Total Hip Arthroplasty via an Anterior Approach Provided Improved Early Functional Recovery when Compared to the Posterior Approach: Preliminary Results of a Randomized Trial

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Disclosures:
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Introduction: The anterior approach has become an increasingly popular total hip arthroplasty (THA) technique due in large part to the perceived improvements in early functional recovery. While these improvements have been demonstrated when compared to lateral approaches, subjective and objective measures of postoperative function have not been compared between the anterior and posterior approaches. We then questioned whether the functional recovery during the early postoperative period is improved when using an anterior approach than a posterior approach. We hypothesized that the anterior approach would result in significantly earlier ability to discontinue use of an assistive ambulatory device, greater subjective outcome scores, and superior instrumented measures of function during the early postoperative period.

Methods: An a priori power analysis was performed to determine the sample size for this study, with the time to discontinued use of an assistive ambulatory device as the primary outcome variable. Previous authors have independently reported that the time to discontinued use of an assistive device with a mini-posterior approach was 28.5 days and 16.8 days with an anterior approach. Assuming variability of 16.6 days as reported by Della Valle et al., a sample size of 26 THAs per group would be 80% powered to detect group differences of this magnitude (G*Power, version 3.1.3). To date, 33 patients (35 THAs) have volunteered to participate in this IRB-approved protocol, with 19 patients (21 THAs) having completed both preoperative and 6-week postoperative data collection. Patients were excluded if they were less than 18 or more than 85 years of age, had been diagnosed with inflammatory or rheumatoid arthritis, had a Body Mass Index (BMI) greater than 40 kg/m^2, or had previously undergone any prior ipsilateral hip surgery including arthroscopic procedures. Patients were then randomly assigned to have either anterior or posterior THA. All procedures were performed by a single board-certified orthopaedic surgeon that has performed more than 2,000 posterior THAs and 400 anterior THAs. Patient function was assessed prior to surgery and at each patient’s 6-week postoperative follow-up visit. Patient-reported outcome tools included modified Harris Hip Scores (HHS) with Pain (PS) and Function (FS) subcomponent scores, the Lower Extremity Function Scale (LEFS), Single Assessment Numeric Evaluation (SANE) and the SF-12 Mental and Physical Scores. A dual force platform (Bertec, Columbus, OH) was used to collect force data as patients performed a sit-to-stand maneuver. For the sit-to-stand test, patients were asked to rise from a chair with seat height of 45.7 cm (18”) and then stay as motionless as possible for 5 to 10 s, and were allowed to use arm rests if necessary. Patients performed two to three trials and force data were collected for each limb at a sampling rate of 1000 Hz and later filtered using a fourth order Butterworth filter. Center of pressure sway velocity was used to quantify dynamic postural stability, and was defined as the sway velocity occurring during the first 150 ms after the patient had achieved a standing position. Greater sway velocity is suggestive of a reduced ability to maintain a neutral static position. The mean maximum force (N) generated by each limb and mean sway velocity (cm/s) were calculated for the two to three trials of the sit-to-stand test. Patients were also asked to perform a timed-up-and-go test. For this timed test, the force platform was used to calculate the time necessary to complete the test, with the chair being placed directly on the platform. Time began when the chair was unweighted and stopped when the patient sat back down on the chair. Patient-reported outcomes, max force of the involved limb when rising from a chair, sway velocity, and timed-up-and-go data were compared between the anterior and posterior THA groups using 2 x 2 mixed model ANOVAs (group x time). In addition to the patient-reported outcome scores and instrumented measures of patient function, we also recorded the duration of hospital stay and number of days to discontinued use of an assistive ambulatory device which were compared between groups using two-tailed independent t-tests. All analyses were performed using SPSS Statistics v21 (IMB, Armonk, NJ) with p < 0.05 considered statistically significant.

Results: The two groups did not differ in age, sex, or BMI. While not statistically significant, the anterior THA group demonstrated somewhat shorter length of hospital stay (1.6±0.7 days vs. 2.2±0.7 days, p = 0.07) with an earlier ability to discontinue use of an assistive ambulatory device (28.4±25.6 days vs. 49.2±17.8 days, p = 0.054). Regardless of group, HHS, PS, FS, LEFS, and SANE scores as well as the force generated when rising from a chair significantly improved between the preoperative and 6-week postoperative time points. Significant group x time interactions were noted for HHS, PS, FS, SANE, and SF-12 Physical Scores indicating that the anterior THA group demonstrated significantly greater gains after surgery than the posterior THA group. (Figure 1) Max force of the involved limb when rising from a chair significantly improved for both groups after surgery; however, no group differences were noted (p = 0.59). A significant group x time interaction was also present for...
sway velocity, with the posterior THA group demonstrating improvements in sway velocity whereas the anterior THA group had greater sway velocity at the 6-week follow-up than prior to surgery.

**Discussion:** The anterior approach consistently resulted in significantly improved patient-reported outcomes than the posterior approach six weeks after primary THA. It is, however, interesting to note that the anterior approach group demonstrated inferior postural stability. This finding was not only contrary to our hypothesis, but also with the patient-reported outcomes and other instrumented measures of patient function utilized in this study. Previous authors have reported a greater number and concentration of mechanoreceptors in the portion of the capsule that is interrupted when using an anterior approach.[3] We speculate that inferior postural stability may be caused by interrupting a greater number of mechanoreceptors with the anterior approach, but a great deal of future research will be necessary to support such a theory.

**Significance:** The preliminary results of this randomized study are pertinent to both orthopaedic surgeons and patients electing to undergo primary THA. The current results suggest that the anterior approach yields significantly greater patient-reported pain relief and function during the early postoperative period. Long-term evaluation will be necessary to ensure that an improved early functional recovery with the anterior approach is not a trade-off for inferior long-term results.

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Figure 1. Changes in patient-reported outcome scores six weeks after THA performed using an anterior or posterior approach. * indicate statistically significant with p < 0.05.