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Intraoperative Evaluation of Acetabular Cup Position During Anterior Approach Total Hip Arthroplasty: Are We Accurately Interpreting?

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Introduction: Intraoperative radiographic evaluation during total hip arthroplasty (THA) has shown to improve the accuracy of acetabular component placement, however, differences in interpretation based on radiographic technique has not been established. This study aims to determine if differences exist in the interpretation of acetabular component abduction and anteversion between intraoperative fluoroscopic posterior-anterior hip (FH), intraoperative fluoroscopic posterior-anterior pelvis (FP), and postoperative anterior-posterior pelvis (PP) radiographs.

Methods: 55 consecutive direct anterior THAs in 49 patients over a 6-month period were prospectively enrolled. Target anteversion and abduction was defined by the Lewinnek zone. Fluoroscopy was used to direct acetabular component placement intraoperatively. After final cup implantation, fluoroscopic posterior-anterior hip and pelvis images were obtained for analysis. At the completion of the procedure, an anterior-posterior plain pelvis radiograph was obtained in the operating room. Acetabulum component abduction and anteversion were postoperatively determined using specialized software on each of the three image acquisition methods.

Results: Average acetabular cup abduction for FH, FP, and PP was 40.95±2.87, 38.87±3.82, and 41.73±2.96 degrees, respectively. Target abduction was met on 100%, 100%, and 98% of FH, FP, and PP, respectively. The FP tended to underestimate acetabular cup abduction compared to both the FH and PP ($p<0.0001$). Average acetabular cup anteversion for FH, FP, and PP was 19.89±4.87, 24.38±5.31, and 13.36±3.52 degrees, respectively. Target anteversion was met on 87%, 64%, and 100% of FH, FP, and PP, respectively. Both the fluoroscopic hip and fluoroscopic pelvis overestimated anteversion compared to the AP pelvis, with a 6.38-degree greater mean value measurement for FH ($p<0.0001$), and an 11-degree greater mean value measurement for FP ($p<0.0001$).

Conclusions: Fluoroscopic technique and differences between radiographic projections may result in discrepancies in component position interpretation. Our results support the use of the posterior-anterior hip as the choice fluoroscopic imaging technique.

Notes