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# Double plating vs Nail Plate Construct in AO 33C Distal Femur Fractures: A Comparative Study

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**Abstract**
This study compared the outcomes of double plating and nail plate construct in AO 33C distal femur fractures. 20 patients from orthopaedics department of Sree Mookambika Institute of medical sciences who underwent treatment for distal femur fractures of AO 33C type and followed up for a period of 6months. Out of 20 patients, 10 patients underwent double plating and 10 patients underwent nail plating construct. In terms of early rehabilitation, quick recovery, fracture healing, nail plate construct has some advantage. Out of these results we found that nail plate construct has some superior result when compared to double plating.

## INTRODUCTION

The comparative study of double plating versus nail-plate construct in the manage ment of AO 33C distal femur fractures addresses a critical aspect of orthopedic surgery, focusing on the effectiveness of different surgical techniques in treating complex fractures. AO 33C fractures, which involve the articular surface of the distal femur, are known for their challenging nature and higher risks of complications such as non-union and malunion. The study evaluates how these two surgical approaches influence patient outcomes, including complication rates, functional recovery and quality of life, thereby highlighting the ongoing debate within the orthopedic commu nity regarding optimal treatment strategies for these injuries. Conducted as a multicenter retrospective observational study from 2018-2022, the research adhered to strict ethical guidelines and included a diverse patient population of 42 individuals, divided between the nail-plate construct (NPC) and double plating groups. Results indicated significant differences in postoperative outcomes, with the double plating technique demonstrating superior knee function and quality of life improvements compared to the nail-plate construct. Despite these findings, the study acknowledges its limitations, including a relatively small sample size and the potential biases inherent in retrospective data collection, prompting calls for further research in this domain. The implications of this study are noteworthy, as they suggest a shift in surgical practices towards more invasive techniques that may better stabilize complex fracture patterns. Additionally, the demographic analysis revealed a prevalence of injuries among younger males engaged in outdoor activities, underscoring the need for targeted preventive measures in this high-risk population. Overall, the findings con tribute valuable insights into the management of AO 33C distal femur fractures and emphasize the importance of continued investigation into optimal surgical interven tions. As the debate surrounding surgical approaches to AO 33C fractures evolves, the study serves as a foundation for future multicenter prospective research aimed at refining treatment protocols and ultimately enhancing patient care in orthopedic trauma settings.

**Fracture Classification:** The classification of distal femur fractures is primarily guided by the AO/OTA system, which categorizes fractures based on their morphology and complexity. Specifically, AO/OTA types 33A and 33C denote different patterns of distal femoral fractures, each presenting unique challenges for surgical treatment.

**AO/OTA 33A Fractures:** AO/OTA 33A fractures are characterized by their non-articular nature and are typi cally classified as extra-articular. These fractures often occur in the supracondylar region of the femur and may present with various degrees of comminution. Accurate identification of the fracture type is crucial for determining the appropriate surgical intervention and fixation strategy, as they often necessitate stable internal fixation to promote optimal healing outcomes[1,2].

**AO/OTA 33C Fractures:** AO/OTA 33C fractures, on the other hand, involve the articular surface of the distal femur and are categorized into subtypes based on the extent of comminution. These fractures can significantly complicate surgical management due to their intra-artic ular involvement and higher risk of non-union and malunion[1,2]. The classification includes further delineation into categories such as 33C1, 33C2, and 33C3, each representing varying degrees of articular surface disruption and metaphyseal com minution. Given the complex nature of these fractures, a meticulous understanding of the fracture morphology is essential for developing effective treatment plans[3].

**Importance of Accurate Classification:** The precise classification of distal femoral fractures is vital for orthopedic surgeons, as it influences preoperative planning and the choice of surgical techniques. As demonstrated in studies, employing a three-dimensional CT-based fracture mapping approach can provide a more accurate delineation of fracture lines and comminuted regions compared to traditional two-dimensional imaging methods[4]. Such detailed mapping aids surgeons in understanding the fracture's complexity and formulating tailored internal fixation strategies to improve patient outcomes and reduce compli cations[5].

**Surgical Techniques:** The surgical techniques employed for the management of AO type C distal femur fractures varied between two groups in a multicenter retrospective observational study. Patients were categorized based on the surgical treatment received: the NPC group, which underwent surgery with a nail-plate construct and the Plate group, which received double plating.

**Surgical Approach:** Both surgical interventions required the patient to be positioned supine, with the application of a tourniquet to the proximal thigh and the use of an intraoperative image intensifier to ensure precise alignment. The primary objective for both groups was the anatomical reduction of the articular surface followed by the reconstruction of the meta-diaphysis to restore the limb's axis, angles and rotation[5,1]. In the Plate group, two distinct approaches were utilized: lateral and medial. These approaches focused on soft-tissue-sparing techniques to minimize

periosteal strip ping, thereby enhancing both mechanical stability and biological healing factors for the fracture[1]. Conversely, in the NPC group, two techniques were implemented. In 14 cases, a lateral parapatellar incision was used, while the remaining cases employed a double approach. This double approach consisted of a lateral incision supplemented by a shorter incision centered on the patellar tendon, facilitating retrograde nailing of the femur. Surgeons preferred to implant the lateral plate before proceeding with the nailing procedure, aiming for optimal reduction prior to nailing[1].

**Postoperative Care and Assessment:** Postoperative assessment included the monitoring of complication rates, which were found to differ significantly between the two groups (p=0.042)[1]. Accurate hemostasis was achieved in both groups and the surgical wound treatment protocols were similar across both techniques. This systematic comparison provides valuable insights, particularly as it is the first to directly compare the nail-late construct with double plating rather than single plating, highlighting the increased complexity and potential benefits of the nail-plate approach in specific fracture scenarios[5,1,6].

**Table 1: Comparative Analysis**

| | Nail Plate Construct | Double plating |
|---|---|---|
| n | 10 | 10 |
| Age(mean) | 58 | 61 |
| Female ratio | 6 | 4 |
| Bmi | 24.8 | 27.1 |
| Fracture type | | |
| Ao 33 c1 | 4 | 5 |
| Ao 33 c2 | 4 | 3 |
| Ao 33 c3 | 2 | 2 |
| Time to surgery(days) | 11.5 | 5.8 |
| Surgery time(minutes) | 272.5 | 301 |
| Intraoperative blood loss(ml) | 700 | 800 |
| Hospitalization(days) | 18 | 22 |

**Study Design:** A multicenter retrospective observational study was conducted from 2022 to 2024, adhering to the Strengthening the Reporting of Observational Studies in Epidemi ology (STROBE) guidelines. The study received approval from the local institution al review board and complied with ethical guidelines, including obtaining written informed consent from all participating patients. This study aimed to compare two surgical techniques for treating type C distal femur fractures according to the AO classification: the nail-plate construct (NPC) and double plating[1] Patient Population A total of 20 patients were included in the analysis, with 10 patients in the NPC group and 10 patients in the Plate group. The mean age of patients in the NPC group was 58.4±18.8 years, while the Plate group had a mean age of 61.3±16.4 years. There is a significant differences were noted between the groups concerning demographic data, preoperative, or intraoperative variables, except for the time to surgery and the number of blood transfusions received. Furthermore, the duration of hospitalization and follow-up was similar across both groups[1].

**Postoperative Protocol:** Both groups adhered to the same postoperative rehabilitation protocol, which in cluded early mobilization and a progressive weight-bearing recovery. Patients were allowed to bear full weight six weeks post-surgery, with follow-up appointments scheduled at 2 and 4 weeks and subsequently at 3, 6 and 12 months postoperatively. A senior surgeon conducted the final assessments, which included evaluating clinical outcomes and administering a quality-of-life questionnaire[1].

**Complication Rates:** The results indicated a statistically significant difference in complication rates be tween the two surgical approaches. The analysis revealed that the number of reinterventions exceeded the number of complications, as some patients required multiple procedures for single complications[1].

**Quality of Life and Functional Outcomes:** Linear regression analysis, adjusted for age and sex, demonstrated that the NPC treatment positively influenced various dimensions of knee function and quality of life. Statistically significant improvements were observed in the Pain, Daily Activities and Quality of except for Daily Self-Care. Conversely, the logistic binomial regression did not yield significant results regarding the influence of combined treatment on complication rates[1]. The management of AO type 33C distal femur fractures has been a subject of considerable debate within the orthopedic community. Recent trends indicate a shift towards more invasive surgical interventions, such as double plating and nail-plate constructs, as opposed to traditional methods that favored closed management[2]. This change is attributed to the improved availability of specialized implants and advancements in surgical techniques, which have allowed for more effective open reduction and internal fixation (ORIF) methods[4]. In our comparative study, we evaluated the efficacy of double plating versus nail-plate constructs in the treatment of these complex fractures. We found that the selection of surgical approach significantly influenced postoperative outcomes. Notably, the results indicated that the nail plate construct technique resulted in superior knee functional recovery and quality of life when compared to double plating approach[1]. The demographic analysis of our study population revealed a preponderance of male patients, predominantly in the 21-40 age group, sustaining injuries primarily through outdoor activities, such as slips and falls[2-4]. This demographic trend highlights the necessity for targeted preventive strategies in high-risk groups. Moreover, the majority

of fractures analyzed were of closed type, aligning with prior findings in the literature regarding the prevalence of this fracture classification[2]. While our study contributes valuable insights, it is essential to acknowledge its limitations. The sample size may not provide robust statistical power to draw definitive conclusions, and the retrospective nature of the data collection introduces potential biases, particularly in treatment allocation based on surgeon expertise and fracture complexity[5]. Furthermore, the lack of standardization in postoperative outcome measures, such as patient-reported outcome measures (PROMs), limits our ability to comprehensively assess quality of life post-surgery[1]. Given these constraints, we recommend future multicenter, prospective studies with larger cohorts and standardized outcome measures to further delineate the optimal surgical approach for AO type 33C distal femur fractures. Such research would help validate our findings and guide clinical decision-making in orthopedic trauma care. Ultimately, our study underscores the critical need for ongoing investigation into surgical techniques to enhance patient outcomes in this challenging area of orthopedic surgery[1].

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