Assessing Predictive Accuracy of 2D Digital Templating in Fluoroscopic-Guided Direct Anterior Approach Total Hip Arthroplasty

Introduction: Preoperative 2D digital templating aids surgical planning in total hip arthroplasty (THA), while linked to improved implant size prediction and outcomes, further understanding is needed of which parameters it predicts most accurately. We evaluated template accuracy by comparing preoperative templated measurements with postoperative findings and final implant sizes.

Methods: We retrospectively reviewed a consecutive series of 100 patients who underwent fluoroscopic-guided direct anterior approach (DAA) THA by a single surgeon from 11/2022-9/2024. All patients received an Emphasys femoral stem with a Pinnacle acetabular cup. A single attending arthroplasty surgeon used Traumacad™ software for preoperative templating, which was compared to postoperative measurements and implants.

Results: Patients had an average age (68.8 yrs), BMI (28.7), 59% female, and 37% with prior contralateral THA. Average preoperative measurements included neck cut length (13.4 mm), neck cut angle (39.1°), and LLD compared to contralateral (-3.8 mm). Preoperative template averages were: cup size (55.1 mm), femur size (5.8), head size (36 mm), and inclination (41.0°). Delta values (difference between postoperative and templated measurements) were: neck cut length (5.6 mm), neck cut angle (2.8°), LLD (0.1 mm), cup size (1.3 mm), femur size (0.7), head size (0 mm), and inclination (2.9°). Cup size was perfectly predicted in 56% of cases, 95% within two sizes; femur size was perfect in 52% of cases, 88% within one size, and 95% within two sizes. Stem offset was 94% accurate. Regression analysis found that higher BMI and male gender were associated with less accurate predictions for neck angle and cup size, respectively.

Conclusion: While variables such as higher BMI and male gender may influence the accuracy of templating, our findings suggest that 2D templating for DAA THA offers reliable predictions within a narrow range for final implant sizes, neck cut, and planned leg length changes.