Could the Freshly Extracted Teeth be a New Alternative for Autogenous Bone Grafts in Dento-Alveolar Bone Defects?

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Editorial

Dento-alveolar bony defects pose a significant problem when dental implants are planned. Dental implant placement in the atrophic alveolar ridge is often limited by the lack of alveolar bone height and width. Reconstructive alternatives for dento-alveolar bone defects are a prerequisite to enhance the success of dental implants functionally and aesthetically. Various graft materials have been developed especially for implant procedures. According to bone-healing mechanisms, they can be categorized into materials that induce osteogenesis, osteoinduction, and osteoconduction. Autogenous grafts which still considered the gold standard are capable of osteogenesis, osteoinduction, and osteoconduction. However, the use of autogenous tissue involves the need of harvesting it from a donor site, with the consequent drawbacks in terms of costs, procedure time, patient discomfort and possible complications. Ideally, the graft material is required to have the ability to facilitate osteogenesis, stability when implanted with the graft, low risk of infection, ready availability, low antigenicity, and a high-level of reliability [1].

It is well known that alveolar bone, as well as dental tissues, including enamel, dentin, cementum, pulp, and periodontal ligament, are derived from the neural crest cells. Recently, studies have been done using fresh tooth in the form of demineralized dentin matrix DDM as a biocompatible autogenous bone graft [2,3]. Previous studies showed that autogenous DDM possessed osteoinductive and osteoconductive properties similar to the one present in bone. These studies proved that BMP2 included in enamel has the capacity for osteoinduction, which is important in bone formation. Enamel has growth factors such as insulin-like growth factor (IGF) II, BMP2, and transforming growth factor (TGF) beta like bone. Cement has TGF-beta, IGFII, and platelet-derived growth factor. Dentin also contains a variety of proteins as those of the bone. All of these growth factors and proteins play an important role in bone formation [4,5]. Kim, et al. [3] developed bone graft materials using human or animal teeth in the form of tooth-ash, which consisted of 55% inorganic and 45% organic substances. Among the inorganic substances, hydroxyapatite (HA) has the characteristics of combining and dissociating calcium and phosphate as those of bone. Organic substances include the bone morphogenetic protein (BMP) as well as type I collagen, which is the same as alveolar bone [6]. From the clinical aspects, tooth derived bone substitutes had achieved positive results. Kim, et al. [7] used demineralized autogenous tooth graft at the time of implant placement simultaneously with guided bone regeneration. Lee, et al. [8] conducted a study to compare the efficiency of autogenous tooth graft and other graft materials used in sinus bone graft surgeries, autogenous tooth graft showed a faster and superior quality bone formation.

Other studies tested the use of autogenous tooth bone graft after extraction for socket preservation and they reported good healing of extraction sockets [9,10]. The extracted teeth were cleaned, crushed, decalcified and disinfected to prepare DDM graft, which is cost and time-consuming. Additionally, in this technique, the organic components are removed and the inorganic component
hydroxyapatite remains as the main component. New trends towards the preparation of bacteria-free tooth-derived graft from freshly extracted teeth without demineralization have been made. In this way, the graft material would be ready to use in a short time. From mentioned above, tooth-derived graft has the potential to be used as a bone graft in spite of the differences in preparation processes. Further studies, including precise preparation methods and the clinical application should be performed to replace autogenous bone and other grafts, which have many limitations.

References