Increased Cup Anteversion may not Prevent Posterior Dislocation in Patients with Abnormal Spinopelvic Characteristics in Total Hip Arthroplasty

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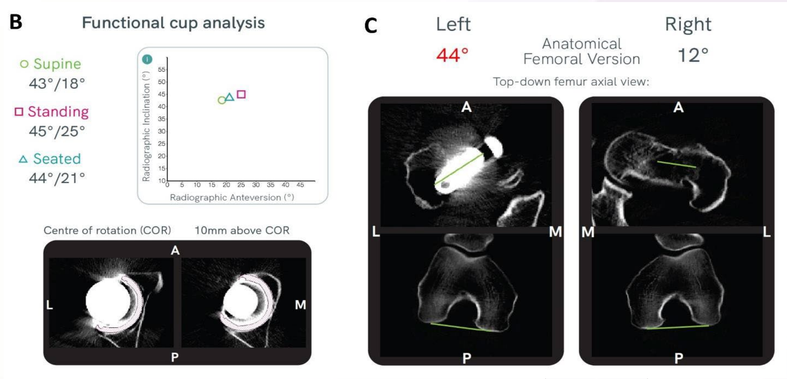
Introduction

- Previous studies have demonstrated that patients with abnormal spinopelvic (SP) parameters are at increased risk for dislocation following total hip arthroplasty (THA).
- Common recommendations to address this issue include increased acetabular anteversion to reduce the risk of dislocation.
- The aims of this study were to
  - (1) assess the degree of variation of acetabular component placement and combined anteversion in a large cohort of dislocating THAs,
  - (2) assess the SP characteristics of the cohort, and
  - (3) examine the association between cup anteversion and reported direction of instability.

Methods

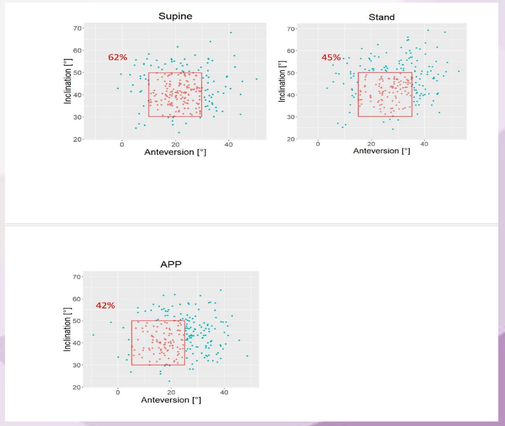
- A commercial database of 245 dislocating THAs referred for post-operative CT and functional radiographic imaging and analysis were reviewed.
- Spinopelvic parameters, and cup and stem position were measured in the supine, standing, anterior pelvic plane (APP) positions.
- Safe zones were defined for the acetabular component as: inclination: 30-50° (all positions); anteversion:5-25° (APP); 15-35° (standing); 10-30° (supine).
- Spinopelvic characteristics were stratified by high, neutral, and low cup anteversion using thresholds of >35° and <15° anteversion in standing, respectively.

CT Imaging



Measurements made on CT imaging: a) Cup and stem positioning and femoral head size were measured by registering 3D computer models of the implants within the CT image volume. b) Cup anteversion and inclination were measured in the supine position and transferred to the standing and seated positions. c) stem version and anatomical femoral version were measured as the angle between the neck axis and the posterior condyles on the operative and contralateral sides, respectively.

Results



Results

- In the dislocation cohort, 62%, 45%, and 42% of cups were within the safe zone in supine, standing, and the APP, respectively($p<0.001$).
- Patients with high vs neutral or low cup anteversion had significantly stiffer spines, more posterior pelvic tilt in standing, greater changes in pelvic tilt, and higher sagittal imbalance.
- Of the 45 patients with high cup anteversion, 60% and 40% were reported to have posterior and anterior instability, respectively, with no differences in spinopelvic characteristics.

Conclusions

- In this dislocating cohort, there is a decreased percentage of cups within the safe zone in the APP and standing position compared to the supine reference.
- In addition, we found that patients having poor SP characteristics and high cup anteversion can still dislocate, suggesting that adjusting cup anteversion alone may not be sufficient for preventing instability.

Illustration of spinopelvic (SP) parameters shown in standing and flex-seated: lumbar lordosis (LL), sacral slope (SS), pelvic tilt (PT), spinopelvic tilt (SPT), pelvic incidence (PI), pelvic femoral flexion (PFA), anterior pelvic plane (APP).