TREATMENT OF PERIODONTAL BONE DEFECTS: BIOGLASS SCAFFOLDS A NOVEL APPROCHE

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ABSTRACT
Periodontal diseases are most common inflammatory disease which characterized by the irreversible loss of tooth supporting apparatus. To maintain loss of periodontal tissues after infection, more recently tissue engineering technique has been used for periodontal regeneration. In present study bioglass scaffolds was used in treatment of various type of bone defects. Aims: The present study was aimed to evaluate clinically and radiographically the effect of scaffold of bioactive glass in the treatment of different forms of periodontal bony defects. Material and methods: Sixteen patients with various type of alveolar bone defects such as infra bony defects and furcations. Results: the study showed a highly significant reduction in the probing pocket depth, relative attachment level (RAL) and radiological bone height after 6 months postoperatively.

KEYWORDS: Periodontal diseases, bioglass scaffolds, radiographically.

INTRODUCTION
It is well known that in the course of periodontal disease process there is progressive loss of alveolar bone along with the destruction of periodontal ligament, necrosis of cementum and apical migration of the epithelial attachment which is clinically manifested by pocket formation and it is a challenge to the therapist to regenerate the periodontium lost by periodontal disease.1

Periodontal Regenerative therapy refers to procedures used in the treatment of periodontal disease to achieve replacement / reconstitution of lost periodontal tissues and thus can be defined as restoration of lost supporting tissues including new alveolar bone, new cementum, and new periodontal ligament.2

Usually 100% regeneration is rarely achieved, for achieving that different regenerative treatment modalities like grafting of biomaterials and application of biological agents have been used with varying success by different workers worldwide. Bioactive glass is one of them. Bioactive glasses are amorphous, silicate-based materials that bond to bone and stimulate new bone growth while dissolving over time, making them candidate materials for tissue engineering.3

CLINICAL PARAMETERS
The following parameters were recorded for each surgical site on the day of surgery (baseline) and after 6 months post operatively.
1. Probing pocket depth (PPD): Distance measured from the gingival margin to the base of the periodontal pocket using University of North Carolina (UNC-15) probe.
2. Horizontal depth of furcation was measured by Naber’s probe.
3. Radiological bone height (RBH): Both pre and 6 month post operative bone height was measured in IOPA radiograph.
4. Relative attachment level (RAL).

SURGICAL TECHNIQUE
All the patients in the present study first underwent Phase I therapy comprising of scaling and root planning to eliminate the inflammatory component. Systemic history and routine haematological investigation was
carried out prior to surgery to exclude any systemic disease. The patients were re-evaluated after every week for 4 weeks following which the surgical procedure was carried out. In surgical procedure crevicular incision given to elevated full thickness mucoperiosteal flaps and granulation tissue removed to prepared alveolar bone defects. Measurement of the infrabony defect was recorded using UNC-15 and furcation by using Nabers probe from fixed reference point marked on the prefabricated stent. Scaffold was properly shaped with the help of micromotor, surgical bur and/or file. Graft material and GTR membrane was properly placed in the bone defects site. Flap was closed by interrupted sutures and periodontal dressing was given. Following the surgery, routine written and oral postoperative care and medicines were given to the patients.

RESULTS

Sites with Intrabony Periodontal Defects
The test site showed a mean probing pocket depth (PPD) of 8.21 mm at baseline and 3.88 mm at the end of six months. Thus a mean reduction of 4.33 mm was achieved which was statistically significant.

The test site showed a mean relative attachment level (RAL) of 9.6500 mm at baseline and 6.3400 mm at the end of six months. Thus a mean reduction of 3.3100 mm was achieved which was statistically significant.

The test site showed a mean radiological bone height (RBH) of 14.00 mm at baseline and 10.65 mm at the end of six months. Thus a mean radiological defect fill of 3.35 mm was achieved which was statistically significant when compared to baseline.

Sites with Furcation Involvement
The test site showed a mean probing pocket depth (PPD) of 5.70 mm at baseline and 1.38 mm at the end of six months. Thus a mean reduction of 4.32 mm was achieved which was statistically significant.

The test site showed a mean horizontal furcation depth 4.85 mm at the base line and 1.00 mm at the end of six months. Thus mean reduction of 3.85 mm was achieved which was statistically significant.
DISCUSSION

Periodontal tissues are the most difficult tissue to achieve complete regeneration because they are affected by many others clinical and biological factors such as they are always in contact with the outside environment of oral cavity and more prone to infection during regeneration procedure. They also wear several types of mechanical stress, one is from occlusal forces and other is the tension stress from gingiva and mucosal membrane which disrupt regeneration procedure. To overcome these environmental factors tissue engineering process has been developed for complete regeneration.

Regeneration of the lost part of periodontium is one of the main goals of periodontal therapy. Conventional periodontal treatments, such as scaling and root planning are highly effective at repairing disease-related defects and halting the progression of periodontitis. However, they do little to promote regeneration of the lost periodontium. On the other hand periodontal surgery in particular regenerative periodontal surgery aims not only to eliminate pocket depths, but to regenerate the lost part of the attachment apparatus and reconstruct the periodontal unit to the extent of previously existing normal physiologic limits.[3]

Among the bone graft and non bone graft materials, several alloplastic materials are available today and these are synthetic substances used to fill bone defects. Ceramics, collagen and polymers are the most recently used alloplastic materials, they can be either bioactive or bioinert. Bioactive ceramics include hydroxyapatite, fluorapatite, bioglass and tricalcium phosphate. They may be porous or non porous.[4]

Bioactive glasses are composed of SiO\textsubscript{2}, CaO, Na\textsubscript{2}O, P\textsubscript{2}O\textsubscript{5} and are bonded to bone through the development of a surface layer of carbonated hydroxyapatite. It is thought that the bioactive properties guide and promote osteogenesis, allowing rapid and quick formation of new bone. According to Fetner et al suggested superior manageability and hemostatic properties of bioactive glasses and remarked that the bioactive glass is possibly osteoconductive.[5]

Scaffold is a temporary structure used to support material in the construction or repair of large structures. It provides a support for bone-producing cells. They are essential for wound healing because they provide the framework for cell migration and maintain the correct cell polarity for the re-assembly for multilayer structures like bone tissue.[6]

In the present study bioglass has been used in porous scaffold form with 40% surface porosity with a view that this physical form (Porous scaffold) of the bioglass graft materials might act as a spacer and the porous network of the scaffold might allow the osteogenic cells to infiltrate into the scaffold of bioglass placed in the bony defects.

REFERENCES


