Bone morphogenetic protein

AKA bone morphogenetic proteins. Biological compounds that induce the transformation of mesenchymal stem cells into osteoblasts (osteoinduction) with the potential to induce ectopic bone formation. There are ≈ 20 different proteins from the transforming growth factor-β family. Produced using recombinant DNA technology.

1. a carrier matrix is required to retain the soluble factor at the graft site (i.e., to prevent the BMP from diffusing into adjacent tissues, thereby reducing the desired effect and possibly inducing bone growth at undesired foci)

2. FDA approved in U.S. only for ALIF. Other uses are “off label”

3. available preparations: rhBMP-2 (Infuse® by Medtronic)

4. PROS: increases fusion rates

5. CONS:

a) expensive b) ectopic bone formation,bone resorption(so-called osteolysis)or remodelling at the graft site

c) in anterior cervical spine surgery: neck swelling with airway compromise, hematoma, painful seroma

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Bone morphogenetic proteins (BMP) stimulate bone growth naturally in the human body. These proteins that exist in the body can be produced, concentrated and placed in the area of the spine for a spinal fusion to take place. More importantly, they can create a fusion without the need for any use of the patient’s own bone.

Discovery of BMP growth proteins is credited to Marshall Urist, MD, an Orthopedic Surgeon, while he was working in the UCLA Department of Orthopaedic Surgery in Los Angeles, CA.

Although recombinant human BMP-2 is effective in promoting arthrodesis, many physicians avoid using it in anterior cervical spine fusions due to concern for increased incidence of dysphagia, significant pre-vertebral swelling, and airway compromise. Pilot studies have shown that the local application of depomedrol may decrease the incidence of postoperative dysphagia.

A study provides Level 1 evidence that locally administered depomedrol on a collagen sponge significantly decreases postoperative dysphagia incidence and magnitude following anterior cervical spine fusion using low-dose rhBMP-2 [1)].

Types of Bone Morphogenetic Proteins (BMP)

While there are several different BMPs naturally found in the body, research has focused on BMP-2

and BMP-7. BMP-2, the most thoroughly evaluated BMP, in particular has been shown through clinical studies to successfully stimulate spinal fusion equal to or better than the patient’s own bone.

The primary goals of using BMP in spinal fusions are:

To create a spinal fusion as well as or better than using the patient’s own bone. To eliminate the need for harvesting the patient's bone from his or her hip, thus avoiding the potential side effects and complications of the bone harvesting procedure.

1)
Edwards CC 2nd, Dean C, Edwards CC, Phillips D, Blight A. Can Dysphagia Following Anterior Cervical Fusions With rhBMP-2 Be Reduced With Local Depomedrol Application?: A Prospective, Randomized, Placebo-Controlled, Double-Blind Trial. Spine (Phila Pa 1976). 2016 Apr;41(7):555-62. doi: 10.1097/BRS.0000000000001284. PubMed PMID: 27018896.