

Low Rate of Planned Reoperations after Retrograde Intramedullary Nailing of 33C Femur Fractures

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Introduction: Supracondylar distal femur fractures represent approximately 0.4-1% of all fractures in adult patients, and roughly 3-6% of all femur fractures¹. The treatment of comminuted supracondylar distal femur fractures with intra-articular extension has classically been with lateral locked plating, and thereafter dual-plating and nail-plate combinations gained popularity^{2,3,4}. The technique of open reduction and retrograde intramedullary nailing of these fractures has been described in recent years with early studies reporting good success. The aim of this study was to assess mid- to long-term outcomes of open reduction and retrograde intramedullary nailing of these injuries and determine union and reoperation rates.

Methods: Institutional board review (IRB) approval was obtained prior to initiation of this study. Patients with a AO/OTA 33C1-3 femur fracture treated with a retrograde intramedullary nail at a single level 1 academic trauma center by six attending surgeons between 1/1/2016 and 1/1/2023 were identified. Fractures treated with a lateral distal femoral locking plate, medial and lateral plating, or nail-plate combination constructs were excluded. Medical charts were analyzed to collect patient demographic and surgical data. Radiographs were reviewed to measure coronal and sagittal plane alignment on immediate postop and final follow-up imaging. Patient records were further reviewed to assess for complications, reoperations, and osseous union.

Results: 127 patients (52% males) with 130 complete articular distal femur fractures (3 patients with bilateral fractures) had a mean age of 49.87 years (range, 12-95 years) and mean body mass index (BMI) of 31.86 (range, 17-63) were identified. Motor vehicle crash (MVC)/Motorcycle crash (MCC) was the most common injury mechanism (69 fractures). AO/OTA 33C-3 was the most common fracture pattern (63 fractures), and 41.5% of fractures were open injuries. Mean coronal and sagittal plane alignment at final follow-up were 82.4 and 1.8 (apex posterior) degrees, respectively. There were a total of 30 reoperations postoperatively, with 47% being removal of implants due to irritation or manipulation under anesthesia due to stiffness. One of the patients in the cohort had a total of 18 reoperations, resulting in distal femoral replacement. There were 2 cases of delayed union, and 2 cases of nonunion that required reoperation to achieve osseous union. Mean follow-up was 254.1 days among all patients.

Discussion: Conventionally 33c femur fractures are treated with the lateral plate method with a reoperation rate of roughly 10-22%. There are few other methods currently available to orthopedic surgeons for the treatment of these fractures. This study shows retrograde intramedullary nailing of AO/OTA 33C1-3 femur fractures is a safe and effective treatment option for patients with a low complication rate, low rate of unplanned reoperations, maintenance of alignment, and high rate of osseous union.

Tables and Figures:

Patients (%)	Fractures	Sex (M/F) (%)	Mean Age (Range)	Diabetes (%)	Tobacco Use (%)	Open Injury (%)
127 (100%)	130	66(52%)/61(48%)	49.87 (12-95)	34 (26.8%)	33 (26%)	54 (42.5%)

Table 1 – Above: Patient Demographics

MVC/MCC (%)	Fall <20 Feet (%)	Fall >20 Feet (%)	Ballistic (%)	Auto v Ped (%)	Other (%)
69 (54.3%)	41 (32.3%)	2 (1.6%)	8 (6.3%)	5 (3.9%)	2 (1.6%)

Table 2 – Above: Mechanism of Injury

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SIGNIFICANCE/CLINICAL RELEVANCE: The findings from this study provide basis for the use of retrograde intramedullary nailing for 33C distal femur fractures, resulting in more techniques available for treating this subtype of fracture.

Categorical Submission- Bone (Injury and healing)