

Predictors of Failure After RIA Bone Grafting in Lower Extremity Injuries

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Purpose: The reamer-irrigator-aspirator (RIA) can be used to harvest autogenous bone graft and has been utilized in the treatment of lower extremity nonunions. Proposed advantages of this technique include a larger volume of graft material, less donor site morbidity, and decreased operative time. Existing literature reports mixed results and has not determined any patient- or injury-related variables linked with treatment failure. The aim of this study is to evaluate the efficacy of RIA bone grafting in lower extremity nonunions.

Methods: A retrospective chart review was conducted over a 10-year period at a Level-I trauma center. 65 patients were identified who underwent RIA bone grafting to address bone deficit or nonunion in the femur or tibia. Seven patients with inadequate follow-up (<12 months) following the grafting procedure were excluded. The main outcome measure was union, as defined by radiographic bridging callus and clinical evidence of union. Failure was defined as the need for a surgical procedure to promote union. Demographic, clinical, injury, and surgical characteristics were recorded. Fisher exact tests were utilized to identify variables associated with treatment failure.

Results: 58 patients underwent RIA grafting, with 38 procedures (66%) to the tibia and 20 procedures (34%) to the femur. 41 patients (71%) had open fractures initially (Gustilo-Anderson Type 1, 3; Type 2, 4; Type 3A, 19; Type 3B, 13; Type 3C, 2). 29 of the 58 fractures (50%) utilized an antibiotic cement spacer and the average delay to grafting following spacer placement was 15 weeks (standard deviation [SD] = 8). The overall failure rate was 16% (9 out of 58 fractures). Univariable comparisons showed no association between sex, smoking status, diabetes, body mass index, vitamin D deficiency, or protein malnourishment and treatment failure. Femoral fracture sites were linked to greater failure rates (30% vs 8% in tibia fractures, $P = 0.05$). Open distal femur fractures (OTA 33) with bone loss had a failure rate of 43%. The time interval between spacer placement and RIA grafting was comparable among patients with treatment failure and those who went on to union (average of 15 weeks for both groups). No other injury characteristics were correlated with subsequent failure.

Conclusion: Our overall failure rate was similar to reported rates in existing literature. Compared to tibial nonunions, failure of RIA bone grafting was significantly more common in femoral nonunions. In particular, nearly half of open distal femur fractures with bone loss went on to treatment failure. Going forward, alternative bone reconstruction techniques may be warranted in this setting.