Bone morphogenetic proteins and spinal fusion

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Bone morphogenetic proteins (BMPs) have increasingly become a focus of research in the laboratory, with animal models, and in human clinical trials for the treatment of spinal disorders. Basic science research has elucidated the putative mechanism of action of BMPs, and the efficacy of BMPs in inducing bone formation has been evaluated in multiple animal models of anterior and posterior spinal fusion. Not only has BMP been shown to improve the quality and amount of bone formation when used as a supplement to autograft, it has also been shown to promote superior fusion in the absence of autograft, even in high-risk fusion models involving the use of nicotine or nonsteroidal antiinflammatory agents. Both completed and ongoing clinical trials have demonstrated the efficacy of recombinant BMP, leading to the first BMP product being approved for clinical use earlier this year.

Animal models and clinical trials have also been used to evaluate the safety of BMPs. Although few complications have been reported, BMPs can induce heterotopic bone formation, especially when placed adjacent to exposed neural elements. Potentially more serious, antibody formation has been seen in up to 38% of patients in some clinical trials. No clinical sequelae have been reported despite the development of antibodies against BMP, a naturally occurring human protein implicated in processes other than osteoinduction.

The future directions of biological manipulation of the osteoinduction process include further understanding of the interactions of the BMP subtypes, the interactions of BMP with its receptors, and exploring other molecules capable of osteoinduction.

KEY WORDS • bone morphogenetic protein • osteoinduction • spinal fusion