

## Compartment Syndrome in Pilon Fracture Patients: Risk Factors and Sequelae

*Justin Haller MD; Brady Wilkinson MD; John Cade Wheelwright BS; Iain Elliott MD; Michael Githens MD*  
University of Utah, Salt Lake City, UT, United States

**Purpose:** Compartment syndrome (CS) is a rare condition that occurs when limb perfusion pressure is affected by elevated compartment pressures. CS most commonly occurs in patients with tibia and tibial plateau fractures; however, CS has never been studied in pilon fracture patients. The purpose of this study is to identify risk factors associated with CS in pilon fracture patients and compare surgical outcomes.

**Methods:** Following IRB approval, we retrospectively reviewed all tibial plafond fractures (OTA 43-B3 and OTA 43-C) treated at 2 academic Level-I trauma centers from 2006 to 2018. CS was defined as any patient who underwent fasciotomy. Nonunion was defined as failure to achieve cortical bridging on at least 3 cortices on orthogonal radiographs with clinical pain after 9 months, catastrophic failure of implants, and/or failure of radiographic progression on sequential visits a minimum of 2 months apart. We performed a univariate analysis on the factors potentially associated with CS using  $\chi^2$  and Student's t test.

**Results:** During the study period, 708 pilon fractures were treated and 20 patients developed CS (2.8%). There was a significantly higher proportion of males in the CS group (18/20, 90%) as compared to the non-CS group (480/688, 68%) ( $P = 0.05$ ). Other demographic data including age, body mass index (BMI), tobacco-use, diabetes, and mechanism of injury were not different between groups. Bone loss (CS: 15/20, 75% vs non-CS: 270/688, 39%;  $P < 0.001$ ), fracture extension from joint (CS:  $90 \pm 40.5$  vs non-CS:  $65.6 \pm 32.6$ ;  $P = 0.001$ ), and zone of comminution (CS: 22.5 cm; range, 0-62 cm vs non-CS: 0 cm; range, 0-19 cm;  $P = 0.004$ ) were significantly greater in the CS group. Open fracture, syndesmosis injury, varus/valgus presentation were not different between groups. Of 708 pilons, 538 patients had greater than 12 months of follow-up. Patients with CS had slightly higher rates of deep infection (2/18, 11%) as compared to non-CS (44/520, 8%) ( $P = 0.11$ ). Similarly, patients with CS had higher rates of nonunion (4/18, 22%) as compared to non-CS (56/520, 11%) ( $P = 0.06$ ). Rates of amputation, tibiotalar arthrodesis, and total ankle replacement were not different between groups.

**Conclusion:** Compartment syndrome in pilon fracture patients is rare with only 2.8% of patients being diagnosed in our series. Male gender, bone loss, fracture extension from the ankle joint, and zone of fracture comminution were all risk factors for compartment syndrome development. Patients diagnosed with CS had slightly higher infection and nonunion rates.