

Dynamic Sitting to Standing Radiographs More Accurately Depict Functional Mechanics Than Static Radiographs in Total Hip Arthroplasty

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Introduction: Hip osteoarthritis (OA) is frequently co-existent with lumbar degenerative pathology, and therefore static sitting-standing radiographs are often used to preoperatively evaluate dynamic changes in spinopelvic parameters when planning THA. The purpose of this study is to compare dynamic sitting-standing to static radiographs in the accuracy of determining functional spinopelvic mechanics in patients with hip OA.

Methods: An institutional review-board approved cohort of 50 patients with hip osteoarthritis whom underwent full body sitting-standing radiographs from August 2016–December 2017 at a single institution were retrospectively reviewed. Subjects who underwent dynamic (single leg extension standing, single leg step-up, and flexed seated) radiographs were compared to subjects who underwent normal standing and relaxed sitting radiographs. Spinopelvic parameters including pelvic incidence (PI), pelvic tilt (PT), sacral slope (SS), and lumbar lordosis (LL) were measured in both dynamic and static radiographs. Independent-sample t-tests and ANOVA were used to compare alignment parameters between both groups.

Results: A total of 50 patients with static radiographs were compared to 50 patients with dynamic radiographs. Standing PT ($p < 0.001$), standing LL ($p < 0.001$), sitting PT ($p < 0.001$), and sitting LL ($p = 0.007$) were significantly different between dynamic and relaxed cohorts, respectively. Dynamic imaging from single leg standing to the flexed seated position demonstrated greater effects of LL ($p < 0.001$) and PT ($p = 0.001$) in functional positions. Dynamic imaging showed a lower effect of PT ($p = 0.002$) and greater effect SS ($p = 0.003$) from the standing to step up compared to relaxed sitting to standing positions.

Conclusions: Dynamic sitting-standing imaging emphasizes the compensatory mechanisms of patients with concomitant hip and spine pathology more effectively than static imaging, and more reproducibly simulates high-risk positions of dislocation in THA. Dynamic radiographs should be included as part of routine spinopelvic evaluation when planning THA, especially in individuals with co-existing OA and lumbar pathology.