

A Biomechanical Investigation of the Sacroiliac Joint in the Setting of Lumbosacral Fusion: Impact of Pelvic Fixation Versus Sacroiliac Joint Fixation

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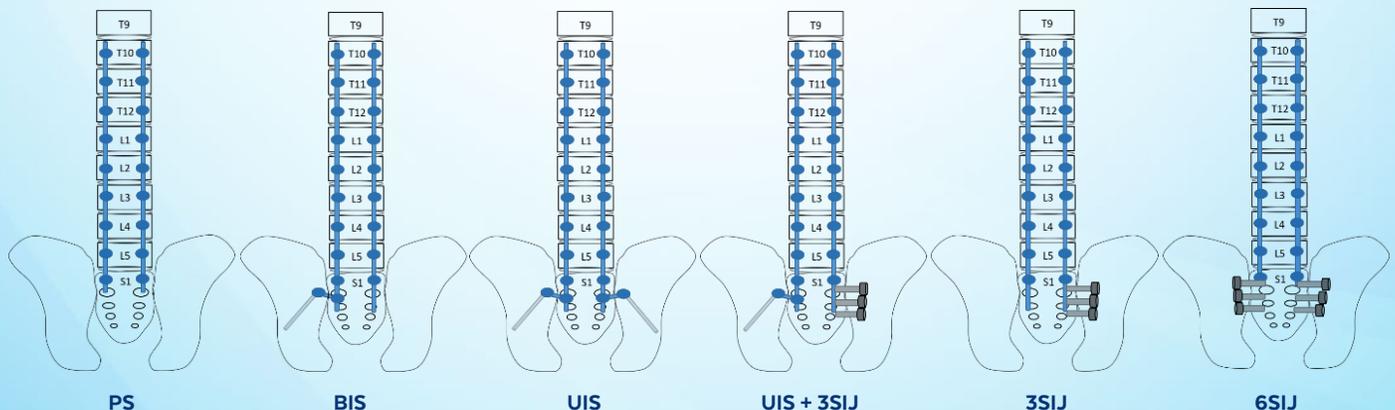
OBJECTIVE: To evaluate the effect of pelvic fixation versus sacroiliac joint fixation using SI-LOK on the sacroiliac joint (SIJ) in a biomechanical study.

METHOD: A custom-built 6 degrees-of-freedom apparatus was used to simulate three bending modes: flexion-extension (FE), lateral bending (LB), and axial rotation (AR) in seven fresh-frozen human cadaveric specimens.

One intact specimen and six operative constructs were studied as follows:

- Posterior pedicle screws and rods from T10 to S1 (PS)
- PS + bilateral iliac screw fixation (BIS)
- PS + unilateral iliac screw fixation (UIS)
- PS + UIS + 3 contralateral unilateral SIJ screws (UIS + 3SIJ)
- PS + 3 unilateral SIJ screws (3SIJ)
- PS + 6 bilateral SIJ screws (6SIJ)

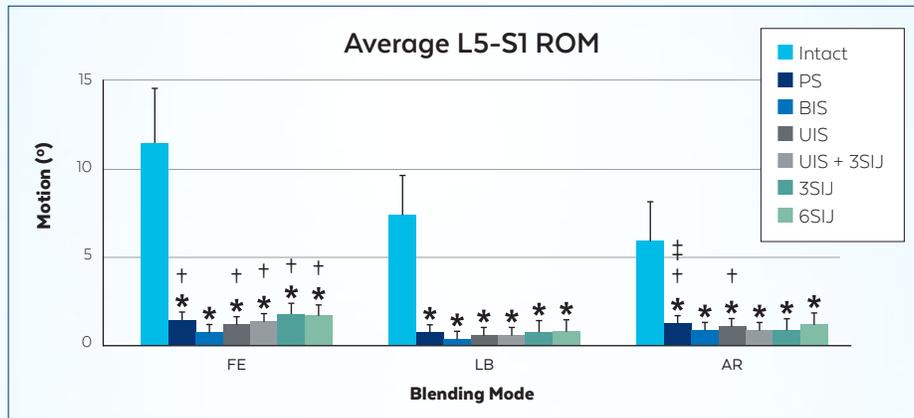
Range of motion (ROM) was recorded at L5-S1 and the SIJ, and compared across constructs and loading modes.



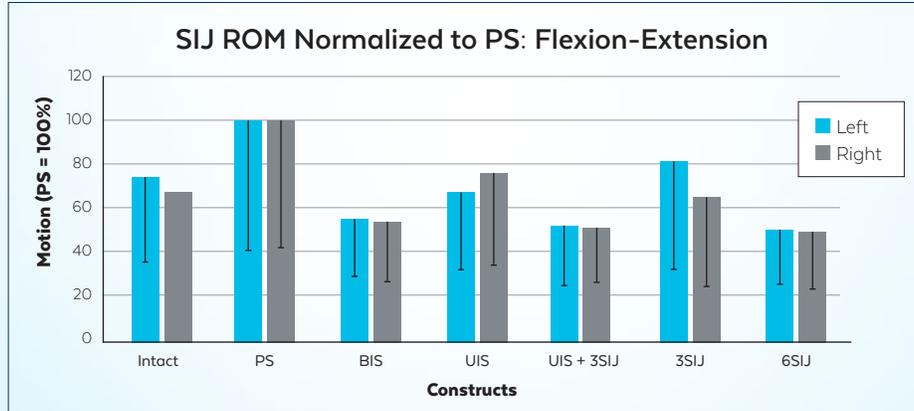
AR = axial rotation; FE = flexion-extension; LB = lateral bending; ROM = range of motion; SIJ = sacroiliac joint; SIJF = SIJ fusion, PS = pedicle screws, UIS = unilateral SIJ screws.

RESULTS:

- All six operative constructs had significantly reduced ROM at L5-S1 in all three bending modes compared to that of the intact specimen ($p < 0.05$).
- In FE mode, the BIS construct had a significant reduction in L5-S1 ROM as compared to the other five constructs ($p < 0.05$). SIJ ROM was greater in FE compared to LB and AR across all constructs.
- The PS construct had the highest SIJ ROM in FE and LB (increased 30% and 35% respectively, relative to intact).
- The BIS construct reduced bilateral SIJ FE ROM by 44% in comparison to the PS construct. The BIS and 6SIJ constructs showed nearly equal reductions in SIJ FE ROM compared to the PS construct.
- UIS and 3SIJ showed an appreciable reduction in SIJ ROM compared to PS.



Mean ROM at L5-S1 for all operative constructs and intact condition.



Mean ROM in the left and right SIJs in FE for all operative constructs, normalized to the PS construct.

CONCLUSION:

Bilateral pelvic fixation using of SI-LOK[®] Sacroiliac Joint Fusion System showed significant reduction of movement at L5-S1 and was equivalent to bilateral sacroiliac fusion in reducing SIJ motion. Unilateral SIJ fusion and pelvic fixation may have bilateral benefit in reducing SIJ ROM in the setting of long fusion constructs to S1.