Pilot study of a new acrylic cage in a dog cervical spine fusion model.

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Abstract

STUDY DESIGN: An experimental pilot study using an acrylic interbody cage in a dog cervical spine fusion model.

OBJECTIVE: To compare bony fusion in autologous bone grafting with a novel acrylic cage in terms of preservation of disc height, biomechanical properties, and histologic characteristics.

SUMMARY OF BACKGROUND DATA: Degenerative diseases of cervical intervertebral discs are commonly treated by anterior decompression and interbody fusion. To restore physiologic disc height and achieve fusion, the disc is replaced with bone graft, bone cement, interbody fusion cages, or other materials. The advantages of bone cement in contrast to bone graft and interbody fusion cages are immediate stability and less subsidence, although real bony fusion cannot be achieved. To overcome this problem, we designed a new, inexpensive acrylic cage.

METHODS: Ten adult hybrid dogs underwent C3/C4 (5 dogs) and C4/C5 (5 dogs) discectomy and fusion with an acrylic interbody fusion cage made of polymethylmethacrylate filled with bone graft (n=5, group 1) or an autologous iliac bone graft (n=5, group 2). Dynamic functional x-ray was obtained 1 and 12 weeks after the operation. After 12 weeks, the animals were killed and fusion sites were evaluated with quantitative computed tomographic scanning to evaluate bone mineral density. Subsistence was quantified with biomechanical testing. Histopathologic analysis was used to evaluate fusion and possible foreign body reactions associated with the acrylic cage.

RESULTS: The acrylic cage led to significantly higher disc space height and less subsidence than bone grafting (P=0.021). Bone mineral density after 12 weeks was greater with the acrylic cage, but the difference was not statistically significant. Histologically, new bony tissue and hyaline cartilage were seen inside the acrylic cage, accompanied by mild chronic inflammation.

CONCLUSIONS: The acrylic cage showed significantly higher mechanical stiffness and less subsidence than bone grafting. Additional studies with more subjects and longer follow-up periods are needed to compare the cost effectiveness of acrylic cages and polyetheretherketone devices.