NEW ENGLAND BAPTIST HOSPITAL

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6) TITLE: **Evaluation of Intraoperative Pelvic Position In the Lateral Position During Hip Arthroplasty Using Computed Tomography/Radiography Matching**
(TRAINEE)

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INTRODUCTION: Acetabular component malpositioning can lead to accelerated wear, wear induced osteolysis, instability, impingement and early revision for any of these problems. Malposition of the pelvis at the time of acetabular component insertion can contribute to malpositioning of the acetabular component.

OBJECTIVE: This study measures the variation in intraoperative positioning of the pelvis on the operating table during surgery by matching intraoperative radiographs with pre-operative computed tomograms (CT) using 2D-3D matching.

METHODS: This prospective study was comprised of a random sample of 45 patients (n = 45, 26 female, 19 male) who had received a total hip arthroplasty (THA) from a single surgeon from 10/21/2003 to 9/6/2007. No THA candidate was excluded for any reason, including body habitus (mean BMI = 27.7, range 17.5 – 42.3), underlying disease process, age (mean age at surgery = 57, range 27 – 80), sex or side of surgery (21 left THAs, 24 right THAs). According to our standard clinical treatment protocol, each patient had a pre-operative CT scan for CT-based surgical navigation of the hip arthroplasty and each patient had an intraoperative radiograph taken to assess component positioning. All THAs were performed in the lateral decubitus position on a radiolucent peg-board positioning device. Each patient's intraoperative pelvic radiograph was taken after acetabular component and trial femoral component insertion with the leg placed in a neutral position on the operating table and with the xray plate aligned squarely with the operating table. The orientation of the pelvis on the operating table was calculated by comparing the intraoperative 2D projection to the 3D CT dataset using software that can perform 2D-3D matching (*Xalign*). This software has been validated previously to have an accuracy of 0.8 ± 2.0 degrees. By matching the 3D CT dataset to the magnification and orientation of the plain radiograph, the position of the anterior pelvic plane relative to the operating table could be calculated. These data were then plotted and descriptive statistics were performed.

RESULTS: The mean pelvic tilt (rotation around the medial-lateral axis) was 6.84 degrees of anterior pelvic tilt (lordosis) with a standard deviation of 7.95 degrees and a range from 27.24 degrees of lordosis to 4.96 degrees of kyphosis. The mean pelvic obliquity (rotation around the longitudinal axis) was 2.89 degrees anterior from neutral with a standard deviation of 9.44 degrees and a range from 29.36 anterior to 16.59 posterior from neutral. The mean pelvic rotation (rotation around the anterior-posterior axis) was 2.56 degrees cephalad, with a standard deviation of 4.10 degrees and a range from 10.88 degrees cephalad to 5.97 degrees caudad.

CONCLUSION: This study shows a high variability of intraoperative pelvic positioning in the clinical setting using accurate measurement tools. While pelvic orientation was variable in all planes, the greatest variation was in pelvic obliquity. This has the greatest influence on anteversion/retroversion of the acetabular component. Since all of our intraoperative radiographs were taken with the leg in a neutral position, it is likely that the pelvis is even more greatly malpositioned at other times during the surgery when forces applied by retractors or upon the leg may be greater.

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