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Review Article

Non surgical periodontal therapy: An evidence-based perspective

Debarghya Pal[1,*], Farha Nasim[1], Himadri Chakrabarty[1], Abhijit Chakraborty[1]

[1] *Dept. of Periodontics, Guru Nanak Institute of Dental Sciences and Research, Kolkata, West Bengal, India*

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ABSTRACT

Non surgical periodontal therapy is a critical aspect of periodontal treatment, aimed at removal of the etiologic factor, thereby halting the disease progression and re-establishment of biologically acceptable root surface for healing. With non surgical periodontal therapy, periodontal health can be achieved in the least invasive manner. In comparison to other modes of periodontal treatment, Non-surgical therapy remains the corner stone of periodontal treatment, as not only the first mode of treatment approach for treating periodontal disease but it also restores tissue health to prepare it for further surgery. Scaling and root planing have been extensively studied over decades to evaluate their efficacy, to decide on the treatment approach, to determine the criteria for assessing its adequacy to facilitate healing. This review article focuses on the studies done to bring into light the various aspects of non surgical periodontal therapy.

1. Introduction

Periodontal disease is a multifactorial infectious disease characterized by inflammation and subsequent destruction of the tooth-supporting tissues like periodontal ligament and alveolar bone.[1] Treatment of periodontitis aims to prevent further disease progression, to minimize symptoms and possibly to restore lost tissues.[2] Various therapeutic interventions are employed to achieve these goals, of which non surgical periodontal therapy is a key element. Even though non-surgical periodontal therapy may have been common as far back as Egyptian times 2000 years BC,[3] until the mid-1980s, periodontal therapy always included periodontal surgery, and nonsurgical therapy alone was considered to be a malpractice and incomplete therapy.[4]

The Minnesota studies[5,6] initiated a paradigm shift in periodontal therapy towards a nonsurgical approach as it was the first direct comparison of a surgical therapeutic approach with a nonsurgical one. Subsequent studies[7,8] only went on to confirm that nonsurgical periodontal therapy is a prerequisite and the basis for any type of periodontal therapy.

2. Aims of Non-Surgical Treatment

The overall aim of non-surgical treatment is to create an environment that is biologically compatible with healing of the periodontal tissues. This is mostly achieved by:

1. Decontamination by removal of endotoxins from the root surface
2. Disruption and elimination of biofilm from the root surface
3. Removal of subgingival calculus from the root surface.

Studies have shown that a gentle stream of water can remove about 39% of the Lipopolysaccharides (LPS) while brushing the root surface eliminates a further 60%. This suggests that the hygiene phase of non-surgical treatment may be instrumental in disrupting the biofilm and eliminating up to 99% of endotoxins in the pocket.[9] The problem with such a

* *Corresponding author*.
E-mail address: dp.perio16@gmail.com (D. Pal).

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hypothesis is that it assumes that the patient is able to access the entire depth of the pocket during cleaning. However this is seldom achieved for pockets that are greater than 5mm in depth. Thus, deeper the pocket, the more residual, undisturbed biofilm is likely to remain.[10]

In the past, endotoxin or LPS derived from gram-negative bacterial cells were thought to have potential to affect gingival fibroblast attachment and proliferation. It was supposedly so firmly attached to the root surface that extensive cementum removal was advocated during subgingival instrumentation.[11] More recent studies on extracted teeth indicate that endotoxins are much more superficially bound and can be removed simply by brushing. Thus systematic root planing to remove cementum was not suggested as a necessity.[12]

3. Manual vs sonic/ultrasonic instrumentation

Several studies have compared the efficiency of sonic and/or ultrasonic versus manual instrumentation. Almost all of these studies indicate that to achieve similar clinical results manual instrumentation generally takes 20–50% more time when compared to sonic and/or ultrasonic scaling instruments.[13–20]

While studies have shown that hand instrumentation, ultrasonic, and sonic instrumentation seem to lead to similar clinical improvements in patients with advanced periodontitis,[15] curette produced rougher root surfaces when compared to ultrasonic devices and caused more root surface removal. Piezoelectric devices produced minimum root surface roughness but caused more root substance removal and more cracks than magnetostrictive ultrasonic devices.[21]

4. Elimination of Calculus

Complete calculus removal, by scaling and root planing, is extremely difficult to perform and unrealistic. Waerhaug in 1978 showed that in sites having probing depth deeper than 5 mm, complete calculus removal was achieved only 11% of the time.[22,23] Other factors shown to affect the success of calculus removal include the distance of the deposit from the cemento–enamel junction, the ability to detect calculus on the root surface, the experience of the clinician and the location of calculus on a furcation or nonfurcation surface. Stambaugh et al. observed that removal of all subgingival plaque and calculus was unlikely to occur when mean probing depths were $\geq$ 3.73 mm.[24]

5. Root surface smoothness

Overinstrumentation can lead to excessive cementum and dentin removal. Extensive instrumentation may cause increased surface roughness in both supragingival and subgingival areas, which in turn may enhance plaque retention. Studies investigating the degree of roughness following the use of hand and sonic/ultrasonic instruments are often difficult to interpret because critical information such as forces applied during instrumentation were often not reported. However the fact that different instruments lead to the same clinical results seems to suggest that variations in root surface roughness do not affect overall healing. Thus several studies conclude that periodontal healing, reductions in probing depth, and clinical attachment gains, were not related to the root surface texture.[25–27]

6. Healing Following Non Surgical Periodontal Therapy

Efficient root surface instrumentation and dislodgement of the subgingival biofilm creates a root surface that is biologically compatible with the formation of a long junctional epithelium which adheres to the root surface cementum by a hemidesmosomal attachment. Waerhaug studied the healing of the dento-epithelial junction following subgingival plaque control in 39 biopsies from 21 patients. Following removal of subgingival calculus and plaque and a healing period varying from 2 weeks to 7 months, block biopsies were harvested and analysed histologically. The histological analysis revealed that a normal dento-epithelial junction has been routinely reformed in areas from which subgingival calculus and plaque has been removed. The new dento-epithelial junction appeared to be completed within a period of 2 weeks.[22,23]

One of the principal signs of a healing pocket is the reduction in probing depth that follows treatment. This reduction is largely a result of the resolution of gingival inflammation leading to shrinkage of the gingival tissues and the formation of a new, long junctional epithelium with no connective tissue attachment.[28] Histological evidence indicates that the healing following non-surgical periodontal therapy is characterized by epithelial proliferation, which appears to be completed after a period of 7–14 days after treatment. Complete removal of calculus and plaque was associated with a limited or complete lack of inflammation.[29] The epithelial cells in the long junctional epithelium are derived from the remaining apical healthy junctional epithelium and some of the pocket epithelium that retains the potential for regeneration. This contributes to the healing process once the bacterial challenge to the host is removed.

7. Clinical outcomes of Non-Surgical Therapy

The Minnesota group published a randomized controlled clinical trial in which scaling and root planing plus open flap debridement was compared with scaling and root planing alone. The long-term outcomes of pocket depth reduction and maintenance of attachment levels were found to be not significantly different in both the treatment modalities when the initial probing depth was up to 6 mm. Only in sites

having initial probing depth of ≥7 mm was pocket reduction significantly greater when scaling and root planing was followed with open flap debridement. However, attachment level was maintained, irrespective of whether additional flap surgery was done in those deep sites.[5,6]

In the 1980s, Anita Badersten and colleagues, reported a series of clinical trials that studied the healing events and clinical outcomes following non-surgical treatment in patients with moderate and advanced chronic periodontitis. They showed that in moderately advanced periodontitis (average probing depths 4–7mm) the total mean reduction of probing depths after instrumentation was approximately 1.5mm and more pocket depth reduction and gain of attachment seen in initial probing depths of > 6mm than in those of 4–5.5 mm with most of the clinical improvement occurring within 5 months of treatment. In case of advanced chronic periodontitis (probing depths up to 12mm), sites with deep probing depths showed more gain of attachment, gingival recession and ultimately, deeper residual probing depths than sites with shallow probing depths.[13–15]

A systematic review[30] of the effect of surgical debridement vs. non-surgical debridement for the treatment of chronic periodontitis showed that when sites with initial probing depth 4–6mm were treated by open flap debridement, there was significantly less CAL gain than with the scaling and root planing procedure. However when sites with initial probing depth >6mm were treated with open flap debridement, there was significantly more clinical attachment level gain and probing depth reduction than with scaling and root planing.

In a recent systematic review[31] it was seen that irrespective of the choice of instrument (sonic/ultrasonic vs. hand) or mode of delivery (full mouth vs. quadrant), subgingival instrumentation in shallow sites (4–6 mm), resulted in a mean reduction of probing depth of 1.5 mm at 6 to 8 months, while at deeper sites (=7 mm) the mean probing depth reduction was estimated at 2.6 mm. In addition, an overall proportion of pocket closure of 74% at 6 to 8 months was observed. Similar results were also shown earlier in a meta analysis by Hung and Douglass.[32]

The greatest change in probing depth reduction and gain in clinical attachment occurs within 1–3 months post-scaling and root planing, although healing and maturation of the periodontium may occur over the following 9–12 months.[8,13,14,33,34] Thus, evaluation of the response of the periodontium to scaling and root planing should be performed not before 4 weeks following treatment, to avoid any misinterpretation.[27,33,35]

8. Concept of "Critical Probing Depth"

Critical probing depth indicates the probing pocket depth below which clinical attachment would be lost as a result of the respective treatment procedure and above it would result in clinical gain of attachment.[36] Thus the concept of "critical probing depth" may be helpful to know when to treat non-surgically and when to add surgical interventions to obtain the best therapeutic results.

A critical probing depth of 2.9 mm. for nonsurgical therapy and 4.2 mm for surgical approach was given by Lindhe et al.[36]The critical probing depth value of 4.2 mm, indicates that surgical interventions would only be beneficial for achieving clinical attachment gain if lesions with a probing depth of at least 4.2 mm are treated.

Heitz-Mayield and Lang[37] put forward the concept of critical probing depth of 5.4 mm. It means that a probing depth of about 5.5 mm would benefit from additional surgical therapy, while sites with a shallower probing depth require only nonsurgical therapy. This determination was made based on statistical analysis of data of surgical outcomes.

9. Conclusion

Non surgical therapy forms the mainstay of any periodontal therapy and is now well recognized as a prerequisite before any surgical intervention. Most of the periodontal lesions can be treated successfully with nonsurgical therapy and additional surgical interventions are only considered above a critical probing depth of 6 mm. Thus periodontal surgical procedures are limited to advanced lesions which even after a successful hygienic phase yield a probing depth of at least 6 mm.

10. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

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None.

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Author biography

Debarghya Pal, Post Graduate Student

Farha Nasim, Post Graduate Student

Himadri Chakrabarty, Professor

Abhijit Chakraborty, Professor and HOD

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