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RESEARCH ARTICLE

PERIODONTAL REGENERATION WITH A COMBINATION OF BONE GRAFT AND CONCENTRATED GROWTH FACTOR

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ABSTRACT

Introduction: While the primary goal of periodontal therapy is the maintainance of the natural dentition in health and comfortable function, predictability of outcomes following surgical procedures is of fundamental importance.

Methods: This goal may be achieved by following the principles of biological solutions to biological problems. Various biological solutions include platelet rich plasma, platelet rich fibrin and concentrated growth factor. This case series deals with the use of concentrated growth factor in combination with bone graft for regeneration.

Conclusion: Concentrated growth factor is an excellent biologic material which can be used in a gel form or membrane form alone or in combination with other regenerative materials.

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INTRODUCTION

The primary goal of periodontal therapy is the maintenance of the natural dentition in health and comfortable function (American Academy of Periodontology, 1992). (AAP1992). To attain this primary goal, periodontal reconstructive surgical procedures have been attempted over the years. Periodontal reconstructive procedures are time consuming and financially demanding. Hence there is an increased interest among clinicians to learn of factors that may influence the clinical outcome following reconstructive procedures in order to provide best possible service to patients (Polimeni *et al*., 2000). Predictable regeneration may be achieved by following the principles of 'biological solutions to biological problems'. The biological solutions include the growth factors contained in the alpha granules of the platelets. These platelet concentrates improve esthetic outcome, shorten the duration of therapy and result in reduction of postoperative symptoms.

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Concentrated growth factor is one among the platelet concentrates developed by Sacco *et al* in 2006. We present a case report of periodontal regeneration using CGF and bone grafts.

Case report

Patient name Mr. Sukumar 47y/male reported to the Outpatient Department of APDCH Melmaruvathur, Tamilnadu with a chief complaint of mild mobility of upper front teeth for the past 6 months which increased gradually over time. On examination, grade 2 mobility was noted in teeth numbers 11 and 21. A probing pocket depth of 7 mm was noted on teeth number 12,11,21,22. IOPA revealed an endo-perio lesion irt 11 and 21. Hence endodontic therapy was advised. Phase I therapy was performed and endodontic therapy was initiated. Two months after completion of endodontic therapy mobility of teeth 11 and 21 was reduced. Reconstructive periodontal surgery was planned. Papilla preservation flap was elevated and bony defects were thoroughly debrided. Patient's venous blood was collected and centrifuged in medifuge silfradent to obtain CGF.

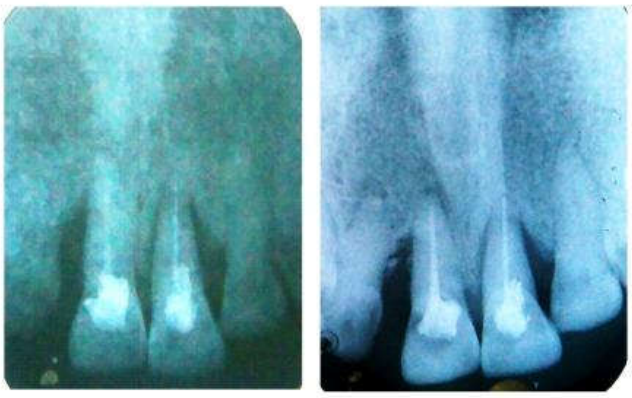

Image 1. preoperative and postoperative IOPA

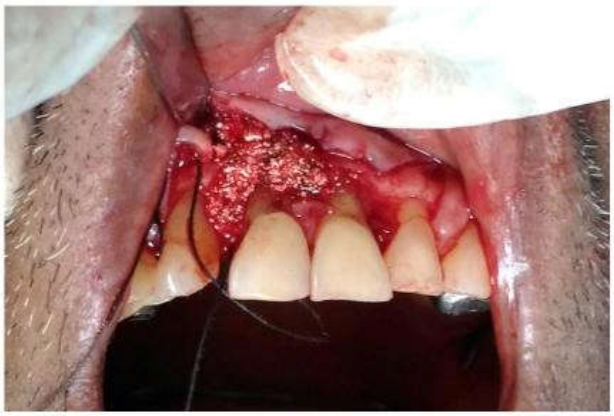

Image 2. surgical procedure using CGF and bone graft

Image 3. preoperative and postoperative clinical pictures

CGF obtained was mixed with hydroxyapatite bone graft and placed in the intrabony defects. Sutures were placed. Periodontal pack was placed.

Patient was recalled after 10 days for suture removal. IOPA was taken 6 months and one year after the surgical procedure. The probing depth at 6 months and 1 year post surgically was 2mm at 12,11,21,22. Postoperative IOPA at 6 months and 1 year revealed an increase in radioopacity at the surgical site as compared to the preoperative radiograph

DISCUSSION

Locally delivered platelet concentrates such as Platelet rich plasma (PRP), Platelet rich fibrin and Concentrated growth factor are supposed to increase the proliferation of connective tissue progenitors to stimulate fibroblast and osteoblast activity and enhance angiogenesis, all of which are fundamental to tissue healing and regeneration (Del Fabbro *et al*., 2011). Five major growth factors, platelet derived growth factor, fibroblast growth factor, transforming growth factor beta and insulin like growth factor-1 were released from the local application of platelet concentrates (Bozkurt Doğan *et al*., 2015). Concentrated growth factors, put forth by Sacco *et al* in the year 2006, is produced by the centrifugation of venous blood. Platelets are concentrated in a gel layer containing fibrin matrix. However a different centrifugation speed permits the isolation of much larger denser and richer growth factors in fibrin matrix from CGF (Thorat *et al*., 2011).

Method of CGF preparation

Protocol involves obtaining 9 ml of venous blood sample in a glass coated plastic tube. Another glass coated plastic tube is filled with 9 ml of saline. These tubes are then immediately centrifuged for 13 minutes with a CGF centrifuge machine (medifuge, silfradent, Italy) using a program with the following characteristics: 30" acceleration, 2' 2700rpm., 4' 2400 rpm., 4' 2700rpm., 3' 3000rpm and 33" deceleration and stop (Borsani *et al*., 2015). At the end of the centrifugation there were three blood fractions (Borsani *et al*., 2015). The upper layer, representing the liquid phase of plasma named platelet poor plasma (PPP)

- The upper layer, representing the liquid phase of plasma named platelet poor plasma (PPP)
- Middle layer representing the solid CGF consisting in three parts: upper white part, the downer red part (about 0.5cm from RBC) and the middle buffy coat part
- Lower layer representing red blood cells (RBC)

The CGF clot was removed from the tube and separated from the RBC by using surgical scissors. This resulting fibrin block is of a higher quality than platelet rich fibrin due to the agglutination of fibrinogen, factor XIII and thrombin that is obtained. Clinically this results in a clot with a higher tensile strength and adhesive strength that is resistant to plasmin degradation (Thorat *et al*., 2011). CGF membranes can be produced by squeezing the obtained CGF in a special box that produces membranes at a constant thickness of 1mm.

Advantages of CGF

- Autogenous source of growth factors
- No anticoagulant is used
- Thicker, stronger and rigid fibrin meshwork
- Has higher tensile strength and higher adhesive strength than PRF

- Accelerates bone formation; retards epithelial migration
- Reduces healing time and cost of bone materials and barrier membranes
- Addition of graft material to CGF encourages cell migration and neoangigenesis
- Antimicrobial activity
- May contain small amounts of leukocytes that synthesise interleukins involved in the non specific immune reaction
- Fibrinogen and fibrin degradation products stimulate CD11 and CD18 receptors thus stimulating the transmigration of neutrophils.
- Other uses of CGF can be
- Placement in extraction sockets for alveolar socket preservation
- Sinus lift procedure
- Filling of cyst cavity after cystectomy
- Ridge augmentation
- CGF membrane can be used as GTR membrane
- Regeneration of furcation defects
- Filling of bony lesion after a periapical surgery

Conclusion

Regeneration of periodontal tissues have been an elusive goal for the periodontist in the past. Newer materials which are biological in nature and from the patient's own blood have less chances of infection and more acceptance by the tissues. These materials are also less expensive and the healing time for the tissues is also reduced post surgically. Concentrated growth factor is an excellent biologic material which can be used in a gel form or membrane form alone or in combination with other regenerative materials. Further studies such a case control studies and randomized clinical trials need to be performed for better evidence so that CGF in combination with other regenerative products can be incorporated into clinical practice.

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