

Fixation of Tibial Pilon Fractures: Which Side of the Tibia Do I Plate?*Gennadiy Busel, MD; J Tracy Watson, MD; Heidi Israel, PhD, RN;**St. Louis University, Department Orthopaedic Surgery, St. Louis, Missouri, USA*

Purpose: Understanding fibular fracture morphology is crucial for the treatment of pilon fractures. Comminuted fibular fractures (compression failure) occur with the tibial component following a valgus force. Transverse fibular fractures (tension failure) occur with varus stress to the tibial component. No definitive guideline for determining the location of tibial fixation currently exists. We hypothesize that plate fixation on the anterolateral tibia for valgus fibular failures and medial tibial plating for varus fibular fractures will be superior and demonstrate fewer complications.

Methods: Pilon fractures were identified from our database and reviewed with the inclusion criteria for this retrospective study. Pilon fractures were classified with AO/OTA and included 43-A through 43-C fractures. Inclusion criteria included skeletal maturity, presence of an associated fibular fracture, and definitive tibial plating. Primary factors assessed included age, sex, weight, mechanism of injury, fibular fracture type (comminuted or transverse), tibial plate location (medial or lateral), location of open wound (if any), time to definitive fixation, time to full weight bearing, and complications. Patients were grouped based on the fibular component fracture type (comminuted vs transverse), and the location of plate fixation (medial vs lateral) was noted. Clinical outcomes were compared using a chi-square test for nominal data and t test for continuous variables.

Results: 407 patients were identified. 120 fractures in 119 patients (61 men and 58 women) met inclusion criteria with appropriate follow-up. 48 fractures resulted from a varus force (transverse fracture of the fibula) and 72 were due to valgus forces (comminuted fibula). In the transverse fibular fracture group ($n = 48$), 14.3% that were correctly plated medially developed mechanical complications. 83.3% that were incorrectly plated laterally developed mechanical complications ($P \leq 0.001$). For comminuted fibular fracture type (valgus), 35.1% of incorrectly medially plated fractures demonstrated mechanical complications versus 17.1% for fractures correctly stabilized with a lateral plate ($P = 0.083$). Time to weight bearing as tolerated (WBAT) was significant between groups plated medially and laterally for varus (transverse) fibula fractures ($P \leq 0.001$) and (valgus) comminuted fibular fractures ($P = 0.01$) in favor of the appropriately applied plate. Overall rate of nonunion/malunion was 25%, with the majority related to mechanical failures due to incorrect plate location.

Conclusion: Correctly assessing the fibular component for pilon fractures provides valuable information regarding deforming forces. Using this as a guide for correct tibial component plate location can minimize mechanical failures and malunion/nonunion. Soft-tissue injury remains an important factor in determining surgical approach; however, plates should be applied such that the tension band is re-established and can resist the original deforming forces as described by the fibular fracture morphology.