Bioactive Dentin for Guided Bone Regeneration

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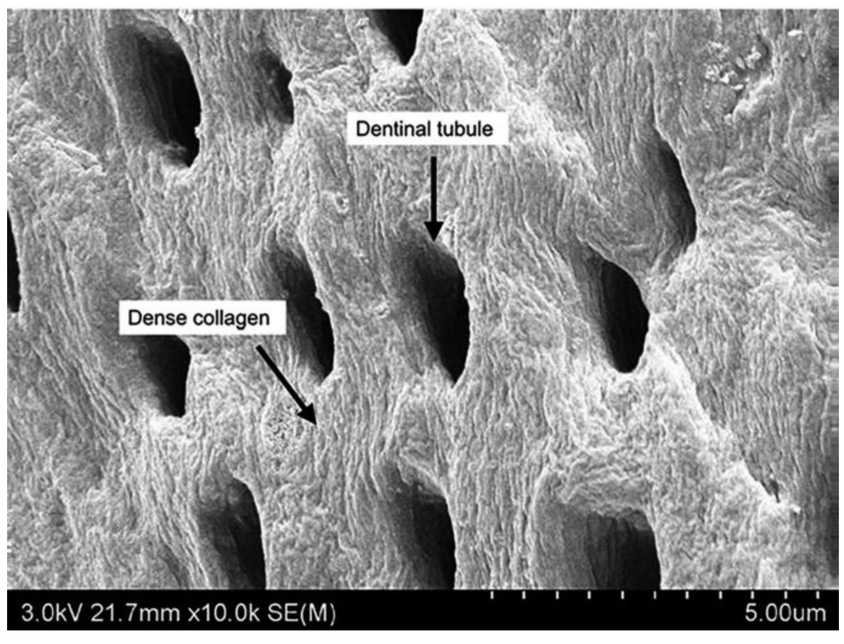
INTRODUCTION

Alveolar bone preservation and regeneration is of vital importance in dentistry today. Limited research is available using our own natural teeth as a graft material. Dentin is a permeable tubular composite and complex structure, and in weight, it is composed of 20% organic matrix, 10% water, and 70% hydroxyapatite crystalline matrix. How can our own teeth serve as a potential grafting material? This can be achieved by demineralizing dentin with gradient concentrations EDTA, 0.6 N HCL, or 2% nitric acid, which removes a major part of the crystalline apatite and maintains a majority of collagen type I and non-collagenous proteins. This creates an osteoinductive scaffold containing numerous matrix elements and growth factors. Demineralized dentin should be considered as an excellent naturally-derived bioactive material to enhance dental and alveolar bone tissues regeneration.

METHODS & MATERIAL

I searched in pubmed Bioactive Dentin for Guided Bone Regeneration. A total of 9 results appeared. I selected an article to review titled: Demineralized Dentin Matrix for Dental and Alveolar Bone Tissues Regeneration: An Innovative Scope Review. This article aimed to compare the difference between treated dentin matrix (TDM)and demineralized dentin matrix (DDM).



Discussion

Demineralized bone matrix (DBM) likely as DDM is predominantly composed of COL-1 (95%) with the remainder comprising of NCPs with a small amount of growth factors. Consequently, DDM and DBM can be defined as acid-insoluble collagen bind with BMPs, which are members of the TGF-b super-family that enhances bone formation [93]. The quality and effectiveness of commercial DBM varies with processing techniques and several donor dependent factors likely as gender and age as they have an effect on osteoinductivity of DBM [94]. Therefore, differences in preparation and processing methods for bone can impact properties and clinical performance of DBM. In our opinion, the superiority of autogenous DDM over other graft materials should be confined to the dental applications facilitating the release of BMPs to induce the differentiation of undifferentiated mesenchymal cells into osteogenic and odontogenic cells, which have the potential to stimulate bone and dentin formation [95]. DDM is biocompatible, does not induce foreign body reactions and can be prepared by a standard treatment with very low cost.

RESULTS

Fang et al. [57] conducted a prospective randomized clinical trial of a total thrity-three graft sites in twenty-four patients and they suggested that autogenous DDM is a viable option for alveolar bone augmentation following dental extraction, in comparison with anorganic bovine bone. Likewise, Elfana et al. [73] conducted a randomized controlled clinical trial to evaluate autogenous whole-tooth versus DDM grafts for alveolar ridge preservation and they concluded that the two grafts have similar clinical effects but histologically autogenous DDM grafts seems to demonstrate better graft remodeling, integration, and osteoinductive properties. Recently, Ouyyamwongs et al. [76] assessed clinically in a split-mouth randomized controlled clinical trial the potential of using autologous DDM in combination with platelet-rich fibrin (PRF) membrane or PRF membrane alone to preserve the ridge dimension. They concluded that the combination therapy reduced the horizontal ridge collapse, and promoted bone healing as shown clinically and radiographically.

CONCLUSION

Based on the results of this review article, it may be beneficial to utilize extracted teeth as bone substitutes in implant dentistry. There are limitations in supply of available teeth to be used for this purpose. There is no risk of transmitting diseases as it is autogenous tissue and no additional surgery is needed to harvest tissues since unwanted teeth are utilized. As mentioned in the article, before clinical application there must be an established standardization process for preparing the grafting material. Further studies are required to determine the most suitable conditions of demineralization and particle sizes for clinical application in implant dentistry. The potential application of the usage of autologous teeth for bone grafting could be highly beneficial to patients and can be provided at a low cost.

Presented at the 98th Annual Session of the Greater New York Dental Meeting in 2022