

Technical Reports

Interbody device endplate engagement effects on motion segment biomechanics

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Abstract

BACKGROUND CONTEXT: Stand-alone nonbiologic interbody fusion devices for the lumbar spine have been used for interbody fusion since the early 1990s. However, most devices lack the stability found in clinically successful circumferential fusion constructs. Stability results from cage geometry and device/vertebral endplate interface integrity. To date, there has not been a published comparative biomechanical study specifically evaluating the effects of endplate engagement of interbody devices.

PURPOSE: Lumbar motion segments implanted with three different interbody devices were tested biomechanically to compare the effects of endplate engagement on motion segment rigidity. The degree of additional effect of supplemental posterior and anterior fixation was also investigated.

STUDY DESIGN/SETTING: A cadaveric study of interbody fusion devices with varying degrees of endplate interdigitation.

OUTCOME MEASURES: Implanted motion segment range of motion (ROM), neutral zone (NZ), stiffness, and disc height.

METHODS: Eighteen human L23 and L45 motion segments were distributed into three interbody groups (n=6 each) receiving a polymeric (polyetheretherketone) interbody spacer with small ridges; a modular interbody device with endplate spikes (InFix, Abbott Spine, Austin, TX, USA); or dual tapered threaded interbody cages (LT [Lordotic tapered] cage; Medtronic, Memphis, TN, USA). Specimens were tested intact using a 7.5-Nm flexion-extension, lateral bending, and axial torsion flexibility protocol. Testing was repeated after implantation of the interbody device, anterior plate fixation, and posterior interpedicular fixation. Radiographic measurements determined changes in disc height and intervertebral lordosis. ROM and NZ were calculated and compared using analysis of variance.

RESULTS: The interbody cages with endplate spikes or threads provided a statistically greater increase in disc height versus the polymer spacer (p=.01). Relative to intact, all stand-alone devices significantly reduced ROM in lateral bending by a mean 37% to 61% (p≤.001). The cages with endplate spikes or threads reduced ROM by ~50% and NZ by ~60% in flexion-extension (p≤.02). Only the cage with endplate spikes provided a statistically significant reduction in axial torsion ROM compared with the intact state (50% decrease, p<.001). Posterior fixation provided a significant reduction in ROM in all directions versus the interbody device alone (p<.001). Anterior plating decreased ROM over interbody device alone in flexion-extension and torsion but did not have additional effect on lateral bending ROM.

FDA device/drug status: approved for this indication (Tapered threaded cage; PEEK interbody spacer; Modular spacer).

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