

Comparing Outcomes of Plate Augmentation, Nail Exchange, and Nail Exchange With Plate Augmentation in the Treatment of Atrophic Femoral Shaft Nonunion After Intramedullary Nailing: A Multicenter Retrospective Study

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Purpose: Intramedullary (IM) nailing is the treatment of choice for femoral shaft fractures, but nonunion rates have been reported to be as high as 12%. Surgical interventions for nonunion involve exchange nailing or plate augmentation. Recently, a combined treatment of exchange nailing and plate augmentation has demonstrated good results, but its comparative effectiveness remains unclear. This study aimed to compare the clinical and radiographic outcomes of 3 different surgical interventions for atrophic femoral shaft nonunion, and investigate the factors that affect bone healing after reoperation.

Methods: A retrospective study was conducted at 5 university hospitals involving 149 patients with aseptic atrophic nonunion after IM nailing. These patients underwent reoperation with plate augmentation, exchange nailing, or combined treatment. Clinical and radiographic outcomes were assessed and compared according to reoperation procedure. Logistic regression analysis was performed to identify factors affecting persistent nonunion after reoperation.

Results: Of the cohort, 57 patients underwent plate augmentation, 64 underwent exchange nailing, and 28 received combined treatment. There were no significant differences in patient demographics among the groups. Exchange nailing produced a significantly lower union rate than did the combined treatment (82.8% vs 100%, $P = 0.016$), whereas no significant difference was observed in the union rate and time to the union between plate augmentation and the combined treatment. Combined treatment showed the longest operative time and the greatest transfusion requirements. The risk factors for persistent nonunion included age, absence of autogenous bone grafts, and use of an exchange nailing technique.

Conclusion: Exchange nailing as a treatment for atrophic femoral shaft nonunion after IM nailing resulted in a lower union rate. The efficacy of the combined treatment requires further study, and persistent nonunion may be influenced by age, bone grafting, and surgical techniques. A comprehensive approach targeting both biological environment and mechanical stability is crucial in the treatment of atrophic femoral shaft nonunion.