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Multilevel Cervical Fusion and Its Effect on Disc Degeneration and Osteophyte Formation.
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Study Design. The effect of single and double cervical fusion on adjacent segments was investigated using a finite element model of the cervical spine. A healthy spine and a cervical spine with a single and double fusion at different levels were analyzed and evaluated. Disc degeneration and osteophyte formation at the endplates and joints can then be addressed.

Objectives. To evaluate the biomechanical effects of cervical fusion on the cervical spine from C3-C7. The goal was to asses the increase of intervertebral disc and bone stress induced by cervical fusion, the effects of single versus double level fusion, and whether the level in which the fusion is performed, might affect the biomechanics of the spine.

Summary of Background Data. Clinical studies have reported that 25% of fusion patients report further degenerative problems within 10 years of fusion.

Methods. Four finite element models of single fusion at different levels were generated, as well as three additional models for the case of double fusion. The maximum von Mises stresses for anulus, nucleus, and endplates and the motion of the nonfused segments were obtained during lateral bending, flexion, axial torsion, and extension. Each case was compared with the normal cervical spine.

Results. Results showed stress increases of up to 96% in the anulus, nucleus, and endplates after fusion. Facet constraining prevents increases in stress during extension. The stresses at all levels tend to be larger for double than for single fusion.

Conclusions. The results of this study quantify the significant increase in the level of stresses below and above the fused segments in the cervical spine. A sustained level of this stress can lead to further discs degeneration and osteophytes.