

The Effects of Sacroiliac Joint Fixation on the L5/S1 Facet Joint: A Cadaveric Study*Corey J. Schiffman, MD; Erik Arthur Magnusson, MD; Scott Telfer, PhD;**Reza Firoozabadi, MD**University of Washington, Seattle, WA, United States*

Purpose: Injuries to the posterior pelvic ring are often stabilized with fixation across the sacroiliac joint (SIJ). However, the compensatory changes at the neighboring L5/S1 facet joint are unknown. The objective of this study was to determine the change in pelvic kinematics and contact forces at the L5/S1 facet joint after SIJ fixation using a cadaveric biomechanical model.

Methods: Five fresh-frozen cadaveric pelvis specimens were dissected to remove all nonstructural soft tissue. Retroreflective marker clusters were fixed to the L5 vertebral body, S1 body, and bilateral anterior superior iliac spines (ASISs) to represent the motion of L5, S1, and the ilium, respectively. Flexible pressure sensors were inserted in both L5/S1 facet joints. Biomechanical testing was performed using a hexapod robotic system that applied axial load individually to each side of the pelvis. Biomechanical testing was performed prior to SIJ fixation, after unilateral fixation with a 7.0-mm iliosacral screw, and after bilateral SIJ fixation.

Results: Contact force at the L5/S1 facet joint significantly increased from 65.4 ± 40 N to 128 ± 122 N following unilateral fixation ($P = 0.0161$) and to 144 ± 154 N ($P = 0.0038$) after bilateral fixation. Significantly more motion in multiple planes occurred at L5/S1 facet joint after fixation of the SIJ. Unilateral SIJ fixation increased flexion of the ilium relative to L5 from 1.25° to 2.04° ($P = 0.01$) and increased axial rotation of L5 relative to S1 from 2.81° to 3.23° ($P = 0.001$). Bilateral fixation increased flexion of the ilium relative to L5 to 1.8° from 1.25° prior to fixation ($P = 0.001$), increased axial rotation of L5 relative to S1 to 3.6° from 2.81° prior to fixation ($P = 0.002$), and increased flexion of L5 relative to S1 to 3.7° from 3.1° prior to fixation ($P = 0.04$).

Conclusion: The L5/S1 facet joint experiences compensatory increased motion under increased contact force after unilateral and bilateral SIJ fixation, possibly predisposing it to adjacent segment arthritis.

