

Failure Patterns of Young Femoral Neck Fractures: Which Complication Should We Choose?

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Purpose: The higher functional demands of nongeriatric patients with femoral neck fractures often necessitate surgical fixation instead of arthroplasty management. While it is unclear if implant selection can improve fracture healing outcomes, it is also unknown if the fixation failure patterns in adult patients resemble osteoporotic failures or if the patterns are associated with the surgical implant selected. The purpose of this study was to describe the failure patterns of young femoral neck fracture fixation, and secondarily to determine if the pattern of failure varies by implant type.

Methods: Adult patients (ages 18-55 years) that experienced a "fixation failure" following internal fixation of a femoral neck fracture were identified from five trauma centers. Failure was defined by screw cutout, implant breakage, varus collapse ($<120^\circ$ neck-shaft angle), or severe fracture shortening (≥ 1 cm). When multiple complications were identified, mechanical failures were preferentially noted for the analysis. The X2 statistic and Fisher's exact test were used to compare the failure patterns between patients that received multiple cancellous screws versus a sliding hip screw derotation screw (SHS).

Results: 44 patients with treatment failures were identified from the overall cohort of 215 patients. 28 patients with fixation failures were treated with multiple cancellous screws, while the remaining patients received an SHS construct. The failure rate for cancellous screws was 24%, while SHS fixation failed 19% of the time. Severe fracture shortening was the most common complication identified (61%), followed by screw cutout (18%), varus collapse (16%), and implant breakage (5%). A significant difference in the distribution of failure patterns was identified between the treatment groups ($P = 0.024$). No differences in the incidence of severe shortening ($P = 0.750$) or implant breakage ($P = 1.000$) were detected between the fixation groups; however, fixation method was associated with varus collapse and screw cutout. Among the failures with an SHS construct, a greater portion were related to screw cutout (SHS 38% vs screws 7%, $P = 0.019$); whereas, failures from multiple screws were more commonly associated with varus collapse (screws 25% vs SHS 0%, $P = 0.037$).

Conclusion: Severe shortening is the most common fixation failure and neither implant appears to prevent this complication. Our results confirm that femoral neck fracture fixation in younger adults fails in a similar pattern as elderly patients: SHS constructs are associated with screw cutout, and multiple cancellous screws typically fail by varus collapse. While neither fixation technique has demonstrated improved fracture healing outcomes, selecting a surgical implant based on its likely failure pattern may allow surgeons to minimize the severity of the failure or its need for secondary conversion to hip arthroplasty.