

Femoral Neck Shortening and Varus Collapse in “Stable” Ptertrochanteric Femur Fractures

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Purpose: Ptertrochanteric hip fractures are common injuries affecting elderly patients. Comparative studies of cephalomedullary nails (CMN) and sliding hip screws (SHS) have demonstrated superiority of cephalomedullary implants in unstable fracture patterns. There is a lack of evidence for implant selection in simpler stable fracture patterns, and the implant is routinely determined by surgeon preference. This study compares these 2 implants in stable ptertrochanteric fractures, evaluating varus collapse and femoral neck shortening in the horizontal and vertical dimensions. These parameters are important for abductor tension and gait mechanics, with previous studies demonstrating poor quality of life correlated with greater shortening and varus collapse. We also evaluate implant failure in this cohort.

Methods: A retrospective review was performed of ptertrochanteric femur fractures (AO/OTA 31A1,2,3) treated with a trochanteric entry CMN or SHS from January 2003 through January 2014 at our institution. Inclusion criteria were patients 55 years or older, low-energy fracture mechanism, stable ptertrochanteric fracture pattern (AO/OTA 31A1-2.2), and follow-up until fracture healing or failure. Pathologic and periprosthetic fractures were excluded. Injury radiographs were classified according to 2018 AO/OTA criteria. Imaging from the immediate postoperative period was analyzed for femoral neck-shaft angle at fixation and films from the most recent follow-up were analyzed for neck-shaft angle as well as femoral neck shortening in the horizontal and vertical dimensions. Implant failure was recorded. Univariate statistical analysis was performed.

Results: A total of 300 subjects met inclusion criteria. Average patient age was 82 years (range, 55-102) with average follow-up of 27 months (range, 3-142). Both implants allowed varus collapse during healing. The SHS group contained significantly more fractures that progressed to varus collapse $>5^{\circ}$ ($P = 0.02$), mild horizontal shortening >5 mm ($P < 0.01$), and severe horizontal shortening >10 mm ($P < 0.01$). There was no difference in vertical shortening ($P = 0.5$) or implant failure ($P = 0.8$) between groups.

Conclusion: In the setting of stable ptertrochanteric fracture fixation, for which there is currently no clear evidence for preferential use of a CMN or SHS, the hip screw allows development of greater deformity after fixation. The SHS group experienced greater varus collapse and horizontal shortening. There was no difference in overall implant failure. This set of parameters correlates with poorer quality of life and physical function scores. These findings suggest that a CMN is a superior construct for maintenance of reduction in stable ptertrochanteric fractures, which may lead to improved functional outcomes as patients recover.