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Research Paper

Periodontal Regeneration in Clinical Practice: A Case Report

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ABSTRACT*: The regeneration or restitution of lost supporting tissue has always been considered the ideal objective of periodontal therapy. Over the last decade different modalities of regenerative treatment have been used and clinically applied. The positive effect of bone grafts and bone substitute on the outcome of periodontal regenerative procedures are well documented. This article presents a case report on periodontal regeneration using Demineralised Freeze Dried Bone Allograft (DFDBA) in which significant improvement in the periodontal status of the patient was reported.*

Keywords: *periodontal regeneration; bone graft; Demineralised Freeze Dried Bone Allograft*

I. INTRODUCTION

The regeneration or restitution of lost supporting tissue has always been considered the ideal objective of periodontal therapy. Regeneration can be defined as the reproduction or reformation of organs or tissue that have been lost or injured as a result of a wound or infection. Regenerative periodontal procedure involves the creation of new alveolar bone, cementum, and periodontal ligament. Most periodontal practices focus on prevention of disease, initiation and corrective surgical treatment to eliminate deep pockets. Regeneration is distinct from tissue repair and is characterized by replacement of the damaged tissues with something that may be inferior to the original tissues both structurally and functionally.[1]

Eliminating bacteria and regenerating bone and supporting tissues helps in reducing pocket depth and repair damage caused by progression of periodontal disease. Over the last decade different modalities of regenerative treatment have been used and clinically applied. The positive effect of bone grafts and bone substitute on the outcome of periodontal regenerative procedures are well documented. At the present time, periodontists favor the bone as grafting material which has shown clinical effectiveness, functional periodontal repair, apparent bone defect fill and pocket reduction to manageable levels.

In (1923) Hegdus attempted the use of bone grafts for the reconstruction of bone defects produced by periodontal disease[2] . Subsequent to their report and for the next several decades, the evolution of xenografts of various types became the main focus of attention.

Scopp et al (1966),[3] used Boplant bovine bone and reported pocket depth reduction at 6 months. Older (1967)[4] reported good results by measuring by probing depth reduction and increasing radiographic density.

Using Freeze Dried Bone Allograft (FDBA) Mellonig found at least 50% bone fill in 67% of periodontal defects and this percentage increased to 78% when FDBA was combined with autogenous bone[5]. Studies evaluating Demineralised Freeze Dried Bone Allograft (DFDBA) reported a similar bone fill compared with FDBA, with an average range of 1.7–2.9 mm.

II. CASE REPORT

A 45 year old male patient reported with generalised gingival bleeding and difficulty in chewing from the maxillary right posterior teeth. The clinical presentation included reddish pink, swollen gingiva with bleeding on probing and clinical probing depth in the maxillary right posterior quadrant was recorded to be 6-7 mm while in the remaining areas it ranged between 3 and 5 mm. Horizontal defects were found radiographically in the maxillary right posterior teeth and a vertical defect with respect to the maxillary right premolars. Therapeutic scaling and root planing were performed and curettage was done in areas with 5 mm pocket depth

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which resolved. The management for the maxillary right posteriors further included a Conventional Flap Debridement with DFDBA placed for bone regeneration with respect to tooth numbers 14 and 15 followed by suturing and periodontal dressing for 14 days. (Figures 1-8)

Fig 1. Pre operative **Fig 2.** Incision placed **Fig 3.** Flap raised and debrided

Fig 4. Vertical defect irt 14, 15 **Fig 5.** Bone graft placed **Fig 6.** Suturing done

Fig 7. Periodontal dressing **Fig 8.** Post operative

The patient was given postoperative instructions and kept on maintenance therapy. The postoperative recordings for probing depth were made after 6 months. The results indicated significant improvements with the gingival presentation being normal in colour, absence of swelling and probing depth reduced to 1-2 mm in all areas. Probing depth was recorded to be 2 mm in the maxillary right premolar region following the periodontal regenerative therapy. Radiographically, the vertical defect was found to be obliterated.

III. DISCUSSION

Early studies observed that bone filling was possible with radicular scraping and planing treatment, followed by strict hygiene[6]. These techniques are based on the principal that a biocompatible radicular surface and a strict hygiene control favor the development of the innate regenerative capacity of the periodontal tissue.

Prichard in 1957 on was the first author to focus attention on the morphology of the bone defect, and on the importance of its careful débridement. He considers bone regeneration to be a real and predictable objective in treatment, provided a careful selection of cases according to the bone morphology of the defect is made[7]. In a study published by Lang et al[8], an average increase of 1.78mm in the clinical attachment level and 1.55mm in bone filling was calculated, highlighting the effect on both parameters of following a strict protocol for professional control of postsurgical plaque. The information provided by these studies underlines the importance of achieving a clinical situation without inflammation and strictly controlling the bacterial plaque (periodontal health maintenance), so that the periodontal tissues can attain the ideal conditions to completely develop their regenerative capacity.

For almost 50 years, the attention of the investigators was focussed on bone regeneration, believing that it constituted a prerequisite for the formation of a new attachment, and that the formation of new bone would induce the formation of new cementum and periodontal ligament[9].The only materials demonstrated as being osteogenic, that is, having living bone cells able to create new bone, are the grafts of fresh trabecula bone from the ileac crest, and the intraoral bone graft. Autografts from the ileac crest have even demonstrated a capacity to achieve supracrestal regeneration. The disadvantages of creating a second surgical area and the possibility of provoking radicular resorption and ankylosis have limited its use in daily practice.

Autografts of intraoral bone are obtained from edentulous areas, tubera, exostosis, and from post-exodontic alveoli. Clinical studies suggest that the use of these grafts improves bone filling against conventional treatment (débridement), and that the differences in the results appear to depend on the morphology of the defect and the type of donor bone. Although some authors consider periodontal bone graft material to be the ‘gold standard’, its limited availability and the time required for its acquisition have stimulated the search for other materials.

In contrast to the above mentioned limitations, the allografts of lyophilized bone and demineralized lyophilized bone originating from cadaver, provide the advantage there is unlimited amount of material available, and with a minimum risk of infection. The risk of HIV transmission in any particular section of demineralized lyophilized bone, following an adequate selection and processing process, has been calculated to be 1 in 2.8 billion[10]. These materials are considered osteoinductors, that is, they have the capacity to induce the formation of new bone, stimulating the maturation of the undifferentiated mesenchymal cells to preosteoblasts and osteoblast forming cells.

The principal reason for demineralizing is based on studies by Urist[11], who suggested that the demineralization of lyophilized bone would allow the exposure of morphogenetic bone proteins, polypeptides that induce the pluripotential stem cells to differentiate into osteoblasts. However, it has been found that this osteoinductive capacity depends on the donor characteristics, especially the age, and the degree of demineralization, in such a way that depending on the bone bank and even the batch, the capacity to induce bone formation can vary and may even be nonexistent.

The results of published studies indicate that following the use of bone grafts a significant bone filling can be expected against treatment by débridement, obtaining an average filling of the defect of between 60% and 65%[12]. With respect to histological findings, a certain degree of regeneration has been described following the use of autografts and of demineralized lyophilized bone. In contrast, other studies have found that although formation of new cementum occurs, the ligament fibers are not functionally oriented, and even a long epithelial attachment has been observed interposed between the newly formed bone and the radicular surface[13,14].

In recent years, investigation has centered on the application of Guided Tissue Regeneration (GTR) and biomedical engineering to periodontal regeneration, especially with the use of biomedical mediators that attempt to imitate the natural processes that occur in spontaneous regeneration. Work has been done with cellular growth factors, such as the platelet-derived growth factor (PDGF), the insulin-like growth factor (IGF), and with cellular differentiation factors, especially with bone morphogenetic proteins (BMP). The objective of these new approaches in regenerative therapy is to select and improve cellular repopulation during the periodontal healing process.

Figure 9 shows the influence diagram for the data published on the factors related with the treatment of periodontal bone defects[15]. Primary factors have been identified (primary line of globus, bacterial contamination, innate healing potential, local characteristics and surgical technique) whose influence on treatment of intrabony defects seems clear. Poor control of bacterial plaque by the patient, and likewise the lack of maintenance visits, are determining factors in the results of periodontal treatment and therefore can provoke a reduction in the formation of new attachment and bone tissue[6].

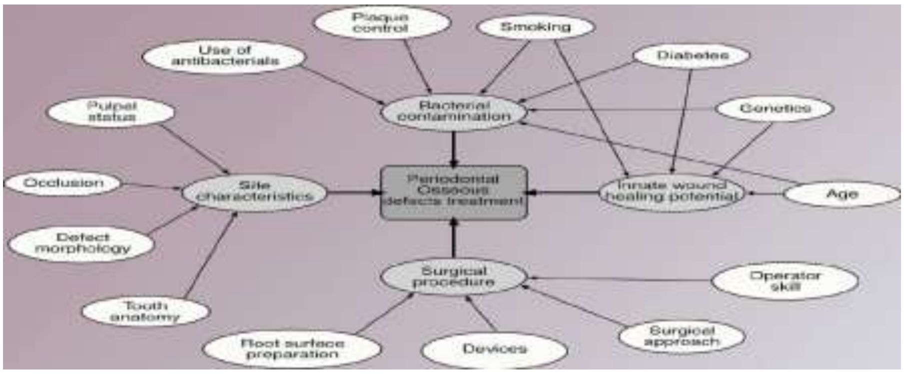

Figure 9. Influence diagram for factors related with the treatment of periodontal bone defects[15]

Given that the healing process is a structured process, any alteration in any of its steps would potentially vary the results of the treatment. The studies tend to consider diabetes and any other systemic disease that could imply an alteration in the innate healing capacity of the individual as reasons for exclusion. In the opinion of some authors, smoking is a reason for exclusion from periodontal regeneration, it has been clearly demonstrated that smoking is a major risk factor, not only for the progression of periodontitis, but also in adverse results of treatment[16]. Among local factors that may influence the result of regenerative therapy, occlusion and morphology of the bone defect have been the most studied. Occlusal control and the stabilization of the tooth would be indicated in the case of hypermobile teeth which are to receive periodontal regeneration treatment.

The total depth of the defect and the angle of the bone wall with respect to the root are the variables most consistently related to the amount of bone filling obtained. As early as 1949, Goldam pointed out that one of the factors affecting the result of gingival curettage in the treatment of infrabony pockets was the type of bone defect; in such a way that the narrower the bone defect, the smaller the area to heal and the better the stability of the wound during healing; on the other hand, the wider it is then the greater the possibility of displacing the coagulum and therefore the greater the risk of secondary infection. Later, Prichard[7] indicated that the most important diagnostic criteria in obtaining a favorable result is the presence of a 3-walled bone defect. Gottlow et al[17], explicitly state that alveolar bone regeneration is almost totally restricted to locations where there was an angular bone defect. Studies by Cortellini & Tonetti[18] support the importance of this local factor, indicating that 'the morphology of the defect plays a principal role in the healing response to GTR in intrabony defects'.

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