Eight human cadaveric human lumbar spines (L1-S1, 44±6.5 yr) were tested in flexion (8Nm) and extension (6Nm) under 0N, 400N and 800N compressive follower preloads.

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M6-L disc maintained physiologic ROM in flexion-extension under preloads up to 800 N

M6-L disc maintained physiologic quality of motion under preloads up to 800 N

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Summary

• Eight human cadaveric human lumbar spines (L1-S1, 44±6.5 yr) were tested in flexion (8Nm) and extension (6Nm) under 0N, 400N and 800N compressive follower preloads.
• The Load-Displacement Curves of the M6-L closely approximate intact controls.
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Introduction
The lumbar spine experiences compressive preloads up to 800N during activities of daily living (ADL). However, kinematics of lumbar disc prostheses under large preloads have not been reported. In our experience, disc prostheses with articulating bearings tend to “bind” under large preloads, resulting in degradation of motion quantity and quality.

Purpose
To test the hypothesis that quantity and quality of motion of lumbar segments implanted with compressible non-articulating disc prostheses will not be significantly affected by compressive preload magnitude.

Methods
Eight human cadaveric human lumbar spines (L1-L5, 44±6.5 yr) were tested in flexion (8Nm) and extension (6Nm) under 0N, 400N and 800N compressive follower preloads (Fig. 1). Following intact tests, the PLL was resected and a disc prosthesis, composed of a compressible polymer core and fiber matrix between two metal endplates (Spinal Kinetics, Sunnyvale, CA), was implanted in the L3-L4 (n=2) or L4-L5 (n=6) disc space, centered in the frontal plane and centered on or slightly posterior to the sagittal midline. Range of motion (ROM) was calculated in all conditions. Quality of motion was assessed by calculating stiffness in flexion and extension (FE, Fig. 2), and center of rotation (COR).

Results
The kinematic signature of implanted segments approximated intact controls (Fig. 3). The compressible disc maintained physiologic quality of motion similar to that of the intact control at preloads up to 800N. The compressible disc was much better at maintaining the quality of motion regardless of preload as compared to an incompressible mobile core device (Fig. 4).

Conclusions
The compressible disc prosthesis maintained physiologic quantity and quality of motion in FE under compressive preloads up to 800N. Maintenance of physiologic motion under preloads experienced during ADL may be one of the main benefits of compressible non-articulating disc prostheses.

References
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