

Risk Factors for Fibular Nail Failure in the Management of Unstable Fractures of the Ankle Joint

Tom Henry Carter, MBBS; Katrina Roxanne Bell, MBBS; Samuel Peter Mackenzie, MBBS; Marcus A. Hollyer, BSc; Emma Chelsea Gill, BSc; Andrew David Duckworth, MD, PhD; Timothy O. White, MD

Royal Infirmary of Edinburgh, Edinburgh, Lothian, UNITED KINGDOM

Purpose: The fibular intramedullary nail provides secure fixation, high patient-reported outcome scores, and low complication rates. However, technological developments bring new potential sources of complication and error. The purpose of this study was to review our radiographic failures to determine (1) the frequency of failure of fixation, (2) radiographic risk factors for failure, and (3) a classification of modes of failure.

Methods: We identified 333 cases over an 8-year period that were managed with a fibular nail. All had adequate preoperative, intraoperative, and postoperative radiographs for analysis, with a minimum follow-up to fracture union. Demographic data, fracture classification, and detailed radiographic parameters were recorded. Failed fixations were reviewed in detail including scrupulous assessment of radiographs and operative and clinical notes. The primary outcome measure was failure of lateral malleolar fixation requiring revision.

Results: There were 332 patients with a mean age of 64 years (range, 14-96). The majority were type 44B fractures (272 cases, 82%) and according to Lauge-Hansen 262 cases (79%) were supination-external rotation (SER) type. Syndesmosis injury was seen in 58 cases (17%). Mean radiographic follow-up was 39.5 weeks (range, 6-396 weeks). In 20 patients (6%) the construct failed prior to bone healing, requiring revision. Detailed review revealed loss of locking screw fixation in osteoporotic bone in 4 cases and surgeon error in 16. Failure to implement non-weight-bearing restrictions in cases with associated syndesmotic injury resulted in 8 of the failures. In 5 cases the final intraoperative fluoroscopy images demonstrated inadequate talar reduction or poor nail placement. In 3 cases, the transverse locking screw had simply not been secured tightly. Independent risk factors for failure were pronation-abduction type fractures ($P = 0.035$), syndesmotic injury ($P = 0.006$), poor intraoperative talar reduction ($P = 0.045$), and a proximally sited locking screw >20 mm above the plafond ($P = 0.003$).

Conclusion: Fibular intramedullary nailing offers exciting possibilities for achieving stable fixation while reducing soft-tissue complications. We have reviewed our own experience, which has resulted in the manufacturer modifying the nail design, providing interlocking screws to improve pull-out strength. Surgeons are reminded of the important technical aspects of a successful intraoperative technique and appropriate postoperative management.