

Suprapatellar Intramedullary Nail Technique Lowers Rate of Malalignment of Distal Tibia Fractures

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Purpose/Background: Distal tibia fractures are challenging to align anatomically with infrapatellar intramedullary nail (IMN) techniques with the knee in flexion. Vallier et al reported on radiographic outcomes following treatment with either IMN or plate fixation and found a 23% rate of malalignment in distal tibia fractures treated with an infrapatellar IMN. In a larger trial, Im and Tae identified an 11.7% incidence of angular deformity $>5^\circ$ in the infrapatellar IMN group. Suprapatellar IMN insertion enables the surgeon to maintain the leg in a semi-extended position, which eliminates the challenges associated with knee flexion of the limb required for instrumentation and fixation with infrapatellar IMN techniques. We hypothesize that use of the suprapatellar IMN technique results in lower rates of malalignment following surgical treatment of distal tibia fractures compared to infrapatellar IMN insertion.

Methods: A retrospective review of distal tibia fractures treated with an IMN from 2008 to 2014 at two Level-I trauma centers was completed. Demographic data for each patient were abstracted from chart review. Distal tibia fractures were graded according to the OTA classification scheme on injury radiographs. Patients were grouped into those who underwent either suprapatellar or infrapatellar IMN insertion in fractures located up to 5 cm from the tibial plafond. Anatomic alignment of the tibia was measured on postoperative radiographs on both the AP and lateral views. Acceptable radiographic alignment was defined as $<5^\circ$ in any plane. A trained reviewer not involved in direct care of the study groups graded each radiograph. Statistical analysis was completed using Pearson uncorrected chi-square test. $P < 0.05$ was considered statistically significant.

Results: 266 patients meeting all inclusion criteria were identified. 132 patients underwent suprapatellar IMN, and 134 underwent infrapatellar IMN. The two treatment groups were evenly matched with respect to age, gender, fracture grade, and presence of open fracture. Within the suprapatellar group, the fibula was intact, fixed, and remained fractured in 6 (4.5%), 22 (16.7%), and 104 (78.8%) cases, respectively. The fibula was intact, repaired, and remained fractured in 9 (6.7%), 32 (23.9%), and 93 (69.4%) cases, respectively, in the infrapatellar group. There was no difference in the rate of fibular fixation between groups ($P = 0.2$). Primary angular malalignment $>5^\circ$ occurred in 35 patients (26.1%) with infrapatellar IMN insertion, and in five patients (3.8%) who underwent suprapatellar IMN insertion ($P < 0.0001$).

Conclusion: This is the largest patient series directly comparing the suprapatellar to infrapatellar IMN insertion technique in the treatment of distal tibia fractures. Suprapatellar IMN technique results in a significantly lower rate of malalignment compared to the infrapatellar IMN technique.