EFFICIENCY OF NONSURGICAL PERIODONTAL THERAPY IN MODERATE CHRONIC PERIODONTITIS

Antoaneta M. Mlachkova, Christina L. Popova*
Department of Periodontology, Faculty of Dental Medicine, Sofia, Bulgaria

ABSTRACT

INTRODUCTION: Chronic periodontitis is defined as an inflammatory disease of the supporting tissues of teeth caused by microorganisms in the dental biofilm, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation and gingival recession. Treatment of chronic periodontitis aims at arresting the inflammation and stopping the loss of attachment by removal and control of the supra- and subgingival biofilm and establishing a local environment and microflora compatible with periodontal health. The aim of this study was to evaluate the effectiveness of non-surgical therapy (scaling and root planning) in the treatment of moderate chronic periodontitis. MATERIALS AND METHODS: The study included 30 patients aged between 33 and 75 years, of which 46.7% women and 53.3% men, diagnosed with moderate and, at some sites, severe periodontitis. They were treated with non-surgical periodontal therapy methods (scaling and root planning and curettage if indicated). Additionally, chemical plaque control with rinse water containing chlorhexidine was applied. The diagnostic and reassessment procedures included measuring the periodontal indices of 601 periodontal units before and after the therapy. The indices measured were the papillary bleeding index (PBI), the hygiene index (HI), the probing pocket depth (PPD) and the clinical attachment level (CAL). RESULTS: Significant reduction of plaque and gingival inflammation was found in all treated patients; we also found a statistically significant reduction of periodontal pockets with clinically measured depth < 5 mm (PD < 5 mm). Pockets with PD > 5 mm did not show statistically significant lower incidence rates probably due to the initially small percentage of deep pockets in the patients studied. There was a statistically significant reduction of all sites with attachment loss, the highest significance found at sites where the attachment loss was greater than 5 mm. CONCLUSION: The results of the study suggest that nonsurgical periodontal therapy is effective in managing the moderate chronic periodontitis. Given a good patient compliance, the antimicrobial periodontal therapy can be quite efficient in arresting the inflammatory process and reducing the depth of periodontal pockets; it can also achieve a stable attachment loss level and obviate the need to use a surgical periodontal treatment modality.

Key words: nonsurgical treatment, dental biofilm, loss attachment, moderate periodontitis

The results of the study...

Copyright © 2014 Medical University, Plovdiv
terapii i zakrytой procédurom parodontalnego kuretaža po indikacii. Dodatno obmenja i khimicheskiy kontrol za zubnym naleyom, prymena vodu dlya poloskaniya, soedintuyu khlorhkephalin. Primenенные metody v celih diagnosta i rekoenki sostoyaniya parodonta vkluchayut izmerenie parodontalnych parametr 601 parodontalnaya ediniča s registriruvaniem sostoyostey do i po posle terapii Papillary bleeding index (PB1), Hygiene index (HI), Probing pocket depth (PD) i Clinical attachment level (CAL). РЕЗУЛЬТАТИ: Статистически достоверная редукция зубного налета и гингивального воспаления отмечена для каждого пациента, а также отмечена и статистически достоверная редукция парodontalnych карманов с клинически измеренной глубиной < 5 mm (PD) < 5 mm). Карманы глубиной PD > 5 mm не показывают статistically значимо более низкий процент распространеня по всей вероятности из-за случайного из-за низкого процента наличия глубоких карманов у обследованных пациентов. Получена статически достоверная редукция для всех мест с потерей периодонтальной свяки со самой высокой степенью значимости в местах с потерей свяки > 5 mm (CAL) > 5 mm). ЗАКЛЮЧЕНИЕ: Полученные авторами результаты подтверждают эффективность нехирургического парodontального лечения при умеренно выраженному хроническому пародонтите. Адекватная антибактериальная парodontalная терапия при хорошем кооперировании со стороны пациента успешна в редукции воспаления и в уменьшении глубины карманов. Она в состоянии стабилизировать уровень периодонтальной свяки и редукировать необходимость в хирургической парodontальной терапии.

Ключевые слова: нехирургическое лечение, дентальный биофильм, потеря периодонтальной свяки, умеренный пародонтит

© 2014 Все права защищены. Медицинский университет, Пловдив

INTRODUCTION

In the modern classification systems of periodontal diseases chronic periodontitis is defined as an inflammatory-destructive disease affecting commonly people over 35 years of age (but not only), characterized by slow progression and predominantly horizontal alveolar bone loss. Modern understanding of the etiology of periodontitis indicates bacterial infection as a major cause. Various periodontopathogen microorganisms such as Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans, Bacteroides forsythus, Prevotella intermedia and spirochetes are closely associated with chronic periodontitis and can trigger and sustain the disease in susceptible individuals in connection with the local and systemic factors, including those of the environment. Adopting a criterion of attachment loss of 1-2 mm at one or more sites, the spread of the disease shows 67% - 100% in all age groups which means greater health and social significance of chronic periodontitis.

The clinical features of chronic periodontitis include loss of clinical attachment (CAL), loss of alveolar bone (BL), periodontal pocket formation and gingival inflammation. Typically, a considerable amount of plaque and local factors are detected, associated with plaque retention. The clinical course of the disease demonstrates less frequently a continuous slow progression and more typically there are brief episodes of a relatively rapid progression and long periods of remission. The main goal of periodontal therapy is to preserve the natural dentition by achieving and maintaining a stabilized periodontium.

The mechanical non-surgical treatment of periodontal pockets is an essential part of periodontal therapy - the removal of all dental deposits (plaque and calculus) is now regarded as the first stage of any periodontal therapy with the primary objective to reduce the inflammation and pocket depth. It is assumed that the primary therapy in the treatment of chronic periodontitis is the mechanical cleaning of tooth surfaces, supra- and subgingivally, as well as the regular control of the bacterial biofilm. This approach is expected to lead to an improved gingival health, stop disease progression and thus reduce the risk of tooth loss. Badersten et al., however, found that independent professional instrumentation in some cases may give rise to unsatisfactory healing response. Along with professional control of biofilm it is necessary that the patient receive proper instruction as well as achieve good personal oral hygiene control and detailed cleansing of the exposed root surfaces to reach the goals of non-surgical periodontal therapy.

AIM

The aim of this study was to evaluate the effectiveness of the non-surgical treatment (scaling and root planning) of chronic periodontitis by comparing the basic parameters of periodontitis before and after the initiating therapy (at reassessment).
MATERIALS AND METHODS

CLINICAL RESEARCH METHODS
- Selection of patients
The study included 30 patients (women 46.7% and men 53.3%, age range 33 to 77 years) with moderate chronic periodontitis, without systemic diseases and not treated for periodontitis in the last 6 months, excluding antibiotic therapy for any reason.
- The diagnostic methods for establishing the periodontal status in the initial selection of patients included plaque level (HI) and gingival inflammation (PBI), as well as measurement of periodontal parameters for the initial registration status and reporting of therapy - pocket depth (PD) and attachment loss (CAL). All patients were diagnosed with orthopantomographic images and segmented radiographs by indications to determine the extent and morphology of alveolar bone loss.

STATISTICAL ANALYSIS
Data were entered and processed with the help of statistical package IBM SPSS Statistics 19.0. The level of significance, wherein rejecting the null hypothesis, was at p < 0.05.

The following methods were applied:
- Descriptive analysis - a table presents the frequency distribution of the signs in question, broken down by group of study;
- Analysis of Variance - it calculates the central tendency and dispersion estimates;
- The Shapiro-Wilk nonparametric test - it analyses the type of distribution;
- The Mann-Whitney nonparametric test - it tests the hypothesis of a difference between two independent samples.

THERAPEUTIC PROTOCOL
All patients were treated with the conventional methods of non-surgical periodontal therapy (oral hygiene instructions and plaque control and retention factors, scaling and root planning closed procedure of periodontal curettage by indications). Supra-and subgingival instrumentation was performed both with ultrasound and hand and machine tools. The patients were trained to keep good personal oral hygiene, including interdental hygiene (floss, brushes) and water for chemical plaque control containing 0.2% chlorhexidine, 3 - 4 weeks twice a day. The degree of instrumentation and the intervals between treatments in the phase of mechanical therapy were determined by local factors (plaque, calculus and retention sites) and by the individual level of motivation and ability of the patients to perform plaque control. The duration of initial non-surgical treatment for most patients was 1.5 - 2 months. The reassessment conducted 8-10 weeks after the end of the initial therapy involved assessment of the oral hygiene status, of the severity of gingival inflammation, of the periodontal pocket depth and of the level of clinical attachment in order to ascertain the therapeutic efficacy.

RESULTS
601 units of 3606 periodontal sites were tested in all patients at the beginning and end of the study.

The initial diagnosis in the selection of patients recorded the following mean values for gingival status of the patients studied and the relative proportions of sites with different probing depths and loss of attachment:
- Papillary bleeding index (PBI) - 2.31;
- Hygiene index (HI) – 13.9% (plaque-free surfaces)
- Probing pocket depth (PPD):
  - 1-3 mm in 1783 sites (49.45%)
  - 3-5 mm in 1690 sites (46.87%)
  - > 5 mm in 133 sites (3.69%)
- Attachment loss (Clinical attachment level - CAL):
  - 1 – 2 mm attachment loss sites in 1008 (27.95%);
  - 3 – 4 mm loss attachment sites in 1679 (46.56%)
  - > 5 mm loss attachment in 919 sites (25.49%)

The registration of the values of the selected parameters makes it possible to categorize the patients as having moderate chronic periodontitis. Less than one third of the sites showing advanced attachment loss were identified.

The results of the non-surgical therapy application are presented according to the principles of the registration status of patients with periodontal disease as follows:

ORAL HYGIENE STATUS
The study uses the hygiene index (HI) as a criterion for oral hygiene: this index is considered sufficiently objective and precise to estimate the amount of plaque, and demonstrative enough to motivate and instruct patients on oral hygiene principles and in
performing periodontal therapy. Two months after the end of therapy, the patients’ oral hygiene at the reassessment had mean values of HI - 51.9% (compare 13.9% measured at baseline) (Table 1). The increase of the mean values of the plaque-free surfaces by 38.0% in the survey period is statistically significant (p < 0.001), demonstrating the improvement of oral hygiene both in the course of the therapy and as its result.

**Gingival status**

At reassessment, after active mechanical treatment, the mean PBI, used to diagnose and monitor the severity of gingival inflammation, was 1.1 ± 0.82 (Table 1). The gingival inflammation index, which is obtained by estimating the bleeding on probing the gingival/periodontal pockets, is now considered sufficiently sensitive and well reproducible. The index is used to make an accurate differential diagnosis of gingival inflammation both by severity and distribution. This index allows an accurate assessment of healing results and a diagnosis of a relapse. The results obtained in the reassessment of the patients show a significant reduction in the severity of inflammation, which correlates with plaque reduction assessed by HI - when compared with the baseline value (2.31 ± 1.16) we found a significant reduction by 1.20 (52.4%) for the mean index (p < 0.001).

Table 1 presents the PBI distribution for the gingival inflammation before and after therapy. As a result of successful plaque control during the mechanical therapy in all patients, we achieved a significant reduction in the prevalence of gingival bleeding (PBI-distribution) - from 86.46% ± 11.57 in the assessment at baseline to 21.13% ± 7.28 at reassessment. A statistically significant reduction in bleeding sites by 65.31% (p < 0.001) was achieved, which corresponds to the increased plaque control with 38.0% plaque-free surfaces at reassessment (Table 1).

**Periodontal status**

Table 2 shows the periodontal pocket depth reduction and attachment gain after treatment. It presents the baseline distribution of shallow pockets (PD < 3 mm), the moderately deep pockets (PD = 3-5 mm) and areas with very deep pockets (PD > 5 mm) and the change in the distribution of pockets with different depths as a result of therapy. This can be

---

**Table 1.** Effectiveness of non-surgical treatment of chronic periodontitis by improving oral hygiene and reduction of inflammation

<table>
<thead>
<tr>
<th>Index</th>
<th>At baseline</th>
<th>At reassessment</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x ± SD</td>
<td>x ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HI (%)</td>
<td>13.9 ± 4.7</td>
<td>51.9 ± 8.6</td>
<td>16.76</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>PBI – Mean values</td>
<td>2.31 ± 1.16</td>
<td>1.1 ± 0.82</td>
<td>4.65</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>PBI – distribution (%)</td>
<td>86.46 ± 11.57</td>
<td>21.13 ± 7.28</td>
<td>26.13</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

**Table 2.** Effectiveness of non-surgical treatment of chronic periodontitis by periodontal pocket reduction and attachment gain

<table>
<thead>
<tr>
<th>Indices</th>
<th>At baseline</th>
<th>At reassessment</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% ± Sp</td>
<td>x ± SD (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PD &lt; 3 mm</td>
<td>49.45 ± 5.20</td>
<td>84.47 ± 6.43</td>
<td>32.75</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>PD 3-5 mm</td>
<td>46.80 ± 4.90</td>
<td>12.34 ± 4.74</td>
<td>27.79</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>PD &gt; 5 mm</td>
<td>3.69 ± 1.70</td>
<td>3.19 ± 1.3</td>
<td>1.25</td>
<td>&gt; 0.10</td>
</tr>
<tr>
<td>CAL 1-2 mm</td>
<td>27.95 ± 3.88</td>
<td>32.36 ± 6.87</td>
<td>3.06</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>CAL 3-4 mm</td>
<td>46.56 ± 5.38</td>
<td>52.11 ± 8.46</td>
<td>3.03</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>CAL &gt; 5 mm</td>
<td>25.49 ± 4.61</td>
<td>15.53 ± 2.26</td>
<td>10.60</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
used to assess the changes in the distribution of sites with small attachment loss (CAL between 1 and 2 mm), and sites with moderate attachment loss (CAL = 3-4 mm), the latter being the most common at baseline and the reason why the patients were classified as having moderate periodontitis, and sites with advanced attachment loss (CAL> 5 mm).

After completion of the non-surgical therapy, the pockets less than 3 mm deep were 3046 (84.47% ± 6.43); before the treatment they were 1783 (49.45% ± 5.20) out of total 3606 studied sites. The statistically significant increase by 35.00% ± 2.46 (p < 0.001) in the percentage of sites with the smallest depth on probing is evidently a result of the mechanical treatment; this finding shows how efficient this therapeutic approach is – it can be used as a measure of a stable periodontal status of patients. The number of dental sites with PD between 3 and 5 mm went down to 445 (12.34% ± 4.74) from the 1690 sites (46.80% ± 4.90) found at baseline, that is, a reduction by 34.46% ± 3.68 (p < 0.001). The PD > 5 mm sites decreased to 115 (3.19% ± 1.3) from the 133 sites (3.69% ± 1.70) before the therapy - a reduction by 50.0% ± 1.60, but the difference here failed to reach statistical significance (p > 0.10 ) (Table 2).

The changes in the relative levels of clinical attachment after the initial therapy are presented in Table 2. At reassessment we found that the number of sites with CAL of 1-2 mm increased [1008 sites (27.95% ± 3.88) before treatment and 1167 sites (32.36% ± 6.87) at reassessment], and the difference was statistically significant: 4.40% ± 2.89 (p < 0.01). The changes in the number of sites with CAL between 3 and 4 mm were small but statistically significant - from 1679 sites (46.56% ± 5.38) before treatment to 1879 sites (52.11% ± 8.46) after treatment - a change of 5.55% ± 3.41 (p < 0.01). The most pronounced changes occurred in the number of sites with CAL > 5 mm - they were 919 (25.49% ± 4.61) before treatment and 560 (15.53% ± 2.26) after treatment, and here the difference also reached statistical significance: 9.35% ± 2.67 (p < 0.001). Figure 1 presents the changes in the distribution of sites with CAL > 5 mm. Less demonstrative are the changes in the representation of sites with great depth (PD > 5 mm), probably due to the small initial distribution of these sites in the group. Statistically significant changes, however, are found in the distribution of sites with CAL > 5 mm, which indicate a more favorable course of recovery in the periodontal pockets (obtaining attachment gain due to the process of fibrosis in the pocket bottom) in comparison with reduction healing as a result of gingival retraction.

At the beginning of the therapy 3.69% ± 1.70 of all studied sites had a clinically measured depth of PD > 5 mm and 25.49% ± 4.61 of the sites had an attachment loss of more than 5 mm. The results show that the therapy we administered brought about the following changes: the periodontal pockets greater than 5 mm in depth measured at reassessment were 3.19% ± 1.3, which however could not reach statistical significance (p > 0.10) probably due to the small percentage of sites with the greatest depth. Attachment loss at reassessment of more than 5 mm was observed in 15.53% ± 2.26 of the sites: here we have a statistically significant reduction by 9.35% (p < 0.001).

The results we report here suggest that the nonsurgical therapeutic modality can be highly efficient in the treatment of moderate chronic periodontitis – it reduces the depth of periodontal pockets and gains clinical attachment. The clinical attachment gain we measured in this study is a clear indication that the periodontal structures become stable as a result of healing of the periodontal pocket bottom after conventional mechanical therapy, which is consistent with results published in the literature.5,7,8,24
DISCUSSION

A comparison of the results of the present study with data reported in the literature suggest clearly that nonsurgical therapy can be highly effective in managing dental plaque and gingival inflammation, with the exception of a small proportion of patients with chronic periodontitis who exhibit an unsatisfactory response to the initial therapy. We did not have patients in this study that had refractory periodontitis resistant to the conventional therapy.

This study confirms the data from the literature that nonsurgical treatment of chronic periodontitis is highly effective in controlling the causal factors, mostly the dental biofilm. The mean rate of reduction of the plaque index in the studied patients was 38%, which is an expression of the effectiveness of the mechanical treatment in raising the oral hygiene standard of the patients with chronic periodontitis during non-surgical therapy. The resultant reduction in plaque amount reflects the efficiency of both the professional plaque control and the patients’ personal efforts in the study period. Achieving an effective mode of plaque control for an extended period is the necessary condition for the occurrence of healing in the periodontal pocket and stability of periodontal status.

Periodontal pocket reduction is a major goal of any periodontal therapy because of the need to reduce the bacterial load associated with subgingival biofilm. Many studies have focused on the effectiveness of the mechanical treatment, as assessed by reduction of the periodontal pocket. The established statistically significant reduction in the percentage of sites with abnormal depth of the periodontal pocket at the end of this study clearly shows the effectiveness of non-surgical therapy. The residual distribution of sites with periodontal pockets can be a criterion for the effectiveness of the therapeutic approach on the one hand, and on the other hand can be accepted as a factor which may allow successful support to patients with chronic periodontitis after mechanical therapy. This study demonstrates a significant increase in small pocket depth at the expense of reducing the percentage of pockets with critical depth. These results indicate that, after the mechanical treatment, there was a substantial increase in the number of pockets with a depth similar to that of a normal gingival sulcus with a significant reduction in the number of pockets with pathological depth. The data could be interpreted as a non-surgical treatment option to reduce the need for resective therapeutic approaches to periodontal pockets. This fact is of great significance in moderate periodontitis, especially in the aesthetic field - a problem that is intensively discussed in the periodontal literature.

The reduction of periodontal pockets obtained in this study is comparable with the results published in the literature review on the effectiveness of mechanical therapy by Claffey N, et al. For example, in one of the referenced studies, a 2-year follow-up on 45 patients showed a mean reduction of 2-3 mm in pockets with the greatest depth, which means a change in the distribution of sites with different depths.

The values for the parameters of periodontitis obtained in this study mean that, as a result of the removal of supra-and subgingival plaque, of the control of retention factors and of the strict personal hygiene regime, healing periodontal pockets of patients with moderate chronic periodontitis has led to a coronary positioning of the level of the epithelial attachment – this is attachment gain. The data support the results published in the literature that the beneficial effects of healing periodontal pockets in nonsurgical periodontal therapy is performed by reducing the pocket depth as a result of the clinical attachment gain besides the retraction of gingiva due to the elimination of inflammation.

CONCLUSIONS

Non-surgical periodontal therapy in moderate periodontitis is an effective periodontal therapy. This therapeutic approach, which is a mandatory part of any periodontal treatment, is successful in reducing inflammation, pocket depth and leads to stability and/or certain gain in attachment level. Adequate non-surgical therapy requires a strict implementation of the procedures of scaling and root planning and is received well by the patients. The healing of periodontal tissue after the mechanical treatment, in many cases, can reduce the indications for surgical therapy of the pocket and alter the periodontal environment so as to keep the periodontal health in the long term.

REFERENCES