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Fluoroscopy-based Robotic-assisted Total Hip Arthroplasty Resulted in Greater Improvements in Hip-specific Outcome Measures at One-year Compared to CT-based Robotic-assisted Technique



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Robotic assistance for Total Hip Arthroplasty may improve post-operative PROMs

Fluoroscopy-based robotics resulted in improved HOOS-PS scores relative to CT-RTHA

Differences in HOOS-PS scores may be attributable to differences in surgical workflow

Introduction

- Use of intra-operative robotic assistance for total hip arthroplasty has been associated with improved patient reported outcome measures (PROMs)
- Most of the literature on robotic-assisted total hip arthroplasty (THA) outcomes is derived from a single computerized tomography-based robotic (CT-RTHA) platform, leaving little guidance for surgeons who utilize alternative systems
- **Purpose of the study:** To compare one-year PROMs between a novel, fluoroscopy-based, robotic-assisted (FL-RTHA) system and a CT-RTHA system for direct anterior approach (DAA) THA

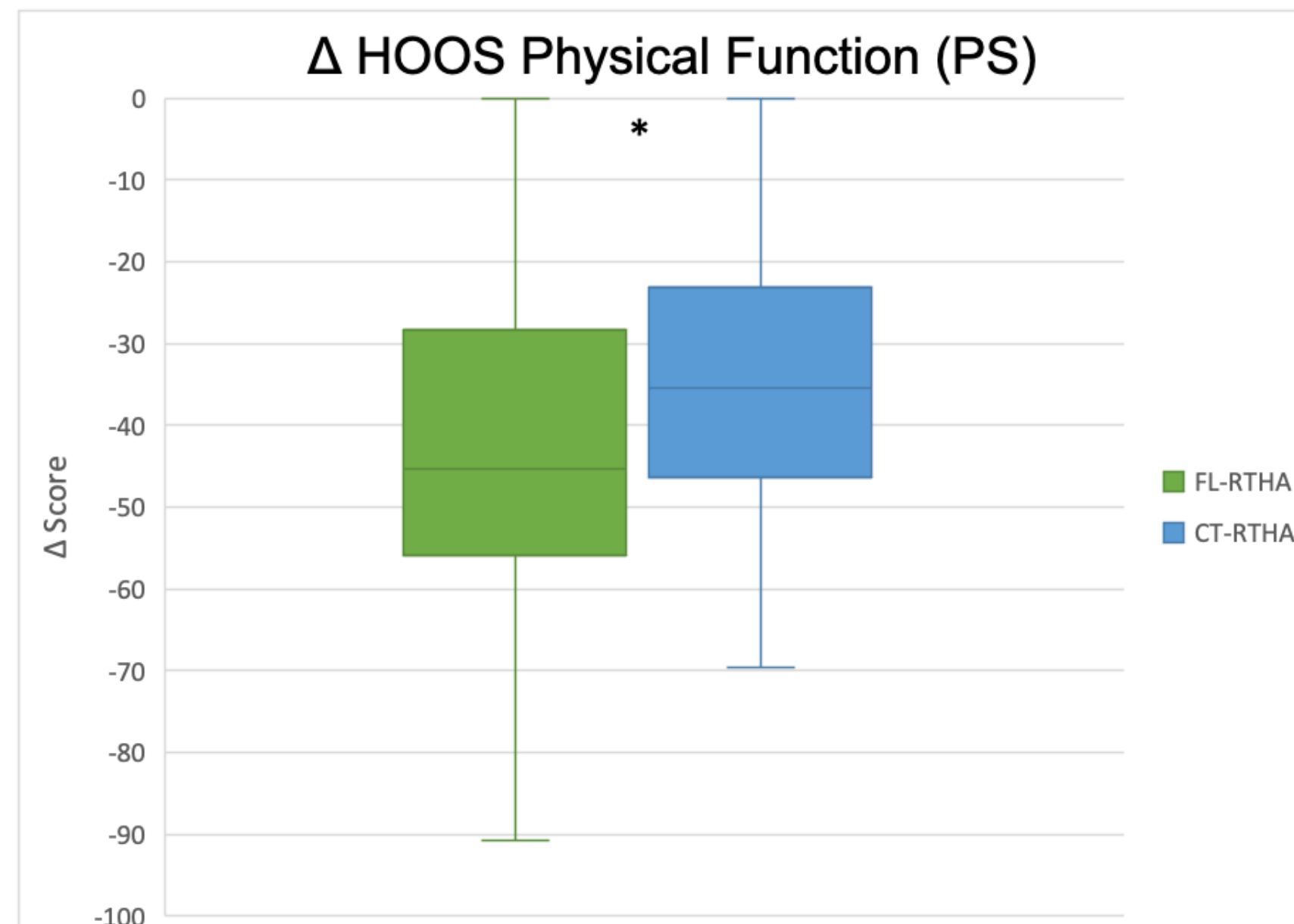
Methods

- All cases were performed consecutively via a DAA by one of two surgeons at the same healthcare institution
- Cohort 1: 85 FL-RTHA; Cohort 2: 125 CT-RTHA
- Cohorts had similar distributions of patient Body Mass Index (BMI), procedure laterality, and pre-operative American Society of Anesthesiologists (ASA) scores
- Inclusion criteria: 1) Age ≥ 18 ; 2) Primary THA; 3) Primary dx osteoarthritis, rheumatoid arthritis or avascular necrosis
- Outcome variables: 1) One-year PROMs (Veterans RAND-12 (VR-12) Physical/Mental, Hip Disability and Osteoarthritis Outcome (HOOS) Pain/Physical Function (PS)/Joint Replacement (JR), University of California Los Angeles (UCLA) Activity scores); 2) Differences between pre- and post-operative PROMs (Δ); 3) Major post-operative complications requiring re-operation (dislocation, periprosthetic fracture, etc)

Results

- Patients in the FL-RTHA cohort had lower pre-operative VR-12 Physical, HOOS Pain, HOOS-PS, HOOS-JR, and UCLA Activity scores compared to patients in the CT-RTHA cohort
- Patients in the FL-RTHA cohort reported significantly greater improvements in HOOS-PS scores (-41.54 vs. -36.55; $p=0.028$) than patients in the CT-RTHA cohort
- Cohorts experienced similar rates of major post-operative complications requiring reoperation/revision surgery (FL-RTHA 0% vs. CT-RTHA 3.20%; $p=0.095$)

Figure 1: Comparison of FL-RTHA and CT-RTHA Δ HOOS-PS



Note: * = $p < 0.05$

Discussion

- **Use of the fluoroscopy-based robotic system resulted in greater improvements in HOOS-PS, with similar rates of complication at one-year relative to the CT-based robotic technique**
- Differences in HOOS-PS scores may be attributable to the intra-operative workflows of each system
- FL-RTHA utilizes standard intra-operative fluoroscopic images for pin-less digital navigation in conjunction with an image-based robotic registration, while the CT-RTHA platform requires navigation tracker pin insertion and physical probe contact with bony points around the acetabular rim (potentially imprecise)

Conclusions

- Both fluoroscopic and CT-based platforms in this study achieved excellent PROM results and similar complication rates at this short-term follow-up of one year post-operatively
- Adoption of the robotic-assisted DAA THA may be associated with greater improvements in HOOS-PS scores at one-year relative to CT-RTHA
- Additional prospective research that utilizes an expanded cohort with matched demographics is still needed to validate this study



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