

**What Are the Major Risk Factors for Nonunion in Pilon Fractures?**

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**Purpose:** Pilon fractures are difficult injuries to manage as they are typically associated with extensive soft-tissue damage. Although staged management of external fixation followed by open reduction and internal fixation is often used to prevent additional soft-tissue damage and its associated complications, rates of nonunion remain high in this patient population. The purpose of this study is to evaluate and identify factors associated with increased rates of nonunion following operative fixation of pilon fractures.

**Methods:** A retrospective review of all operatively managed pilon fractures at a single Level I trauma center from 2014 to 2019 was performed. Minimum 6-month follow-up was required for inclusion. Patients with skeletal immaturity or amputation prior to definitive fixation were excluded. Patients were grouped based on presence or absence of nonunion, which was defined as lack of bridging bone in at least 3 of 4 cortices and the presence of pain with ambulation at 6-month follow-up. Demographics, injury and operative characteristics, and surgical outcomes were compared between the 2 groups.

**Results:** 279 patients met inclusion criteria for the study, with 48 patients displaying nonunion at 6-month follow-up (17.2%). Average follow-up was 3.2 years. Patients with nonunion had a significantly higher rate of open fractures (50.0% vs 22.1%,  $P < 0.001$ ) and more required skin grafts (14.6% vs 5.6%,  $P = 0.029$ ), muscle flap coverage (12.5% vs 2.6%,  $P = 0.002$ ), and bone grafting (25.0% vs 3.9%,  $P < 0.001$ ) compared to controls. Those who developed nonunion had significantly lower rates of medial column fixation (43.8% vs 67.5%,  $P = 0.002$ ) and higher rates of surgical site infection (45.8% vs 7.8%,  $P < 0.001$ ). Rates of AO/OTA 43C fractures (70.8% vs 52.4%) and fractures treated with plates overlapping the site of external fixation (39.5% vs 26.6%) were higher in the nonunion group, but these differences did not reach statistical significance ( $P = 0.064$  and  $P = 0.098$ , respectively). There were no significant differences in demographics, mechanism of injury, Gustilo-Anderson classification, associated ipsilateral lower extremity injuries, surgical approach, or type of fixation between the 2 groups.

**Conclusion:** In the present study, pilon fractures were found to have a nonunion rate of 17.2% at 6-month follow-up. Nonunion was associated with the presence of open fracture, need for soft-tissue coverage or bone grafting, and surgical site infection. Medial column fixation was associated with a lower rate of nonunion in these fractures.