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Non-Surgical Periodontal Therapy- Revisited.

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Abstract: *Non surgical therapy remains the cornerstone of periodontal treatment. Clinical trials are still needed to objectively evaluate adjunctive periodontal therapy. Frequent re-evaluation and careful monitoring allows the practitioner the opportunity to intervene early in the diseased state, to reverse or arrest the progression of periodontal disease with meticulous non-surgical anti-infective therapy.*
Keywords*: Host modualation, Periodontal therapy, Lasers.*

I. Introduction

Gingival and periodontal diseases, in their various forms, have afflicted humans since the dawn of history. The Ebers papyrus contains many references to gingival diseases and offers a number of prescriptions for strengthening the teeth and gums, applied in the form of a paste with honey, vegetable gum, or residue of beer as a vehicle[1].

Gingivitis is gingival inflammation associated with plaque and calculus accumulation. Gingivitis may or may not progress to more advanced form of the disease known as periodontitis, which is associated with alveolar bone loss and diagnosed by increase in probing depth, loss of clinical attachment and radiographic evidence of bone loss. Periodontal disease however is treatable and may even be prevented[2].

Pihlstrom et al in 1983 conducted a review of current studies to compare surgical and non-surgical treatment of periodontal disease and found loss of clinical attachment following flap procedures for shallow pockets and no clinically significant loss after scaling and root planing[3].

Conventional non-surgical periodontal therapy consists of mechanical supra and sub gingival tooth debridement and instruction in self-administered oral health care measures. These measures are directed towards reducing the bacterial load and altering the microbial composition towards a flora more associated with health[4].

Debridement of the root surface by scaling and root planing came into relatively common use in the first half of the past century and has become the central feature held in common by all currently used forms of periodontal therapy. Until the 1980s, the most commonly used treatment consisted of scaling and root planing, followed by resective surgery aimed at achieving zero pocket depth. During the 1980s, data were obtained demonstrating that the thoroughness of root debridement and sub gingival infection control, not the presence or absence of periodontal pockets, is the major determinant of successful periodontal therapy; and non-surgical treatment became commonly used treatment modality[5].

Over the years, there has been evolution in the techniques used to perform the task of scaling and root planing. From manual scalers to lasers we have come a long way. Manual scalers have been modified to conform to specific requirements such as ease of use with less effort and effective removal of plaque and calculus, especially in inaccessible areas such as furcation and root grooves**.**

Another major advance, which is currently receiving attention, is the application of lasers for non-surgical periodontal therapy. Lasers may be considered an adjunctive or alternative tool for mechanical periodontal therapy owing to the ablation, haemostatic and bactericidal characteristics. The most commonly used lasers include CO_2, Nd:YAG and Er:YAG. However, it appears that further research is warranted before the clinical application of this promising tool[6].

The recognition that specific microbes are the causative agents of periodontal disease stimulated the development of new tools to reduce the supragingival and sub gingival microbiota. Certain patients do not respond favorably to conventional mechanical therapy alone, for various reasons. The use of adjunctive antimicrobials might benefit this subset of patients.

Antimicrobial agents are chemotherapeutic agents that reduce the amount of bacteria present either superficially targeting certain organism or by non-specifically reducing all bacteria. Chemical antimicrobial agents may gain access into the periodontal pocket through both a systemic and local route of delivery. At present, no single therapeutic regimen has shown clinical benefits in all patients.

The concept that local delivery of an antibiotic into the periodontal pocket achieves a greater, more potent concentration of drug than available with systemic delivery is very appealing.

Systemic administration has been useful in treating periodontal pockets, but repeated; long- term use of systemic antibiotics is fraught with potential danger including resistant strains and superimposed infections. Local administration, therefore provide a useful answer to these problems; however, the important factor in the success of this treatmentis the ability to control and to prolong the release rate of therapeutic agent from the device.
Oral irrigation is a generic term that covers two separate treatment modalities- professionally delivered (chair side) irrigation and home (self applied) irrigation- for the prevention and treatment of periodontal disease. The rationale for adding irrigation with an antimicrobial agent at chair side after scaling and root planing is based on the assumption that bacteria left behind during mechanical debridement could be eradicated by an antimicrobial solution applied into the pocket[7].

Host modulation therapy (HMT) is a treatment concept that aims to reduce tissue destruction and stabilize or even regenerate the periodontium by modifying or down regulating destructive aspects of the host response and up-regulating protective or regenerative responses, so that in combination with conventional treatments to reduce the bacterial burden, the balance between health (resolution of inflammation and wound healing) and disease progression (continued proinflammatory events) is tipped in the direction of a healing response.
Periodontal treatment traditionally comprises initial nonsurgical debridement followed by a reevaluation, at which stage the need for further treatment, usually surgical in nature, is established.

II. Scaling And Root Planing

Current concepts and advances in manual and power-driven instrumentation:

Mechanical debridement consisting of scaling and root planing is an important procedure in the treatment of periodontal diseases.Scalers can be divided into manual, power driven and other types.
There are also other instruments mounted on air turbines or microengines. Rotosonic scalers are mounted on air turbine. A hexagon pyramidshaped bur on the air turbine removes calculus with rotational movement. Diamond points with fine diamond particles are also used.

Various aspects of manual and power driven instrumentation:

I. **Effectiveness in plaque and calculus removaleffectiveness in elimination of endotoxins from the periodontally involved root.**
II. **Root surface removal by scaling and root planingrequired time and clinical outcome for scaling and root planing.**
III. **Developments of manual and power-driven scalers for use in deep pockets.**
IV. **Developments of power-driven scalers (for use in furcation area).**
V. **Quadrant versus same day full mouth scaling and root planing.**

Oral Irrigation

Oral irrigation is a generic term that covers two separate treatment modalities- Professionally delivered (chair side) irrigation and home (self applied) irrigation for the prevention and treatment of periodontal disease.
Professional irrigation appears to be of limited value, regardless of agent used, in enhancing the outcomes of scaling and root planing.
Home irrigation has a stronger body of supportive evidence than professional irrigation and is safe and effective for a wide range of patients, including those receiving periodontal maintenance and those with calculus build up, gingivitis etc.

Hardy et al in 1982 did a study to compare the penetrability of periodontal pockets by two direct irrigation techniques-by use of a syringe and a blunt hypodermic needle and concluded that deep irrigation within periodontal pockets provides an efficient and predictable means of reaching the subgingival plaque apical border regardless of pocket depth and superficial irrigation is a highly inefficient means of gaining access to subgingival plaque[8].

Pistorius et al in 2003 did a studyto evaluate the efficacy of an herbal-based mouth rinse in combination with an oral irrigation in reducing gingival inflammation. The results showed that sub gingival irrigation with an herbal-based mouth rinse led to a significant reduction in both Sulcus bleeding index and Gingival index, and can therefore be recommended as an adjunctive procedure to reduce gingival inflammation[9].

Lasers

Laser is an acronym for "light amplification by stimulated emission of radiation." The stimulated emission of a photon by an excited atom, which triggers the release of a subsequent photon, is responsible for generation of a coherent, monochromatic, and collimated form of light, or laser. Lasers can concentrate light

energy and exert a strong effect, targeting tissue at an energy level much lower than natural light. The wavelength of a laser determines its characteristics[10].
Since the discovery of the ruby laser by Mainman in 1960, lasers have been widely and increasingly used in medicine and surgery[11]. The neodymium:yttrium-aluminium-garnet (Nd:YAG), carbon dioxide (Co_2), diode, erbium:YAG (Er:YAG), chromium:yttrium (Er,Cr:YSGG), and argon are the lasers most often used and studied in dentistry. In dentistry, lasers were first used in 1964 in the field of operative dentistry for caries removal and cavity preparation[10].

Current researches on different laser systems include:

I. **CO_2 laser-basic studies on root surface treatment and a clinical study on periodontal pocket treatment.**
II. **Nd:YAG–basic studies on calculus removal and root surface treatment.**
III. **Nd:YAG laser-clinical studies on periodontal pocket treatment.**
IV. **Er:YAG laser-basic studies on removal of subgingival calculus.**
V. **Er:YAG laser–basic studies on root substance removal and root surface alteration.**
VI. **Er:YAG laser-basic studies on temperature elevation, disinfection and detoxification.**
VII. **Diode laser- basic and clinical studies on root surface and periodontal pocket treatment.**

Chemotherapeutic agents

Chemotherapeutic agent is a general term for a chemical substance that provides a clinical therapeutic benefit. An anti-infective agent is a chemotherapeutic agent that works by reducing the number of bacteria present. An antibiotic is a naturally occurring, semisynthetic, or synthetic type of anti-infective agent that destroys or inhibits the growth of selective microorganisms, generally at low concentration.
Chemotherapeutic agents can be administered locally or orally. With either approach, their purpose is to reduce the number of bacteria present in the diseased periodontal pocket. Systemic administration of antibiotics may be a necessary adjunct in controlling bacterial infection because bacteria can invade periodontal tissues, making mechanical therapy alone sometimes ineffective. Local administration of anti-infective agents, generally directly into pocket, has the potential to provide greater concentrations directly to the infected area and reduce possible systemic side effects.

Antimicrobial agents are chemotherapeutic agents that reduce the amount of bacteria present either by superficially targeting certain organisms or by non-specifically reducing all bacteria**.**
Chemical antimicrobial agents may gain access into the periodontal pocket through both, a systemic and local route of delivery. Systemic antimicrobial agents enter periodontal pockets following their intestinal absorption and passage from the blood stream into oral tissues, gingival crevicular fluid and saliva[12].

III. Tetracyclines

These are a class of antibiotics having a nucleus of four cyclic rings. All are obtained from soil actinomycetes. The first to be introduced was chlortetracycline in 1948, under the name aureomycin(because of the golden yellow color of S.aureofaciens colonies producing it). It contrasted markedly from penicillin and streptomycin (the other two antibiotics generally available at that time) in being active orally and in affecting a wide range of microorganisms – hence called 'broad spectrum antibiotics'.All tetracyclines are slightly bitter solids, which are weakly water soluble, but their hydrochlorides are more soluble. On the basis of chronology of development, as well as for convenience of description they may be divided into 3 groups:

Group I	Group II	Group III
Chlortetracycline	Demeclocycline	Doxycycline
Oxytetracycline	Methacycline	Minocycline
Tetracycline	Lymecycline	

Tetracycline, doxycycline and minocycline are detectable at higher levels in gingival crevicular fluid (GCF) than in the serum. Doxycycline is excreted mainly in faeces; the other drugs are eliminated primarily in the urine.

Local delivery of antimicrobial agents include:

Actisite Fiber, Atridox, Minocycline, Arestin, Penicillins, Amoxicillin, Amoxicillin–Clavulanate Potassium, Clindamycin, Metronidazole, Chlorhexidine, Subgingival Delivery Of Chlorhexidine (Periochip).

IV. Host Modulation

Host modulation therapy (HMT) is a treatment concept that aims to reduce tissue destruction and stabilize or even regenerate the periodontium by modifying or down regulating destructive aspects of the host response and up regulating protective or regenerative responses. HMTs are systemically or locally delivered pharmaceuticals that are prescribed as part of periodontal therapy and are used as adjuncts to conventional periodontal treatments such as scaling and root planing (SRP) and surgery.

A variety of different drug classes have been evaluated as host modulation agents, including the non-steroidal anti-inflammatory drugs (NSAIDs), bisphosphonates, tetracycline's and sub antimicrobial dose doxycycline (SDD).

Periodontal therapy is broadly classified into two types:

Non-Surgical periodontal therapy and surgical periodontal therapy.

Non-surgical periodontal therapy includes mechanical debridement combined with oral hygiene instruction. A large number of longitudinal studies were initiated comparing the outcome of various therapeutic modalities on non-surgical periodontal therapy.It is clear from the literature that scaling and root planing play an important role in the elimination of causative factors of periodontal disease throughout periodontal therapy; including the non-surgical, surgical and maintenance phases. Inthe past it had been generally agreed that excessive root surface removal by hand instruments was necessary to remove the calculus deposits. However research over the past years has shown that definitive root surface detoxification can be achieved without excessive cementum removal or aggressive instrumentation as has been suggested by Cheechiet al[13], Smart et al[14]. Studies by Oosterwaalet al[15], Cheechi et al[13], Smart et al[14], Baehni et al[16], Copulos et al[17] have demonstrated that hand and power driven instruments are equally effective in reducing the probing depth, reducing inflammation by removal of plaque bacteria, calculus and endotoxin. Power driven instrument have many advantages over the manual scalers. Loos et al[18], Sherman et al[19], Copulos et al[17], found no difference in clinical response, however the instrumentation time was longer in manual instrumentation than power driven. Recently developed power driven scalers for use in furcation area found them to be more effective than hand scaling as has been suggested by Oda et al[20]. However long-term randomized controlled studies are also required to examine the efficacy of the newly designed scalers.

Study by Hardy et al[21], found that deep irrigation within periodontal pockets provides an efficient and predictable means of reaching sub gingival plaque.A study by Jolkovskyet al[22] found no significant changes in clinical parameters when sub gingival and gingival marginal irrigation with chlorhexidine (CHX) was compared.

With conventional mechanical instruments complete access and disinfection may not be achieved during the treatment of periodontal pockets. The effectiveness of instrumentation may vary with the skills and experience of the practitioner and is therefore technique sensitive. Conventional mechanical treatment has various limitations in techniques and effects; lasers have been introduced as an adjunct to mechanical therapy. Several basic studies have shown the effects of continuous CO_2 laser irradiation on root surfaces. Tucker at al[23] showed that CO_2 laser was able to remove dental plaque, and studies by Coffelt at al[24].

Liu et al[26] in an in vivo study using laser treatment followed by scaling and root planning after 6 weeks showed greater reduction of IL-1 **β**and more clinical improvement than scaling and root planning.

The microbial etiology of inflammatory periodontal disease provides the rationale for the use of antimicrobial medication in periodontal therapy. Numerous investigators have evaluated the use of antibiotics to halt the progression of periodontitis, with some benefit demonstrated when these medicines are incorporated into the treatment protocol.

Regular home care by the patient in addition to professional removal of sub gingival plaque is generally very effective in controlling most inflammatory periodontal diseases. When disease does re-occur, despite frequent recalls, it can usually be attributed to lack of sufficient supra gingival and sub gingival plaque control or to other risk factors that influence host response, such as diabetes or smoking.

In most cases, simply performing a thorough periodontal debridement under local anesthesia will stop disease progression and result in improvement in the clinical signs and symptoms of active disease. If however clinical signs of disease activity persist following thorough mechanical therapy, such as increased pocket depths, loss of attachment, other pharmacotherapeutic therapies should be considered.

Augmenting scaling and root planing or maintenance visits with adjunctive chemotherapeutic agents for controlling plaque and gingivitis could be as simple as placing the patient on an antimicrobial mouth rinse and/or toothpaste with agents such as fluorides, chlorhexidine or triclosan etc.

If patient applied antimicrobial therapy is insufficient in preventing, arresting or reversing the disease progression, then professionally applied antimicrobial agents should be considered including local drug delivery products. Other, more broadly based pharmacotherapeutic agents may be indicated for multiple failing sites.

Such agents would include systemic antibiotics or host modulatory drugs used in conjunction with periodontal debridement.

Although the use of Lasers for sub gingival curettage and calculus removal in the treatment of periodontal pockets has been increasing among practitioners, further basic and clinical studies, are necessary to elucidate the actual effects and effectiveness of Lasers in comparison with conventional treatment as well as negative side effects.

At present, there is no single periodontal therapeutic regimen that will provide a beneficial response for all patients. It is very unlikely that there, ever will be one.

Non surgical therapy remains the cornerstone of periodontal treatment. Clinical trials are still needed to objectively evaluate adjunctive periodontal therapy. Frequent re-evaluation and careful monitoring allows the practitioner the opportunity to intervene early in the diseased state, to reverse or arrest the progression of periodontal disease with meticulous non-surgical anti-infective therapy.

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