Preventing deformity in 43C tibia pilon fractures: revisiting conventional wisdom of implant placement

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INTRODUCTION: Tibia pilon fractures are challenging injuries to treat. Surgical goals aim to restore the native axis, joint congruency, while minimizing soft tissue insults. Classic teaching emphasizes critically evaluating the injury film and choosing a primary implant based on the pattern of deformity. Our research question was “does an implant to counteract the initial deforming force prevent malunion or fracture collapse on follow up?”

METHODS: A retrospective review of all tibia pilon fractures surgically treated in a single Level 1 trauma center from 2014-2021 was done. All 43C tibia pilon fractures were screened. Open injuries, fractures treated nonsurgically or with definite external fixation, and patients with less than 6 months follow up were excluded from analysis. We classified the unsplinted, unreduced injury film in the coronal, sagittal and axial planes based on the presenting deformity. We then measured the aLDTA and aADTA on immediate postoperative imaging and at final follow up for comparison. We defined our primary outcome (malunion) as alignment that changed > 5 degrees based on the deformity parameters on either plane.

RESULTS: Our cohort included 143 patients, and we compared two groups: patients who had an implant resisting the initial deformity, and patients who did not have an implant to resist the initial deformity. The most common injury film deformity was an oblique plane deformity. 49% of patients had a valgus deformity, and 44% had a recurvatum deformity in their initial injury film. 100% of patients had shortening. On final follow up, 27% of our entire cohort had a malunion. When comparing the two groups, patients with an implant resisting the initial deformity in the coronal plane (i.e. medial plate for a varus pilon) had a 19% malunion rate vs 36% for those without ($p=0.02$). In the sagittal plane, the rates of malunion were not statistically different (25% with vs 29% without, $p = 0.53$). Fibula pattern and fixation strategy did not change the results.

DISCUSSION AND CONCLUSION: Tibia pilon fractures are devastating injuries that are challenging to treat. Complete articular injuries are particularly challenging because they require restoration of the articular surface in addition to restoration of the native axis. Based on our results it seems that the classic teaching of using plates to resist the initial injury film deformity protects from malunion in the coronal plane, with no difference in the sagittal plane. Fixation of the fibula does not seem to have a role in predicting malunion. Our future research efforts will include analyzing the quality of reduction, patient reported outcomes, and full-length weight bearing imaging.