

Tooth -A Potential Graft Material for Periodontal Regeneration ?

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Citation

Devani VR, Manohar B, Humagain M, Shetty N. Tooth -A Potential Graft Material for Periodontal Regeneration ? *Kathmandu Univ Med J.* 2020;69(1):93-5.

INTRODUCTION

Tooth and maxillofacial bones share many similarities. They embryologically originate from the neural crest sharing identical origin and many common proteins to bone, dentin and cementum.^{1,2} Extracted teeth being infectious material are often discarded as medical waste. The bone-induction and absorbable properties of dentin encouraged researchers to introduce medical reprocessing of extracted human tooth and a novel grafting choice was availed to us. Interestingly, undamaged growth factors can be found in extracellular-matrix component of archaic human teeth.³ Recently, several studies have reported the use of processed extracted teeth from patients as a very effective bone substitute for alveolar defects.⁴

Autogenous bone graft is the ideal choice for periodontal regeneration. Reusing of potential teeth indicated for extraction as grafting material could help the patient benefit clinically, economically and effectively in cases of alveolar bone defects.

ABSTRACT

Use of tooth as a promising replacement substitute has been validated by various animal as well as human studies. Though widely used in GBR and Sinus grafting techniques, its use in periodontal intrabony defect is not documented. In the present case report, the tooth graft has been placed in periodontal intrabony defect. Post-operative CBCT after 26 weeks revealed homogeneous incorporation of tooth graft. Clinical parameters show bone fill. However; results with larger sample size could further validate the use of tooth graft in periodontal regeneration.

KEY WORDS

Autogenous tooth graft, Bone replacement substitute, CBCT bone analysis, periodontal regeneration, Tooth graft

CASE REPORT

A systemically healthy 32 year old man with no habits, presenting with a vertical defect confirmed on radiograph and with teeth indicated for extraction was selected. The subject had a 9 mm pocket mesial to first maxillary right premolar. The Clinical attachment loss of upto 7 mm was elicited. The Subject was systemically healthy with no records of antibiotics taken within the last 6 months of initial examination. All maxillary and mandibular posterior teeth were present. Periodontally compromised mandibular incisors indicated for extraction were selected as donor teeth for preparing the graft material.

The primary endpoint was defined as the bone fill recorded on CBCT at baseline and after 26 weeks. Imaging Software (Carestream CS 3D) was used to evaluate the bone defects. Modified Quigley Hein plaque index, gingival index (Loe and Silness), Probing Pocket Depth (PPD) and Clinical Attachment Level (CAL) were evaluated and recorded at baseline and 26 weeks post-operatively. Single calibrated investigator performed all the clinical measurements.

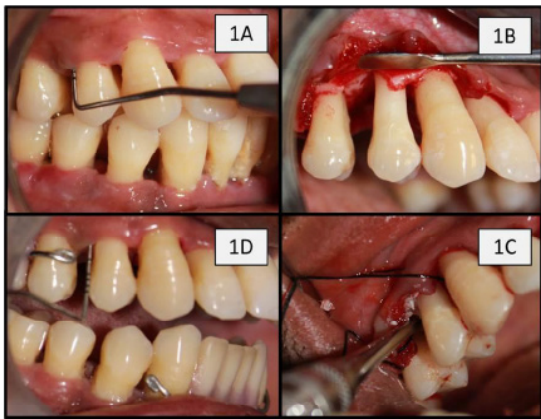


Figure 1A. Pre-operative probing depth of 9 mm, **1B.** flap elevation and debridement, **1C.** graft placement and **1D.** reduction in post-operative probing pocket depth at 26 weeks.

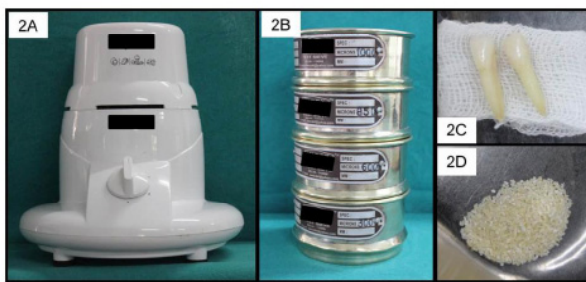


Figure 2A. conventional mixer grinder, **2B.** 4 customized stainless steel sieves for standardization of particle size, **2C.** donor teeth after scaling and root planing and **2D.** standardized bone graft particle.

Asepsis was maintained during the entire surgical procedure. After achieving adequate anesthesia, sulcular incisions were placed followed by elevation of mucoperiosteal flap to expose the margins of the alveolar bone. Following debridement (fig. 1B), the site (mesial to first maxillary right premolar) was treated with autogenous tooth bone graft mixed along with 0.9 N saline solution. Flap was approximated using figure of eight sutures (fig. 1C).

Periodontally compromised mandibular central incisors indicated for extraction, were selected as a potential donor graft material for preparation. After extracting the donor tooth atraumatically, thorough scaling was performed (fig. 2C). The teeth were powdered using a conventional mixer grinder (fig. 2A) having motor rating 1500 W and speed of 800 rpm. Frozen distill water cubes were added to compensate the heat produced. The crushed granules obtained were passed through four customized autoclaved stainless steel sieves (fig. 2B) to obtain graft particulate measuring between 300 to 850 μm in size (fig. 2D). The graft material obtained was sterilized by immersing it in 1N lactic acid for 15-17 min which also partially decalcified them. Residual traces of Lactic acid were washed out using copious irrigation with 0.9 N sterile saline solution.

Postoperative instructions were given. Uneventful wound healing was recorded post-operatively. The endpoint of 26 weeks observation showed no adverse events like soft

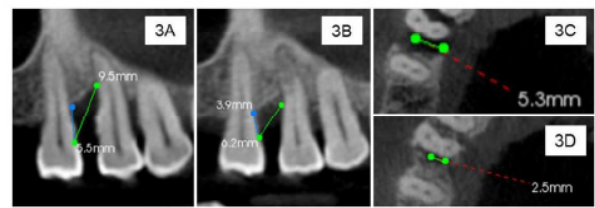


Figure 3A,C. Pre-operative defect analysis on CBCT and **3B,D.** Post-operative bone fill analysis on CBCT at 26 weeks.

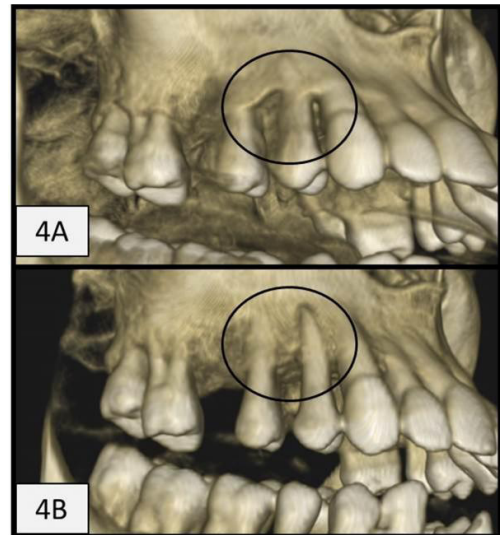


Figure 4A. Pre-operative defect on CBCT and **4B.** 26 weeks post-operative bone file analysis on CBCT.

tissue dehiscence or wound infection. The values of PI and GI obtained were found to be satisfactory. At baseline, the PPD was 9 mm (fig. 1A) which reduced to 3 mm (fig. 1D) post-operatively. The defect volume at baseline on radiograph (fig. 3A,C) was recorded at 67.25 cm^3 . Six months post-surgery on radiography (fig. 3B,D), the defect size was measured at 10.144 cm^3 . The defect fill of 85% was achieved.

DISCUSSION

The two important figurative improvements on the use of tooth graft observed were - cutback in probing pocket depth and gain in clinical attachment level. The plaque and gingival indices assessed at baseline and six months post-operatively, monitored patient's oral hygiene and its effect on soft tissues, which was found to be satisfactory throughout the study period.

'Insufficient graft' is usually a problem with Autogenous graft. The type of donor tooth may determine the quantity obtained. In the current case report, mandibular central incisors were used as the donor teeth. Adequate graft material was processed for a single defect.

It is advisable to use infection free teeth in clinical setting. Infection on teeth in terms of failed root canal, root caries, attached granulation tissue or a cyst in the surrounding periodontal tissue are not the suitable candidates for

graft. The donor teeth used in the current case report was periodontally compromised and free of any infection. No adverse reaction or discomfort was experienced by the patient during the observational period.

The particle size influences the bone formation.⁵ 500 µm is the ideal graft particle size with inter-particulate distance of 150 µm.⁶ Koga et al. concluded that larger particle size of partially demineralized dentin graft induced prominent bone regeneration.⁷ Too large a particle size prolongs the resorption whereas; too small a particle size tends to resorb even before functioning. In either of the above mentioned scenario, the blood clot retention is hampered

due to too large or too small inter-particulate distance.⁸ Therefore, a particle size of 300-850 µm was chosen for the present case.

The use of CBCT in this case report facilitated in more accurate recording of the defect and its fill (fig. 4A,B). The possible explanation for better results with ATG is validated by various invitro and animal studies which have demonstrated its biocompatibility, osteoinductive and osteoconductive potential.^{9,10}

This proof-of-concept case report suggests further research and investigation with a larger sample size.

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