

A Predictive Model for Complications After Flap Coverage of Open Tibia Fractures

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Purpose: Previous studies have reported high complication rates for treatment of open tibia fractures that require acute flap coverage for limb salvage; however, little data exist to predict the likelihood of complications for these mangled limbs. Our hypothesis is that risk factors can be identified that increase the likelihood of complication after flap coverage of type IIIB open tibia fractures.

Methods: A retrospective review of all acute fractures of the tibia requiring flap coverage at a single Level I trauma center yielded 134 patients (139 flaps) from 2005 to 2013. Patients were excluded if they required a delayed flap for failed primary closure of a traumatic wound, had a limb-threatening vascular injury, or inadequate follow-up. The primary outcome measure was any complication requiring unplanned surgical treatment of the study injury, including infection and flap complication such as thrombosis or necrosis. Patient, injury, and treatment characteristics were abstracted from the medical record. Bivariate and multiple variable regression techniques were used to identify independent predictors of flap complications while adjusting multiple confounders.

Results: Overall 55 patients (41%) experienced complications after flap coverage. Of these complications, 34% were flap-related (thrombosis, necrosis, hematoma, or dehiscence) and 66% were infectious. The limb salvage rate for the study population was 87%. A number of variables were tested and found not to be risk factors for flap complications including age, sex, body mass index, American Society of Anesthesiologists score, Injury Severity Score, use of negative-pressure wound therapy or an antibiotic bead pouch, external fixation, and type of definitive fracture fixation. Only three statistically significant predictors of flap complications were identified: patients with fractures classified as AO/OTA type B or C (odds ratio [OR]: 4.2, 95% confidence interval [CI]: 1.1, 16.3), delay of flap coverage >7 days (OR: 1.5, 95% CI: 0.6, 2.8), and patients treated with anterolateral thigh (ALT) free flaps (OR: 4.6, 95% CI: 1.7, 12.3). In this sample, patients with none of these risk factors had an 18% chance of complication after flap coverage (2/11). Those with one risk factor had a 32% chance of complication (24/74). Patients with two risk factors had a 44% chance of complication (21/48), and those with all three risk factors had a 90% chance of complication (9/10).

Conclusion: Analysis of this large cohort of type IIIB open tibia fractures identified strong predictors of complication including fracture severity, timing of surgery, and the type of tissue used for flap coverage. To our knowledge, we are the first to report an increased risk of complication with use of the ALT flap. The etiology of complications associated with the

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ALT flap is unclear at this time and may be related to surgeon selection, limited ability of this flap to contour to large defects, the tenuous vascular pedicle, or an undetected variable in patients receiving coverage with this type of tissue.