Comparative assessment of relaxed- and flexed-seated radiographs in evaluating spinopelvic parameters in Total Hip Arthroplasty

Andreas Fontalis, Fabio Mancino, Thomas Pierre Vanspauwen, Warran Wignadasan, Pit Putzeys, Fares Sami Haddad

INTRODUCTION:

This study evaluated the comparative value of relaxed- and flexed-seated lateral radiographs in assessing spinopelvic mobility in in total hip arthroplasty (THA).

METHODS:

A prospective cohort of 100 patients undergoing robotic-arm assisted THA for primary osteoarthritis underwent radiographic assessment in standing, relaxed-seated and flexed-seated positions. Measurements included sacral slope (SS), lumbar lordosis (LL), pelvic incidence (PI) and pelvic tilt (PT). Patients were also classified according to the Hip-Spine Classification.

RESULTS:

The mean age was 66.2 years and BMI 27.9 kg/m². Based on standing to relaxed-seated change, 8% were classified as stiff (types 1B/2B) and 34% had flatback deformity (PI–LL > 10°). Using standing to flexed-seated views, 47% met stiff spine criteria and 18% had ΔLL ≤ 20°. Among these, only 11% were identified using relaxed-seated SS, compared to 72% using flexed-seated SS.

The mean ΔSS between relaxed- and flexed-seated positions was 14.6 ± 12.1°, with 26% showing ΔSS > 20°. SS increased (anterior tilt) in 24% of patients from standing to flexed-seated and exceeded 10° in 7%. All such patients were classified as stiff. No association was found between ΔSS > 20° and BMI, PI, or native SS. In patients with flatback deformity, stiffness was identified in 15% using relaxed-seated SS vs 50% with flexed-seated. These patients also had lower standing SS (34.2° vs 38.1°, p=0.03), but similar ΔSS between seated positions.

DISCUSSION AND CONCLUSION:

Relaxed-seated radiographs may underestimate the prevalence of spinal stiffness. The lack of strong correlation between standing and flexed-seated parameters limits predictive value, making flexed-seated x-rays a useful tool in surgical planning. Patients with a stiff spine may show a ΔSS > 20° between relaxed- and flexed-seated views, making relaxed-seated imaging alone insufficient to identify them. Additionally, relaxed-seated x-rays may underdetect anterior pelvic tilt changes. In patients with flatback deformity, relying solely on relaxed-seated imaging may lead to a threefold underestimation of stiffness, supporting the use of flexed-seated radiographs in this group.