Clinical Case Report

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Application of enamel matrix derivative and deproteinized bovine bone for the treatment of peri-implantitis after decontamination with an ultrasonic scaler

A case report

Jun-Beom Park, DDS, MSD, PhD*

Abstract

Rationale: The purpose of this report is to present a case of peri-implantitis with successful regeneration. The surface of the affected dental implant was decontaminated with an ultrasonic scaler and treated with bovine-derived hydroxyapatite and enamel matrix derivative.

Patient concerns: A 52-year-old male was referred for evaluation of a dental implant placed in the mandibular right second premolar area.

Diagnosis: The radiographic evaluation showed the loss of supporting bone around the dental implant. Bleeding upon probing and suppuration were observed, with the deepest probing depth at 6 mm.

Interventions: The area was firstly treated with a nonsurgical approach. After re-evaluation, a full-thickness flap was elevated. The area was well debrided using various instruments, including curettes and an ultrasonic scaler. The defect area was grafted with bovine-derived hydroxyapatite and enamel matrix derivative.

Outcomes: Histopathologic evaluation revealed chronic inflammation with fibrosis and calcification. The evaluation at 2 years and 3 months after surgery showed that the prosthesis was functioning well. Bleeding upon probing and suppuration was not noted, and reduction of probing depth was seen, with the deepest depth at 4 mm. The area showed maintenance of graft material with increased radiopacity around the dental implant.

Lessons: In conclusion, a case of peri-implantitis can be successfully treated with bovine-derived hydroxyapatite and enamel matrix derivative after surface decontamination with an ultrasonic scaler.

Abbreviations: HE = hematoxylin-eosin, NRF = National Research Foundation of Korea.

Keywords: bone substitutes, enamel matrix proteins, peri-implantitis, regeneration

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This study was reviewed and approved by the Institutional Review Board of Seoul St Mary's Hospital, College of Medicine, Catholic University of Korea, Seoul, Republic of Korea (KC18ZESI0491).

All data analyzed during this study are included in this published article.

The authors have no conflicts of interest to disclose.

Department of Periodontics, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea.

** Correspondence: Jun-Beom Park, Department of Periodontics, Seoul St Mary's Hospital, College of Medicine, The Catholic University of Korea, 222, Banpo-daero, Seocho-gu, Seoul 06591, Republic of Korea (e-mail: jbassoonis@yahoo.co.kr).*

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1. Introduction

Enamel matrix derivative is used for various purposes, including periodontal regeneration and root coverage.[1,2] Enamel matrix derivative is prepared from porcine enamel matrix and consists majorly of amelogenin and ameloblastin.[3] Application of enamel matrix derivative is regarded to produce better results when compared to open flap.[4] It was previously reported that the combination of enamel matrix and bone graft produced enhanced clinical outcomes.[5]

However, there are limited reports on the use of enamel matrix for the treatment of peri-implantitis, especially for regeneration of lost bone. The purpose of this report is to present a case of peri-implantitis with successful regeneration. The surface of the affected dental implant was decontaminated with an ultrasonic scaler and treated with bovine-derived hydroxyapatite and enamel matrix derivative.

1.1. Ethics, consent, and permissions

This study was reviewed and approved by the Institutional Review Board of Seoul St Mary's Hospital, College of Medicine, Catholic University of Korea, Seoul, Republic of Korea (KC18ZESI0491) and consent was obtained from the participant.

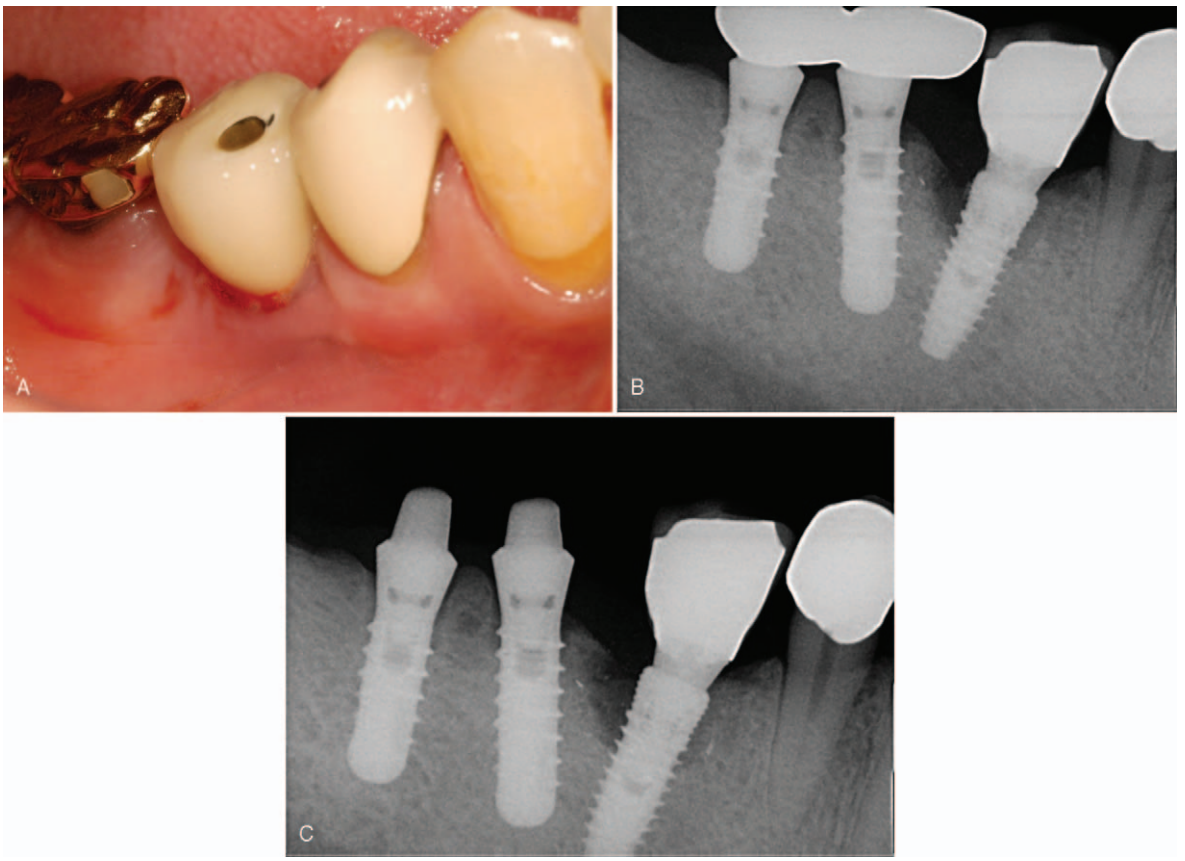

Figure 1. Evaluation of the peri-implantitis. (A) Buccal view showing bleeding upon probing and suppuration. (B) Periapical radiograph showing the loss of supporting bone around the dental implant. (C) Clinical photograph after nonsurgical approach.

2. Case presentation

A 52-year-old male was referred to Department of Periodontics for the evaluation of a dental implant placed in the mandibular right second premolar area. Bleeding upon probing and suppuration were observed at the peri-implant mucosa (Fig. 1A). The deepest probing depth was 6 mm. Clinical implication of the evaluated dental implant was peri-implantitis. The radiographic evaluation showed the loss of supporting bone around the dental implant (Fig. 1B). The area was firstly treated with a nonsurgical approach. After re-evaluation, the area was considered for the surgical procedure (Fig. 1C).

The crown portion was removed before the surgery (Fig. 2A). Immediately before the surgical procedure, the patient rinsed for 2 minutes with a 0.12% chlorhexidine digluconate solution (Hexamedine, Bukwang, Seoul, Korea). Following an injection of 2% lidocaine with 1:100,000 epinephrine local anesthetic, a full-thickness flap was elevated (Fig. 2B). There was a circumferential defect around the dental implant, with partial loss of the buccal plate. The area was well debrided using various instruments, including curettes and an ultrasonic scaler (Satelec, Acteon, Merignac, France). The defect area was grafted with bovine-derived hydroxyapatite (Endobon; Biomet 3i, Palm Beach Gardens, FL) and enamel matrix derivative (Emdogain; Straumann AG, Basel, Switzerland) (Fig. 2C–E). The biopsy was performed at the time of the surgery and was sent to the Department of Pathology for histopathologic analysis, which revealed chronic inflammation with fibrosis and calcification (Fig. 2G, H).

The implant was loaded after removal of the sutures. The evaluation at 2 years and 3 months after surgery showed that the prosthesis was functioning well (Fig. 3A). Bleeding upon probing and suppuration was not noted, and reduction of probing depth was seen, with the deepest depth at 4 mm. The area showed maintenance of graft material with increased radiopacity around the dental implant (Fig. 3B). The participant is under the routine follow-up check.

3. Discussion

This report showed regeneration of destructed bone with bovine-derived hydroxyapatite and enamel matrix derivative after surface decontamination with an ultrasonic scaler.

Enamel matrix derivative is regarded to simulate the enamel proteins during cementogenesis, and application of enamel matrix derivative may produce acellular cementum formation, followed by periodontal regeneration.[6,7] More recently, enamel matrix derivative, which was seeded on the titanium surface, was applied to stem cells.[8] The use of enamel matrix derivative applied on titanium surfaces produced increased proliferation and osteogenic differentiation of stem cells and enhanced expression of angiogenic genes in endothelial cells.[8,9]

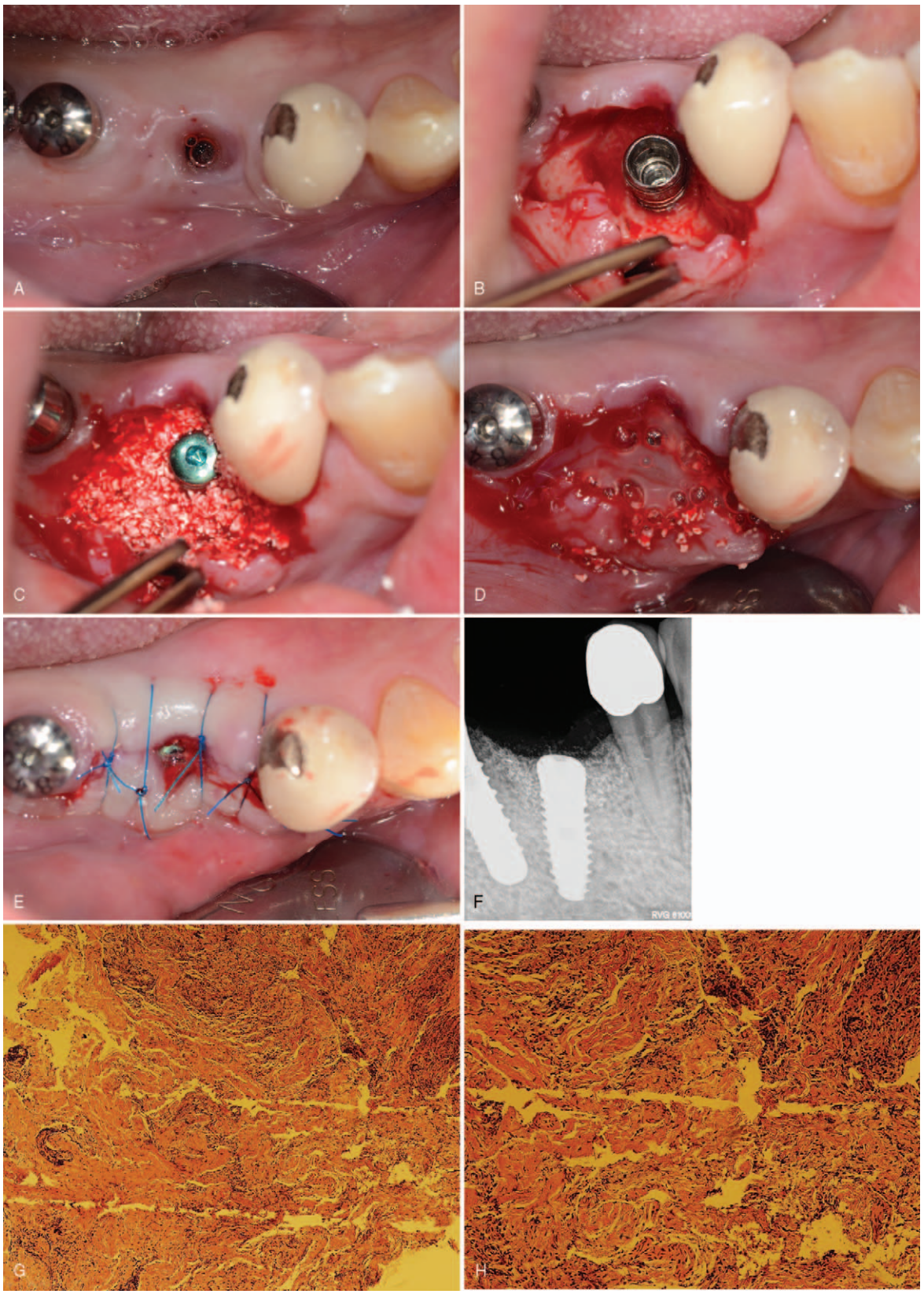

Figure 2. Surgical procedures. (A) Preoperative occlusal view. (B) Occlusal view after elevation of a full thickness flap showing loss of supporting bone. (C) The defect area grafted with bovine-derived hydroxyapatite. (D) The clinical photograph after application of enamel matrix derivative. (E) Occlusal view after suture. (F) The radiograph of the dental implant after surgery. (G) Immunohistochemical staining of biopsy from peri-implant mucosa. Histopathologic evaluation revealed chronic inflammation with fibrosis and calcification (hematoxylin-eosin [HE] stain; original magnification ×50). (H) Magnified view of HE stain (original magnification ×100).

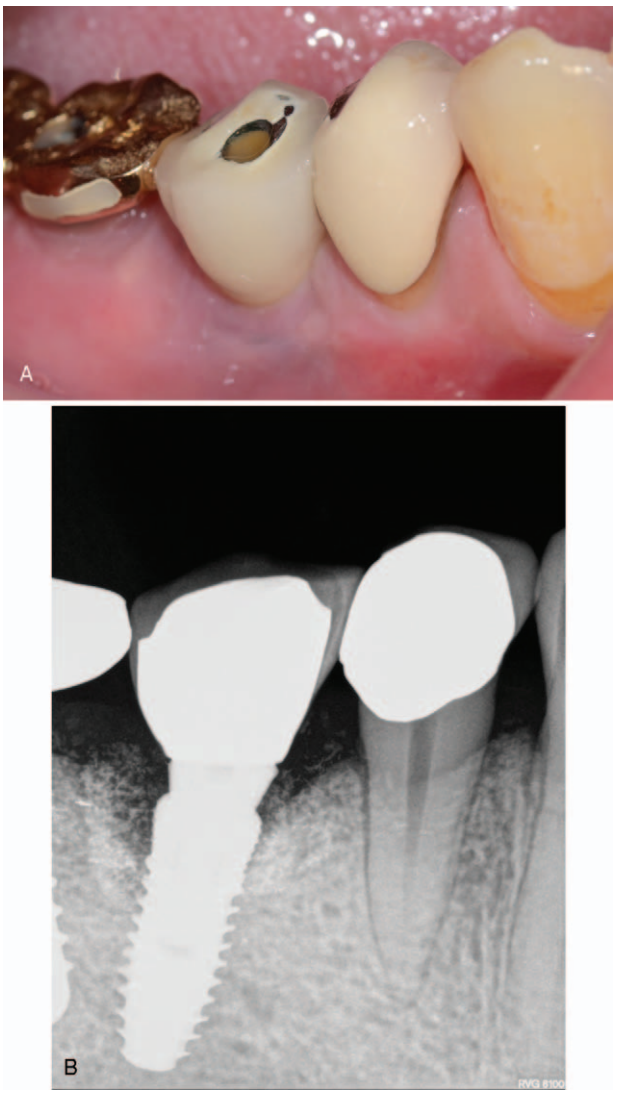

Figure 3. Postoperative follow-up. (A) Two-year and 3-month postoperative clinical view indicating the uneventful healing without suppuration. (B) The radiograph at 2 years and 3 months postoperative, showing increased radiopacity around the dental implant.

Previous reports showed that case reports in humans shown that application of tetracycline after implantoplasty or air powder abrasive and followed by bone graft and membrane resulted in bone fill of the peri-implant defects.[10,11] A combination of enamel matrix derivative and synthetic bone graft of biphasic calcium phosphate showed clinical intrabony defects over a period of 3 years.[12] The previous review showed that the combination of enamel matrix derivative and bone graft resulted in additional improvements in probing depth reduction.[13]

Inflammation around the dental implant leading to destruction of soft and hard tissue is defined as peri-implant mucositis and peri-implantitis.[14] Enamel matrix derivative was suggested to be an adjunct to mechanical debridement of peri-implant mucositis.[15] Histopathologic evaluation in this study showed chronic inflammation with fibrosis around the dental implant, and radiographic evaluation showed regeneration of hard tissue around the dental implant. A previous report tried a regenerative approach in the treatment of peri-implantitis, and the results showed a gain of bony level, along with recovery of soft tissue margin.[16]

Decontamination of dental implants can be performed with various instruments, including hand instruments, titanium rotary instruments, and ultrasonic scalers.[17,18] This report applied an ultrasonic scaler with a metal tip.[17,19] It was shown that application of the ultrasonic metal scaler resulted in reduction of surface roughness with efficient removal of bacteria.[20,21]

In conclusion, a case of peri-implantitis can be successfully treated with bovine-derived hydroxyapatite and enamel matrix derivative after surface decontamination with an ultrasonic scaler.

Author contributions

JBP conceived of the study, participated in its design, analyzed the data, wrote the manuscript and approved the final manuscript.
Conceptualization: Jun-Beom Park.
Data curation: Jun-Beom Park.
Formal analysis: Jun-Beom Park.
Funding acquisition: Jun-Beom Park.
Methodology: Jun-Beom Park.
Writing – original draft: Jun-Beom Park.
Writing – review & editing: Jun-Beom Park.

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