BIOMECHANICAL STUDY SUMMARY

The Comprehensive Biomechanics and Load-Sharing of Semi-Rigid PEEK and Semi-Rigid Posterior Dynamic Stabilization Systems

D.K. Sengupta, MD, Dr. Med[1]; Brandon Bucklen, PhD[2]; Paul C. McAfee, MD, MBA[3]; Jeff Nichols, MS[2]; Raghavendra Angara, PhD, PMP, CQE[2]; and Saif Khalil, PhD[2]

[1]Dartmouth-Hitchcock Medical Center, Lebanon, NH, USA; [2]Globus Medical, Inc., Audubon, PA, USA; [3]Towson Orthopaedic Asssociates, P.A. Scoliosis and Spine Center, Bell Air, MD, USA

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OBJECTIVE: This study aimed to compare the load-sharing and regional load distribution of the interbody area between rigid titanium rods, semi-rigid polyetheretherketone (PEEK) rods, and semi-rigid posterior dynamic stabilization (PDS) devices like the TRANSITION® Stabilization System with flexion-extension dampening materials.

METHOD: There were two arms to this study. The first arm was to determine the load-sharing through the anterior column as determined by the type of posterior instrumentation. The second arm was to determine the kinematic range of motion as determined by the type of posterior instrumentation. Mechanical testing was conducted on a spine model with a flat disc surface, to accommodate a pressure sensor on the disc. The range-of-motion characterization was carried out on human cadaveric spines.

Select test images from flexibility testing, showing rigid and semi-rigid devices

Rigid rods

Semi-rigid (TRANSITION®)

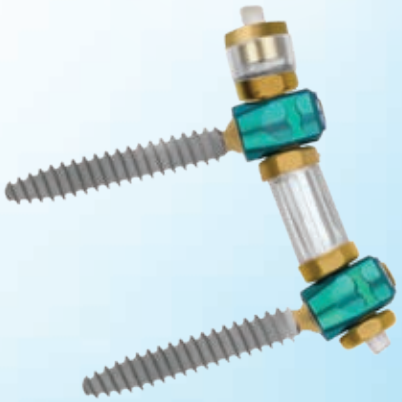
Semi-rigid (PEEK)

Spacer + rigid rods

Spacer + semi-rigid (TRANSITION®)

Spacer + semi-rigid (PEEK)

TRANSITION® Stabilization System



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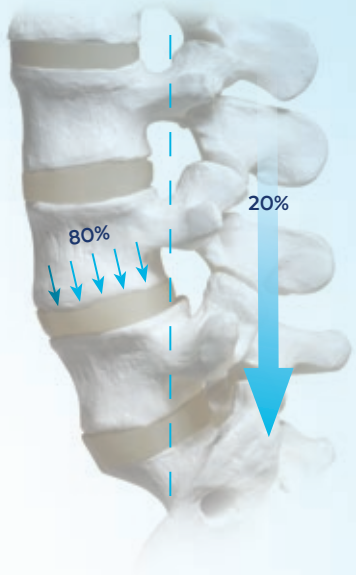
RESULTS:

Load-Sharing:

The TRANSITION® Stabilization System most closely approximated the load-sharing in a normal spine, of 80% to 20% distribution in the anterior to posterior column.[1]



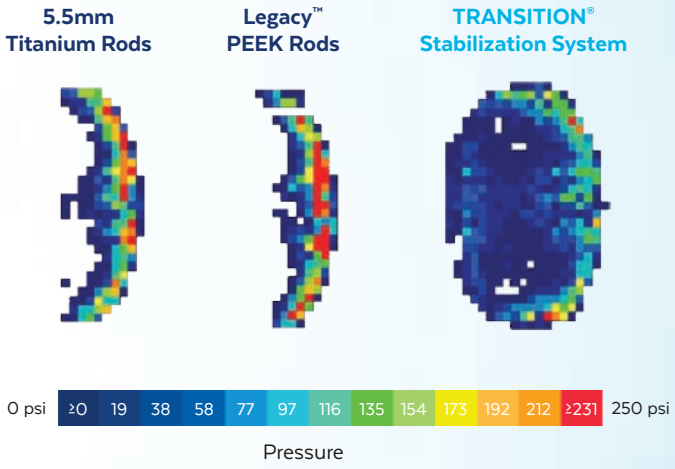
Load Distribution

	Anterior	Posterior
Normal Spine[1]	80%	20%
Titanium Rods	55 ± 5%	45 ± 5%
LEGACY™ PEEK Rods	59 ± 3%	41 ± 3%
TRANSITION®	**75 ± 5%**	**25 ± 5%**

Regional Loading:

The load distribution across the interbody spacer area proved to be more uniform with the TRANSITION® Stabilization System when compared to semi-rigid PEEK or rigid fixation. Disparity between the anterior and posterior regions was least favorable for PEEK (312PSI) and most favorable for TRANSITION® (65PSI).

The ability of the TRANSITION® Stabilization System to bend and stretch allows load transmission across the entire disc.



Kinematics:

Rigid rods achieved the highest level of fixation both with and without interbody. The kinematics of PEEK rods and TRANSITION® were very similar.

CONCLUSION:

In this study, the overall load-sharing was highest for the TRANSITION® Stabilization System, with marginal differences between rigid and semi-rigid PEEK instrumentation. The TRANSITION® Stabilization System reduced regional pressure gradients and was more uniform in the anterior, posterior, left, and right interbody spaces when compared to the other instrumentation types.

1. White AA, Panjabi MM. *Clinical Biomechanics of the Spine* (2nd ed.). Philadelphia: J. B. Lippincott Company; 1990.

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