

Non-Weight-Bearing Following Intramedullary Fixation of Femoral Diaphyseal Fractures Is Associated With Slower Radiographic Healing and May Increase Nonunion Risk

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Purpose: The impact of weight-bearing on healing of diaphyseal femur fractures treated with intramedullary fixation has been sparsely described. Previously, the effect of delayed weight-bearing has been analyzed as a dichotomous variable (eg, union/nonunion), without consideration for graded approaches, and with only qualitative measures used to define nonunion. The purpose of this study was to quantitatively determine the effect of weight-bearing status on radiographic healing of diaphyseal femoral shaft fractures following intramedullary nail fixation.

Methods: This was a retrospective cohort study performed at a single Level-I trauma center in a major metropolitan area of the Midwest region of the United States. 253 AO/OTA type 32 fractures managed with reamed, statically locked intramedullary fixation in patients with and/or without concomitant ipsilateral lower extremity injuries were analyzed. Radiographic healing and time to union were analyzed using the modified radiographic union scale for tibia fractures (mRUST) scores. The influence of weight-bearing was specifically assessed. Weight-bearing status was subcategorized into weight-bearing as tolerated (WBAT), 30-lb flat foot weight-bearing (FFWB), and non-weight-bearing (NWB).

Results: After the index procedure, 38.7% of patients were WBAT, 25.4% were FFWB, and 38.7% were NWB. FFWB was prescribed in 18.5% of cases due to concurrent acetabular or femoral neck fractures, while the remainder were due to attending surgeon preference. In contrast, 73% of patients in the NWB group had a concomitant ipsilateral injury (ipsilateral foot, ankle, plateau, or pelvic ring fracture) that dictated NWB status. NWB patients had higher ASA (American Society of Anesthesiologists) scores (2.52 vs 2.17 vs 2.15, $P = 0.005$) and higher ISS (21.0 vs 15.0 vs 15.5, $P < 0.001$) than patients who were FFWB or WBAT. The NWB group had higher rates of open fractures than either weight-bearing group (32.6% vs 17.2% vs 23.1%, $P = 0.05$). Lower mRUST scores were associated with older age ($b = -0.026$) and prolonged time to WBAT ($b = -0.061$). As the time from injury to radiographic evaluation increased, ISS more negatively influenced mRUST ($b = -0.0032$, $P < 0.03$) (model $R^2 = 0.24$, $P < 0.001$). Median time to union was increased 58% in the NWB group (any WB: 91 days; NWB: 144 days; $P < 0.001$). NWB status was associated with a 5-times higher risk of nonunion (any WB: 1.4%; NWB: 7.5%, $P = 0.035$).

Conclusion: Based on quantitative analysis, delaying weight-bearing in patients following diaphyseal femur fractures treated with intramedullary fixation slows radiographic time to union by 58%, or approximately 6.5 weeks. Early weight-bearing is beneficial to fracture healing and clinicians should work to advance weight-bearing status as soon as concurrent injuries allow.