

Bone Morphogenetic Proteins: Indications and Uses



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KEYWORDS

• Bone morphogenetic protein • BMP • Foot and ankle surgery • Bone healing

KEY POINTS

- One specific family of proteins that is generating interest is bone morphogenetic proteins.
- Coupled with the current increase in patient comorbidities (eg, diabetes), considerable interest remains focused on improving the bone healing process.
- In an effort to improve on osseous healing success rates, clinical and basic science studies are beginning to focus on elucidating the role of various growth factors on bone healing.

INTRODUCTION

Although bone healing is generally successful, it is anticipated that 5% to 10% of the estimated 5.6 million fractures occurring annually in the United States is delayed or impaired with an unknown cause.¹ Fusions may be considered to functionally represent similar considerations for healing; thus, when coupled with fractures, a considerable number of patients have impaired bone healing. Poor bone healing in high-risk patients, whether of a fusion or a fracture, continues to be a challenge for foot and ankle surgeons (Figs. 1–3). There are several risk factors for poor bone healing,² which should always be in the forefront of planning when the surgical management of an osseous condition is being contemplated (Box 1).

In consideration of the overall 5% to 10% rate for delayed bone healing in the pooled general population, the aforementioned factors pose an even worse risk for failed bone healing in foot and ankle surgery. Coupled with the current increase in

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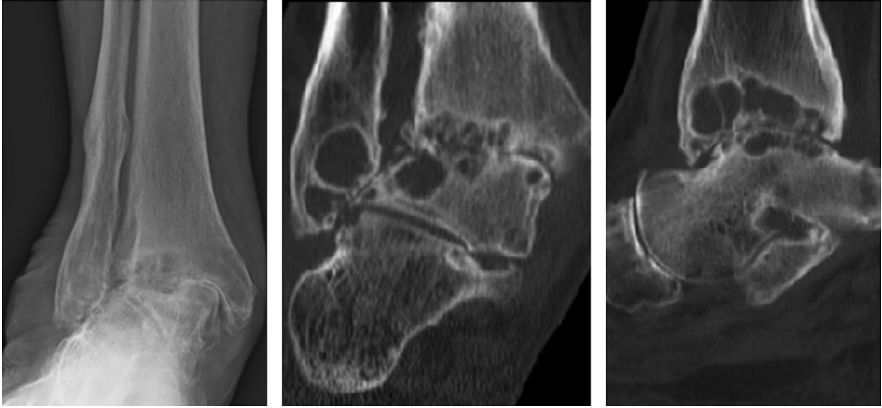


Fig. 1. Radiographs and computed tomography of an 80-year-old female diabetic with disabling pain and valgus deformity; this patient is at high risk for poor bone healing.

patient comorbidities (eg, diabetes), considerable interest remains focused on improving the bone healing process. In an effort to improve on osseous healing success rates, clinical and basic science studies are beginning to focus on elucidating the role of various growth factors on bone healing. One specific family of proteins that is generating interest is the bone morphogenetic proteins (BMPs).

THE BASIC SCIENCE OF BONE MORPHOGENETIC PROTEINS

Bone development and growth is a highly complex process that may occur via 2 major pathways: intramembranous or endochondrial. During intramembranous development, bone tissue is formed directly in primitive connective tissue (mesenchyme), whereas endochondrial bone tissue replaces a hyaline cartilage template. Current knowledge suggests that the regulation of intrauterine skeletal patterning is controlled

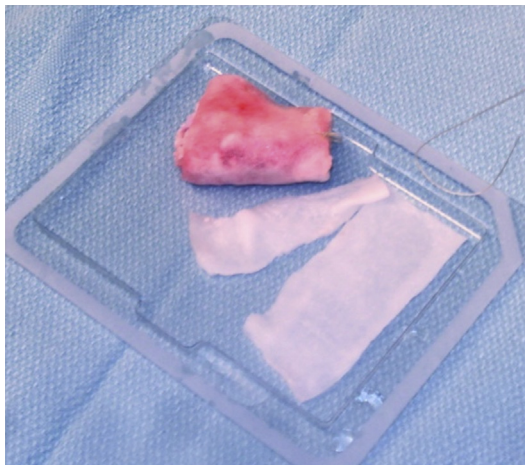


Fig. 2. Collagen sponges soaked in rhBMP-2 and structural bone needed to fill areas of bone voids; BMPs are adjuvants and are not a substitute for structural bone requirements.

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