

Robotic Assistance Provides Surgical Efficiency for Direct Anterior Total Hip Arthroplasty

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INTRODUCTION: The increased demand for total hip arthroplasty has led hospitals to seek opportunities for improvement of operating room efficiency [1]. Direct anterior approach (DAA) for manual total hip arthroplasty (MTHA) has increased in popularity due to the desire for a less invasive procedure associated with a faster recovery [2], and has shown to be a more efficient procedure when compared to posterolateral approach [3]. CT-based robotic-assisted total hip arthroplasty (RATHA) has shown to decrease incidence of acetabular component outliers and decrease operating time after the learning curve was observed [4], however few studies have investigated surgical efficiency with DAA RATHA. Therefore, the purpose of this study was to compare surgical efficiency between DAA MTHA and RATHA.

METHODS: Six cadavers were evenly distributed among two surgeons, both with previous experience in MTHA and RATHA. For each cadaver, DAA MTHA with fluoroscopy was performed on the first hip and DAA RATHA without fluoroscopy was performed on the contralateral hip. Surgical efficiency data collected for all cases included total operative time from skin to trials, surgical task time for acetabular and femoral workflow and number of reamers and broaches used. Acetabular workflow was defined as acetabular preparation, reaming and impaction. Femoral workflow was defined as femoral preparation, broaching and impaction. Two sample t-tests were performed to assess statistical difference of case data between the two procedures.

RESULTS: Average total operative time for RATHA was three minutes less than MTHA (23 ± 5.8 min vs 26 ± 7.1 min), however the times were not significantly different ($p=0.452$). Less time was spent during acetabular workflow for RATHA (3 ± 1.6 min) compared to MTHA (6 ± 3.1 min) ($p=0.070$). One reamer was utilized for each RATHA case (vs 2.67 ± 0.58 reamers for MTHA) and RATHA demonstrated significantly less reaming time (24 ± 0.40 sec RATHA vs 2.4 ± 0.61 min MTHA, $p<0.001$). Less time was spent during femoral workflow for RATHA by an average of 1.5 minutes, but was not significantly different from MTHA ($p=0.407$). On average, 4.3 ± 2.6 broaches were used for RATHA case, and 5.0 ± 1.9 broaches were used for MTHA ($p=0.593$).

DISCUSSION: This cadaveric study showed that CT-based RATHA provided improved surgical efficiency for DAA THA through less operative time, significantly less acetabular reaming time with single staged reaming, less time spent on femoral workflow and fewer instruments used. The encouraging results should be further investigated in a clinical setting.

SIGNIFICANCE/CLINICAL RELEVANCE: For a direct anterior approach total hip arthroplasty, robotic assistance can be an opportunity for operating rooms to improve their surgical efficiency with regards to reduced surgical time and use fewer instruments.

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