

## Novel approach in managing post-extraction alveolar bone dimensions

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### Abstract

This case report presents a novel approach towards the preservation of alveolar ridge dimensions following the extraction of an upper left lateral incisor. The extracted teeth of a 56-year old patient was ground with a diamond bur running under the normal saline spray. Sedimented fine tooth-powder was collected and mixed with 2.0 ml of patient's intravenous blood. The powdered paste pushed inside the tooth socket by means of plugger until the socket was filled, leaving a space of 3mm only. The socket was sutured with a non-resorbable silk material. After one week, the adjacent tooth were endodontically prepared and a fixed partial denture was placed on the prepared abutments. The results suggest therapeutic approach with no immune response, which can be implemented at chairside. A significant preservation of alveolar ridge can be maintained using this novel approach.

**Keywords:** Alveolar ridge, Bone resorption, Hydroxyapatite, Tooth.

### Introduction

The post-extraction resorption of an alveolar ridge is a natural process of bone remodeling which may seriously affect the dimensions of the ridge.<sup>1</sup> Alveolar ridge resorption may create a clinical problem such as esthetically and functionally defected removable prosthesis and fixed prosthesis. Moreover, it can make dental implants placement very difficult or sometimes even impossible.<sup>2</sup> Therefore, it is always desirable to prevent the alveolar bone dimensions following tooth extraction.

During the era of the 80s and in the early 90s bone grafting procedures were commonly performed to increase the bone volume.<sup>3</sup> However, emphasis on using bovine bone matrix and more recently, the use of synthetic hydroxyapatites (containing calcium and phosphate minerals) and bioglasses have been greatly

increased.<sup>4</sup> The advantages of calcium phosphate (Ca-P) minerals in augmentation processes are its biocompatibility and osteoconductivity. The data is available related to the clinical success of synthetic Ca-P based ceramics as a bone augmentation material. However, no in vitro, in vivo literature or clinical study is available documenting the use of biological Ca-P mineral as a bone augmentation material.

We report an unusual case of bone augmentation with patient's own extracted teeth that were ground into fine powder and mixed with patient's intravenous blood.

### Case Report

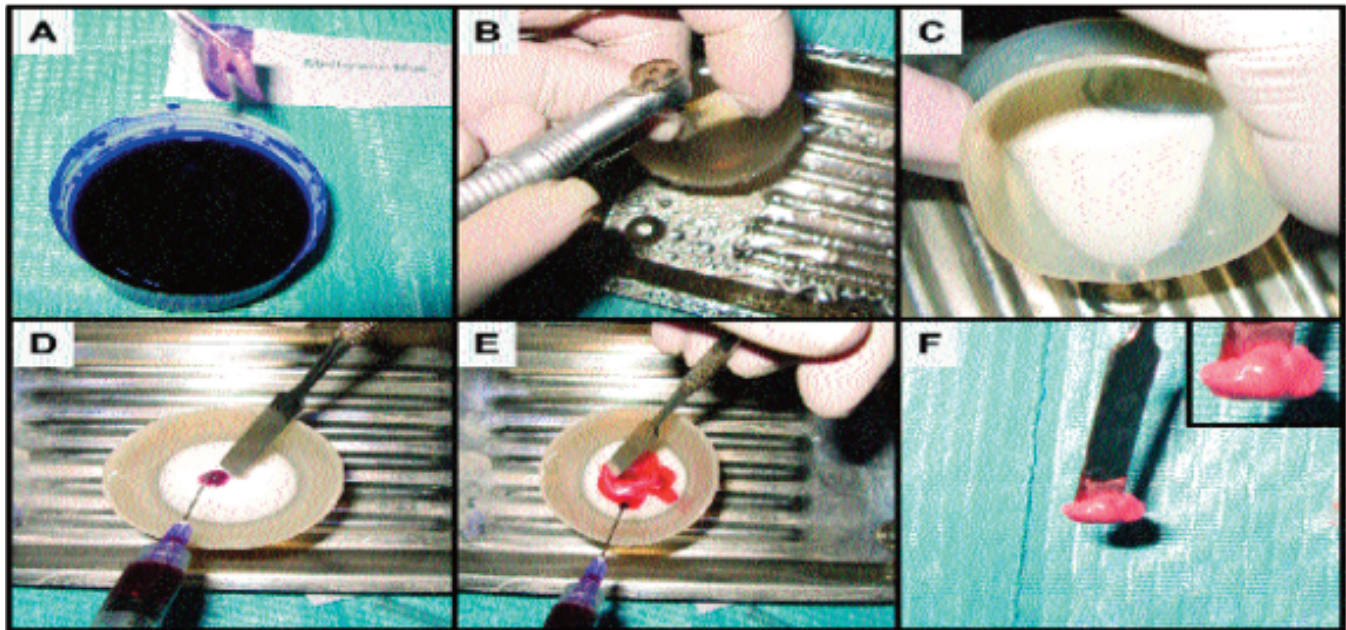
A 56-years old male patient came to a dental clinic in Riyadh, KSA in April 2015 with a complaint of perpetual dull pain in upper left central incisor, with a history of dull pain for 2 years with occasional onset. The patient had to travel abroad in 2 weeks.

On clinical examination, grade 2 mobility was observed in upper left central incisor and also in lower left first molar. The tooth was extracted by one of the authors. The extracted tooth was washed in normal saline for 5 min and soaked in methylene blue dye for 30 sec and left for air dry for 5 min. High-speed hand-piece was run with asaline spray for 5 minutes to release and free any contamination from the water port of the hand-piece. The use of normal saline in lieu of water was taken into consideration to achieve a minimal level of bacteria or spore present in the tap water.

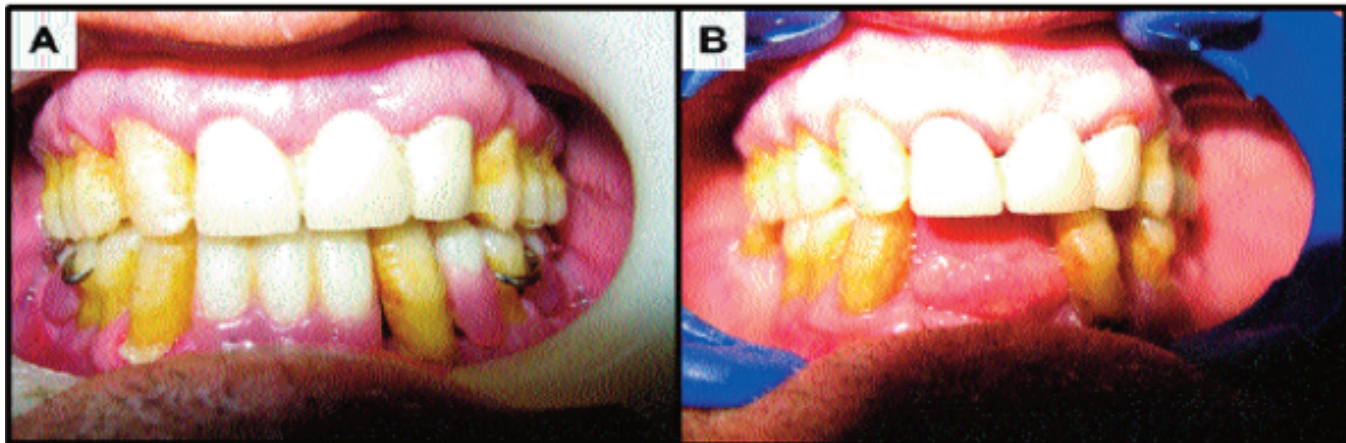
Next, the outer surface of the tooth was ground approximately 100 microns to clean the smear layer. A digital Vernier caliper was used to measure the reduction in outer dimensions. Teeth were ground with a sharp tapered fissure diamond bur. The droplets were collected in a sterilized silicone cone-shaped dish placed on a dental tray (Figure-1B). The procedure of teeth grinding was performed by feather light touch, upwards and downwards repeatedly and moving the tooth in a circular motion until the surfaces of the teeth were ground except the pulp area and approximately 1mm thick dentine that surrounds the pulpal area. The teeth were ground by considering the pulpal anatomy of the tooth and the visual appearance of yellowish hue which

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**Figure-1:** Process of osteoinductive material preparation for alveolar bone ridge. (A) methylene blue dipped teeth, (B) grinding of tooth, (C) ground tooth in normal saline forming a thick slurry, (D) blood being dropped in white slurry, (E) mixing of blood and slurry and (F) a thick paste is formed after mixing blood with grinded particles of teeth in normal saline.



**Figure-2:** (A) Digital image of porcelain bridge on the day of implantation and (B) Digital image of porcelain bridge after a period of two-years.

indicates the proximity of pulp canal. Next, the normal saline was decanted off from the precipitated powder and the sedimented powder was collected and mixed with patient's blood (2.0 ml collected intravenously) (Figure 1D) and the powdered paste (Figure 1F) pushed inside the tooth socket by means of plugger until the socket was filled with the powdered paste, leaving a space of 3mm only.

A syringe filled with decadron injectable material (containing dexamethasone: 4mg/ml) was smeared on the surface of the filled powdered paste to reduce the

immune response. Finally, the buccal and palatal gingival sulcus were sutured with a non-resorbable silk material. After one week, sutures were removed. Both upper right central incisor and upper left lateral incisor were endodontically treated to preserve them from any future periapical infection, and a fixed partial denture was placed on the prepared endodontically treated abutments (Figure 2A). After the surgery, the patient travelled abroad and returned two years later for follow-up (in March 2017). Post-surgical examination revealed that the osteoinductive material put inside the socket

significantly maintained the ridge platform even after the lapse of two years. Informed consent was taken from the patient for case publication.

## Discussion

Tooth comprises a combination of organic and inorganic components. Various calcium phosphates are present in the tooth. The presence of calcium phosphates helps in the remodeling of the existing bone when used as a graft. Post-extraction bone resorption is a key issue to handle.<sup>5</sup> Several techniques have been employed to combat the issue of bone resorption that eventually leads to bridge failure and leads to pain and morbidity.<sup>5</sup> Though it is reported that alveolar ridge's height is affected during the first three months after extraction.<sup>6,7</sup> However, the clinical examination revealed excellent healing with bone formation (Figure 2B).

The results of the current case suggest a therapeutic approach which can be implemented at chairside with ease, with no additional materials. Overall, crushed tooth-powdered mixed with patient's own blood proved to be beneficial as it did not generate any immune response. It must have helped in new tissue formation and adherence since tooth contains hydroxyapatite, which is highly crystalline and due to its highly crystalline nature, it cannot decompose easily. Moreover, of all organic compounds in a tooth, 90% is approximated to account for type I collagen and various growth factors such as bone morphogenic proteins.<sup>8</sup> Collagen-based materials have a track record of excellent biocompatibility and exceptional bone forming capability.<sup>8,9</sup> To the best of the authors' knowledge, no study has ever been carried out using powdered tooth graft material mixed in blood, forming a thick easy to handle bone forming paste. On the contrary, a very few case reports are available suggesting block or chip typed tooth grafting materials covering the extraction socket with collagen sheet to prevent dissemination of small chips. All these cases show promising results.

For future work, more cases and probably a study ought to be performed to validate the method described in this report for clinical implementation. Furthermore, a study on different particle size of powdered tooth grafting material and their effect on bone forming would also be interesting to evaluate.

## Conclusion

There are a plethora of techniques available involving various natural and synthetic osteoinductive materials. However, augmentation of the bone with hydroxyapatite minerals derived from patient's own crushed teeth are not only beneficial but also reduces the chance of immune rejection. This case is one of its kind that documented the factual advantages of the novel, easy and cost-effective therapeutic approach for preservation of the alveolar bone ridge following extraction of the teeth.

**Disclaimer:** The work has never been previously presented or published in a conference, or published in an abstract book.

**Conflict of Interest:** None.

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