

**Biplanar Reduction Influences Fracture Collapse and Immediate Postoperative Ambulation in Intertrochanteric Hip Fractures Fixed with a Cephalomedullary Nail**

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**Purpose:** While avoidance of varus malreduction in intertrochanteric hip fractures is supported by substantial evidence, the role of sagittal plane reduction is relatively underappreciated. Although implants allow for controlled collapse, excessive collapse may influence postoperative ambulation. We hypothesized that the quality of biplanar reduction influences fracture collapse throughout healing and postoperative mobilization.

**Methods:** Low-energy intertrochanteric hip fractures treated with a cephalomedullary nail were identified and those who were ambulatory at baseline and with a minimum of 90-day clinical follow-up were included. Two blinded reviewers independently analyzed injury, operative, midterm follow-up, and most recent radiographs for previously described parameters of reduction (corrected neck shaft angle and Ikuta classification), implant position (femoral head quadrant location and tip-apex distance), and fracture collapse (shortening/sliding). Chart review provided data on immediate postoperative mobilization and clinical outcome. The primary outcome was fracture collapse; secondary outcomes included postoperative ambulation and interval change in ambulatory status.

**Results:** 139 patients were included with an average age of 80.0 years (standard deviation [SD] = 9.7). Median time to surgery was 1 day and average radiographic follow-up was 497 days. There were 52 radiographically stable and 87 unstable fracture patterns. 31 fractures with a good reduction (ie, a corrected neck shaft angle  $>135^\circ$  and Ikuta type N with anterior cortical apposition on the sagittal plane) slid 5.0 mm (SD = 3.3); 62 acceptably reduced fractures meeting one of these two criteria slid 7.5 mm (SD = 6.1), and 44 poorly reduced fractures slid 7.5 mm (SD = 4.9,  $P = 0.045$ ). Neither of these reduction criteria independently predicted slide, nor did fracture pattern stability. However, the amount of shortening was significantly influenced by the quality of the implant position. Optimally placed implants (in the middle tip position in coronal and sagittal planes and a tip-apex distance  $<25$ mm) collapsed an average 6.3 mm ( $n = 97$ , SD = 3.4) compared to 8.5 mm ( $n = 40$ , SD 7.4) in suboptimally placed implants ( $P = 0.011$ ). Patients with a good or acceptable reduction were more likely to ambulate in the first 3 days following surgery ( $P = 0.026$ ).

**Conclusion:** Biplanar reduction quality significantly influenced both fracture collapse and mobilization in the acute postoperative period. Additionally, the femoral head screw position affected the amount of fracture collapse. These data suggests that to achieve early mobilization, these fractures should not only be fixed early, but with good biplanar reduction and optimized implant placement.