

## Comparative Analysis of Hybrid Dynamic Stabilization and Fusion for Degenerative Disease of the Lumbosacral Spine: Finite Element Analysis

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**Abstract :** The Radiographic apparent assumed that the asymptomatic adjacent segment disease ASD is common after lumbar fusion, but this does not correlate with the functional outcomes while compensatory increased motion and stresses at the adjacent level of fusion is well-known to be associated to ASD. Newly developed, the hybrid stabilization are allocated to substituted for mostly the superior level of the fusion in an attempt to reduce the number of fusion levels and likelihood of degeneration process at the adjacent levels during the fusion with pedicle screws. Nevertheless, its biomechanical efficiencies still remain unknown and complications associated with failure of constructs such screw loosening and toggling should be elucidated. In the current study, a finite element (FE) study was performed using a validated L2/S1 model subjected to a moment of 7.5 Nm and follower load of 400 N to assess the biomedical behavior of hybrid constructs based on dynamic topping off, semi rigid fusion. The residual range of motion (ROM), stress distribution at the fused and adjacent levels, stress distribution at the disc and the cage-endplate interface with respect to changes of bone quality were investigated. The hybrid instrumentation was associated with a reduction in compressive stresses compared to the fusion construct in the adjacent-level disc and showed high substantial axial force in the implant while fusion instrumentation increased the motion for both flexion and extension.

**Keywords :** intervertebral disc, lumbar spine, degenerative nuclesion, L4-L5, range of motion finite element model, hyperelasticity

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