A CLINICAL TRIAL USING 45S5 BIOGLASS IN TREATMENT OF DEEP INTRABONY DEFECTS IN ADULT PERIODONTITIS PATIENTS

Thesis

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بسم ا الرحمن الرحيم

" وما أوتيتم من العلم إلا قليلاً "

صدق ا العظيم

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INTRODUCTION

Periodontal therapy has greatly advanced during the past years and a major objective of therapy was, and still is, the maintenance of the periodontium by preventing further breakdown. More recently, however, the regeneration of lost tissue is routinely considered to be an achievable goal and both researchers and clinicians are focusing on new regenerative techniques. (Schwartz et al., 1996 and 2000).

Efforts in periodontal regeneration to reach this goal fall under certain categories which include guided tissue regeneration using barrier membranes, bone grafts (allografts, autografts and alloplasts), root surface treatments (tetracycline, fibronectins, platelets derived growth factor and many other chemical agents) , coronally positioned flaps for epithelial exclusion and finally interproximal denudation (Nyman et al., 1987).

Various grafting materials were advocated and clinical trials to treat dental osseous lesions with bioactive glass granules of size range (300 – 360 nm) have been conducted since early Spring, 1990 and gave encouraging results (Schepers et al., 1993).

Bioactive glass can be regarded as three dimensional silica (SiO_2) network, which is modified by incorporating oxides (Andersson et al., 1993).

The therapeutic response to the bioactive glass material exceeded the response to hydroxyapatite as evidenced by very extensive osteoconduction, as well as the capacity to cause differentiation of osteoprogenitor cells to osteoblasts (Schepers et al., 1993).

The phenomenon of osteogenesis guided by bioactive glass particles with a narrow size range has been explained by Schepers et al. (1991), to be based upon the availability of cells with osteogenic capability or their precursors amongst the bioglass particles.

Consequently, bioglass can be used as filler material in periodontal intrabony defects as it has the ability to bond the bone tissue and enhances bone growth by its osteoconductive properties. Actually, trabecular bone growth was observed in the center of the cavities treated with glass particles, with the trabeculae found to be bonded to the particles (Schepers and Ducheyne , 1993).

The present study was thus conducted as a clinical and radiographic evaluation of the regenerative power of intrabony defects treated with bioglass material.

Review of Literature

Ratcliff (1966 a, b) proposed an analysis of repair systems in periodontal therapy. He stated that there were four basic forms of periodontal therapy used for elimination of pockets; namely shrinkage, excision, healing scar and new attachment.

However, more recently trials were carried out to reach true periodontal regeneration. Through such regeneration the architecture and function of lost periodontal tissues should be completely regained, with a new cellular cementum attached to underlying dentin. Into this newly formed cementum, functionally oriented periodontal ligament fibers should be inserted as well as being inserted in newly formed bone (Heijl et al., 1997). These trials could be attributed to the knowledge that periodontal healing by repair, not true regeneration, does not restore the original functional integrity of periodontium and results in the production of tissues that are to suffer from recurrent attachment loss (Thomas and Wilson, 1999; Wang and Greenwell, 2001).

It has been reported that a new attachment can occur only when the pocket is within the alveolar process (Goldman, 1948). Pockets apical to the alveolar crest are classified according to the number of bony walls (Goldman and Cohen, 1958). Actually, the number of bony walls is related to the periodontal ligament that is exposed (Ruben et al.1980).

Owing to the circumferential nature of most of periodontal intrabony defects, and their resultant morphology, it was difficult to categorize each defect with regard to a specific number of osseous walls present. The most widely used system [Goldman & Cohen, 1958] applies primarily to defects located adjacent to a single tooth surface and classifies defects as having one to three osseous walls. Extrapolation of their system of osseous anatomy to a defect, which extends circumferentially onto 2,3 or 4 surface of a tooth means that the defect becomes four, five or even six walled (Polson and Heijl, 1978).

Furthermore, osseous defects have varying numbers of walls depending on topography in the vertical direction (Goldman &Cohen 1958, Hiatt & Schallhorn,1973; Froum et al. 1975 “b”).

It has been established that certain types of periodontal osseous defects have an osteogenic potential. The type of defects most favorable for regeneration is the three-walled defect. On the other hand, it has been postulated that the two-walled type of osseous defects has a much lower potential for osseous regeneration (Goldman & Cohen, 1958; Patur & Glickman, 1962; Wade, 1966; Ellegard & Loe, 1971; Carraro et al., 1976).

However, this has been questioned after quantitating and comparing osseous fill in two and three-walled situations where regeneration seemed to be the same for two and three walled bony defects (Rosling et al, 1976).

In addition to the number of osseous walls bordering the defect, the circumferential extent may affect the potential for osseous regeneration .It has been maintained that the defect which is localized to a single surface has a better chance for repair (Wade, 1966; Polson & Heijl, 1978).

Another factor is the morphology of the periodontal defect as regards the size and volume of the remaining periodontium. Complete new attachment was reported to be possible in narrow deep bony defects (Goldman & Cohen, 1958).

Gottlow et al. (1986) pointed out that several factors might influence the process of regeneration, one of them is the degree of gingival recession after surgery, i.e. the more the gingiva recedes, the shorter the root surface portion that is available for periodontal ligament cells repopulation.

Conversely, tooth mobility didn’t seen to have a great effect, where osseous regeneration took place in the presence of various degrees of tooth hypermobility. No differences were apparent in the magnitude of osseous regeneration adjacent to teeth with different initial degrees of mobility. The observation appeared to corroborate experimental findings that increased tooth mobility might affect the healing of periodontal tissues (Glickman et al, 1966).

Aukhil et al. (1986) mentioned two factors responsible for the incomplete migration of periodontal ligament cells. First comes the slow rate of angiogenesis in the periodontal space (which consists of avascular tissue; root surface and membrane). Second is the fact that progenitor cells which should initiate coronal migration, their premature differentiation into formative cells such as cementoblasts may result in delayed migration at the leading fronts.

Generally, various modalities were proposed and tried clinically for periodontal therapy of osseous defects associated with infrabony pockets (Schwartz et al., 2000).

One of these modalities is surgical debridement followed by meticulous control of the bacterial plaque adjacent to these lesions during periodontal healing (Polson & Heijl, 1978).

Several authors recommended that transseptal fibers which follow the bony wall surface in interdental angular bony defects should be removed; for if left, they might act as a barrier to proliferation from the marrow. The granulation tissues which filled the remainder of the defect, and which could have been originating from perivascular cells of the gingiva, periosteum, bone marrow or periodontal ligament should also be removed. For, in spite of containing chronic inflammatory cells and the elements of repair, they are also full of elongated epithelial retepegs (Carranza & Glickman, 1957;Goldman, 1957;Toto et al., 1964).

A Clinical study (Rosling et al., 1976) with careful documentation has demonstrated gain of attachment upon probing and bone fill in 3-wall, 2- wall and combination bony defects treated by curettage.

Histologic evaluation of bony defects in monkeys treated by flap and curettage and having a gain of attachment on probing and bone fill on X-ray, revealed at one year follow up that bone had filled the defects. However, very little connective tissue new attachment had formed at the base of the defects and junctional epithelium extended on the roots in areas of bone fill (Caton & Nyman, 1980).

Thus, it seems that following curettage and various surgical flap procedures, even with gain in probing depth, radiographic and re-entry evidence of bone fill, there might not be a concomitant connective tissue new attachmen Histologic examination could then reveal that epithelium has migrated to the depth of the former pocket, healing with a long epithelial attachment (Bjron, et al 1965; Cook et al, 1977), or a combination of the latter with a long connective tissue attachment (Thomas and Wilson, 1999).

Since the epithelium of free gingival grafts usually dies and sloughs, it was theorized that bony defects could be covered with free grafts, delaying the migration of epithelium and allowing more time for connective tissue new attachment. Complete regeneration as determined clinically was found in 60 % of 88 human bony defects using this technique, as compared to 40 % treated with conventional flaps (Ellegaard et al., 1974).