Outcomes of Periprosthetic Distal Femur Fractures by Fixation Construct: A Retrospective Cohort Study

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INTRODUCTION:
Periprosthetic distal femur fractures (PDFF) are becoming more common due to an aging population and increased rates of arthroplasty. These fractures are challenging to treat, especially in elderly patients with poor bone quality and multiple comorbidities, making early weight bearing and avoiding reoperation critical goals. Traditional fixation methods include locked plating and retrograde nailing, though both have shown high revision rates. Recently, combined nail-plate constructs (NPCs) have gained attention for potentially improving union rates and allowing earlier mobilization. However, data on outcomes with NPCs remain limited. This study aims to compare complication and reoperation rates among different fixation strategies. We hypothesize that NPCs will result in fewer returns to the operating room and promote better healing outcomes.
METHODS:
After institutional review board approval, a retrospective review was conducted on adult patients with operatively managed femur fractures from January 2012 to June 2024 at a single Level I trauma center. Patients with an ipsilateral total knee arthroplasty or distal femoral replacement at the time of injury were included if treated with an intramedullary nail (IMN), plate, or NPC. Those managed with revision arthroplasty or with less than 30 days of follow-up were excluded. Fractures were grouped by single vs. dual implant fixation, and primary outcomes included unplanned reoperation, reoperation for bone healing, implant failure, and time to weight bearing. Secondary outcomes included infections, wound dehiscence, and 30-day readmissions. Demographics, comorbidities, injury details, and perioperative data were collected from the medical record. Statistical analysis was performed using chi-square, t-tests, and multivariate regression, with significance set at $p < 0.05$.
RESULTS:
A total of 97 fractures met inclusion criteria, with 58 cases (59.8%) managed using single implant fixation and 39 cases (40.2%) treated with dual implant fixation. The mean patient age was 70.2 years (range 47–95), with an average follow-up duration of 286 days (range 34–3,546), and the majority of patients were female (83.1%). The dual implant group included a significantly higher proportion of female patients compared to the single implant group (87.2% vs. 67.2%, $p = 0.026$). A significantly greater proportion of patients in the dual implant group were allowed to weight bear as tolerated (WBAT) postoperatively (76.9% vs. 32.8%, $p < 0.001$). There were no statistically significant differences between groups in rates of reoperation for bone healing, malunion, wound complications, infections, implant failure or removal, or hospital readmissions.

When comparing specific fixation constructs, NPCs were associated with the highest rates of WBAT compared to IMN or plate fixation (80.8% vs. 48.0% vs. 4.8%, $p < 0.001$). IMN fixation had the lowest overall reoperation rate compared to plate or NPC constructs (16.0% vs. 52.4% vs. 26.9%, $p = 0.025$). Multivariate analysis revealed that both IMN and NPC fixation were independently associated with a reduced risk of unplanned reoperation (IMN: OR = 0.105, $p = 0.005$; NPC: OR = 0.238, $p = 0.037$).
DISCUSSION AND CONCLUSION:
NPCs allowed for immediate weightbearing more frequently than any other fixation construct. Isolated plate fixation had the highest rate of unplanned reoperation. Intramedullary nailing in isolation or in conjunction with plate fixation is recommended when able in distal femur periprosthetic fractures.