Acetabular Morphology in Patients With Failed Femoral Neck Fracture Fixation

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Purpose: There has been increasing evidence to suggest preoperative radiographic features can be used to predict femoral neck fracture fixation failure. The use of advanced imaging is becoming more common and femoral retroversion angle measured on a CT scan has been shown to be a predictor of femoral neck fracture nonunion and reoperation rates. Existing literature focuses on analyzing the femur for fixation failure. However, there is little evidence questioning native acetabular morphology in the setting of femoral neck fracture fixation failure. The objective of this study was to evaluate the relationship between a patient's native acetabular morphology and likelihood of fixation failure after femoral neck fracture.

Methods: In this retrospective cohort study, 312 patients with femoral neck fractures that underwent internal fixation and had CT scans of the pelvis were identified. The lateral center edge angle, the anterior and posterior acetabular sector angle, and acetabular version at the level of the femoral head center were assessed on CT. Primary outcome was fracture fixation failure as defined by conversion to hip arthroplasty. Fisher's exact test and Student t test were used to identify differences between groups. Multivariate analysis was used to identify predictors of the primary outcome. All tests were 2-sided and $P<0.05$ was considered significant.

Results: Fracture fixation failure rate was 11% (34 of 312) and all were converted to hip arthroplasty. Increased acetabular anteversion was associated with female sex ($P<0.05$) and increased age ($P<0.05$). The mean lateral center edge angle was significantly lower in hips that failed internal fixation (mean 40.9°) compared to controls (mean 46.2°) ($P = 0.004$). No significant difference in acetabular version or anterior and posterior acetabular sector angle was observed between the 2 groups. Multivariate analysis found significant predictors of fracture fixation failure were increased age, Garden classification III and IV, and decreased lateral center edge angle ($P<0.05$).

Conclusion: The rate of revision surgery after internal fixation of femoral neck fracture in this cohort was 11%, which is consistent with the published literature, ranging from 8% to 27%. In a multivariate analysis controlling for age, sex, and Garden classification, decreased lateral center edge angle was associated with fracture fixation failure.