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Title	Non-Surgical Periodontal Therapy-A Beginning
Type	Article
URL	https://clock.uclan.ac.uk/id/eprint/44224/
DOI	10.56600/jwmdc.v1i2.37
Date	2022
Citation	Ayub, Uzair, Pisani, Flavio, Qayyum, Zahoor, Malik, Sidra Azeem and Khan, Shahid (2022) Non-Surgical Periodontal Therapy-A Beginning. Journal of Women Medical & Dental College, 1 (2). pp. 37-42. ISSN 2957-5265
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It is advisable to refer to the publisher's version if you intend to cite from the work.
10.56600/jwmdc.v1i2.37

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Non-Surgical Periodontal Therapy- A Beginning

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Abstract

A narrative review explains non-surgical periodontal treatment options. In order to alleviate the patient's discomfort, periodontitis treatment should bring the gums back to a healthy state. Scaling and root surface debridement are two main components of non-surgical periodontal therapy (NSPT), which aims to eradicate bacterial plaque on the root surface and set the stage for the root surface to heal without resorting to surgery. NSPT improves the Visible Plaque Index (VPI), Gingival Bleeding Index (GBI), Probing Pocket Depth (PPD), and Clinical Attachment Level (CAL), and reduces inflammation and periodontal infections. The results of the NSPT are subject to change based on the severity of the patient's condition and any other health concerns. This narrative review aim is to reacquaint the reader with all possible options for dealing with periodontal disease without resorting to invasive surgery. Every person with periodontal disease does not accept surgery. Patients prefer non-invasive treatments because it is less invasive and less risky.

NSPT options include different effective options. Scaling with either manual or powered devices can successfully reduce subgingival bacteria to gain healthy tissue. Systemic antibiotics reduce probing depth by 0.2 to 0.8 mm and increase attachment level by 0.2 to 0.6 mm. When utilized properly, lasers can treat both hard and soft tissue walls. Hyperbaric oxygen therapy improved severe periodontitis for almost a year. Single-event photodynamic therapy with scaling and root planning doesn't improve clinical attachment or reduce pocket depth, but it does reduce bleeding.

Non-surgical periodontal therapy is the "gold standard" for enhancing patient-based results, lowering co-morbidities, and increasing safety and quality of care.

Keywords: Non-surgical Periodontal Treatment, Periodontal Disease Treatment, Scaling & Polishing, Pain-free Periodontal Treatment.

1. Introduction

"Nonsurgical management is effective in treating periodontal disease. Nothing will replace instrumentation. This hasn't changed over thousands of years and is unlikely to change in our lifetimes." (1).

Non-surgical periodontal therapy (NSPT) involves the replacement of inflamed periodontal tissue with healthy, collagen-rich tissue. Non-surgical treatment consists of the removal of the bacterial biofilm and thus creating a healthy environment around the tooth. The first suggested procedure to manage periodontal disease is non-surgical treatment. It is also known as "cause-related therapy". Before discussing the details of non-surgical treatment options, the following paragraphs will summarize periodontal disease (2).

Gingivitis and periodontitis are periodontal diseases involving bacteria that initiate immune responses (3). The model proposed by Page and Schroeder narrates that the progression of gingivitis into periodontitis occurs in four stages. In the early lesion (second stage), the clinical signs of gingivitis start appearing, and up to the third stage, the disease process can be stopped by removing the plaque (4).

Inflammation of gingival soft tissue and connective tissue is termed gingivitis, which is easily reversible by maintaining daily oral hygiene measures (5). Gingivitis affects 50%-90% of adults worldwide (6). When deep tissues and bone are involved in inflammation, then resorption of bone is initiated, resulting in a condition called periodontitis. Periodontitis can be chronic, slowly

progressing, or aggressive, causing bone loss around the tooth (5). The risk factors of periodontal disease are shown in table 1.

Table 1: Risk Factors of Periodontal Disease (7)

Risk Factors

Local Factors	Systemic Factors
• Poor oral hygiene • Carious lesion • Malocclusion • Anodontia • Oral breathing • Smoking	Physiological Factors • Puberty • pregnancy • menopause Pathological Factors • Diabetes • Atherosclerosis • Cardiovascular disease • Kidney disease • Osteoporosis

Professional cleaning of teeth with 14 scalers was strongly recommended over several days. The success of periodontal therapy depends on the efficacy of treatment in deeper areas. Manual instrumentation done for periodontitis can result in a decrease in the bacterial count in subgingival areas (8). Removal of plaque and calculus, along with bacterial biofilm, is the major objective of non-surgical treatment. Calculus is a hardened form of bacterial plaque, but plaque is more dangerous to your health than calculus (7).

Another goal of non-surgical treatment is to eliminate the biofilm that is associated with teeth along with its by-products, such as enzymes, antigens, and other substances that may irritate tissue. Biofilm eradication can only be accomplished by subgingival scaling and root planning or debridement with or without local and systemic antibiotics. This research will discuss the non-surgical treatment options for periodontal disease, their outcomes, and their advantages for subsequent surgical therapy (9).

PubMed and Google Scholar were used as data bases.

1.1. Current Treatment Options, Advantages, and Outcomes:

An introduction to the non-surgical treatment options, their outcomes, and their advantages are under consideration in the discussion given below.

1.2. Root planning and scaling

Equality and successful reduction of subgingival microbiota can be achieved either by hand or powered instruments to gain healthy tissue (10).

Hand instruments include explorers, periodontal probes, sickle scalers, hoes, chisels, and curettes. Then there are some modified forms of curettes like mini-bladed, extended shank, langer, and mini langer curettes. The two basic types of curettes are Universal and Gracey curettes. The differences between these two types of curettes occur due to area specificity, angle, the curvature of cutting edge, and a number of cutting edges. Hand instruments require sharpening after being used regularly. It has been accepted that periodontal instruments must be sharpened after use (11). An edge retention property has been introduced in hand instruments which require very little or no sharpening. To increase the efficiency and life of instrument materials, like carbon steel, stainless steel, tungsten carbide, and high-speed steel, are used. Most of the studies indicate that manual scaling provides a much smoother surface than powered scaling (12).

Sonic and ultrasonic instruments are powered instruments that use high vibrational energy transferred to the scaler's tip to create vibrations of frequencies between 25000 and 42000Hz and amplitude between 10 and 1001m. Those vibrations then remove the calculus along with water. The purpose of water supply during the procedure is to avoid thermal damage to the gingiva. The operation of sonic scalers is based upon the turbine unit's operation at low frequencies between 3000 and 8000 cycles per second. In contrast, ultrasonic scalers function based on a generator, which transforms electrical energy into ultrasonic waves. The transformation of energy is done via piezoelectricity or magnetostriction, which then helps in the scaling procedure (13) Types of ultrasonic scalers are shown in table 2.

Table 2: Types of Ultrasonic Scalers (14)

Magnetostrictive Scalers	Piezoelectric Scalers
18000-45000 CPS	25000-45000 CPS
Magnetic field cause tip to vibrate	No magnetic field
Elliptical movement of tip	Linear movement of tip

Sonic/ultrasonic instruments take less time as compared to manual instruments when subgingival instrumentation is being done. When the pocket exceeds 4mm, it becomes difficult to completely eradicate the plaque and calculus by hand instruments because it is

difficult to approach root surfaces. Sonic and ultrasonic instruments were considered more suitable to reach the deep pockets and completely clean the surfaces (15).

The outcomes of scaling and root planning are very vast. Smooth surfaces are obtained, which initiates tissue attachment to the tooth surface. Bacterial colonies are disrupted, pathogenic bacteria are

Table3: Chemotherapeutic generations

Chemotherapeutic Agents		
1 st Generation	Phenol, ammonium sanguinarine and antibiotics	quaternary compound,
2 nd Generation	Bipyridines, amonium compounds, phenolic compounds, metal ions, enzymes, surfactants, oxygenating agents, salifour and amino alcohols and agents which increase redox impending.	
3 rd Generation	Effective for specific periodontogenic organism	
4 th Generation	Probiotics as in mouthwashes	

removed, and as a result, we have a healthy oral environment. A reduction of 2 mm in mean pocket depth was reported by Badersten et al. with one instrumentation phase. After repeated instrumentation, there was no further achievement (16).

1.3. Antibiotics and chemotherapeutic agents

Systemic and local anti-inflammatory agents decrease the bacterial load in the periodontium through systemic or local administration. Chemotherapeutic generations are shown in table 3. Chlorhexidine can reduce plaque and gingivitis. It is used as an adjunct to non-surgical treatment and reduces the level of supragingival plaque when compared to non-surgical treatment alone. Subgingival bacterial recolonization is inhibited by chlorhexidine as well (17).

Local antibiotics have a positive effect on periodontal tissue. Tetracycline fibers, monocycline, and sustained-release doxycycline are the most effective agents, with a mean probing depth reduction rate of 0.5 to 0.7mm. In contrast, chlorhexidine and metronidazole are the least effective agents, with a probing depth reduction rate of 0.1 to 0.4mm (15). According to two systemic reviews, local antimicrobials benefit smokers and patients with periodontitis and diabetes (18).

Systemic antimicrobials should be used with mechanical treatment in non-surgical treatment. Systemic antibiotics provide additional benefits besides scaling and root planning alone, with a reduction of probing depth of 0.2 to 0.8 and a gain in attachment level of 0.2 to 0.06 mm. These changes are evident in deep pockets, periodontitis, or any infection. The research looks at the treatment with ciprofloxacin plus metronidazole, amoxicillin plus metronidazole, amoxicillin, or metronidazole alone (19).

1.4. Lasers

The use of lasers has been reported to be bactericidal, along with its detoxification properties. A better condition for the attachment of periodontal tissue to the root is achieved after the laser. The types are:

- CO2 laser
- Neodymium-doped yttrium aluminum garnet (Nd:YAG)
- Erbium-doped yttrium aluminum garnet (Er:YAG)
- Diode laser
- Alexandrite laser
- Excimer laser

There was decreased pocket depth and inflammation after treatment with carbon dioxide lasers. Nd: YAG laser, CO2 laser, and ultrasonic instrumentation also improved clinical conditions and reduced microflora (20).

A low dose of argon laser has also been shown to be effective against infections caused by *Prevotella* and *Porphyromonas* species. Improper handling and use of the laser will cause catastrophic effects on the gingiva and in pockets. Thermal damage caused by the lasers can alter the attachment of tissue and healing capability. When used with protocol, Nd: YAG lasers have satisfactory effects on hard and soft tissue walls (21).

1.5. Hyperbaric Oxygen Therapy

Hyperbaric oxygen therapy is used as an appendage to other therapies. It is a procedure to administer a high pressure of pure oxygen to improve the diseased condition. The pressure of oxygen is kept greater than the atmospheric pressure. It was demonstrated that using hyperbaric oxygen therapy along with supra and subgingival scaling synergistic effect on periodontitis. Hyperbaric oxygen therapy improved the symptoms of

severe periodontitis, and the effects lasted more than a year (22).

1.6. Photodynamic Therapy

In photodynamic therapy, the phenomenon of photo disinfection is used, which decreases the infection and improves the tissue condition. Scaling and root planning, along with complimentary photodynamic therapy, provide significant improvements compared to the scaling and root planning done alone.

In cases like bone loss in furcation areas, photodynamic therapy may be effective in these scenarios, and bone loss can be controlled (23).

In a single event of photodynamic therapy with scaling and root planning, there is a failure in pocket depth reduction and no gain in clinical attachment. Still, bleeding is reduced compared to scaling and root planning done without photo-disinfection (24).

1.7. The Patient's Role in Non-Surgical Periodontal Disease Treatment

Patient motivation and oral hygiene maintenance are critical factors in periodontal disease management.

Plaque control is performed via two methods, which are mechanical and chemical plaque control. For buccal, lingual, and occlusal surface cleaning, and for maximum cleaning (25) powered toothbrushes are preferred. For interdental surfaces, dental floss and interdental brushes are used. Interdental brushes are preferred more than dental floss because of technique sensitivity. Dentifrices include kinds of toothpaste, gels, and mouth rinses. Dentifrices containing chlorhexidine, essential oils, and triclosan copolymer have better plaque removal effects (26).

1.8. The Advantages of Non-Surgical Treatment for Subsequent Surgical Therapy

The foremost objective of periodontal surgery is access to scaling and root planning so that healthy gingiva can be achieved. During non-surgical therapy, deep pockets remain untreated, whereas in surgical treatment, deep pockets are treated professionally, which reduces the pocket depth and preserves the tooth. After an evaluation between the direct surgical treatment and non-surgical treatment followed by the surgical treatment, there was a reduction in pocket depth and closure of pockets in cases with non-surgical treatment done previously (27).

When non-surgical treatment is done initially before surgical treatment, it has multiple advantageous effects, including reduced inflammation, enhanced visibility, easy tissue handling, and increased blood supply, which help healing. So, to get good results, any periodontal treatment should start with non-surgical treatment. The advantages of subsequent surgical therapy after non-surgical therapy depend on the type of defect present Intra-bony, supra-bony, and intra-radicular defects. The types of surgeries which can be performed are conservative, resective, or regenerative surgery. Conservative surgeries can produce significant effects. After the analysis of the study, it was found that the reduction of pocket depth was 2.85mm, clinical attachment gain was 1.65mm, and the increase in gingival recession was up to 1.15mm in 12 months. Resective surgery is performed on small intrabony defects in the posterior dentition or palatal defects (28).

In the case of supra-bony defects previously treated with non-surgical therapy, pocket depth reduction of 1.41mm, clinical attachment gain of 0.5mm, and an increase in recession of 1.15mm Suprabony defects may benefit from the use of a papilla preservation flap (27).

The third type of defect usually involves a furcation. The success rate depends on the degree and location of the furcation, root trunk length, entrance width of the furcation, and pocket depth. Tunnel treatment is beneficial in cases with short root trunks, rigorous bone loss, and increased divergence of roots. Tunnel treatment can also cause resection of soft tissue. Root resection may eradicate the furcation defect, but it needs adjunctive endodontic and prosthodontic therapy, which overall increases the complications (28).

2. Conclusion

The non-surgical treatment of periodontal disease has been the treatment of choice by dentists and patients. Low cost, no use of surgical blades, timesaving, minor pain, and being effective are some points attracting the patient. There are numerous non-surgical options for treating periodontal disease, but none has demonstrated clear superiority over the others. To treat periodontal disease, the foremost step is the patient's motivation. Scaling and root planning via manual and ultrasonic methods remove the plaque, calculus, and biofilm. Antibiotics also significantly in non-surgical treatment, either locally or systemically. Systemic antibiotics can improve the outcomes of non-surgical therapy, but they must be used carefully to avoid bacterial resistance and

adverse effects. The use of the laser provides detoxification effects, but on the other hand, it may cause thermal trauma, damaging the gingiva.

During non-surgical treatment, the deep pockets are left untreated, so, therefore, surgical therapy is done to reduce the pocket depth and gain the clinical attachment of tissue. To gain maximum results from surgical therapy, it is necessary to perform non-surgical therapy before. Intra bony, supra bony, and functional defects are treated by surgical treatment, but a careful surgical procedure is selected after the detailed analysis of the defect.

There are many options for non-surgical treatment of periodontal disease, but the success of treatment depends upon the patient's motivation. Supragingival plaque control by the patient is an important factor. Manual or automated toothbrushes, interdental brushes, dentifrices, and floss can help reduce the bacterial biofilm in the oral cavity. When professional treatment is under consideration, the ultrasonic scalers have a few plus points, which include decreased time consumption, less trauma, effective removal, no sharpening of the tip, and less fatigue for the patient.

Acknowledgement We are very grateful to all the participants who willingly participated in the study and contributed to the development of questionnaire. All the authors have approved the manuscript.

Conflicts of Interest The authors declare no conflicts of interest.

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