

The Failed Pilon: Factors Associated with Delayed Amputation, Arthroplasty, or Arthrodesis after Open Reduction and Internal Fixation

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Purpose: Pilon fractures are devastating injuries, with high reported rates of postoperative complications and persistent functional morbidity after open reduction and internal fixation (ORIF). The purpose of this study was to compare factors associated with tibial pilon fractures that failed ORIF, later requiring delayed amputation, arthroplasty, or arthrodesis.

Methods: Study design was a case control with 1:1 matching for controls, by date of surgery. Inclusion criteria included: age >18 years, OTA type 43B or 43C tibial plafond fractures treated with ORIF at a single institution. For the cases, "failure" was defined as amputation, arthrodesis, or arthroplasty performed at greater than 3 months post-ORIF. For controls, a minimum of 3 months of follow-up was needed. Demographic variables were collected, which included: age, gender, race, body mass index (BMI), marital status, diabetes, vascular disease, smoking, alcohol, Workers' Compensation. Injury variables were collected, which included: open versus closed injury, OTA type, vascular injury, radiographic severity score, radiographic alignment, bone loss, impaction, anterior plafond impaction, fibula fracture location. Operative variables were collected, which included: single versus two-stage treatment of the pilon component, and need for flap coverage. Complications of minor (requiring oral antibiotics) or major (requiring operative debridement or intravenous antibiotics) infection were recorded. Univariate analysis was performed for each variable, with odds ratios reported, and significance at $P < 0.05$. Results were entered into stepwise logistic regression for variables with $P < 0.1$.

Results: Between January 2000 and May 2014, 1560 43B or 43C injuries were treated with ORIF. 37 met the inclusion criteria for failure (21 fusion, 9 amputation, 7 arthroplasty) and 37 controls were matched. The average length to follow-up was 764 days (cases) and 452 days (controls). Factors associated with failure were: OTA type (C-type odds ratio [OR] 5.6, $P < 0.01$), two-stage management (OR 5.44, $P = 0.02$), minor infection (OR 7.9, $P = 0.01$), major infection (OR 12.6, $P < 0.01$), radiographic overall severity ($P < 0.001$), radiographic articular severity ($P < 0.001$), plafond impaction (OR 8.14, $P < 0.001$), and anterior plafond impaction ($P < 0.001$). Stepwise logistic regression demonstrated major infection ($P = 0.03$), overall radiographic severity ($P = 0.01$), and anterior impaction ($P = 0.006$) to be most predictive of pilon failure.

Conclusion: Multiple injury factors, including anterior impaction, overall radiographic severity, and major infection, were associated with failure of ORIF of tibial pilon fractures, which required delayed amputation, arthrodesis, or arthroplasty. Early recognition of the injury factors and early intervention, perhaps at the time of injury with a salvage procedure, may improve the reportedly high rates of poor outcomes following these injuries. In addition, patients with infections should be counseled about the severity of their injury.