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RESEARCH ARTICLE

ABGEL – A boon for periodontal regeneration

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Abstract

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Recent studies claim that haemostatic agents promote periodontal regeneration& are effective bone graft substitutes. Here we describe the use of absorbable gelatin (abgel) in teeth affected by severe periodontitis treated using three different surgical procedures: periodontal flap surgery, intentional tooth replantation (IR) and ridge augmentation. Abgel has proven to be a good and clinically safe biomaterial for the controlled release of growth factors, eg. BMP, PDGF, and TGF-ß in the blood clot which may exert biological activities and promote tissue regeneration at surgical sites. Radiographical images demonstrated no evidence of ankylosis, and revealed the presence of alveolar bone regeneration.

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INTRODUCTION

The management of periodontal defects has been an ongoing challenge in clinical periodontics.¹ Although utilization of various grafting materials for periodontal defects may result in some gain in clinical attachment levels and radiographic evidence of bone fill, careful histologic assessment usually reveals that these materials have little osteoinductive capacity and generally become encased in a dense fibrous connective tissue.² It is reported that blood clot is rich in platelets and are non-toxic, as well as being a rich source of autologous growth factors. In addition, it has been reported that the presence of a good biodegradable material such as gelatin is required to enhance the biological function of bone morphogenetic protein (BMP) for bone regeneration.³ Absorbable gelatin is a water-insoluble, off-white, nonelastic, porous, pliable product prepared from purified porcine skin. Therefore, if controlled release of growth factors could be achieved for the purposes of regeneration, then growth factor-induced regeneration therapy might become a viable treatment option for preservation of natural dentition.⁴

Here we describe the use of gelatin for achieving successful clinical outcomes in three different surgical procedures: periodontal flap surgery, intentional tooth replantation & ridge augmentation. In all the four cases described below the medical history was non-contributory, and patient reported no allergies to any medication. After thorough oral prophylaxis, the tooth was splinted with wire & composite.Buccal and lingual intracrevicular incisions were made and mucoperiosteal flaps were elevated.The gelatin sponge was cut into small pieces (less than 1 mm²) and placed into the periodontal defects after bleeding had been induced.The flap was repositioned and sutured with 3-0 silk suture to accomplish complete interproximal closure

Case 1:

A 23-year-old male patient came to the Department of Periodontics with the main complain of tooth mobility around the left mandibular second molar. Intra-oral examination revealed a 13mm probing pocket depth mesial to left second mandibular molar and Grade III mobility [Figure. 1]. Radiographs showed vertical bone loss around the left mandibular second molar [Figure. 2].On opening a full thickness flap [Figure 3], debridement was completed & the osseous defect was treated with small pieces of gelatin, after bleeding was induced [Figure 4]. Clinical and radiographic follow-up was continued thereafter. 9 months after the surgery, the patient remained clinically asymptomatic, and the periodontal pocket depth reduced to 7 mm. Bone regeneration along the roots of the left mandibular second molar was also evident on intraoral radiographic images [Figure 5].

Case 2 :

A 22-year male patient came to the Department of Periodontics with chief complaint of pus discharge from the lower front tooth region since 1 month. He bit on a hard food after which he noticed this. Periodontal examination revealed 14 mm probing pocket depth & Grade II mobility with respect to 41. Horizontal bone resorption along the distal aspect of 41 was evident on intraoral radiographic images [Figure 6A]. To treat the periodontal defect, in this case also gelatin sponge was used. Clinical and radiographic follow-up was continued thereafter for 9 months. The patient remained clinically asymptomatic, and the periodontal pocket depth reduced to 4 mm. Bone regeneration was evident on intraoral radiographic images. [Figure 6B].

Case 3:

A 23-year male patient came to the Department of Periodontics with a main complaint of tooth mobility & difficulty in chewing food with respect to the lower front tooth region since last 3 months. No prior history of any trauma was reported by the patient. On clinical examination, distal pocket depth of 13mm & Grade III mobility was seen with respect to 31. The pretreatment conventional intraoral radiograph showed complete bone loss around the mesial & distal aspect of 31 [Figure 7A]. The patient was not willing for extraction & wanted to save the tooth. Hence it was planned for intentional re-implantation. The lower front tooth was extracted and extra-oral root canal treatment was performed. The socket walls were then curetted and thorough debridement was done. The socket was filled with gelatin. The tooth was then re-implanted into the socket & splinted to the adjacent tooth to immobilize it for proper healing and minimize any possible traumatic occlusal force.

Clinical and radiographic follow-up was continued thereafter for 9 months. The re-implanted tooth showed physiological mobility, without any radiographic evidence of root resorption or ankylosis. In addition, bone regeneration was evident around the root. [Figure 7B].

Case 4 :

A 28 year old female patient came with the chief complaint of missing tooth in upper front tooth region & wanted replacement of same. She gave a history of accident 1 year back & lost the same tooth.On clinical examination, significant collapse of alveolar bone was seen [Figure 8A]. To overcome that, ridge augmentation was done & abgel was placed as a membrane.Clinical and radiographic follow-up was continued thereafter for 9 months, which showed significant bone fill [Figure 8B].

DISCUSSION :

The mechanism of action of surface-mediated hemostatic devices are supportive and mechanical. The spongy physical properties of the gelatin sponge hasten clot formation and provide structural support for the clot formation. Platelets make up a large part of a blood clot and function as a reservoir of natural growth factors essential for tissue healing and regeneration. Thereafter, several growth factors such as BMP, PDGF, and TGF-B in the blood clot may exert biological activities and promote tissue regeneration at surgical sites.⁴

Therefore, our present results suggested that blood clot gets immobilized with gelatin hydrogel fragments which might function not only as a carrier of natural growth factors, but also as a filler to prevent the growth of soft tissue into the periodontal defect & promote osseous regeneration. These findings were similar to those reported by Hiroaki Kabashima et al⁴. In addition the slow degradation of the gelatin facilitated controlled release of growth

factors from the clot, thus helping to maximize the healing potential of the residual tissue through growth factormediated tissue regeneration in the circumferential periodontal defects surrounding the affected teeth. Similar results were seen in study conducted by Yamamoto M et al.⁵ & Kosen Y et al.⁶

However, further long-term studies of treatment outcomes should be performed to investigate the possible clinical application of gelatin to promote tissue healing and alveolar bone regeneration after surgical procedures.

Figure 1:13mm Probing pocket depth



Figure 2 :Pre operative radiograph



Figure 3 : Intra – bony defect after reflection of full thickness flap



Figure 4 : Small pieces of cut gelatin



Figure 5 :Post operative radiograph after 9 months





Figure 6A &6B : Pre &Post operative radiograph after 9 months

Figure 7A & 7 B : Pre &Post operative radiograph after 9 months



Figure 8A :Pre operative radiograph



Figure 8B :Post operative radiograph



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