Risk Factors for Tibial Plafond Nonunion

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Purpose: Tibial plafond nonunion following open reduction and internal fixation has been reported to occur in 2-10% of patients. The purpose of this study was to identify the risk factors associated with development of tibial plafond nonunion.

Methods: Following IRB approval, we retrospectively reviewed all plafond fractures treated at 2 Level I trauma centers from 2006-2015. We included patients >18 years of age with a minimum of 6 months follow-up. Nonunion was defined as failure to achieve bridging on >3 cortices with clinical pain after 9 months, catastrophic implant failure, or failure of radiographic progression. Patients with a planned bone grafting were not placed in the nonunion group unless the procedure failed. Substantial bone loss was defined as patients who underwent staged bone grafting, received >15 cc bone graft, or had operative reports documenting substantial bone loss. Minimal bone loss was defined as patients who received <15 cc bone graft or had documented minimal bone loss present. We performed univariate analysis on risk factors using chi-square and Student's t test. Using variables with $P < 0.2$ in univariate analysis, we performed step-wise multiple regression modeling looking for factors with $P < 0.05$ for significance.

Results: During the study period, 705 tibial plafond fractures were treated and 509 patients met inclusion criteria. Mean age was 44 years (range, 18-76 years), mean follow-up was 25 months (range, 6-115 months), and there were 71% male patients. 135 fractures were open injuries (135 of 509, 27%). Overall infection rate was 12% (63 of 509), and deep infection rate was 9% (46 of 509). 67 patients (of 509, 13%) developed nonunion, with 44 aseptic nonunions and 13 septic nonunions. Using univariate analysis, comminution zone, OTA 43C fracture, open fracture, varus/valgus presentation, presence of fibula fracture, Weber fibula fracture classification, bone loss, locked plating, and treatment of medial column were all found to be significant. These variables, along with tobacco use, fracture zone, and approach, were included in step-wise analysis. Using regression analysis, we found significant bone loss (odds ratio [OR] = 2.6, 95% confidence interval [CI] 1.8-3.8, $P < 0.001$), failure to treat the medial column (OR = 0.6, 95% CI 0.4-0.9, $P = 0.006$), and tobacco use (OR = 2.1, 95% CI 1.1-3.9, $P = 0.03$) as significant risk factors for tibial plafond nonunion.

Conclusion: Tibial plafond nonunion was 13%. Significant bone loss, failure to treat the medial column, and tobacco use were all significant risk factors for developing nonunion. Approach and locked plating were not significantly associated with plafond nonunion.

See pages 401 - 442 for financial disclosure information.