Predictors of Reoperation in Induced Membrane Technique for Acute Traumatic Bone Loss

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INTRODUCTION: Acute traumatic bone loss is a challenge for the orthopaedic trauma surgeon. Masquelet's induced membrane technique (IMT) has been demonstrated to be successful for acute bone loss. However, protocols vary surgeon to surgeon. The purpose of this study was to compare infection and reoperation rates of acute bone defects treated with IMT.

METHODS: Patients who underwent IMT acutely for lower extremity bone loss at four Level 1 trauma centers between 2010-2020 were retrospectively reviewed. Inclusion criteria was acute traumatic fracture with bone loss treated with placement of a cement spacer within four weeks of injury. Patients less than 16 years of age, pathologic fractures, or patients who did not undergo the second stage procedure were excluded. Patient demographics, fracture characteristics, surgical technique, outcomes including infection, secondary grafting surgery, amputation, and fracture union status were collected. Patients were followed to union or a minimum of 12 months.

RESULTS:

A total of 130 patients underwent IMT for acute bone loss. Some 23.8% developed an infection during treatment period. Reoperation for secondary grafting procedure after stage 2 occurred in 21.5% patients. Patient gender, tobacco-use, diabetes, open fracture, and follow up were not significantly different between groups.

Deep infection rate was 20% (26/130). Fasciotomy, Gustilo-Anderson Classification, definitive stabilization with nail, antibiotic selection within spacer, or graft source was not predictive of infection or need for additional grafting procedures. Patients who underwent secondary grafting had longer initial bone defects (8.2cm vs. 5.9cm; OR 1.20 [1.07-1.34]). Infection increased secondary grafting (OR 5.32, [1.81-15.62]). Antibiotic dose was available in 76 fractures. Total antibiotic dose exceeding 4 grams was associated with fewer secondary grafting procedures, when controlling for size of defect (OR 0.352 [0.110-1.13]). Eighty-two percent (107/130) patients achieved clinical and radiographic union at an average of 12.8 months after stage 2 procedure with an additional 7.7% (10/130) having "implant dependent" unions.

DISCUSSION AND CONCLUSION: In this follow-up study of lower extremity fractures treated acutely with IMT, defect size, infection, and longer time between stage 1 and 2 procedures were associated with reoperation and persistent nonunion.