

Prospective Evaluation of Hip-Spine Dynamics in Patients with a Primary Total Hip Arthroplasty Dislocation: a matched case-control study

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INTRODUCTION: Understanding of the comprehensive hip-spine relationship may reduce total hip arthroplasty (THA) dislocation. However, the impact of sagittal pelvic dynamics on three-dimensional implant orientation has not been investigated prospectively. This study aims to assess hip-spine dynamics and changes in three-dimensional implant orientation in patients with stable and unstable primary THAs.

METHODS: In this prospective, case-control study, 23 adults with a THA dislocation were matched to 23 patients with a stable implant. Standing anterior-posterior, as well as standing and sitting lateral pelvic radiographs, were obtained. Sagittal spinopelvic morphology and orientation parameters, sagittal and coronal acetabular and femoral component parameters were measured. Transverse component orientation parameters were computed. A logistic regression was conducted to determine the impact of demographics and hip-spine parameters on the likelihood for dislocation.

RESULTS:

Of the 23 dislocations, 17 sustained a posterior and five an anterior dislocation; one was unknown. The unstable THAs had significantly higher pelvic incidence ($60^{\circ}\pm 13^{\circ}$ vs. $52^{\circ}\pm 10^{\circ}$, $p = 0.015$), and transverse version of the acetabular component ($38^{\circ}\pm 11^{\circ}$ vs. $32^{\circ}\pm 8^{\circ}$, $p = 0.042$) compared to the stable THAs. Patients with posterior dislocations had lower sagittal ante-inclination of the acetabular component than anterior dislocations ($34^{\circ}\pm 10^{\circ}$ vs. $48^{\circ}\pm 5^{\circ}$, $p = 0.012$). Based on logistic regression analysis, pelvic incidence, transverse version of the acetabular component and the approach were significant predictors of THA dislocation.

DISCUSSION AND CONCLUSION:

By assessment of spinopelvic characteristics surgeons could identify patients at increased risk for THA dislocation preoperatively based on a high pelvic incidence. Additionally, posterior dislocations seem to occur more in patients with more transverse version of the acetabular component and posterolateral approach; and anterior dislocations in patients with more sagittal ante-inclination, transverse version and direct anterior approach. This suggests that implementation of a patient-specific functional safe-zone of the acetabular component based on a prediction model for surgeons, may further reduce THA dislocation rates.