BIOMECHANICAL STUDY SUMMARY

Could Junctional Problems at the End of a Long Construct be Addressed by Providing a Graduated Reduction in Stiffness? A Biomechanical Investigation

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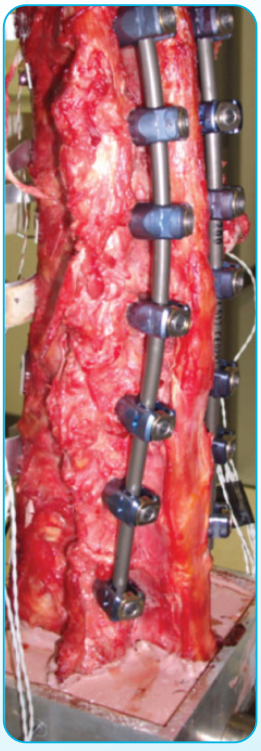
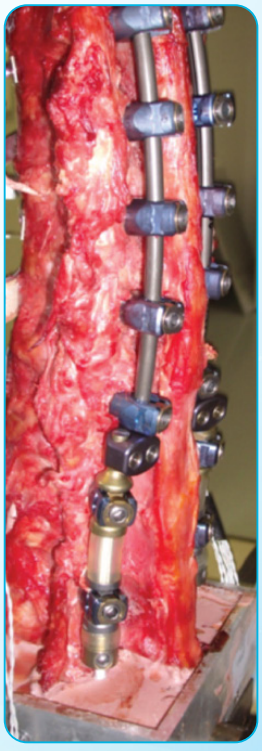
OBJECTIVE: The aim of this study was to evaluate if a posterior dynamic stabilization (PDS) device, such as the TRANSITION® Stabilization System, is useful in the setting of spinal deformities to restore increased adjacent level motions, which occur in long constructs.

METHOD: Seven cadaver spines were tested from T7 to L3. Long instrumentation was applied in two rigid groups, R1: Rigid (T8-L2) and R2: Rigid (T8-L1), and PDS to the last caudal level of each, RP1: Rigid (T8-L1) + PDS (L1-L2) and RP2: Rigid (T8-T12) + PDS (T12-L1). Range of motion was evaluated at surgical and distal adjacent levels after displacement-controlled loading in a spine tester.



Rigid instrumentation (T8-L2)



Rigid (T8-L1) + TRANSITION® Stabilization System (L1-L2)

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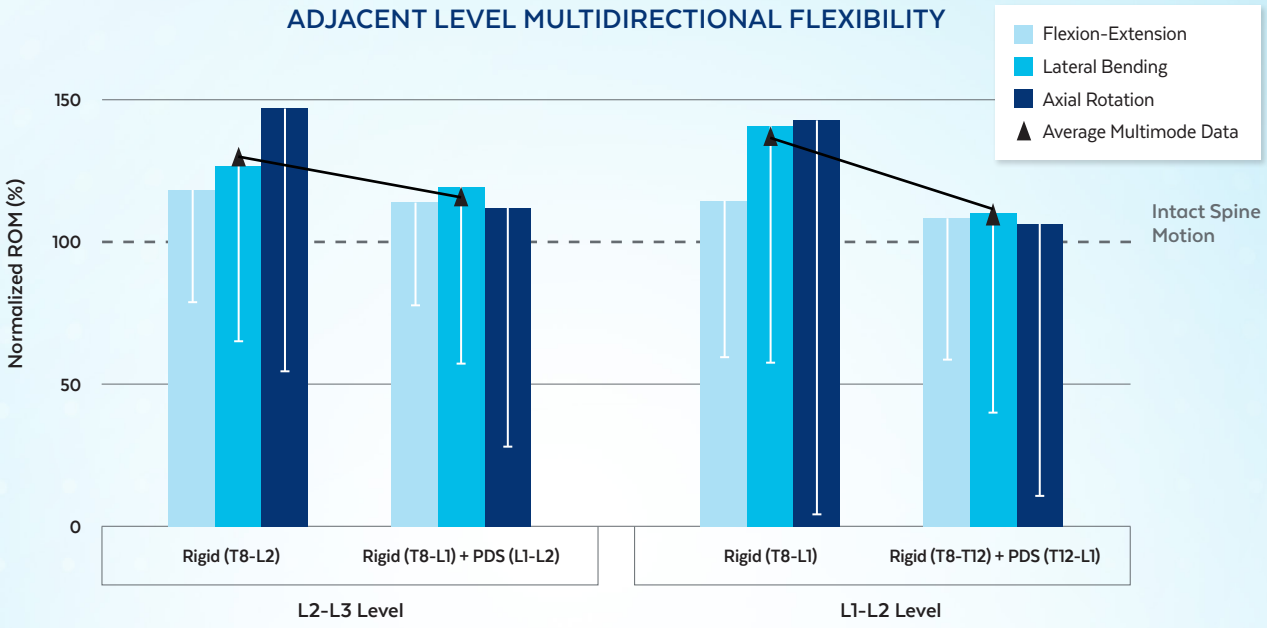

Range of motion of subadjacent level to rigid fixation normalized to intact (%) for each loading mode.

R1 = Rigid (T8-L2), **RP1** = Rigid (T8-L1) + PDS (L1-L2),
R2 = Rigid (T8-L1), **RP2** = Rigid (T8-T12) + PDS (T12-L1).

RESULTS:

- Distal adjacent level motion was increased after five- and six-level rigid fixation in flexion-extension, lateral bending, and axial rotation.
- Most of the increases were seen in axial rotation and lateral bending.
- Replacing the last caudal instrumented level with the PDS test device was able to alleviate hypermobile conditions of the adjacent non-instrumented level, closer to intact (24% and 12% reduction in RP2 and RP1, respectively).

CONCLUSION:

In this study, reduction of hypermobility caused by extended arthrodesis may represent a new and ideally suited function for PDS devices, like the TRANSITION® Stabilization System. Mechanically, these devices were seen to kinematically restore abnormal distal motion, especially with placement of the TRANSITION® Stabilization System at the thoracolumbar junction.

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