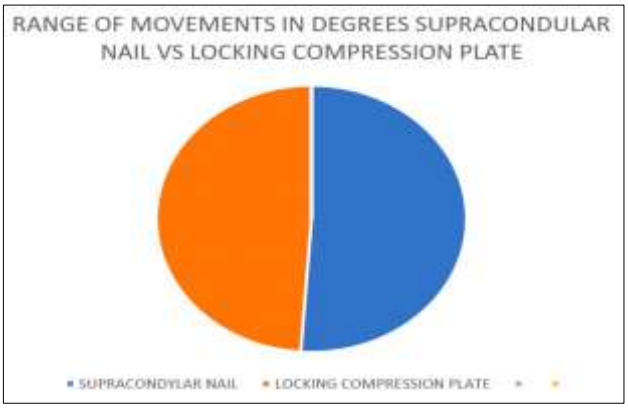

Figure 5: Time taken for radiological union in supracondylar nailing versus plating in weeks in our study.

Functional outcome (Neer's score)

Clinical results were assessed using Neer's scoring system (Figure 6) - type A1: all 6 patients with nailing had favorable outcomes; all 5 plating cases were rated good, type A2: all 3 nailing cases were rated good, and type A3: of the 6 nailing cases, all scored good; in the plating group, 4 were good.

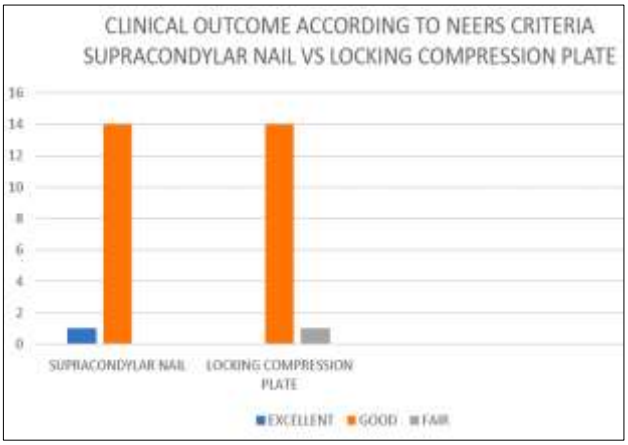

Figure 6: Clinical outcome according to Neer's criteria.

Overall, in the supracondylar nailing group, 14 had good results and 1 excellent result; and in the locking compression plate group, 14 had good results and, 1 had fair outcome.

Hospitalization, complications, and blood loss

Hospital stay

Slightly longer in the nailing group (average 14.9 days) versus the plating group (12.6 days) (Figure 7).

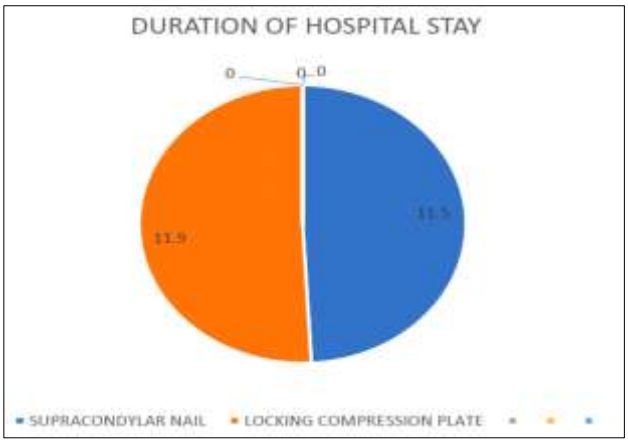

Figure 7: Duration of hospital stay.

Complications

Only one intraoperative issue was reported—a broken drill bit during nailing. No surgical site infections occurred postoperatively, and all patients had a stable recovery.

Blood loss

The nailing group experienced less blood loss, averaging 150 ml, compared to 300 ml in the locking plate group.

DISCUSSION

This study evaluated 30 cases of supracondylar femur fractures to compare the effectiveness of retrograde supracondylar nailing and distal femoral locking compression plating.

The findings indicate that nailing offers distinct advantages, including shorter surgical duration, less intraoperative blood loss, better postoperative knee flexion, minimal disruption of surrounding soft tissues, and faster radiological union, when compared to locking plate fixation.

Pattern of injury and fracture classification

Consistent with current literature, road traffic accidents emerged as the leading cause of supracondylar fractures in this study. Similar observations were made by Kurahatti et al, who reported vehicular trauma in nearly 85% of cases.[5] Other authors, including Daroch and Jillala et al, reported corresponding rates of 96.66% and 56%, respectively.[6,7]

In terms of fracture classification, Müller type A3 fractures were most prevalent in this cohort, accounting for 37% of all cases. This distribution closely mirrors findings by Gellman et al, where type A3 comprised 43%.[8] In contrast, Lucas et al noted a higher proportion of type A2 fractures (44%), reflecting potential differences in trauma patterns, patient age, and energy of impact across populations.[9]

Radiological healing and time to union

Fracture union was radiologically confirmed in all cases within 11 to 20 weeks (Figure 4), with average healing times of: 16.1 weeks for type A1, 14.5 weeks for type A2, and 15.7 weeks for type A3.

These outcomes are favorable compared to previous reports. For example, Kurahatti et al reported an average union time of 24 weeks with plating, whereas Pascarella et al and Virk et al reported healing at 16.3 weeks and 19 weeks, respectively.[5,10,11]

Studies by Daroch and Jillala showed average union times of 14 weeks and 15.6 weeks, aligning closely with the present study.[6,7] Comparatively, Acharya and Rathi reported union at 19–24 weeks, particularly in plating groups, while Jillala's findings in the nailing cohort revealed faster healing at 13.4 weeks.[12,13]

These variations may stem from biological advantages of intramedullary nailing, including preservation of periosteal blood supply, reduced soft tissue handling, and central biomechanical support, all of which facilitate early bone consolidation.

Functional outcomes and Neer's scoring

Based on Neer's scoring system, functional recovery was generally favorable (Figure 6) - nailing group: 14 patients rated good, and 1 rated excellent, and plating group: 14 patients rated good, and 1 rated fair.

These results, although positive, show slightly lower percentages of excellent outcomes than prior studies. For instance: Kurahatti et al reported excellent scores in 56.6% (LCP) and 51.7% (nailing), Daroch et al found 33.34% excellent outcomes in the LCP group, Virk and Acharya reported 80% and 77% excellent results, respectively, and Rathi documented a 50% rate of excellent results.[5,6,11-13]

These disparities could be due to variability in fracture complexity, rehabilitation compliance, surgeon experience, and subjective interpretation of outcome scores. Nevertheless, our findings reinforce that both fixation methods are clinically effective, with nailing offering a slight edge in early mobility and union times.

Hospitalization, complications, and intraoperative considerations

In our study, intraoperative blood loss was significantly lower in the nailing group, contrasting with earlier research where nailing was sometimes associated with higher bleeding volumes.

Christodoulou et al, comparing SCN with DCS, concluded that nailing reduced both blood loss and operative time.[15] Similarly, Hartin et al noted that implant removal

following nailing could lead to increased pain during revision surgeries.[16]

Biomechanical insights were provided by Koval et al, who evaluated three fixation constructs (retrograde nail, Russell-Taylor nail, and condylar plate).[17] They emphasized that locked plate constructs with buttress support offer strong mechanical fixation.

In a separate comparative study, Duffy et al found the LISS plating system to have superior biomechanical strength over conventional implants.[18]

Despite the ongoing evolution of plating technologies, retrograde nailing remains a robust choice, particularly for fractures amenable to closed or minimally invasive fixation. Its advantages include shorter operative time, reduced soft tissue damage, less blood loss, and encouraging early functional outcomes, as demonstrated in this cohort.

CONCLUSION

Supracondylar femoral fractures pose a notable challenge in orthopedic practice due to the high mechanical stresses sustained at the distal femur, even under limited patient mobility. Effective surgical management demands adherence to principles outlined by the AO-ASIF system, including indirect reduction techniques, interfragmentary compression, minimal disruption to soft tissues, and the use of bone grafts when necessary to enhance healing.

Based on the clinical and radiological outcomes observed in this study, retrograde supracondylar nailing demonstrated distinct advantages over distal femoral locking compression plating. These benefits included shorter operative time, lower intraoperative blood loss, better postoperative range of motion, minimal soft tissue stripping, and faster radiographic union. These findings support the use of supracondylar nailing as a preferred fixation method in appropriately selected cases.

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REFERENCES

1. Whittle AP, Wood II GW. Campbell's operative orthopedics. Fractures of Lower Extremity. J Bone Joint Surg. 2003;85(7):1414.
2. O' Brien PJ, Meek RN, Blachut PA, Broekhuyse HM. Fractures of the distal femur: Rockwood and Green's Fractures in Adults. Lippincott Williams and Wilkins. 2001;2:5.
3. Seifert, J, Stengal D, Matthes G, Hinz P, Ekkernkamp A, Ostermann, PAW, et al. Retrograde Fixation of Distal Femoral Fractures: Results Using a New Nail System. J Orthop Trauma. 2003;17(7):488-95.
4. Stewart MJ, Sisk TD, Wallace SL. Fractures of the distal third of the femur. J Bone Joint Surg. 1966;48A:784-807.
5. Kurahatti A, Prabhu E, Naik S, Arun HS. Distal femur fracture, a comparative study of locking compression plate versus distal femur nail. Int J Orthop Sci. 2019;5(2):793-8.
6. Daroch MS, Vashisht D, Sreen S. Management of intra-articular fracture of distal femur with LCP and Lag screws in adults. Int J Res Med Sci. 2017;5(4):1434-8.
7. Jillala SR, Ahmed SMW, Shruthi A, Gajul R, Katikitala A, Rakesh K. A Comparative Study of Supracondylar Nail versus Locking Compression Plate in Distal Femur Fractures. Ann Int Med Dent Res. 2017;3(4):35-41.
8. Gellman RE, Paiement GD, Green HD, Coughlin RR. Treatment of supracondylar femoral fractures with a retrograde intramedullary nail. Clin Orthop Relat Res. 1996;(332):90-7.
9. Lucas SE, Seligson D, Henry SL. Intramedullary supracondylar nailing of femoral fractures: A preliminary report of the GSH Supracondylar Nail. Clin Orthop. 1993;296:200-6.
10. Pascarella R, Bettuzzi C, Bosco G, Leonetti D, Dessi S, Forte P, et al. Results in treatment of distal femur fractures using polyaxial locking plate. Strat Traum Limb Recon. 2014;9:13-8.
11. Virk JS, Garg SK, Gupta P, Jangira V, Singh J, Rana S. Distal Femur Locking Plate: The Answer to All Distal Femoral Fractures. J Clin Diagnost Res. 2016;10(10):1-5.
12. Acharya KN, Rao MR. Retrograde nailing for distal third femoral shaft fractures: a prospective study. J Orthop Surg. 2006;14(3):253-8.
13. Stewart MJ, Sisk TD, Wallace SL, Sidney L. Fractures of distal femur a compression method of treatment - A comparison of methods of treatment. J Bone Joint Surg. 1966;48(4):784-807.
14. Gellman RE, Paiement GD, Green HD, Coughlin RR. Treatment of supracondylar femoral fractures with a retrograde intramedullary nail. Clin Orthop Relat Res. 1996;(332):90-7.
15. Christodoulou A, Terzidis I, Ploumis A, Metsovitis S, Koukoulidis A, Toptsis C. Supracondylar femoral fractures in elderly patients treated with the dynamic condylar screw and the retrograde intramedullary nail: a comparative study of the two methods. Arch Orthop Trauma Surg. 2005;125(2):73-9.
16. Hartin NL, Harris I, Hazratwala K. Retrograde nailing versus fixed-angle blade plating for supracondylar femoral fractures: A randomized controlled trial. ANZ J Surg. 2006;76:290-4.

17. Koval KJ, Kummer FJ, Bharam S, Chen D, Halder S. Distal femoral fixation: A laboratory comparison of the 95 degree plate, antegrade and retrograde inserted reamed intramedullary nails. J Orthop Trauma. 1996;10:378-82.
18. Duffy P, Trask K, Hennigar A, Barron L, Leighton RK, Dunbar MJ. Assessment of fragment micromotion in distal femur fracture fixation with RSA. Clin Orthop Relat Res. 2006;448:105-13.

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