Interbody cage stabilisation in the lumbar spine: biomechanical evaluation of cage design, posterior instrumentation and bone density

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We performed a biomechanical study on human cadaver spines to determine the effect of three different interbody cage designs, with and without posterior instrumentation, on the three-dimensional flexibility of the spine. Six lumbar functional spinal units for each cage type were subjected to multidirectional flexibility testing in four different configurations: intact, with interbody cages from a posterior approach, with additional posterior instrumentation, and with cross-bracing. The tests involved the application of flexion and extension, bilateral axial rotation and bilateral lateral bending pure moments. The relative movements between the vertebrae were recorded by an optoelectronic camera system. We found no significant difference in the stabilising potential of the three cage designs. The cages used alone significantly decreased the intervertebral movement in flexion and lateral bending, but no stabilisation was achieved in either extension or axial rotation. For all types of cage, the greatest stabilisation in flexion and extension and lateral bending was achieved by the addition of posterior transpedicular instrumentation. The addition of cross-bracing to the posterior instrumentation had a stabilising effect on axial rotation. The bone density of the adjacent vertebral bodies was a significant factor for stabilisation in flexion and extension and in lateral bending.

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