

Intramedullary Nailing of Tibial Shaft Fractures with an Intact Fibula: Is This a Fracture at Risk for Nonunion?

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Purpose: Numerous risk factors for tibial shaft fracture nonunion have been established; however, the role of an intact fibula on union rates in tibial shaft fractures when treated with intramedullary nailing (IMN) remains controversial. The purpose of this study was to determine the incidence and cofactors of delayed healing in middle- and distal-third tibial shaft fractures treated with IMN, in the setting of an intact fibula.

Methods: This study was a retrospective review of patients with middle- and distal-third tibial shaft fractures with intact fibula treated at our institution by IMN over a 10-year period. Data collection included a chart review assessing patient demographics, with image review to characterize fracture pattern, construct of locking screw and nail patterns, fracture stability, and radiographic healing. Delayed union was defined as fractures ununited 6 months after the index procedure. Nonunion was defined as fractures ununited greater than 9 months post index procedure.

Results: A total of 974 patients were treated with IMN for tibial shaft fractures. 74 patients (7.6% incidence) presented with a tibial shaft fracture with an intact fibula. 42 patients (57%) met our inclusion criteria. Four patients (9.5%) developed an established nonunion, and 9 patients (21.4%) exhibited delayed union, for a total of 13 patients (31%) with abnormal healing. Use of a single distal locking screw was found to be a risk factor for nonunion ($P = 0.024$, risk ratio [RR] 11.3). Use of 2 medial to lateral only distal locking screws was associated with healing issues ($P = 0.021$, RR 8.6). A nonsignificant trend toward valgus ($P = 0.089$) and apex anterior ($P = 0.091$) malreduction was seen in all cases of abnormal healing. No significant change in alignment was seen between the initial postoperative images and final follow-up images of patients with abnormal healing. There were no significant differences in healing times and union rates between middle- and distal-third tibial shaft fractures. No differences were noted regarding open fractures, or with respect to fracture orientation. The average time to weight bearing was not significantly different between patients with union and patients with abnormal healing (an average of 39 and 47 days, respectively). Average time to union was 14 weeks in patients with normal healing. Patients with delayed union united at an average of 34 weeks while nonunions healed an average of 50 weeks following index procedure.

Conclusion: Isolated tibial shaft fractures remain a challenge. Medial to lateral only distal locking screws and single distal locking screws were significantly associated with abnormal healing. Use of fewer and medial-entry only locking screws likely allow cantilever bending through the intact fibula due to a less stiff construct. There was a trend toward valgus and apex anterior malalignment among delayed unions, reinforcing the importance of anatomic reduction of these fractures. Consideration for biplanar distal interlocking and adjunct measures for anatomic reduction should be strongly encouraged.