Tibial Malalignment Is an Independent Predictor of Nonunion Following Intramedullary Nailing of Tibial Shaft Fractures

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Purpose: Tibial shaft fractures are often treated with intramedullary nailing. Much effort is devoted to ensuring "acceptable" intraoperative alignment; however, it is not known if malalignment is related to nonunion. This study assessed the relationship between postoperative alignment and nonunion in patients with tibial shaft fractures treated with intramedullary nailing. We hypothesized that malalignment after tibial nailing would be associated with an increased odds of nonunion.

Methods: This retrospective case-cohort study included the creation of a study group of 175 patients (68 with nonunion, 107 without nonunion, randomly sampled over the same time period) with a tibial shaft fracture treated with intramedullary nailing at a single academic trauma center. The primary outcome was an unplanned reoperation for nonunion. Alignment was measured on immediate postoperative radiographs in the coronal and sagittal plane by 2 independent reviewers. 69 patients had no malalignment (39%), 66 had malalignment of at least 2° in 1 plane (38%), and 40 had malalignment of at least 2° in 2 planes (23%). We used multivariable logistic regression to adjust for baseline differences in nonunion risk including smoking, diabetes, open fracture, fracture location, compartment syndrome, translation, American Society of Anesthesiologists (ASA) score, and cortical continuity.

Results: There was a strong association between postoperative tibial malalignment in 1 plane and nonunion (odds ratio [OR], 2.7, confidence interval [CI] 1.0-7.1, P = 0.04). This association was greater for malalignment in both coronal and sagittal planes (OR, 3.3, CI 1.2-9.8, P = 0.02).

Conclusion: To our knowledge, this study is the first to identify a strong relationship between postoperative tibial malalignment and developing a nonunion. After controlling for confounders and utilizing rigorous statistical techniques aimed at causal inference, postoperative malalignment of even a few degrees in the coronal or sagittal plane appears to be associated with tibial shaft nonunion. Clinicians should be aware that even relatively small amounts of malalignment during tibial shaft nailing may increase the risk of nonunion.