

## Comparison of planned vs final femoral stem version in robotic assisted total hip arthroplasty

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**INTRODUCTION:** The aim of this study was to determine accuracy of stem placement to plan for CT-based robotic-assisted total hip arthroplasty (RATHA).

**METHODS:** A prospective study was performed on 53 consented patients who received CT-based RATHA that incorporates functional pelvic tilt and virtual ROM during preoperative planning. Preoperative CT-scan was required for RATHA. Final planned implant placement with respect to stem version was recorded intraoperatively. CT-scans were collected at 6-week follow-up and stem version was assessed. Accuracy measurements were performed using 3D analysis software to segment and evaluate pre- and postoperative CT-scans to measure differences between final implant plan and postoperative placement with respect to stem version. A Mann Whitney U test (95% confidence interval) was performed to assess statistical difference between final planned and postoperative implant placement.

**RESULTS:** 51% of RATHA cases were completed with direct anterior approach. Broach version measured with the robotic-arm was mean 9.8°(SD 10.0°) and mean version measured using postoperative CT was 10.2° (SD 9.1°). There was a strong relationship between the CT measured and robotic measured version ( $R^2=0.94$ ). On average there was a difference of 1.9° (SD 1.6°) between the intraoperative broach measurement and postoperative CT stem measurement. There was no statistical difference between planned and postoperative measurements ( $p=0.328$ ). There were two patients (3.8%) that had a measured postoperative version greater than 5° degrees as measured on the CT (5.06° and 8.08°) and can be considered outliers.

**DISCUSSION:** Intraoperative consideration of pelvic tilt and virtual ROM with RATHA influenced implant placement. RATHA demonstrated accuracy of stem placement compared to plan in comparing preoperative to postoperative CT scans.

**SIGNIFICANCE/CLINICAL RELEVANCE:** RATHA with the consideration of patient specific factors can influence implant placement, while still demonstrating accuracy of stem component placement compared to surgical plan.