

## The Results of a Systematic Approach to Exchange Nailing for the Treatment of Aseptic Femoral Nonunions

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**Purpose:** This study evaluated the effectiveness of a systematic approach to exchange nailing for the treatment of aseptic femoral nonunions previously treated with an intramedullary nail.

**Methods:** 50 aseptic femoral nonunions in 49 patients who presented with an intramedullary nail in situ an average of 25 months after the initial fracture nailing were evaluated. Our systematic approach includes inserting an exchange nail at least 2 mm larger in diameter than the in situ nail, using a different manufacturer's nail to facilitate placement of interlocking screws in different locations or trajectories or both, static interlocking, correction of any metabolic and endocrine abnormalities, and secondary nail dynamization in cases showing slow progression toward healing. In addition, we do not utilize closed exchange nailing in patients with partial segmental defects of the femur comprising greater than 50% of the cross-sectional cortical contact surface area. The outcome measures were radiographic and clinical evidence of nonunion healing and time to union.

**Results:** All 50 femoral nonunions (100%) healed following this systematic approach to exchange nailing. The average time to achieve union was 7 months (range, 3-26 months). Fourteen (28%) nonunions healed but had undergone nail dynamization performed between 3 and 9 months following exchange nailing due to concerns about slow progression to healing on radiographs. In 6 patients who had either a subtrochanteric nonunion initially treated with a retrograde nail or a distal femur nonunion initially treated with an anterograde nail, an exchange nail in the opposite direction was utilized to achieve greater stability in the shorter segment. Time to bony union did not vary by patient age ( $P = 0.464$ ), gender ( $P = 0.754$ ), fracture pattern ( $P = 0.579$ ), soft tissues at the time of original injury (closed vs. open) ( $P = 0.777$ ), nonunion location ( $P = 0.907$ ), nonunion type ( $P = 0.656$ ), nonunion duration ( $P = 0.852$ ), history of prior failed dynamization of the in situ nail at presentation ( $P = 0.783$ ), and increase in nail diameter with exchange nailing ( $P = 0.649$ ).

**Conclusion:** Utilization of our systematic approach of exchange nailing for treatment of aseptic femoral nonunions resulted in a 100% healing rate. The systematic approach includes careful patient selection, increasing nail diameter by at least 2 mm, selecting a different nail manufacturer for the exchange nail, static interlocking, dynamization after 3 months if necessary, and screening for and treating metabolic, endocrine, and other medical problems.