



## Review Article

## Phase I therapy in periodontics and periodontal regeneration: Gate to success in dentistry- A review

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## ABSTRACT

Periodontal disease is a multifactorial inflammatory condition comprising of a complex interaction between pathogenic bacteria, environmental and acquired factors and host related factors. It is well known that to achieve successful result one must focus on eliminating the cause of disease. In this review we will be discussing most important phase in dental treatment i.e Phase I therapy because the basis of any dental problem ever seen is primarily or secondarily due To “Plaque” Hence Pahse-I Therapy.

Scaling and root planning (SRP) is a conventional, non-invasive periodontal therapy and when used alone or as adjunct with other non-surgical therapeutic modalities have shown a great success in dental procedures.

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### 1. Introduction

Generally disregarded part by dental specialists is Stage I treatment. It should be recollected that the primary objective of stage I treatment is to lessen the periodontal microorganisms by zeroing in on the etiological element as it can influence the outcomes on the off chance that appropriate oral cleanliness isn't kept up with by the patient. It consolidates both mechanical and chemotherapeutic modalities to limit or destroy microbial biofilm.<sup>1</sup> Periodontitis is a fiery sickness of the supporting tissues of the teeth for the most part brought about by unambiguous microorganisms or their gatherings, bringing about moderate obliteration of gingiva, periodontal tendon and alveolar bone with expanded testing pocket profundity arrangement, downturn, or both.<sup>2</sup> The systems hidden the periodontal annihilation process contains both immediate and aberrant tissue harm; direct tissue

harm by bacterial items and circuitous tissue harm through bacterial acceptance of the host incendiary and resistant reactions prompting overproduction of horrendous compounds and favorable to provocative go between consequently deciding the degree and seriousness of tissue annihilation. Subsequently, a particular treatment is simply founded on conclusion of a specific pathology.<sup>3</sup>

#### 1.1. Role of mechanical therapy: manual, sonic and ultrasonic scalers

Mechanical treatment by manual instrumentation or potentially mechanical scalers have been ended up being useful in diminishing the gamble of loss of teeth, which decline the pace of periodontal sickness movement, decreasing draining on endlessly testing pocket profundities and in this manner, at last improve the gingival health.<sup>4</sup> Scaling is the technique because of which plaque and math are eliminated supra as well as sub-gingivally and Root arranging is method in which leftover implanted math and

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a similar piece of cementum is killed from the roots to deliver a smooth, hard and clean surface.<sup>5</sup> To make careful debridement and progress in long haul of the working site requires a lot of endurance, persistence with respect to the dental specialist and the patient and furthermore on the instrumentation expertise of the clinician. Various examinations since the 1950's have alluded that manual instrumentation in everyday takes from 20% to half longer to accomplish a similar clinical end-focuses than that of sonic as well as ultrasonic scalers. Notwithstanding, the utilization of hand scalers has been alluded to as "highest quality level" the main constraint being it is tedious, requires more ability, and is tiring for dental specialist and patients the same. The principal point of SRP is to reestablish the soundness of gingiva by completely destroying the results that cause gingival irritation, (for example, plaque, analytics, endotoxin) from the tooth surface however it is additional tedious, requires more ability, and is tiring for dental specialist and patients the same. While, ultrasonic instrumentation works on understanding consistence and calls for less investment for exhaustive debridement.<sup>4</sup> An orderly survey by Tunkel J on the progress of ultrasonic and hand subgingival debridement in persistent periodontitis concluded that machine-driven subgingival debridement is less tedious contrasted with hand instruments, however the clinical viability of both remaining parts the same. It further detailed no significant contrast in the recurrence and seriousness of antagonistic impacts following the two treatment modalities.<sup>6</sup> Further it is seen that with the expansion in testing profundity, instrumentation turns out to be less powerful at eliminating bacterial plaque and analytics. Notwithstanding, some recently planned ultrasonic and sonic scaler tips when utilized on medium power settings has shown similarly lesser root surface modification and viewed as more compelling in furcation regions, in this way have upgraded the capacity of the administrator to the pocket profundity all the more effectively in distant areas.<sup>1</sup> Mechanical treatment is the main method of treatment suggested for most periodontal diseases. The American Institute of Periodontology (AAP) 1996 World Studio agreement report expresses that ultrasonic and sonic instrumentation have shown comparable clinical impacts as manual scaling and root arranging. It has been recommended by proven and factual examinations that power-driven scalers alone or in assistant with mechanical scaling might draw out the best generally outcome.<sup>4</sup>

### 1.2. Root conditioners

The main aim of periodontal treatment is to completely eradicate the periodontal disease, regenerate the periodontal structures to a healthy, functional state which can be accomplished by supportive periodontal therapy. Due to degeneration of remnants of Sharpey's fibers, aggregation of

bacteria and their by-products, decomposition of cementum and dentin, alteration in the pocket wall impede with new attachment. Even though hurdles to new attachment can be abolished by effective root planing, the root surface of the pocket can be treated to enhance its chances of gaining the new attachment of gingival tissues by root conditioning which include mechanical methods, chemical methods, growth factors and lasers.<sup>7</sup>

### 2. Mechanical Methods

It involves SRP which is removal of diseased, necrotic and altered cementum as well as removal of softened dentin, or the smoothening of surface irregularities. Even though, the efficacy of SRP has been well documented, its efficiency in creating the disease free surface of root has been questioned. Due to which various applications have been suggested.

### 3. Chemical Methods

All conditioning agents are mainly used to remove root surface impurities including minerals and cytotoxic materials derived from bacterial products which later on helps in attachment of cells of gingival and periodontal fibers.

Various chemical agents include EDTA, citric acid, tetracycline, fibronectin, doxycycline, polyacrylic acid etc.

1. Ethylene diamine tetra acidic corrosive (EDTA): In Endodontics, EDTA is utilized to open calcified waterways, to wipe out smear layer with conceivable disease and to decrease conceivable micro leakage. It structures stable buildings with Ca Particles and can be utilized in fluid, glue or gel structure to demineralize the root surface.<sup>8</sup>
2. Citrus extract: Concentrates by Urist 9 showed that the implantation of demineralised bone, polish, and dentin lattice into muscle tissue in creatures actuated mesenchymal cells to separate into osteoblasts and began an osteogenic cycle. Remembering this thought, citrus extract (CA) was applied to the tooth roots to demineralize the outer layer of roots, consequently creating cementogenesis and connection of collagen filaments. It has been seen that citrus extract demineralization increments new connection or reattachment and recovery.
3. Fibronectin: Fibronectin is the glycoprotein that fibroblasts expect to connect to root surfaces. The fuse of fibronectin to the root surface might advance new connection, upgrade wound mending, forestalls partition of the fold, favors hemostasis and connective tissue recovery.<sup>7</sup>
4. Antibiotic medication: Alongside its antimicrobial property, it shows calming activity, collagenase hindrance, bone resorption restraint and capacity to upgrade fibroblast connection. They are utilized

in relationship with bone unions and as molding specialists for root surfaces. Concentrates on antibiotic medication's impact on root surfaces have been contraindicating. While a few in vivo examinations, for example, by Wikesjo UME et al. 1988<sup>10</sup> have shown no positive outcomes, while others, for example, by Alger FA et al. 1990<sup>11</sup> have shown that antibiotic medication utilized alone than in blend with fibronectin delivered better connective tissue connection to the root surfaces.<sup>8</sup>

5. Doxycycline: Alongside antimicrobial, it has against enzymatic properties. Effective use of doxycycline displays an unending importance on periodontally infected root surfaces. Demirel et al. 1991<sup>12</sup> showed that the antibacterial impact of doxycycline persuade the adapted root surface upto 14 days.
6. Polyacrylic corrosive: It is a feeble corrosive polyacrylic corrosive which really eliminates smear layer from the root. Willand BB et al.<sup>13</sup> thought about periodontal recuperating on the outer layer of root after the utilization of polyacrylic corrosive for 20 seconds and citrus extract application for 3 minutes. They tracked down a significant connective tissue grip to establish surface in polyacrylic corrosive treated teeth rather than citrus extract treated teeth.
7. Development factors: They are polypeptide atoms that go about as neighborhood chemicals. They incorporate platelet-inferred development factor (PDGF), insulin-like development factor (IGF-1), epidermal development factor (EGF), fibroblast development factor (FGF), bone morphogenetic protein (BMP) and changing development factor (TGF).
8. Platelet determined development factor (PDGF): It is a significant mitogen for fibroblasts, smooth muscle cells, and different cells. PDGF shows a slight impact on digestion of periodontal tendon (PDL) cells and moderate impact on both mitogenesis and relocation of PDL cells.<sup>9</sup>
9. Polish lattice proteins (EMPs): Use of EMP (amelogenins) advance periodontal recovery by mimicking the occasions that happen during the improvement of the periodontal tissues. It advances bone cell connection and cell spreading. Upgrades age of additional juvenile bone cells by empowering separation of additional adult bone cells, is osteopromotive and furthermore invigorates bone development when utilized with DFDB. This idea is laid out on the finding that the cells of the Hertwigs epithelial root sheath store EMP on the root surface preceding cementum arrangement and these proteins are the starting variable for the advancement of acellular cementum.<sup>7</sup>

#### 4. Lasers (Light Amplification by Stimulated Emission of Radiation)

Over the time, LASERS have been studied for their effect on root surface as well as for their effects on the behaviour on periodontal ligament cells, for pocket debridement, wound healing and in various surgical approaches. LASER application on root surface has a notable effect on fibroblast attachment. Contradicting results have been observed, in an in vitro study by Thomas D et al.<sup>10</sup> who used Nd:YAG laser observed that the excisional new attachment procedure (ENAP) to remove pocket epithelium cannot avoid contacting crestal bone resulting in charring & delayed wound healing with bone. But Yukna RA et al.<sup>11</sup> observed better histologic changes with Nd:YAG laser and reported a significant gain in cementum on diseased root surfaces when compared to conventional SRP. It also has great potential for periodontal regeneration by exciting fibroblast and pleural potential cells.<sup>12</sup>

#### 5. Recent Advances

##### 5.1. Tissue engineering

In light of the clinical unpredictability, recently a tissue engineering approach has been proposed, by which periodontal tissues would be fabricated in the laboratory under controlled conditions and eventually implanted into defects surgically Bartold PM et al.<sup>13</sup> It has been described that periodontal ligament cells cultured by utilizing this cell sheet technique can regenerate periodontal ligament tissues after its transfer in animal models.

##### 5.2. Gene therapy

Biologically active agents, such as growth factors have short biological half-life. To overcome this, gene therapy was introduced. It can be used to ease the local delivery of growth factors by transporting the growth factor genes into the local cell population. Animal studies by various authors<sup>14-16</sup> have demonstrated that gene delivery of PDGF stimulated more cementoblast activity and enhanced regeneration in contrast with a single application.<sup>17</sup>

##### 5.3. Photodynamic therapy (PDT)<sup>1</sup>

Antimicrobial photodynamic therapy is a non-invasive therapeutic modality, which is based upon an oxygen dependent photochemical reaction that occurs upon light mediated activation of a photosensitizing compound bound to the target cell but a recent systematic review of seven randomized controlled trials (RCTs) and another with five trials inferred that the use of photodynamic therapy as a independent treatment does not create any beneficial clinical effect as compared to SRP.

#### 5.4. Chemotherapeutic agents

Chemotherapeutic specialist is a general term for a compound substance that gives a clinical remedial advantage. Chemotherapeutic specialists can be conveyed locally, orally, or parenterally.<sup>23</sup> Different chemotherapeutic modalities include the use of antimicrobials and germicides through foundational organization, nearby conveyance into the periodontal pocket, subgingival pocket water system, effective application and furthermore the utilization of host modulatory specialists.

**Fundamental anti-toxin treatment:** The reasoning behind the utilization of foundational anti-microbial treatment is concealment of periodontal microorganisms present in biofilms in abundant resources, root furcations and concavities or living inside the periodontal tissues or other oral specialties where mechanical treatment (SRP) alone may end up being inadequate. Discoveries have prompted the end that foundational antimicrobial treatment is a vital assistant to mechanical treatment for effective administration of periodontal circumstances that can't be dealt with mechanical treatment alone.

In any case, it should be recalled that fundamental anti-infection agents are an assistant to SRP and ought not be utilized as monotherapy as the erratic utilization of foundational antimicrobials can prompt advancement of anti-microbial obstruction among human microorganisms.

**Nearby antimicrobial conveyance (Chap):** Fellow was acquainted due with restricted signs of fundamental antimicrobial treatment. The reasoning behind involving Chap in periodontal sickness is subgingival plaque control by storing high groupings of an anti-toxin or sterile in direct contact with the root surface. Among the main absorbable framework to be created was Atridox™, which is a 10% definition of doxycycline (50 mg in a bioresorbable gel framework). The early outcome of Atridox™ prompted advancement of other absorbable Fellow frameworks, for example, minocycline microspheres (Arestin™), chlorhexidine gluconate chips (PerioChip™) and gel (Chlosite™), and metronidazol gel (Elyzol™). Hanes et al in a meta-examination of 19 investigations assessed the correlation of SRP and adjunctive nearby supported discharge specialists with SRP alone. The creators reasoned that nearby enemy of infective specialists brought about improved results with SRP contrasted with SRP alone.

**Subgingival pocket water system:** The reasoning behind utilizing subgingival pocket water system was that they lessen microbial burden in periodontal pocket thus diminish gum disease scores as it enters a lot further in to the pocket when contrasted with mouth flushes or supragingival water system however the utilization of sterile irrigants enjoys not shown any upper hand over customary periodontal treatment in periodontal sicknesses as be utilized as an assistant to

mechanical treatment according to the Agreement report of sixth European studio on periodontal illness likewise presumed that.

**Effective germ-free application:** Effective utilization of sterilizers such CHX, povidone iodine, phenolic mixtures and sodium hypochlorite, with hostile to plaque or against gum disease activity is by all accounts of restricted esteem, since it doesn't considerably penetrate into the gingival hole, they are powerful assistants to control gingival aggravation, particularly in intense circumstances, post-precisely and during times of hindered hygiene.<sup>1</sup>

**Job of host-tweaking drugs:** Ashley has portrayed in a synopsis of a few examinations that sub antimicrobial dosages of doxycycline (Periostat A) showed diminish collagenase levels in both gingival crevicular liquid and gingival biopsies as an expansion to either SRP or supragingival scaling and dental prophylaxis. It has additionally displayed to increase and keep up with clinical connection level gains and examining profundity decreases, decrease of draining on testing and counteraction of loss of alveolar bone height.<sup>4</sup>

#### 6. Conclusion

Phase I therapy is a gold standard resulting in significant resolution of periodontal inflammation leading to improvement in the clinical signs and symptoms of active disease. However, in cases with incomplete elimination of putative pathogens other treatment modalities can be used as an aid to SRP such as LASERS, photodynamic therapy, systemic, local antimicrobials, HMT and daily irrigation with a powered irrigation device, with or without an antimicrobial agent. However, long term success cannot be achieved without proper patient compliance. Daily home care and frequent recall are still important for long-term success of periodontal therapy. So, it is even concluded as Nonsurgical therapy remains the keystone of periodontal treatment in attaining successful long term results.

#### 7. Source of Funding

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#### 8. Conflict of Interest

None.

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