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The Effect of Nicotine on Spinal Fusion

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Abstract

Study Design: An animal model of posterior lateral intertransverse process fusion healing in the face of systemic nicotine.

Objectives: To evaluate the effect of systemic nicotine on the success of spinal fusion and its effect on the biomechanic properties of a healing spinal fusion in an animal model.

Summary of Background Data: Clinical observations suggested that cigarette smoking interferes with the healing of bony fusion. No direct link has been made to implicate nicotine as a cause for impaired healing of spinal fusions or fractures.

Methods: Twenty-eight adult female New Zealand white rabbits underwent single level lumbar posterior lateral intertransverse process fusion using autologous iliac bone graft. Animals were randomly assigned to either receive systemic nicotine or receive no nicotine. Animals were killed 35 days after surgery. Manual testing of the fusion mass was performed to determine the fusion status. Each fusion mass underwent biomechanic testing.

Results: Fifty-six percent of the control animals were judged to have solidly fused lumbar spines, and there were no solid fusions in the nicotine group ($P = 0.02$). The mean relative fusion strength in the control group was greater ($P = 0.09$) than in the nicotine group. For the comparable stiffness figures, the control group was greater than the nicotine group ($P = 0.08$).

Conclusions: This animal model established a direct relationship between the development of a nonunion in the presence of systemic nicotine. The results suggested that bone formed in the face of systemic nicotine may have inferior biomechanic properties.

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