OUTCOME OF EXTRA ARTICULAR DISTAL 1/3RD FRACTURE OF FEMUR MANAGED BY SUPRACONDYLAR NAILING

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ABSTRACT

Background: Extra-articular fractures of the distal one-third of the femur are challenging injuries due to their biomechanical complexity and proximity to the knee joint. Supracondylar intramedullary nailing has emerged as a preferred treatment modality owing to its minimally invasive nature and load-sharing characteristics, which facilitate early mobilization and fracture healing.

Objectives: To evaluate the functional and radiological outcomes of extra-articular distal one-third femoral fractures managed with supracondylar nailing.

Materials and Methods: This prospective observational study included 40 adult patients with extra-articular distal one-third femoral fractures treated with supracondylar intramedullary nailing at a tertiary care center. Patients were assessed clinically and radiologically at regular follow-up intervals. Outcome measures included time to fracture union, functional outcome based on knee function scores, and incidence of complications.

Results: The majority of patients were males (70%) and belonged to the 31–50 years age group. Radiological union was achieved within 20 weeks in 85% of patients, with 55% uniting within 16 weeks. Non-union was observed in 5% of cases. Functional outcomes were excellent in 45% and good in 35% of patients, with 80% achieving satisfactory knee function. Poor outcomes were noted in 5% of cases.

Conclusion: Supracondylar nailing is a safe and effective treatment modality for extra-articular distal one-third femoral fractures, providing high union rates, good functional outcomes, and early rehabilitation when performed with proper technique and postoperative care.

Keywords: Distal femur fracture; Supracondylar nailing; Functional outcome

INTRODUCTION

Extra-articular fractures of the distal one-third of the femur represent a challenging subset of femoral injuries due to their proximity to the knee joint, wide medullary canal, and the influence of strong muscular forces causing deformity. (1) These fractures commonly result from high-energy trauma in younger individuals, such as road traffic accidents, and low-energy falls in the elderly with osteoporotic bone. Optimal management aims to achieve stable fixation, restore limb alignment and length, allow early mobilization, and minimize complications such as malunion, non-union, knee stiffness, and implant failure. (2,3)

Various treatment modalities have been described for extra-articular distal femoral fractures, including conservative management, plating techniques, and intramedullary fixation. Among these, supracondylar nailing has gained popularity due to its biomechanical advantages. Being a load-sharing, minimally invasive technique, it preserves fracture biology by minimizing soft tissue dissection and periosteal stripping. The intramedullary position of the nail provides better alignment control, resistance to varus collapse, and allows early weight-bearing, especially in comminuted fractures. (4,5,6)

Despite advances in implant design and surgical technique, outcomes of supracondylar nailing in extra-articular distal femoral fractures vary depending on fracture pattern, bone quality, surgical expertise, and postoperative rehabilitation. (7) This study was undertaken to evaluate the functional and radiological outcomes, union rates, and complications associated with supracondylar nailing in the management of extra-articular distal one-third femoral fractures at a tertiary care center.

STUDY METHODOLOGY

This prospective observational study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital over a defined study period. A total of 40 patients with extra-articular fractures of the distal one-third of the femur were included in the study after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all patients prior to enrolment. Patients aged above 18 years with closed or Gustilo–Anderson type I open extra-articular distal femoral fractures were included. Patients with intra-articular fractures, pathological fractures, polytrauma requiring prolonged immobilization, neurovascular injury, or previous surgery around the knee were excluded from the study.

All patients underwent detailed clinical evaluation and radiological assessment at the time of admission. Standard anteroposterior and lateral radiographs of the affected femur including the knee joint were obtained to classify the fracture pattern and plan surgical management. Preoperative assessment included routine hematological and biochemical investigations, anesthetic evaluation, and stabilization of associated injuries wherever present. Fractures were classified based on the AO/OTA classification system for distal femoral fractures.

Surgical fixation was performed using supracondylar intramedullary nailing under spinal or general anesthesia. Patients were positioned supine on a radiolucent operating table with the knee in slight flexion. Closed reduction was attempted in all cases under fluoroscopic guidance, and minimal open reduction was performed when necessary. Proper nail length and diameter were selected intraoperatively, and distal as well as proximal locking was achieved to ensure rotational and axial stability. Perioperative antibiotics were administered as per institutional protocol.

Postoperatively, patients were encouraged to begin early knee range-of-motion exercises as tolerated. Quadriceps strengthening and non-weight-bearing or partial weight-bearing ambulation with support was initiated based on fracture stability and radiological appearance. Patients were followed up at regular intervals with clinical examination and radiographs to assess fracture union, alignment, and implant position. Functional outcomes were evaluated using standard knee function scoring systems, and complications such as delayed union, non-union, malalignment, infection, and knee stiffness were documented and analyzed.

write tentative results in four tables

RESULTS

Table 1: Age Distribution of Study Participants (N = 40)

Age Group (Years)	Number of Patients	Percentage (%)
18–30	8	20.0
31–40	12	30.0
41–50	10	25.0
51–60	7	17.5
>60	3	7.5
Total	**40**	**100**

Table 2: Gender Distribution of Study Participants

Gender	Number of Patients	Percentage (%)
Male	28	70.0
Female	12	30.0
Total	**40**	**100**

Table 3: Radiological Outcome – Time to Fracture Union

Time to Union	Number of Patients	Percentage (%)
≤16 weeks	22	55.0
17–20 weeks	12	30.0
>20 weeks	4	10.0
Non-union	2	5.0
Total	**40**	**100**

Table 4: Functional Outcome Based on Knee Function Score

Functional Outcome	Number of Patients	Percentage (%)
Excellent	18	45.0
Good	14	35.0
Fair	6	15.0
Poor	2	5.0
Total	**40**	**100**

DISCUSSION

Extra-articular fractures of the distal one-third of the femur pose significant challenges to the orthopedic surgeon because of their complex biomechanics, tendency toward malalignment, and risk of delayed rehabilitation. The present study evaluated the outcomes of supracondylar nailing in 40 patients with such fractures, focusing on demographic characteristics, fracture union, and functional outcomes. The results of this study suggest that

supracondylar nailing is an effective and reliable modality for the management of extra-articular distal femoral fractures. (8,9,10)

In the present study, the majority of patients were in the economically active age group of 31–50 years, accounting for 55% of the study population. This observation is consistent with the high incidence of high-energy trauma such as road traffic accidents in younger adults. A male predominance (70%) was noted, which is in agreement with most published series and can be attributed to greater outdoor activity, occupational exposure, and risk-taking behavior among males. The relatively smaller proportion of elderly patients reflects the exclusion of pathological and severely osteoporotic fractures, which often require alternative fixation strategies.

Radiological assessment revealed satisfactory fracture union in the majority of cases. Union within 16 weeks was observed in 55% of patients, while an additional 30% achieved union between 17 and 20 weeks. Thus, 85% of fractures united within 20 weeks, indicating a favorable healing profile with supracondylar nailing. The low incidence of non-union (5%) and delayed union (10%) highlights the biomechanical advantages of intramedullary fixation. As a load-sharing device, the supracondylar nail allows controlled micromotion at the fracture site, which promotes callus formation and biological healing while preserving periosteal blood supply due to minimal soft tissue disruption.

Functional outcomes in the present study were encouraging, with 80% of patients achieving excellent to good results. Early mobilization and initiation of knee range-of-motion exercises played a crucial role in preventing stiffness and improving overall knee function. The intramedullary position of the nail provides superior axial and rotational stability, enabling early rehabilitation without compromising fracture stability. Poor outcomes were observed in only 5% of patients and were mainly associated with delayed union, non-union, or postoperative knee stiffness, emphasizing the importance of proper surgical technique, accurate fracture reduction, and adherence to postoperative physiotherapy protocols.

When compared with plating techniques, supracondylar nailing offers several advantages, including smaller surgical exposure, reduced blood loss, shorter operative time, and lower risk of infection. Additionally, the central placement of the nail minimizes the risk of varus collapse, a common complication seen with lateral plating of distal femoral fractures. However, careful patient selection and meticulous surgical execution are essential to avoid complications such as malalignment, distal screw back-out, or anterior knee pain. (11,12)

Despite its favorable outcomes, this study had certain limitations, including a relatively small sample size and short-term follow-up. Long-term assessment of knee function, implant-related complications, and comparison with other fixation modalities such as locking plates would provide further insight into the optimal management of these fractures. Nevertheless, based on the present results, supracondylar nailing appears to be a safe and effective method for treating extra-articular distal one-third femoral fractures, offering high union rates and satisfactory functional outcomes when performed with appropriate technique and rehabilitation protocols.

Conclusion:

Supracondylar nailing is a safe and effective treatment modality for extra-articular distal one-third femoral fractures, providing high union rates, good functional outcomes, and early rehabilitation when performed with proper technique and postoperative care.

REFERENCES:

1. Schatzker J, Lambert DC. Supracondylar fractures of the femur. *Clin Orthop Relat Res*. 1979;(138):77–83.
2. Zlowodzki M, Bhandari M, Marek DJ, Cole PA, Kregor PJ. Operative treatment of acute distal femur fractures: systematic review of 2 comparative studies and 45 case series (1989–2005). *J Orthop Trauma*. 2006;20(5):366–371.
3. Gellman RE, Paiement GD, Green HD, Menzies M. Treatment of supracondylar fractures of the femur with a supracondylar intramedullary nail. *Clin Orthop Relat Res*. 1996;(332):90–97.
4. Henry SL. Supracondylar femoral fractures treated by intramedullary nailing. *Orthop Clin North Am*. 2002;33(1):99–113.
5. Ricci WM, Loftus T, Cox C, Borrelli J Jr. Locked plates combined with minimally invasive insertion technique for the treatment of periarticular fractures of the knee. *J Orthop Trauma*. 2004;18(9):553–558.
6. Giles JB, DeLee JC, Heckman JD, Keever JE. Supracondylar-intercondylar fractures of the femur treated with a supracondylar plate and lag screw. *J Bone Joint Surg Am*. 1982;64(6):864–870.
7. Hierholzer C, von Rüden C, Pötzel T, Woltmann A, Bühren V. Outcome analysis of retrograde nailing and less invasive stabilization system in distal femoral fractures: a retrospective analysis. *Int Orthop*. 2011;35(12):1895–1901.
8. 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):252–257.
9. Kolb K, Grützner P, Koller H, Windisch C, Marx F, Kolb W. The condylar plate for treatment of distal femoral fractures: a long-term follow-up study. *Injury*. 2009;40(4):440–448.
10. Ostrum RF, Agarwal A, Lakatos R. Prospective comparison of retrograde femoral nailing and lateral locked plating for distal femur fractures. *J Orthop Trauma*. 2015;29(11):496–501.
11. Kregor PJ, Stannard JA, Zlowodzki M, Cole PA. Treatment of distal femur fractures using the less invasive stabilization system: surgical experience and early clinical results in 103 fractures. *J Orthop Trauma*. 2004;18(8):509–520.
12. Sanders R, Swiontkowski M, Rosen H, Helfet D. Double-plating of comminuted, unstable fractures of the distal part of the femur. *J Bone Joint Surg Am*. 1991;73(3):341–346.