Title: Comparison of endplate contact mechanics of expandable versus non-expandable lumbar interbody cages

Background
Interbody cages are used for anterior load bearing following vertebral burst fracture or tumor resection. Both expandable and non-expandable (“fixed”) cage designs are available. Expandable cages are expanded intraoperatively to achieve a solid fit with the adjacent vertebrae, while fixed cages are cut to length. Expandable cages are thought to offer greater stability because of the compressive forces that can be induced intraoperatively; however, these cages have recently been implicated in vertebral body fractures observed clinically (see Chou et al 2008). This is thought to occur from over-distraction of the expandable cage. Spinal alignment – particularly lordotic angle – could influence contact mechanics between the cage and endplate and may interact with

Study Objective
The goal of this study is to fully characterize the endplate contact mechanics for a typical expandable interbody cage design and compare it to a non-expandable (“fixed”) cage design.

Study Design
• Human cadaveric thoracolumbar spinal sections
• Lumbar BMD assessment via DEXA
• Complete corpectomy at mid-vertebral level of spinal section to simulate injury/tumor
• 360 degree fusion with 1-level cage anteriorly and 3-level pedicle screw-rod fusion bilaterally (XIA System, Stryker Spine)
• Half of the specimens receive expandable cages (VLIF, Stryker) and the other fixed cages (VBOSS, Stryker).
• Treatments performed by spine surgeon with spine positioned supine under constant 100 N compressive load (applied via an open compression frame).
• To test effect of lordotic position on contact mechanics, expandable cages were placed in normal, hyperlordotic, and hypolordotic positions by applying wedged endcaps onto the cages
• Real-time pressure sensitive film (F-scan Tekscan; #4000 sensor) placed between cage and inferior vertebral endplate.
• Outcome measures from pressure mapping are:
  o Contact force
  o Contact area
  o Center-of-Pressure (COP), both medial-lateral (COP-ML) and anterior-posterior (COP-AP), measured from geometric center of the cage
Figures

Figure 1: (left) Biomechanical test set-up. Compressive load is applied via an air bladder, and net force through the spinal section is monitored with an in-line load cell. (right) Real-time pressure sensitive film was inserted between the cage and the endplate on the inferior side.

References
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