



## Treatment of Different Types of Bone Defects with Concentrated Growth Factor: Four Case Reports

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### Abstract

Various techniques have been attempted in the past to truly regenerate the lost bone structures. Owing to its stimulatory effect on angiogenesis and epithelialization, concentrated growth factor (CGF) is an excellent material for enhancing bone healing. The purpose of these case series is to document the beneficial role of CGF in the healing of different bone defect areas. This report describes four female patients presented with (lateral cyst on tooth 22; periimplantitis on mandibular left first premolar area; furcation lesion on tooth 36, periapical abscess on teeth 11-21). Mucoperiosteal full-thickness flaps were elevated to perform the surgical debridement of lesion areas in all patients. Then, minced CGF mixed with bone graft was applied to fill the defects. Recall radiographs of cases showed satisfactory healing of the bony defects. According to the results obtained in these case reports, the positive clinical impact of additional application of CGF with bone graft materials in treatment of bone defects is based on significant radiographic defect bone fill.

### Keywords

Concentrated growth factor, Bone defect, Oral surgery

### Introduction

The bony defects can be developed by periodontal disease, tooth loss, trauma and infection. The aim of periodontal therapy is to eliminate inflammatory process, prevent the progression of periodontal disease and also to regenerate the lost periodontal tissues [1]. Various techniques and biomaterials have been attempted in the past to truly regenerate the lost bone structures in addition to autogenous and allogenic bone grafts, but complete and predictable reconstruction of periodontal tissues is still difficult to obtain.

Owing to its stimulatory effect on angiogenesis and epithelialization, concentrated growth factor (CGF) is an excellent material for enhancing bone healing. The use of CGF may be a simple and effective method of improving the healing of the bone defects. Its advantages over platelet-rich plasma include ease of preparation, ease of application, minimal expense, and lack of biochemical modification (no bovine thrombin or anticoagulant is required). It can also serve as a resorbable interpositional membrane [2,3]. The CGF layer avoids early invagination of the gingival epithelium, thereby serving as a

barrier to epithelium migration [4]. The purpose of these case series is to document the beneficial role of CGF mixed with bone graft and CGF barrier membrane to accelerate bone formation in the healing of different bone defect areas.

### Cases Report

This report describes four female patients presented with (lateral cyst on tooth 22; periimplantitis on mandibular left first premolar area; furcation lesion on tooth 36, periapical abscess on teeth 11-21) (Table 1). All patients were informed about the treatment procedures, and were required to fill out a consent form and a medical history questionnaire. The current article was conducted in full accordance with the World Medical Association Declaration of Helsinki. Before the surgical procedures, patients were underwent oral hygiene instructions and scaling with ultrasonic and hand instruments to remove any local irritating factors that may have been responsible for the gingival inflammation at the surgical wound healing duration. In the surgery processes, mucoperiosteal full-thickness flaps were elevated to perform the surgical debridement of lesion areas in all patients under local anesthesia (articain 4% with 1:200.000 epinephrine<sup>†</sup>). 10 cc venous blood was taken to prepare 2 pieces of CGF with special centrifuge<sup>‡</sup>. One piece was mixed with 0.25 – 0.5 gr cancellous-cortical heterologous bone mix<sup>§</sup> to accelerate new bone formation and the other was used as a barrier membrane. After complete removal of granulation tissue at lesion areas, minced CGF mixed with bone graft was gently tapped inside the osteotomy site with osteotomes and mallet to fill the defects. CGF barrier was covered on the graft to accelerate new bone formation and prevent soft tissue ingrowth (Figure 1). After repositioning the soft tissues, primary closure was attained using 4-0 silk suture. Analgesics and antibiotics were prescribed, and the patient was advised to use chlorhexidine mouthwash for a week.

At 1-week post-surgical follow-up the sutures were removed. The patients experienced mild postoperative pain and swelling. There were no significant complications, such as bleeding, severe pain, or delayed wound healing. Clinical healing was uneventful, with neither infectious episodes nor untoward clinical symptoms. Recall radiographs of cases at 3 months showed satisfactory healing of the bony defects (Figure 2). The patients were also satisfied with outcomes of the treatments.

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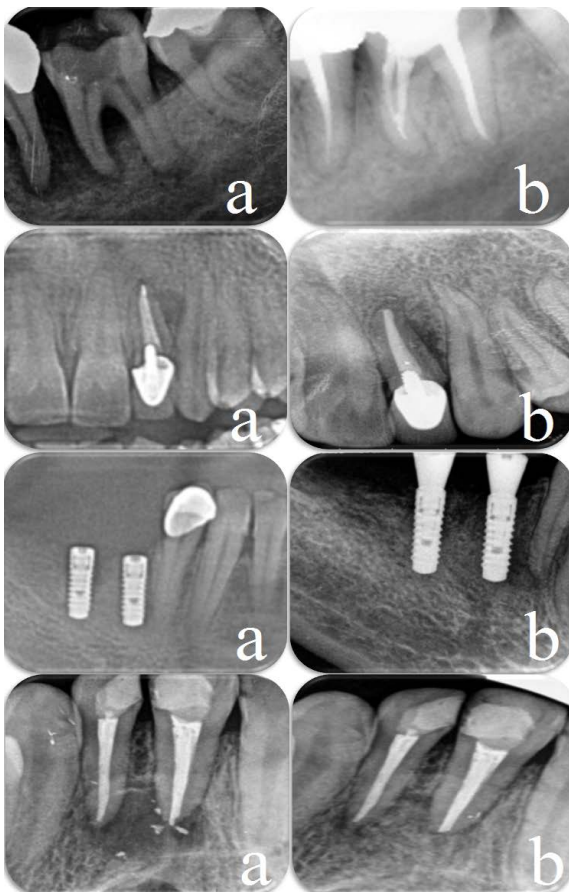
**Table 1:** Demographic details and clinical dental variables in patients.

	Patients			
	1	2	3	4
<b>Sex</b>	F	F	M	F
<b>Age</b>	28	45	42	19
Daily Tooth Brushing (Number/day)				
<i>Baseline</i>	1	1	0	1
<i>After the treatments</i>	3	3	2	3
<b>Smoking (n/day)</b>	-	-	15/day	-
<b>Systemic Disease</b>	-	Diabetes Mellitus (Type 1)		
<b>Bone Defect</b>	lateral cyst	periimplantitis	furcation lesion	periapical abscess
<i>Location</i>	tooth 22	mandibular premolar area	tooth 36	teeth 11-21
<i>Duration</i>	10 months <	3 months <	1 year <	5 months <
<b>Clinical Parameters</b>				
<b>PI</b>				
<i>Baseline</i>	0.88	0.92	1.98	0.37
<i>After the treatments</i>	0.16	0.12	0.47	0.11
<b>GI</b>				
<i>Baseline</i>	0.32	1.08	2.05	0.30
<i>After the treatments</i>	0.10	0.16	0.25	0.07

M: Male, F: Female, PI: Plaque index (Silness and Løe), GI: Gingival index (Løe and Silness)



**Figure 1:** a) Intra-oral view of the lesion after removal of granulation tissue b) Applying CGF mixed with bone graft c) CGF barrier membrane.



**Figure 2:** a) Pretreatment radiographic views showing bone defects b) Periapical radiographic view 3 months after surgery showing evidence of bone healing.

## Discussion

Bony defects in the jaws occur for various reasons such as infections, periodontal diseases, tumors, or cysts. Each year a large number of teeth were extracted due to the bone defects.

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Only a few of them are treated with bone regeneration materials. Therefore, bone regeneration becomes an important tool to prevent the loss of jaw bone, more generally, for all types of bone defects. From past to present many types bone graft materials and patterns of use were investigated in order to find better and inexpensive method for filling bony defects [5]. One of the recent approaches is to ameliorate the bone graft healing by growth factor enhancement. Growth factors are bioactive proteins which control the process of wound healing [6]. These growth factors are present in blood, within platelets and in plasma and platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and recently concentrated growth factor (CGF) have been used for reconstruction of bony defects and increasing the success rate of bone grafting therapy [7,8]. CGF is in the form of platelet gel and can be used in conjunction with bone grafts, which offers several advantages including promoting wound healing, bone growth and maturation, graft stabilization, hemostasis and improving the handling properties of graft materials [8]. The ability of CGF in accelerating bone healing has stimulated the research of its clinical applications in various areas of oral and maxillofacial surgery, which includes healing of extraction sockets including impacted tooth, implantology, ulcer management, and osteonecrosis of the jaw [9]. Therefore, in the present clinical cases, in the treatment of bone defects due to different reasons, the choice was to use CGF mixed with bone graft material, mainly because its biocompatibility, resilience, and availability. As a result, treatment of the bone defects with flap surgery plus CGF and bone

mix provided significant defect fill as demonstrated by clinical and radiographic examinations at one-month follow-up.

A clinical trial suggested that the combination of bone graft along with the growth factors in the platelet-rich fibrin (PRF) may be suitable to enhance the bone density [10]. Mazon *et al.* [11] stated that the use of PRF as the filling material during sinus lift and implantation procedure had stabilized a good amount of regenerated bone in the subsinus cavity. Combined use of PRF and bone graft with good results has also been reported for combined periodontic-endodontic furcation defect [12]. Chang *et al.* [13] reported that infrabony defects exhibited pocket reduction and clinical attachment gain after six months after PRF application by increasing extracellular signal-regulated protein kinase phosphorylation and osteoprotegerin in periodontal ligament fibroblasts and up-regulation of alkaline phosphatase activity. Our results suggested that the growth factors in CGF had large effects on nearly every stage of bone graft healing.

PRF can serve as a resorbable membrane, which can be used in oral surgery to cover bone augmentation site, it is much less expensive than commercial membrane [10]. Since the surface of PRF membrane is smoother, it can cause superior proliferation of human periosteal cells thereby enhancing bone regeneration [14]. Shivashankar *et al.* [15] showed rapid rate of bone formation in the treatment of large periapical lesion by using PRF barrier membrane. In the present cases, CGF barrier was used with the goals of promoting bone regeneration and soft tissue healing improving bonding between bone and bone graft.

According to the results obtained in these case reports, the positive clinical impact of additional application of CGF with bone graft materials in treatment of bone defects is based on significant radiographic defect bone fill. CGF barrier is effective to regenerate bone formation associated with GBR and GTR procedure. In addition, the mixture of CGF and bone graft could improve healing compared to conventional GBR procedure. We also prepare a prospective trial comparing different techniques such as PRP, PRF, CGF, GBR.

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