Robotic-Assisted Direct Anterior Approach Total Hip Arthroplasty: 6.5-Fold Reduction in Fluoroscopic Radiation Exposure Versus Computer Navigation and Manual Instrumentation

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INTRODUCTION: Direct anterior approach (DAA) for total hip arthroplasty (THA) is increasing in popularity. Fluoroscopy is commonly utilized during DAA THA to increase component placement accuracy. The objective of this study was to compare fluoroscopic radiation exposure and fluoroscopy time for DAA THA when utilizing robotic-assistance (RA), computer-assistance (CA), or manual (M) instrumentation.

METHODS:

Retrospective review identified 5,215 patients undergoing primary, unilateral DAA THA between 2016 and 2023, including 3,007 M-THA, 1050 CA-THA, and 1158 RA-THA. Mean age was 65 years, mean BMI was 27, and 62% were women. The CA-THA cohort had fewer women ($p<.001$), was younger ($p<.001$), and had a higher BMI ($p<.001$). The mean fluoroscopy radiation dose (milliGray [mGy]) and fluoroscopy time were compared.

RESULTS: The RA-THA cohort had a smaller mean fluoroscopic radiation dose (0.399 ± 0.592 mGy) than the CA-THA (2.59 ± 2.23 mGy, $p<0.01$) and M-THA (2.66 ± 2.79 mGy, $p<0.01$) cohorts. There was no difference in fluoroscopic radiation dose between M-THA and CA-THA cohorts ($p=0.62$). The RA-THA cohort had a shorter mean fluoroscopy time (5.11 ± 9.04 seconds) than the CA-THA (17.65 ± 9.12 seconds, $p<0.05$) and M-THA (22.62 ± 46.45 seconds, $p<0.01$) cohorts. The CA-THA cohort also had a shorter mean fluoroscopy time than the M-THA cohort ($p<0.01$).

DISCUSSION AND CONCLUSION:

In this series of DAA THA, RA-THA required a 6.5-fold smaller fluoroscopic radiation dose and 3.5-fold to 4.5-fold decrease in fluoroscopy time compared to CA-THA and M-THA. As DAA THA volume increases, while likely insignificant for the patient, surgeons should consider the cumulative radiation exposure to themselves and operating room staff.