

Bone grafts and biomaterials substitutes for bone defect repair: A review

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Key Points:

- Bone grafts have been used to treat bone defects, delayed union or non-union, and spinal fusion in orthopaedic clinical practice for some time, including synthetic bone graft substitutes (BGS).
- Bone morphogenetic proteins (BMPs), parathyroid hormone (PTH) and platelet rich plasma (PRP), are used with structural allografts and synthetic substitutes and, although their clinical exhibits good bone formation, their further use is limited due to high cost and potential adverse side effects.
- This review paper demonstrated support for nanocrystalline hydroxyapatite (HA) addressing the shortcomings of traditional HA with an even-handed overview of BGS.

Abstract

Bone grafts have been predominantly used to treat bone defects, delayed union or non-union, and spinal fusion in orthopaedic clinical use for a period of time, despite the emergence of synthetic bone graft substitutes. Nevertheless, the integration of allogeneic grafts and synthetic substitutes with host bone was found jeopardized in long-term follow-up studies. Hence, the enhancement of osteointegration of these grafts and substitutes with host bone is considerably important. To address this problem, addition of various growth factors, such as bone morphogenetic proteins (BMPs), parathyroid hormone (PTH) and platelet rich plasma (PRP), into structural allografts and synthetic substitutes has been considered. Although clinical applications of these factors have exhibited good bone formation, their further application was limited due to high cost and potential adverse side effects. Alternatively, bioinorganic ions such as magnesium, strontium and zinc are considered as alternatives of osteogenic biological factors. This paper aims to review the currently available bone grafts and bone substitutes as well as the biological and bioinorganic factors for the treatments of bone defects.

Keywords

Fracture healing, Bone grafts and substitutes, Growth factors, Bioinorganic ions

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