The Effect of Free Versus Local Flaps on Time to Union in Open Tibia Fractures

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Purpose: Open fractures of the tibia are associated with increased risk of soft-tissue infection, osteomyelitis, and nonunion. Early soft-tissue reconstruction with either local or free tissue has been shown to decrease infection rates and improve rates of bony union. The purpose of this study was to compare the rates and time to union of open tibia fractures that underwent free tissue or local flaps for soft-tissue coverage.

Methods: A retrospective chart review of 140 patients with open tibia fractures requiring soft-tissue reconstruction treated at a single Level I trauma center was performed. Demographic data as well as AO/OTA fracture classification, flap type, type and timing of revision procedures, and time to union were collected. Union status was determined using radiographic union scale in tibia fractures (modified RUST) score >11. Nonunion was defined as failure of radiographic progression of union over a 6-month period after the time point of 6 months, failure to reach a modified Radiographic Union Score for Tibial Fractures (RUST score) of 12 after 1 year, surgery for nonunion, or catastrophic hardware failure after 6 months.

Results: 15 flaps (11%) were AO/OTA 41 (3A, 1B, 11C), 80 (57%) were AO/OTA 42 (21A, 37B, 22C), 30 (21%) were AO/OTA 43 (9A, 3B, 18C), and 15 (11%) were AO/OTA 44 (5A, 0B, 10C). Limb salvage was achieved in 90% of patients. The overall rate of nonunion was 31%. Flap type significantly affected time to union, with local fasciocutaneous and keystone flaps having significantly longer time to union (202 days) than all other flaproups ($P = 0.01$). Additionally, free flaps had significantly shorter time to union than local flaps (115 vs 149 days $P = 0.02$). Muscle flaps (local and free) had significantly shorter time to union than fasciocutaneous flaps (123 days vs 164 days, $P = 0.04$). Patients who underwent an initial soft-tissue reconstruction with a local muscle flap were more likely to require a second flap to achieve wound closure (odds ratio [OR] = 3.4, $P = 0.009$) and this significantly increased time to union (162 vs 122 days, P = 0.03). Patients treated with local flaps were more likely to develop osteomyelitis and undergo amputation when compared with those treated with free flaps (OR = 9.7, $P = 0.0147$).

Conclusion: Local fasciocutaneous flaps had a significantly longer time to bony union than other local or free flaps. Local flaps demonstrated an increased risk of osteomyelitis and necessity of a second flap procedure and increased time to union. Flap type and composition significantly affected time to bony union.