

**Incidence, Magnitude, and Predictors of Shortening in Young Femoral Neck Fractures**

*Gerard P. Slobogean, MD, MPH, FRCSC; David J. Stockton, MD; Andrew Yamada, BSc; Henry M. Broekhuysse, MD; Piotr A. Blachut, MD; Peter J. O'Brien, MD, FRCSC; Pierre Guy, MD; Kelly A. Lefaivre, MD; University of British Columbia, Vancouver, British Columbia, Canada*

**Purpose:** Fracture shortening following internal fixation of nongeriatric femoral neck fractures remains poorly described. Recent evidence suggests femoral neck fracture shortening of >5 mm is associated with clinically significant decreases in functional outcome. The purpose of this study is to describe the incidence and magnitude of shortening following internal fixation of young adult femoral neck fractures. Secondary objectives are to identify variables associated with femoral neck shortening. We hypothesized that a small magnitude of fracture shortening would be common in this population, but severe shortening would be relatively rare.

**Methods:** Young femoral neck fracture patients (ages <60 years) from 2003-2013 were identified from our prospective trauma database. Only subjects treated with cannulated screws or a sliding hip screw (SHS) were included. Patient demographics and operative data were obtained from the prospective database and retrospectively from the chart when necessary. Femoral neck shortening was measured radiographically along the long axis of the neck. All measurements were adjusted for magnification. Univariate analysis was performed to identify potential predictors of shortening, followed by a multivariable regression model to independently adjust for significant variables.

**Results:** 65 patients with a median age of 51 years (interquartile range [IQR]: 43-56 years) were included. 71% were male and 33% of injuries were from high-energy mechanisms. 75% of the fractures were displaced. The distribution of the fractures within the Pauwel classification was 6% Type I, 58% Type II, and 36% Type III. A closed reduction was performed in 85% of the cases. The median amount of radiographic femoral neck shortening was 6 mm (IQR: 0-12 mm) at a median of 222 days postfixation (IQR: 101-399 days). 54% of patients had  $\geq 5$  mm of femoral neck shortening (22% between  $\geq 5$  mm and <10 mm; 32%  $\geq 10$  mm). Initially displaced fractures shortened more than undisplaced fractures (mean 8.1 mm vs. 2.2mm,  $P < 0.001$ ), and fractures treated with a SHS + derotation screw shortened more than fractures fixed with cannulated screws alone (10.7 mm vs. 5.5 mm,  $P = 0.03$ ). There was no association between fixation type used and fracture displacement, Pauwel angle, Pauwel classification, Garden classification, or level of fracture. Regression analysis confirmed the independent associations of initial fracture displacement and fixation type on femoral neck shortening ( $P = 0.001$ ). When adjusting for initial fracture displacement, fractures treated with a SHS + derotation screw shortened an average of 2.3 mm more than fractures treated with screws alone ( $P = 0.03$ ).

**Conclusion:** There was a 54% incidence of femoral neck shortening  $\geq 5$  mm in our young femoral neck fracture population. Furthermore, 32% of the entire cohort experienced severe shortening >1 cm. Although the clinical significance of this shortening is unknown in our series, an association between  $\geq 5$  mm of shortening and poor functional outcomes

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appears to be emerging in the literature. Finally, irrespective of fracture displacement, fixation with a SHS + derotation screw was associated with more shortening than fixation with screws alone. This adds further controversy to the debate of the optimum fixation method for young femoral neck fractures.