

What Is Too Swollen? Correlation of Soft-Tissue Swelling and Timing to Surgery with Acute Wound Complications for Operatively Treated Lower-Extremity Fractures

*Matthew D. Riedel, MD; Amber Parker, BSN; Jorge Briceno, MD; Steven Staffa; Christopher Miller, MD; Jim Wu, MD; David Zurakowski, PhD; John Y. Kwon, MD
Beth Israel Deaconess Medical Center, Boston, MA, United States*

Purpose: Considerable debate exists regarding how soft-tissue edema should influence timing of surgery for lower-extremity fractures. Assessment of swelling is subjective and timing varies among surgeons. However, timing of surgery is one of the few modifiable factors in fracture care. Ultrasonography can objectively measure swelling and help determine optimal timing. The purposes of this study are: (1) determine whether objective measures of swelling, timing to surgery, and patient-specific risk factors correlate with wound complications; and (2) create a prediction model for postoperative wound complications based on identified modifiable and nonmodifiable risk factors.

Methods: Patients with closed lower-extremity fractures requiring surgery with an uninjured, contralateral extremity were included. Demographic information and sonographic measurements on both lower extremities were obtained preoperatively. Subjects were followed for 3 months and wound complications were documented. A predictive algorithm of independent risk factors was constructed, determining wound complication risk.

Results: 93 subjects completed the study, with 71 of 93 sustaining ankle fractures. The overall wound complication rate was 18.3%. Timing to surgery showed no correlation with wound complications. A heel-pad edema index >1.4 was independently associated with wound complications. Subgroup analysis of ankle fractures demonstrated a 3.4 \times increase in wound complications with a heel-pad edema index >1.4 . Tobacco history and body mass index (BMI) >25 kg/m² were independent predictors of wound complications. An algorithm was established based on heel-pad edema index, BMI >25 , and tobacco history. Patients with none of the 3 factors had a 3% probability of a wound complication. Patients with 1 of 3, 2 of 3 and 3 of 3 factors had a 12%-36%, 60%-86%, and 96% probability of a wound complication, respectively.

Conclusion: Timing to surgery had no correlation with wound complications. Heel-pad edema index >1.4 , BMI >25 , and tobacco use correlated with wound complications. Risk of wound complications significantly increased with each factor. In patients with increased BMI and/or tobacco use, resolution of heel-pad edema may significantly reduce wound complications in lower-extremity trauma. Level of Evidence: II – Prognostic, prospective cohort study