

Current Classifications of Spine Stiffness and Total Hip Arthroplasty Impingement Computer Simulations are Flawed Due to Wrong Assumptions

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INTRODUCTION: Current available tools for preoperative total hip arthroplasty (THA) planning assume that there is no significant difference between preoperative and postoperative sagittal pelvic tilt in standing, sitting, or sit-to-stand positions. We hypothesize that with improvement in pain and range of motion, there will be significant differences in sagittal pelvic tilt as measured by sacral slope in postoperative radiographic imaging.

METHODS:

This study was a multicenter retrospective analysis of pre- and postoperative full-body imaging of 165 primary THA patients in standing, sitting, and sit-to-stand positions. All patients underwent the same positioning protocol for pre- and postoperative imaging. Sagittal pelvic tilt was measured by sacral slope. The results were compared using paired-samples t-test.

RESULTS: The mean sacral slope difference between the pre- and postoperative measurements in standing was 2.1° (range: -32.84° to 43.8°) ($p=0.047$). The mean sacral slope difference between the pre- and postoperative measurements in sitting was -7.7° (range: -72.9° to 42.5°) ($p<0.0001$). The mean sacral slope difference between the pre- and postoperative measurements in sit-to-stand was -3.4° (range: -76.1° to 62.3°) ($p<0.049$). Patients were categorized into stiff spine (change in sacral slope less than 10° from standing to either sitting or sit-to-stand positions) and normal spine groups. Postoperatively, 55.8% of patients switched groups when their sacral slope change from sitting to standing was analyzed. This change in grouping occurred in 49.5% of patients when the change in postoperative sacral slope from sit-to-stand to standing position was evaluated.

DISCUSSION AND CONCLUSION:

Our results show a significant difference between the pre- and postoperative sagittal pelvic tilt measured by sacral slope, particularly in sitting and sit-to-stand positions. Considering that undergoing THA does not change the flexibility of the spine, classification of patients' spine stiffness based on changes in sacral slope from standing to sitting position is flawed. Current planning tools that do not consider these significant modifications in postoperative pelvic tilt, will not provide a valid preoperative THA planning and functional safe zone for THA execution.