EDITORIAL

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Regenerative medicine for the reconstruction of hard tissue defects in oral and maxillofacial surgery

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As the most ideal bone graft material to reconstruct hard tissue with defects, autogenous bone provides excellent bone healing capacity in terms of osteogenesis, osteoinduction, and osteoconduction. Note, however, that patients and clinicians tend to avoid using it due to problems including limited amount and donor site complications. As a result, allograft, xenograft, and alloplastic material (synthetic bones) were developed and applied in clinical surgeries for a long time, yet they do not have the same bone healing capacity as that of autogenous bone[1].

In the early stage, hydroxyapatite-type synthetic bone was used frequently for ridge augmentation to maintain full denture and for the reconstruction of tissue with defects after cyst enucleation. In addition, various synthetic bones such as bioglass, β-tricalcium phosphate (TCP), hard tissue replacement material (HTR), and calcium sulfate were developed and commercialized. Note, however, that synthetic bones only provide osteoconduction capacity and actually have many disadvantages in bony remodeling. As a result, xenograft bone with enhanced osteoconduction capacity such as BioOss (Geistlich Pharma AG, Wolhausen, Switzerland) was developed, and good clinical results have been recorded for several decades[1,2]. Meanwhile, since Urist[3] discovered bone morphogenic protein in the 1960s, many research studies to extract bone morphogenic protein and various growth factors from teeth or osseous tissue to apply in clinical situations have been conducted. Based on such research, allograft materials with excellent osteoinduction were developed and used as substitute for autogenous bone.

Recently, regenerative medicine has been developed remarkably not only in dentistry but in other medical departments as well. Tissue engineering as one field of regenerative medicine is a method of reconstructing tissues and organs with massive defects and recovering their function using biological cells. Moreover, in *Korean Assoc Oral Maxillofac Surg*, many research studies on regenerative medicine have been published since long ago.

Since 1965 when Urist[3] suggested the concept of osteoinduction by bone morphogenic protein (BMP) in cortical bone, many researchers have attempted to extract BMP from teeth or osseous tissue for application in clinical situations. Note, however, that the extraction of a sufficient amount and application in clinical situations were very difficult[4-6]. Nonetheless, various BMPs (recombinant human BMP, rhBMP) have been recently manufactured by gene recombination based on the cell of mammals or colon bacillus[7-9].

Growth factor is very important in bony remodeling and healing because it significantly influences the activity of osteoblast. The growth factor related to the regeneration of osseous tissue includes PDGF, VEGF, TGF-β, AFGF, β-FGF, IGF-I, IGF-II, EGF, etc., and many research studies were reported in the *J Korean Assoc Oral Maxillofac Surg*[10-19].

For stem cells, since Choi et al.[20] reported the differentiation of adult canine bone marrow stem cells into neurons in 2003, many research studies on stem cells derived from human cord blood, buccal fat pad, adipose tissue, impacted wisdom teeth, skin, pulp, periodontal ligament, and dental follicle have been reported[21-26].

Achieving successful reconstruction by applying bone growth enzyme, BMP, and stem cells on defects requires a carrier (scaffold) to transfer them. The ideal scaffold must have a bony restorative effect by itself and encourage the maximum emission of bone growth factor and stem cells in the target area. Many researchers have conducted various research studies to develop an ideal scaffold[27-29].

Autogenous tooth bone graft material was developed and utilized in 2008. It provides excellent bone healing capacity in terms of osteoinduction and osteoconduction because it contains minerals most similar to those of the human alveolar bone as well as type I collagen and a variety of proteins[30-33].

In conclusion, a new material whose functions are very

similar to autogenous bone will be developed and commercialized soon by many researchers based on research studies on regenerative medicine. Therefore, good research on regenerative medicine should be reported in *J Korean Oral Maxillofac Surg*.

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