Controlling bone morphogenetic protein diffusion and bone morphogenetic protein-stimulated bone growth using fibrin glue.

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Abstract:

Study Design. An in vitro and in vivo study. Objective. To evaluate the ability of fibrin glue to limit diffusion of recombinant human bone morphogenetic protein (rhBMP)-2 and its ability to protect spinal nerves from rhBMP-2 stimulated bone growth. Summary of Background Data. Studies have shown bone morphogenetic protein (rhBMP-2) stimulated bone growth can encroach on the spinal canal and nerves, causing neural compression. More recently, rhBMP-2 use in the cervical spine has been associated with life-threatening swelling. Fibrin glue has been used as a biologic carrier but has not been evaluated for its ability to limit rhBMP-2. Methods. In phase 1 of the study, rhBMP-2 soaked absorbable collagen sponges (ACS) were encapsulated in fibrin glue and immediately incubated in physiologic lactated ringers solution at 38deg;C. Samples of solution were tested for rhBMP-2 concentration. In phase 2 of the study, rats were surgically treated with laminectomy and placement of rhBMP-2/ACS versus laminectomy and placement of fibrin glue before placement of rhBMP-2/ACS. After 8 weeks, animals were euthanized and imaged using micro-computerized tomography. Results. The diffusion study showed a significant limitation in rhBMP-2 diffusion when encapsulated in fibrin glue. The laminectomy study revealed blockage of bone formation by fibrin glue and protection of the spinal canal. Conclusions. Fibrin glue can limit the diffusion of rhBMP-2, and, thus, it can be used to help protect the spinal canal and nerve roots from rhBMP-2 stimulated bone growth.