

Preoperative Hip Stiffness Effect on Spinopelvic Compensation Following Lumbar Fusion

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INTRODUCTION: Spinopelvic sagittal alignment is thought to play a critical role in physical function and clinical outcomes following lumbar fusion surgery. Patients with stiff hips may have a reduced ability to adapt to postural changes following surgery. This study evaluated differences in spinopelvic alignment changes from standing to sitting after lumbar fusion between patients with preoperatively identified stiff hips and controls.

METHODS: Adult patients undergoing 1 or 2 level lumbar fusion by a single surgeon with preoperative and 1-year postoperative lateral radiographs in standing and sitting positions were identified. Exclusion criteria included previous lumbar fusion surgery, revision within 1 year postoperatively, and >2 levels fused. Spinopelvic parameters analyzed included pelvic femoral angle (PFA), pelvic tilt (PT), sacral slope (SS), lumbar lordosis (LL), lumbar tilt (LT), and sagittal angle (SA). LT was defined as the angle between a line drawn from the posterior edge of the superior L1 endplate to the center of the femoral head and a vertical line. SA is the angle between a line drawn from the posterior aspect of the superior L1 endplate to the center of the femoral head and a line parallel to the femoral shaft. Patients were classified as having stiff hips preoperatively if Δ PFA from standing to sitting was less than -55° . Preoperative and 1-year postoperative sitting and standing spinopelvic measurements were compared using independent samples t-tests between groups. This study was approved by an institutional review board (HS-23-00758).

RESULTS SECTION: Fifty-four patients met inclusion criteria. The average age was 64.9 ± 12.3 years, and the group included 32 females (55.2%). The average BMI was 29.3 ± 5.5 , with 27 patients identified as having stiff hips preoperatively. Following lumbar fusion, patients with stiff hips showed greater decreases from standing to sitting in SS (-14.89° vs -7.44°) and LL (-18.48° vs -6.73°), greater increases in LT (5.83° vs 8.70°) and PT (16.07° vs 8.30°), and smaller decreases in SA (-64.15° vs -74.15°) and PFA (-58.59° vs -69.15°). Preoperative trends followed similar trends. From preoperative to postoperative, stiff-hip patients had larger decreases in Δ PFA (-17.37° vs -2.26°) and Δ LT (-2.52° vs -0.96°).

DISCUSSION: Patients with stiff hips demonstrated increased pelvic retroversion (larger increase in Δ PT, larger decrease in Δ SS) and larger decrease in lumbar lordosis from standing to sitting. These differences in spinopelvic compensation may impact long-term outcomes following lumbar fusion, as there is likely a redistribution of forces into vertebral segments adjacent to the lumbar fusion construct.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): Patients with preoperative hip stiffness exhibit distinct compensatory spinopelvic adaptations after lumbar fusion surgery, which may alter load distribution across adjacent segments. Increased awareness of how spinopelvic parameters change postoperatively in patients with stiff hips may help guide preoperative planning.

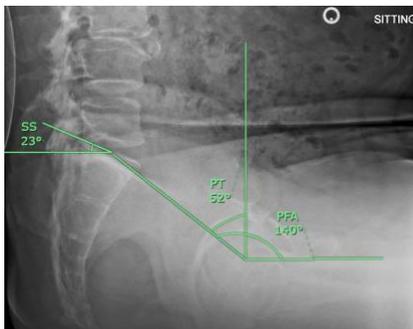


Figure 1. Spinopelvic parameters measured on sitting radiograph: sacral slope (SS), pelvic tilt (PT), proximal femoral angle (PFA).



Figure 2. Spinopelvic parameters measured on standing radiograph: lumbar lordosis (LL), lumbar tilt (LT), modified lumbar tilt (mLT), sagittal angle (SA).