Vitoss Synthetic Cancellous Bone (Void Filler)

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Introduction

Synthetic bone substitutes are increasingly being used in dentistry and medicine. These biomaterials promote bone formation and are biodegraded at the same time. However, so far no ideal synthetic bone substitute is available. As more than 50% of human bone is made of hydroxyapatite (HA), at present synthetic bioceramics used for filling bony defects are primarily made of HA or related calcium phosphates (CaP) i.e. beta tricalcium phosphate.

Beta Tricalcium Phosphate

Beta tricalcium phosphate constructs have been used as synthetic bone graft in the maxillofacial region [1] and treatment of long bone defects also [2].

Vitoss synthetic cancellous bone (void filler) which is an improved form of beta tricalcium phosphate is a porous low density construct prepared by fusing nano particles of approximately 100 nm in diameter. The use of nano sized particles increases the microporosity of the structure so that the resulting scaffold is 90% interconnected with pores size ranging from 1-1000 μ m. Since more surface area is exposed to the biologic milieu, the scaffold is resorbed at a faster rate, consistent with the rate of new tissue ingrowth.

Chemical Properties

The chemical composition of vitoss is similar to natural bone mineral. Bone mineral is a carbonate containing approximately 35% calcium, 15% phosphorous and 4.5% carbonate by weight in a Ca/P molar ratio of 1:71. Vitoss contains 39% calcium and 20% phosphorous approximately in a ratio of 1:5.

Biological Properties

Histologically, osteoblasts are seen only on the surface of bone where normal bone is engaged in turnover and repair. In case of vitoss, the body regards it as normal bone tissue and osteoid formation is seen throughout

the scaffold. Beta tricalcium phosphate has a characteristic basophilic reticular structure. Replacement of beta tricalcium phosphate by bone seemed to occur, because resorption of beta tricalcium phosphate by dissolution and osteogenesis occurred simultaneously.

Biodegradability

The solubility of beta tricalcium phosphate in physiological saline is greater than that of hydroxyapatite. Therefore, the beta tricalcium phosphate blocks are easily broken and the grains generated by fragmentation are engulfed by phagocytes.

In acidic environment several cell types i.e. monocytes, fibroblasts, osteoclasts, multinucleated cells and macrophages have been observed to biodegrade the calcium phosphate implant. However, no chronic inflammatory response have been attributed to this material and it is considered to be non immunogenic.

Placement Technique

Vitoss is available as blocks or morsels. Blocks can be sculpted to fit the shape of the defect. Morsels can be gently taped into irregularly shaped defects. It has excellent wettability and handles best when soaked in blood or marrow.

To conclude Vitoss synthetic cancellous bone (Void filler) appears to be an appropriate substitute for cancellous bone.

References

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