Case Report

Regenerative periodontal therapy in chronic periodontitis : case reports of four different procedures

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Abstract

Etiotropic phase of periodontal therapy is elimination of local deposits so as to resolve the inflammation. However, increased probing depth, loss of clinical attachment, and radiographically observed bone loss often remains. Substantial efforts have been made to alter this anatomic defect as part of non surgical and surgical periodontal therapy. Local and systemic antimicrobials playing a vital role in spite of the management is purely based on non specific plaque hypothesis till date. Surgical management like open flap debridement, with or without using osseous graft and soft tissue augmentation is showing a clinically significant result with long term evaluation from decades. The exact result of this treatment protocol is often inconclusive as the various factors have a substantial role in determining its prognosis. Non surgical management always showed an upper hand in case of effect, efficiency and effectiveness.

Key Words: Chronic periodontitis, etiotropic phase, periodontal regeneration

Introduction

Periodontitis is a multi-factorial disease characterized by clinical attachment loss and is the most prevalent inflammatory disease affecting the humans in various forms. It is mainly of two types: aggressive periodontitis and chronic periodontitis. Chronic periodontitis is characterized by abundant local deposits, periodontal pocket formation, gingival inflammation and recession, bleeding on probing, alveolar bone loss, furcation involvement, mobility. The management of chronic periodontitis is of prime concern to avoid any tooth mortality. The main etiologic factor for periodontal disease is unattached perio-pathogenic plaque. The etiotropic phase of periodontal therapy is elimination of local deposits and by this inflammation gets resolved. Chronic periodontitis progresses in episodes of exacerbation and remission[1]. Periodontal regenerative procedures seek to eliminate the defects by creating new tooth supporting structures. There are various regenerative methods, both surgical and non-surgical. Non-surgical regenerative procedures include scaling and root planing and local drug delivery whereas surgical regenerative procedures include open flap debridement and usage of various osseous grafts. This case report attempts to enlighten the area of case selection and management of various severity stages of periodontitis.

Case Description:

To describe the various treatment procedures and the evaluation of its outcome, cases of chronic periodontitis were selected with age group of 30 - 50 years. All were systemically healthy with no adverse habits and not on any kind of medication. On clinical examination, in the initial visit all patients had probing pocket depth (PPD) of more than 5mm. PPD was measured using UNC15 probe. Complete phase-I therapy was carried out which included full mouth scaling and root planing. Patients were prescribed with chlorhexidine mouthwash (0.2%) twice a day for 15 days postoperatively along with oral hygiene instructions. Re-evaluation of the outcome of this etiotropic phase was done after 3 months using Merin criteria. The patients with PPD less than 5 mm after phase I therapy at 3rd months were kept under further maintenance phase and recalled after 3 months for further evaluation for the first year. Patients with PPD more than 5 mm in first evaluation were subjected to further comprehensive periodontal treatment. Local antibiotic therapy procedure: Two patients with PPD more than 5 mm (Fig 1) in the anterior teeth were selected for local antibiotic therapy/ root biomodification. Taking esthetics into consideration this treatment was planned in the mesial, distal and mid-buccal of 11, 21. The area was anaesthetized using infiltration technique. A thorough root planing was performed to remove the

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Fig 1: Pre- operative PPD

Fig 2: Scaling and root planing

Fig 3: Application of tetracycline paste

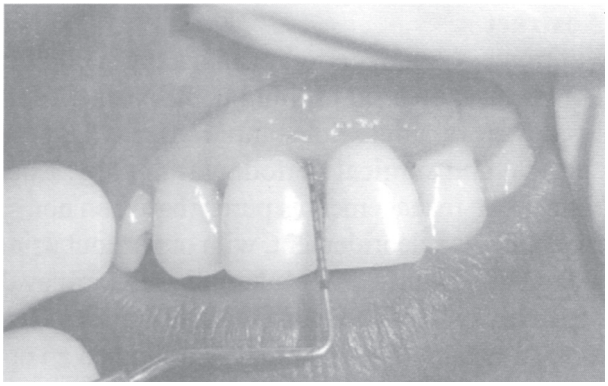

Fig 4: Post operative PPD

residual calculus, necrotic cementum and bacterial smear layer (Fig 2). Tetracycline solution dipped cotton pellets were placed inside the pockets till the depth for 20 minutes (Fig 3). The cotton pellets were removed and rechecked for any residual cotton fibers in the pockets, which could act as any irritant factor if left inside. The patient was then instructed not to rinse or drink for half an hour postoperatively, oral hygiene instructions were reinforced.

Open flap debridement procedure:

Two patients with PPD more than 5mm (Fig 5) and horizontal bone loss were considered for the open flap debridement procedure. Horizontal bone loss was detected in intra-oral periapical radiograph. Appropriate alveolar nerve block was administered to anaesthetize the area. A sulcular incision (Fig 6) was given extending from distal of maxillary left first premolar upto the mesial of maxillary left second molar, using a BP blade. The full thickness flap was reflected using a periosteal elevator (Fig 7) . The horizontal bone loss was confirmed clinically after reflection. A thorough debridement of the area using cumine scaler and Gracey curettes was done along with use of copious irrigation with saline. As there was no three walled or two walled defect, regenerative procedure was not considered. The flap was then repositioned and sutured using a 4-0 silk suture and a non-eugenol periodontal dressing was given. Postoperative instructions were enforced and recalled for removal of the sutures after seven days.

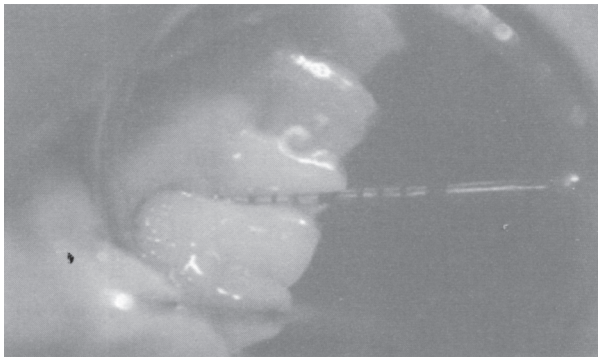

Fig 5:Pre- operative PPD

Fig 6: Sulcular incision given

Fig 7: Flap reflection done for debridement

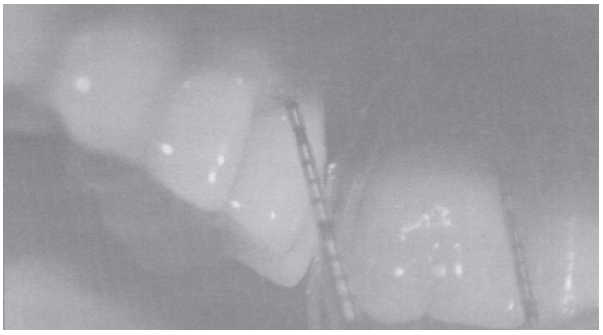

Fig 8: Post operative PPD

Flap surgery with hydroxyapatite:

Two patients with PPD more than 5 mm (Fig 9) and angular bony defect as appreciated in intraoral periapical rediograph in the posterior teeth were considered for flap surgery with bone graft.. After anesthetizing,, sulcular incision was given extending from distal of madibular left canine upto the mesial of mandibular left second molar, using a surgical blade (No. 15). The full thickness flap was reflected using a periosteal elevator. The angular bone loss along with class II furcation involvement was confirmed (Fig 10). A thorough debridement of the area using cuminescaler and area specific curettes was done along with use of copious irrigation with saline. As class II furcation involvement with angular defect was appreciated in the case, use of regenerative material was considered along with debridement. Hydroxyapatite, an alloplastic material was used mixed with the patient's blood in a dapen dish and condensed into the defect almost overfilling the defect (Fig 11). The flap was then re-approximated and sutured using a 4-0 silk suture and a periodontal dressing was placed. Post-operative instructions were given and recalled for removal of the sutures after seven days.

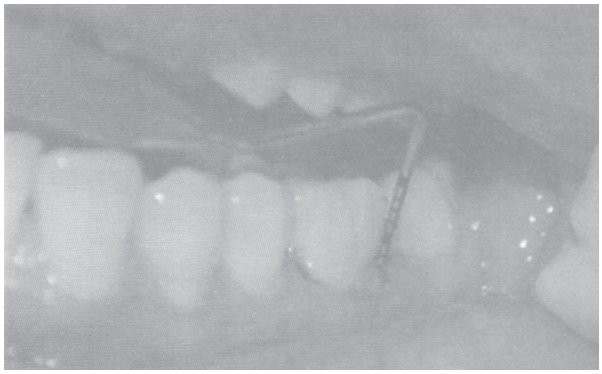

Fig 9: Preoperative PPD

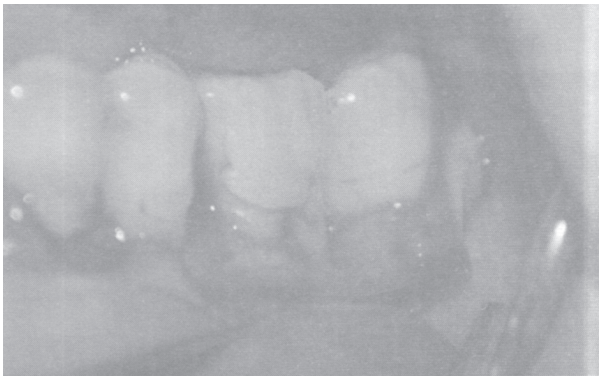

Fig 10: Bone loss and subgingival calculus visualised

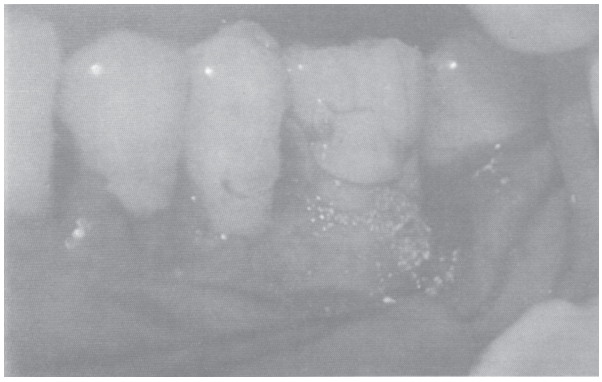

Fig 11: Placement of Hydroxyapatite after debridement

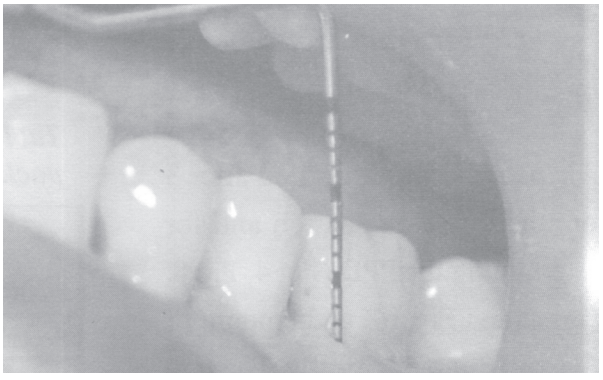

Fig 12: Post-operative PPD

Autogenous bone graft procedure:

Patients with PPD more than 5mm (Fig 13) in posterior teeth and angular bony defect in intra-oral periapical radiograph were considered for flap surgery with bone graft. Use of autogenous bone graft was opted for these patients, after taking the consent and the case was considered ideal. A right inferior alveolar nerve and long buccal nerve block was administered to anaesthetize this area. A sulcular incision for envelope flap design was planned extending from distal of mandibular right canine upto the mesial of mandibular right second molar using a bard-parker blade (No. 15). The full thickness flap was reflected using a periosteal elevator. The angular bone loss along with a cul-de sac furcation involvement was confirmed. A thorough debridement of the area using cumine scaler and Gracey curettes was done and irrigated with saline. Autogenous bone graft was obtained from the area between two right mandibular premolars (mental foramina was detected anterior to first premolar) after the area was denuded of periosteum (Fig 14) and decorticated, using a 3mm trephine bur and back action chisel. Retrieved bone graft was triturated using a motor and pestle (Fig 15) then condensed into the defect almost overfilling the defect. The flap then re-approximated and sutured using a 4-0 silk suture following which a periodontal dressing was given. Post-operative instructions were given and recalled for removal of the sutures after seven days.

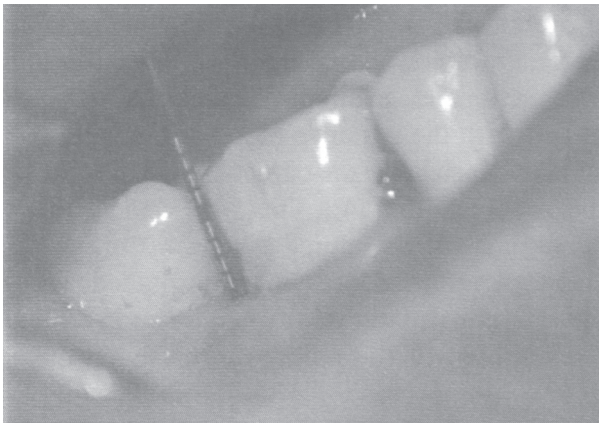

Fig 13: Pre- operative PPD

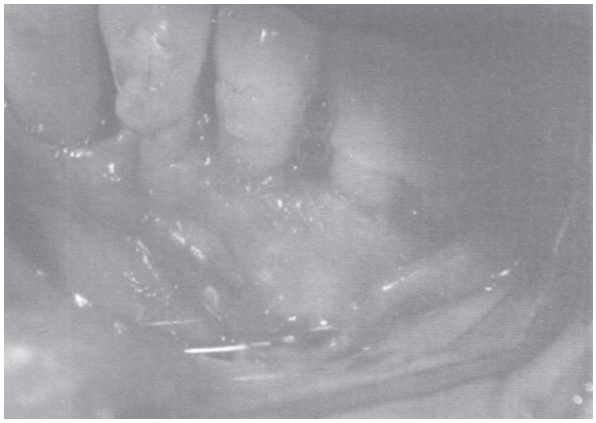

Fig 14: Denudation of periosteum done

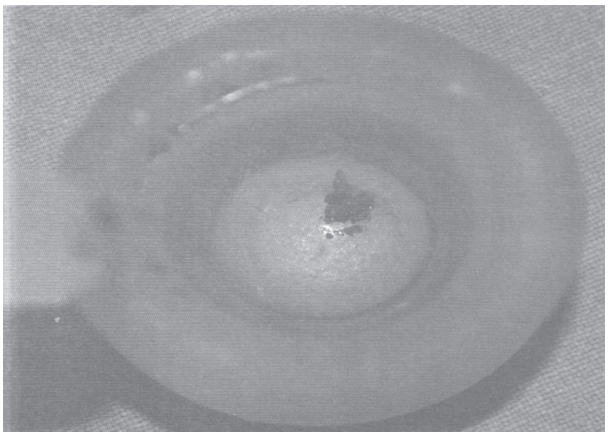

Fig 15: Trituration of the bone graft

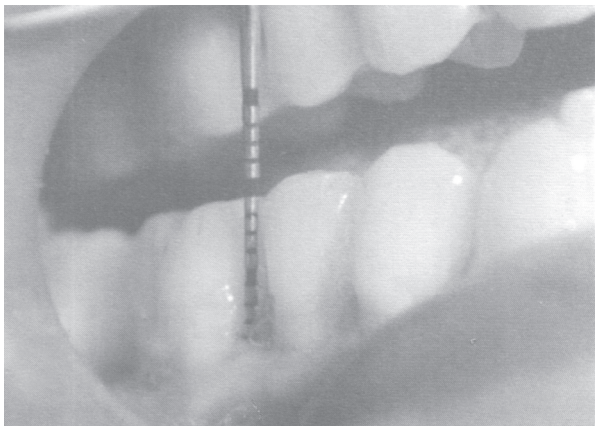

Fig 16: Post operative PPD

The patients were recalled after 3 months for re-evaluation and for determining the PPD (Fig 4, Fig 8, Fig 12 and Fig 16) and amount of bone fill radiographically. The pre-operative and post-operative readings were compared in table 1.

Table 1: Pre-operative and post operative probing pocket depth of procedures

PROCEDURES	Probing Pocket Depth (mm)			
	CASE I		CASE II	
	PRE	POST	PRE	POST
Root biomodification(non surgical)	9	3	7	4
Open flap debridement	7	4	8	3
Open flap debridement- hydroxyapatite	7	3	8	3
Flap surgery with Autogenous bone graft	6	3	5.5	3

Discussion:

Chronic periodontitis is the inflammation of periodontium. It progress slowly and continuously - (continuous model) or it is episodic in nature. The arresting of the disease and regenerating the periodontium to attain the self cleansing level will be the aim and rationale of treating periodontitis.Regeneration is defined as a reproduction or reconstruction of a lost or injured part in such a way that the architecture and function of the lost or injured tissues are completely restored[2]. Previously attachment after any injury or surgery was considered to be new attachment and attachment occurring after any progressing periodontitis as re-attachment. However, it was later considered that there is no difference with attachment of connective tissue once it has been injured in any possible way. Various surgical and non surgical procedures were used to get the desired result.

Supra and subgingival debridement results in the mechanical disruption of the plaque biofilm and remains the 'gold standard' modality for periodontal treatment. This is done in phase I for all the patients as initial therapy in chronic as well as aggressive periodontitis cases.ln mild and moderate cases of periodontitis, non surgical debridement shows a very good result. The etiotropic/non-surgical/phase I therapy aims at removal of this plaque and its retention factors. Phase I therapy includes: Scaling and root planing, antimicrobial therapy, correction of restorative and prosthetic irritational factors, patient education and motivation along with diet control. These measures are directed towards reducing the bacterial load and altering the bacterial composition towards a healthy flora which in turn, results in lower levels of inflammation and relative stability in periodontal attachment levels[3] [4]. Nevertheless, a number of changes affecting the exposed root cementum have been described, such as the formation of localized areas of hypermineralization and demineralization[5, 6, 7] as well as loss of collagen matrix[5, 6], adsorption of endotoxins and other mediators of inflammation[8, 9] and last but not the least invasion of bacteria in the root cementum [10, 11, 12] and radicular dentin The aim of scaling and root planing is to remove the bacterial biofilm, calculus and contaminated necrotic cementum. Numerous studies have proven the effectiveness of reducing the bacterial load, and thus controlling the subgingival microflora, by scaling and root planing[13]. Although some new connective tissue attachment may form, a long junctional epithelium is what predictably establishes itself on the root surface. Healing by formation of a long junctional epithelium (epithelial attachment) is characterized by a thin epithelium extending apically interposed between the root surface and the gingival connective [14, 15] tissue. Reduction in probing depth following mechanical instrumentation results from a combination of gain in clinical attachment and marginal inflamed tissue recession[16]. Re-evaluation of results following initial treatment is mandatory for selecting more specialized therapy and for establishing the best possible long term prognosis. It is routinely done after 1 to 3 months of initial periodontal treatment. Most of the healing expected to be completed in 3 months following therapy[17]. If the severity of the periodontal destruction is more it will not always be treated by etiotropic phase.

Conventional mechanical root debridement does not usually eradicate all periodontopathic bacteria, from the deep anaerobic subgingival ecosystem[18,19]. So, local antibiotic therapy can be considered as an adjunct to mechanical debridement for modification of the root surface by application of chelating agents which may enhance fibrin clot adhesion and promote a connective tissue attachment. Demineralization of the root surface, exposing the collagen of the dentin, would facilitate the deposition of cementum by inducing mesenchymal cells (totipotent and pluripotent) in the adjacent tissue to differentiate into cementoblasts[20]. Tetracycline-HC1 is a bacteriostatic agent that inhibits bacterial protein synthesis and, as such, requires a significantly longer exposure time than metronidazole or chlorhexidine[21] but has the ability to bind to the hard tissue walls of pockets to establish a drug reservoir[22, 23]. The benefit of local antimicrobial therapy is the higher concentration of an antimicrobial agent, which can be attained in subgingival sites as compared with a systemic drug regimen[24]. Several non-antimicrobial benefits have also been associated with tetracycline therapy in the treatment of periodontal diseases. These include the inhibition of collagenase activity[25] and the possible enhancement of reattachment or regeneration[26] With this background, the efficacy of root conditioning with tetracycline has been examined in several studies [27, 28] however, with variable results [22, 29, 30, 31]. It appears also that tetracycline as a root conditioning agent has found widespread use in clinical practice[32,33].

As thoroughness of debridement has been shown to decrease with increasing pocket depth and in accessibility, periodontal flap surgery is often considered a valuable adjunct to subgingival debridement in deep pockets [34, 35, 36, 37,38]. Open flap debridement basically facilitates in accessibility

of root surfaces and removal of pocket epithelium along with granulation tissue. Periodontal surgery involving pocket depth reduction represents a great effort to decrease the subgingival microbial load and to prevent recurrence of periodontal breakdown[39].

Whenever applicable, regeneration of the lost bone and periodontal attachment using bone grafts improves the support of the tooth and hopefully its long-term prognosis. Bone grafts have been shown to produce greater clinical bone defect fill than flap debridement alone [40, 41, 42, 43]. Histological reports have confirmed their ability to support new attachment in the apical portion of periodontal defects[44, 41, 45]. Complete reinstitution is not likely; however, with bone grafts some regeneration or new attachment is more likely to occur [46]. Since periodontal regenerative procedures generally are conducted in an outpatient environment, intraoral autogenous bone grafts are utilized widely and have been shown to produce favorable defect fill[47]. Common donor sources are the maxillary tuberosity and other edentulous alveolar areas, including healing extraction sockets[48] and osseous coagulum harvested from osteoplasty procedures at the surgical site. Other donor sites for cortical and/ or cancellous bone include mental and mandibular retromolar areas. Osteogenesis, the formation of mineralized bone by transplanted osteoblasts, is only achieved with autogenous grafts[49].

Several other bone grafts have been developed for use in periodontal therapy to support bone formation and defect fill. These materials can be synthetically derived (alloplast) or processed from skeletal structures of other species (xenograft). They are biocompatible and non-organic. Their purpose is to substitute for autogenous bone. Most bone grafts are osteoconductive, relatively inert filling materials, and integrate with new bone. Hydroxyapatite grafts are osteophillic, osteoconductive and act primarily as inert biocompatible fillers. They have produced clinical defect fill greater than flap debridement alone in the treatment of intrabony defects[50,51] Its reported advantage is the slow resorption rate, allowing it to act as a mineral reservoir at the same time acting as a scaffold for bone replacement [52, 53].

The use of a protective periodontal dressing for seven days following bone graft surgery is suggested to prevent possible impingement of foreign materials into the graft site, flap displacement and loss of the bone graft material that would jeopardize the success of treatment. Although histology remains the ultimate standard in assessing the periodontal regeneration, periodontal probing, direct bone measurements, and radiographic measurements of osseous changes are used in the majority of studies of regenerative therapy[54].

Conclusion:

Mechanical debridement along with local antibiotic therapy showed better results as compared to other treatment procedures. But it cannot be concluded that local antibiotic therapy as an adjunct is the best treatment for chronic periodontitis cases. Hence, further prospective cohort/case control studies with large sample size are a must to compare the effectiveness among each treatment modalities in cases of chronic periodontitis to halt the progression of this most prevalent inflammatory disease of the mankind in the world.

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