**Optimal Configuration of Internal Fixation Implants During Operative Management of Hip Fractures**

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**Purpose:** Numerous technical factors have been thought to be associated with improved outcomes after femoral neck fracture fixation. Using data from a multicenter trial of femoral neck fracture patients aged ≥50 years who underwent internal fixation with cancellous screws (CS) or a sliding hip screw (SHS), we evaluated which technical factors were associated with: (1) revision surgery within 24 months to promote fracture healing, relieve pain, treat infection, or improve function; (2) functional health, as defined by the Short Form-12 (SF-12) Physical Component Summary (PCS); and (3) hip function, as defined by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

**Methods:** We performed a multivariable Cox regression using revision surgery as the dependent variable and technical factors as independent variables. We adjusted for fracture displacement as it had been predictive of revision surgery previously. Separate analyses were conducted for CS and SHS groups. We performed multilevel, repeated-measures mixed models with 3 levels (center, patient, and time), with patient and center entered as random effects. For both CS and SHS models, we used SF-12 PCS and WOMAC scores as dependent variables (1 for each model). We included technical factors and time of assessment as independent variables in fixed effects. Preinjury scores and several prognostic variables were adjustment variables. All tests were 2-tailed with $\alpha = 0.05$. For CS models, we included screw (or pin) diameter, use of partially threaded screws with short or long threads, screw formation, screw (or pin) orientation, and use of washers as technical factors. For SHS models, we included screw position, number of holes in sideplate, use of a bicortical sideplate, use of supplemental screws, and final tip-apex distance as technical factors.

**Results:** Complete data were available for 459 (mean age: 72.8 years; 66% female) and 504 (mean age: 73.0 years; 64% female) patients to perform revision surgery analyses in CS and SHS groups, respectively. For the health-related quality of life (HRQL) analyses, complete data ranged between 288 and 303 patients per group (mean age: 71.1 years; 65% female). In the CS model, a 3-screw (apex at bottom) formation was associated with a significantly lower risk for revision surgery as compared to a 2-screw formation (hazard ratio 0.47, 95% confidence interval 0.24-9.35; P = 0.03). Regardless of treatment group, no other technical factors were found to be predictive of revision surgery and HRQL (P >0.05).

**Conclusion:** Other than a 3-screw (apex at bottom) formation, there was no optimal configuration of internal fixation implants associated with reduced revision surgery and improved HRQL outcomes after femoral neck fracture fixation. Patient and injury factors such as age, gender, and fracture displacement play a more significant role in outcomes than technical aspects of fracture fixation.