BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 22, Issue 1

DOI:10.58240/1829006X-2025.22.1-83

ORIGINAL RESEARCH

JUSTIFICATION FOR THE CHOICE OF NON-SURGICAL TREATMENT OF INFLAMMATORY PERIODONTAL DISEASES IN PATIENTS WITH PRIMARY HYPOTHYROIDISM

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Received: *Dec 17. 2025;* ***Accepted:*** *Dec 20, 2025;* ***Published:*** *Jan. 27, 2026*

ABSTRACT

Background: The high prevalence of inflammatory periodontal diseases, their prolonged course accompanied by periodic exacerbations, destructive consequences for the health of the dentition and jaws, which significantly impair the quality of life of patients and also have a proven negative impact on the condition of other organs and systems, encourage dentists to further study the etiological, pathogenetic and clinical features of these diseases and improve treatment methods.

Objective. The aim of this study is to investigate the effectiveness of the periodontal flow method for treating generalized periodontitis in patients with primary hypothyroidism.

Materials and methods: Fifty-one women aged 26-47 (mean age 38.9±1.2) with a confirmed diagnosis of primary hypothyroidism and under dispensary supervision by an endocrinologist, receiving appropriate replacement therapy, came to the dental medical center of the Bogomolets National Medical University for examination and treatment. The duration of hypothyroidism ranged from 4 to 10 years (mean 7.2±1.2). endocrinologist and receiving appropriate replacement therapy. Research methods: clinical, psychological, empirical (sociological), statistical analysis.

Results: After 6 months of observation, patients in both groups showed significant improvement in hygiene indices, PMA inflammation, PBI bleeding, PPD and PSR periodontal indicators compared to baseline at the time of initial examination ($p<0.05$). The OHI-S index after treatment in the main group averaged 0.73±0.1 points, and in the control group — 1.45±0.07 points, which corresponded to satisfactory hygiene, while it was 72.7% and 43.6% lower, respectively, compared to the baseline level ($p<0.05$).

Conclusion: With insufficient analysis or inattention to the details of local dental status and insufficient understanding of the peculiarities of the influence of general somatic pathology, standardized treatment methods may prove to be ineffective. In our opinion, the discussion should not focus on the goal of non-surgical treatment, as it is constant and not subject to debate. The discussion should focus on choosing the most optimal personalized method of removing biofilm, taking into account the characteristics introduced into the course of periodontitis by the concomitant pathology – primary hypothyroidism.

Keywords: periodontal diseases, oral hygiene, hypothyroidism, hygiene index, AIR-FLOW.

INTRODUCTION

The high prevalence of inflammatory periodontal diseases, their prolonged course accompanied by periodic exacerbations, destructive consequences for the health of the dentition and jaws, which significantly impair the quality of life of patients and also have a proven negative impact on the condition of other organs and systems, encourage dentists to further study the etiological, pathogenetic and clinical features of these diseases and improve treatment methods[1]. It should be noted that standard treatment methods do not always produce the desired lasting positive results, which may indicate that some important aspects of the pathogenesis of inflammatory periodontal diseases have not been taken into account. With insufficient analysis or inattention to the details of local dental status and insufficient understanding of the characteristics of the influence of general somatic

pathology, standardized treatment methods may prove to be ineffective[2]. When choosing treatment approaches, the scope and methods of intervention should be individualised as much as possible, taking into account the characteristics that the existing general somatic pathology brings to the pathogenesis and clinical course. If necessary, close interdisciplinary cooperation with general practitioners should be established [3].

Modern non-surgical treatment of inflammatory periodontal diseases involves certain stages or steps. According to the recommendations of the European Federation of Periodontology, the periodontist usually performs the first stage of treatment, which is to motivate the patient to achieve adequate individual oral hygiene, as well as to identify and correct those risk factors that may affect the course of periodontitis (systemic and local). The next step involves professional medical interventions aimed at completely removing, ideally, or significantly reducing the amount of biofilm and tartar. This stage may involve various methods, and more often today, a combination of several non-surgical methods aimed at eliminating the aetiological factors of inflammatory periodontal diseases[3].

In our opinion, the discussion should not focus on the goal of non-surgical treatment, as it is constant and not subject to debate, at least at the current stage of development of periodontology. The discussion should focus on choosing the most optimal personalised method of removing biofilm, taking into account the characteristics that concomitant pathology has brought to the course of periodontitis. And it is precisely the choice of the optimal method, or more often a combination of methods, that, in our opinion, should be considered by the doctor when treating patients with periodontitis against the background of primary hypothyroidism. The most atraumatic and gentle removal of biofilm and subgingival calculus should be the main task in such cases, taking into account the characteristics of periodontal tissues, which are extremely vulnerable to mechanical damage [4].

The use of the GBT protocol is promising, according to which the removal of supragingival and subgingival biofilm is performed using air and perioflow, and only then is tartar removed pointwise using an ultrasonic scaler without the use of hand instruments. The advantages of using this particular protocol, according to its proponents, include maximum caution in manipulating hard and soft tooth tissues, comfort for the patient and dentist, reduction of the professional hygiene procedure, and all of the above will be a motivating factor for regular repeat visits by the patient, which, in combination with rational individual hygiene, is the key to success in the treatment of inflammatory periodontal diseases. Erythritol, which is used for air and perioflow in this method, is the most finely dispersed of all powders for the air-perioflow procedure (granule size 14 μm)[5]. Therefore, the water-air-powder stream with erythritol is currently the least abrasive and has the selective ability to remove biofilm without damaging surrounding tissues.

AIM

The aim of this study is to investigate the effectiveness of the periodontal flow method for treating generalized periodontitis in patients with primary hypothyroidism.

MATERIALS AND METHODS

Fifty-one women aged 26-47 (mean age 38.9±1.2) with a confirmed diagnosis of primary hypothyroidism and under dispensary supervision by an endocrinologist, receiving appropriate replacement therapy, came to the dental medical center of the Bogomolets National Medical University for examination and treatment. The duration of hypothyroidism ranged from 4 to 10 years (mean 7.2±1.2). endocrinologist and receiving appropriate replacement therapy. The duration of hypothyroidism ranged from 4 to 10 years (average 7.2±1.1). All patients included in the study groups were representative in terms of gender, age, duration of primary hypothyroidism and periodontitis.

Inclusion criteria: voluntary informed consent to participate in the study; interest; absence of medical contraindications; absence of signs of acute or exacerbation of chronic somatic or infectious diseases. Exclusion criteria: previous surgical correction of frenulum and lateral ligament attachment; previous orthodontic treatment; smoking; alcohol abuse; drug use. Exceptions were cases of attachment loss that were not associated with generalised periodontitis but were caused by other factors, most often of traumatic origin (cervical carious cavities or poor-quality restorations in these areas, orthopedic and orthodontic structures that had a traumatic effect on periodontal tissues, etc.). Patients with grade III generalized periodontitis were also excluded from the study groups, which made it possible to focus exclusively on conservative treatment.

Patients complained of bleeding gums when brushing their teeth, loose teeth, unpleasant odor from the mouth, changes in the appearance of the gums, their colour and configuration, and sensitivity of the teeth to thermal and chemical irritants.

In clinical studies of patients in the main and control groups, attention was traditionally paid to the degree of periodontal support loss, which was reflected in the loss of periodontal attachment (CAL), the presence of gingival bleeding during instrumental examination (BOP), involvement of root furcations in the pathological process, the presence of gingival recession, and hygiene indicators. During X-ray examination, the degree of alveolar bone loss (RBL) was studied. Gingival thickness was assessed for each

tooth and classified as thick or thin biotype based on the probe transparency method. A periodontal probe was inserted into the sulcus in the anterior teeth of the upper jaw. If the contour of the probe could be seen through the gums, the biotype was classified as thin (score 0). If not, it was classified as thick (score 1). The P.D. Miller (1985) classification was used to determine the type of recession.

After periodontal screening and diagnosis, all patients were given an explanation of the problem with a visual demonstration of the results of the periodontal chart, a demonstration of a photo of pre-stained plaque with an explanation of the significance of this factor in the development of the disease, training in individual hygiene with the selection of products that are indicated in each specific case, and the need for regular periodontal examinations at individually determined intervals was demonstrated. All patients underwent professional oral hygiene using an ultrasonic scaler and AirFlow (glycine).

Patients were divided into two groups: in the first group (control group – 15 people), subgingival calculus and biofilm were removed from periodontal pockets mechanically (curettes), and in the second group (main group – 36 people) subgingival biofilm was removed with AIR-FLOW® Perio powder (erythritol, granule size 14 μm) in cases where the depth of the periodontal pocket was up to 4 mm, and subgingival tartar was removed using PIEZON® MASTER 700 (EMS, Switzerland).

Descriptive statistical methods included estimation of the arithmetic mean (M), mean error of the mean (m) for continuously distributed characteristics, and frequency of characteristics with discrete values. P – statistical significance of differences before treatment was determined using the Wilcoxon paired test and the Mann-Whitney U test for independent samples. A statistical difference between groups was considered significant at $p<0.05$.

RESULTS

The prevalence of periodontal diseases among patients in the main group was distributed as follows: 1 person (2.7%) – periodontal health and gingival health; 9 people (25.0%) – gingivitis: dental biofilm-induced; 11 persons (30.6%) – periodontitis I stage; 15 health persons (41.7%) – periodontitis II stage (Fig. 1).

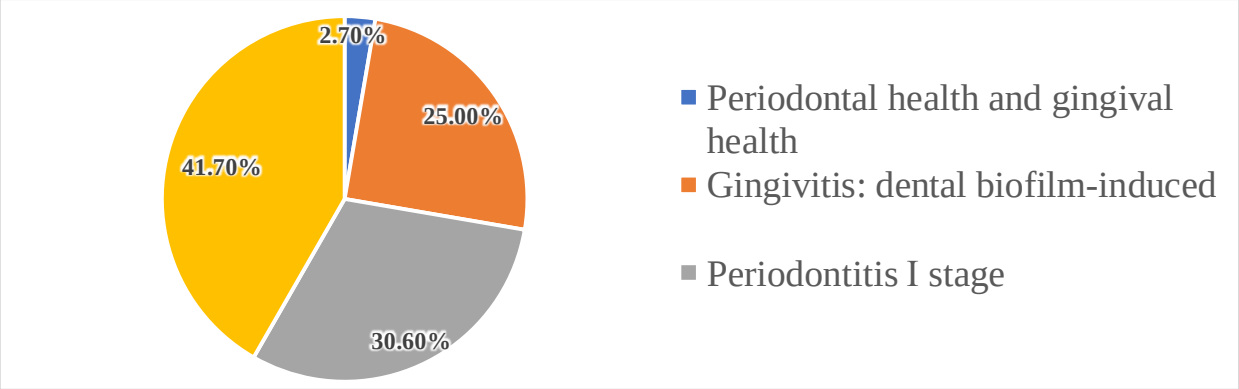

Figure1. Prevalence of periodontal diseases among patients in the main group.

The prevalence of periodontal diseases among patients in the control group was distributed as follows: 1 person (6.7%) – periodontal health and gingival health; 4 persons (26.7%) – gingivitis: dental biofilm-induced; 5 persons (33.3%) – periodontitis I stage; 5 persons (33.3%) – periodontitis II stage (Fig. 2).

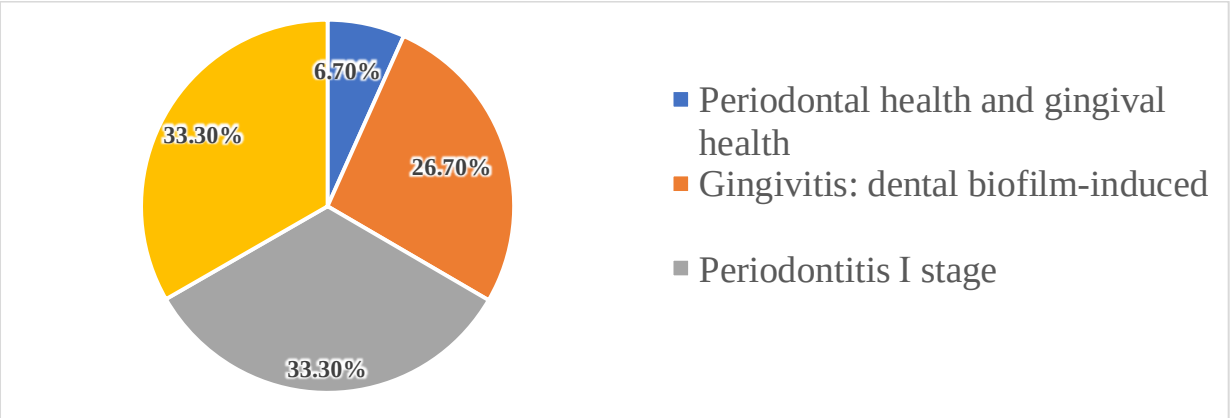

Figure 2. Prevalence of periodontal diseases among patients in the control group.

Before treatment, the OHI-S index in the main group was 2.68±0.12 points ($p<0.05$), and the Silness-Loe index was 2.67±0.09 points ($p<0.05$). These indicators correspond to a high level and unsatisfactory oral hygiene. The API index ranged from 89.4% to 100%, which corresponds to unsatisfactory interdental hygiene ($p<0.05$). In patients, the median value was 95.81%. The PMA index in patients was 46.3%, which corresponds to moderate periodontal tissue inflammation ($p<0.05$). The PBI index in patients was 1.44 points.

During periodontal screening, the periodontal probing depth (PPD) in patients was 3.29 mm. The PSR index code ranged from 0.83 to 2.8, with a mean of 2.45 in patients (Table 1). In patients of the control group, the OHI-S index was 2.57±0.87 points ($p<0.05$), Silness-Loe -- 2.5±0.03 points ($p<0.05$). These indicators correspond to a high level and poor oral hygiene. The API index ranged from 89.4% to 100%, which corresponds to poor interdental hygiene ($p<0.05$). In patients, the median value was 91.82%.

The PMA index in patients was 42.6%, which corresponds to moderate periodontal tissue inflammation ($p<0.05$). The PBI index in patients was 1.32 points. During periodontal screening, the periodontal probing depth (PPD) was 3.02 mm. The PSR index code ranged from 0.83 to 2.41 and was 2.25 (Table 1).

Table 1. Periodontal health indicators in patients in the main and control groups.

Indicators	Control group	Main group
Index OHI-S, scores	2,57±0,87 $^{@}p<0,05$	2,68±0,12 $^{@}p<0,05$
Index Silness-Loe, scores	2,5±0,03 $^{@}p<0,05$	2,67±0,09 $^{@}p<0,05$
Index API, %	91,82 $^{@}p<0,05$	95,81 $^{@}p<0,05$
Index PMA, %	42,6 $^{@}p<0,05$	46,3 $^{@}p<0,05$
Index PBI, scores	1,32 $^{@}p<0,05$	1,44 $^{@}p<0,05$
PPD, mm	3,02 $^{@}p<0,05$	3,29 $^{@}p<0,05$
PSR, code	2,25 $^{@}p<0,05$	2,45 $^{@}p<0,05$

Note: $^{@}$p – indicator of the probability of differences compared to the initial data.

The effectiveness of complex treatment of patients in the main and control groups in the near term was assessed based on an analysis of subjective and objective changes, clinical criteria of studies immediately after treatment and after 6 months. The results of the studies showed very positive changes in the indicators of the oral cavity condition in patients of the main group during the course of complex treatment.

The characteristics of Periodontal oral health status indicators in patients of the main and control groups 6 months after treatment are presented in Table 2.

Table 2. Periodontal oral health status in patients in the main and control groups 6 months after treatment.

Indicators	Control group	Main group
Index OHI-S, scores	0,73±0,1; @p<0,05	1,45±0,07; @p<0,05
Index API, %	54,8 @p<0,05	63,3; @p<0,05
Index PMA, %	10,4 @p<0,05	22,7; @p<0,05
Index PBI, scores	0,31 @p<0,05	0,59 @p<0,05
PPD, mm	1,03; @p<0,05	2,13; @p<0,05
PSR, scores	0,67@p<0,05	1,33; @p<0,05

Notes: @p – indicator of the likelihood of differences compared to the initial data.

After 6 months of observation, patients in both groups showed significant improvement in hygiene indices, PMA inflammation, PBI bleeding, PPD and PSR periodontal indicators compared to baseline at the time of initial examination ($p<0.05$). The OHI-S index after treatment in the main group averaged 0.73±0.1 points, and in the control group — 1.45±0.07 points, which corresponded to satisfactory hygiene, while it was 72.7% and 43.6% lower, respectively, compared to the baseline level ($p<0.05$) (Fig. 3). This indicator was fairly stable throughout the observation period. An additional motivational interview with a check of the patient's personal hygiene did not lead to a significant improvement, which is obviously associated with changes in the oral cavity against the background of thyroid hormone deficiency, namely changes in the salivary glands, which cause changes in the composition of saliva and dental plaque.

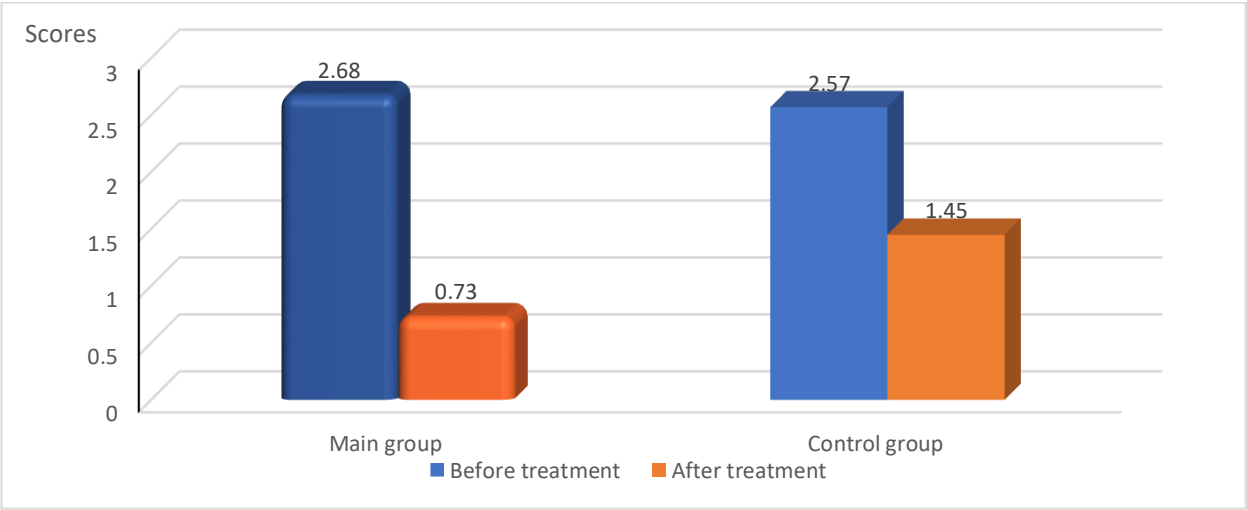

Figure 3. OHI-S index values in the control and main groups before and after treatment.

A reduction in inflammatory symptoms (gum bleeding, normalization of gum colour and texture, disappearance of unpleasant odor, pain during tooth brushing) occurred in both groups. However, the rate of improvement in the second group was faster, and at the follow-up visit, patients in the main group no longer had any complaints, while in the control group, there were complaints of tooth hypersensitivity (66%) and bleeding and pain in some areas. The PMA index showed positive dynamics in both groups and amounted to 22.7% in the control group and 10.4% in the main group ($p<0.05$) (Fig. 4). The worse PMA index values in the first group were due to the presence of isolated areas of inflammation in the gingival papillae and marginal gingiva in the lateral areas, which were clearly caused by mechanical damage with curettes due to the difficulty of access during the procedures.

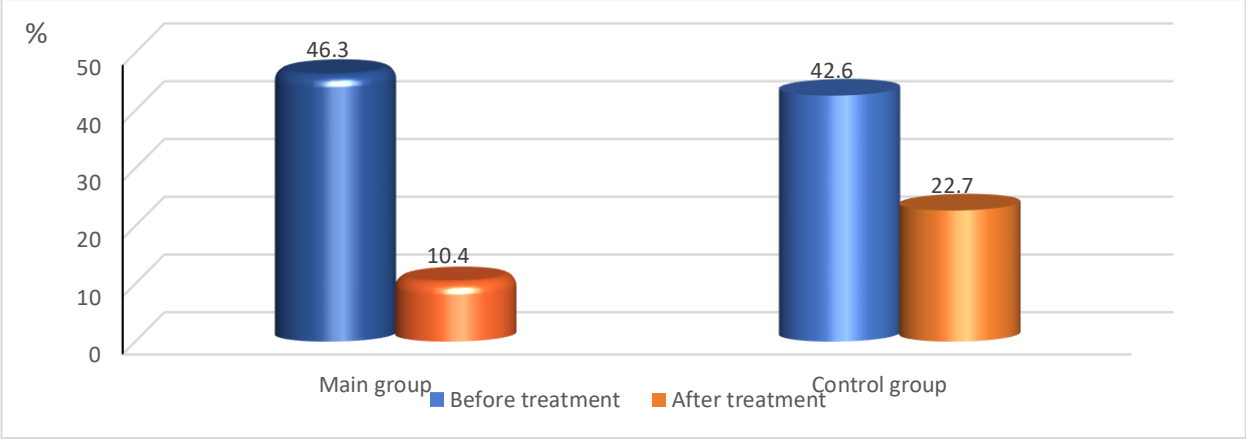

Figure 4. PMA index values in the control and main groups before and after treatment.

Analysis of patient surveys showed that treatment with AIR-FLOW, Piezon Master 400 and PERIO-FLOW was less painful — 2.1 times less (on a pain scale in the main group — 3.7±0.8 points, in the control group — 7.6±0.4 points) ($p<0.05$). Patients also noted an almost complete absence of unpleasant sensations during the rehabilitation period. These patients were more enthusiastic about the need for repeat visits to the periodontist, which is certainly a significant motivating factor

DISCUSSION

The assessment and discussion of the results of treatment of inflammatory periodontal diseases in the main and control groups were carried out in the context of modern concepts of the goals of non-surgical treatment of inflammatory periodontal diseases, which involve achieving the following points: destruction and removal of subgingival biofilm; removal of factors contributing to biofilm formation, primarily subgingival calculus; preservation of hard tooth tissue, which allows further complications and undesirable consequences to be avoided, taking into account regular procedures; creation of a biologically acceptable root surface that will prevent the formation of dental deposits and does not require the removal of tooth root cement; and as a result — reduction of inflammation due to the above points and control of biofilm formation through careful adherence to individual hygiene recommendations and regular periodontal preventive measures [4]. In addition, the effectiveness of treatment methods should be assessed taking into account the specific characteristics of periodontal tissue and hard tooth tissue caused by thyroid hormone deficiency, namely dystrophic changes in connective tissue structures, which unfortunately cannot be completely remedied by replacement therapy. These changes determine the clinical picture (gum recession, predominantly thin gum biotype, erosion of hard tooth tissue and pathological abrasion, hyperesthesia), weakness and inadequacy of reparative processes, and vulnerability to mechanical damaging factors [6].

The endocrine system plays an important role in regulating many physiological processes. Its most important functions include maintaining normal homeostasis and the body's adaptive and compensatory abilities [7,8]. Today, one of the most common diseases of the endocrine system is primary (thyroid) hypothyroidism, caused by damage to the thyroid gland itself. The effects of thyroid hormone deficiency are multifaceted and affect virtually all organs and systems of the body without exception [9]. In the heart, lungs, kidneys, and serous cavities, there is an increase in peripheral vascular resistance; hypercholesterolemia and hyperlipidemia develop, metabolic immunosuppression occurs, and functional disorders of the central nervous system arise [10]. One of the important pathological processes in thyroid hormone deficiency is typical changes in connective tissue caused by the accumulation of highly hydrophilic glycosaminoglycans (protein breakdown products) in the extravascular space. This is associated with the loss of inhibitory effects on the synthesis of hyaluronates, fibronectin and other collagen structures by fibroblasts, which leads to mucinous oedema of the connective tissue[11,12]. An excess of

glycosaminoglycans in the intercellular substance leads to an increase in the hydrophilicity and looseness of collagen fibers, as well as compression of cells, which leads to a disruption of their function, damage and, as a result, necrosis. Accordingly, dystrophic, atrophic and destructive changes are clinically observed in all parenchymal organs. As for periodontal tissues, especially in their connective tissue components, the colloidal structure changes [13-16]. Changes are observed in the epithelium, the lamina propria of the mucous membrane (mucinous edema of the stroma), in odontoblasts, pulp and periodontium. These changes can be classified as mostly dystrophic. Of particular note is the weakness and inadequacy of reparative processes and vulnerability to mechanical damaging factors [17]. In addition, numerous studies prove the direct influence of thyroid hormone deficiency on bone metabolism [18,19]. Clinically, the pathological changes described above are manifested in patients mainly by chronic periodontitis, less often by gingivitis, generalized gum recession, a predominance of thin gum biotype, erosion of hard tooth tissue and pathological abrasion. It has been proven that even minimal doses of L-thyroxine have a protective effect on the condition of periodontal tissues. Therefore, replacement therapy prescribed and dynamically adjusted by endocrinologists for primary hypothyroidism has a positive effect on the clinical situation with regard to inflammatory periodontal diseases, although, unfortunately, the damaged structures are not restored [20].

Instrumental treatment of the periodontal pocket and tooth root surface is aimed at normalizing the subgingival microbiota and, as a result, eliminating inflammation in the periodontal tissues. Unfortunately, complete removal of biofilm from the periodontal pocket remains an unattainable dream at the current stage of medical development, and neither instrumental nor pharmacological methods, nor a combination of both, provide 100% results [4,5]. However, after intervention and provided that the patient follows all recommendations for individual hygiene, it is possible to reduce the microbial load on periodontal tissues to a minimum (subthreshold) level, which will allow the human body to cope with the residual infection and stop the inflammatory process using its own immune reserves. The main clinical signs of successful removal of biofilm and subgingival calculus are the absence of gum inflammation and bleeding during probing and a reduction in the depth of the periodontal pocket. Traditionally, non-surgical treatment of periodontitis includes SRP as the main stage (SRP is also performed as the first and necessary stage before further surgical treatment of GP), thanks to which biofilm, subgingival mineralized deposits and infected altered tooth root cementum are removed. Various means can be used to achieve this [4]. This stage can be performed with hand instruments, sonic and ultrasonic devices, air-powder devices, and lasers, or a combination of several methods. Experts' opinions on the advantages of one method or another, or options for combining them, vary.

The comparative assessments of the results of traditional instrumental and modern hardware methods of treating inflammatory periodontal diseases allowed us to conclude that the latter are superior in some significant parameters. Objective data on hygienic and periodontal indices and clinical indicators of healing processes in the early stages of observation (up to 4 weeks) show that the use of Piezon Master 400 and AIR-FLOW® Perio (erythritol granule size 14 μm) for biofilm removal provides qualitative and quantitative benefits of the therapy for both the doctor and the patient. Faster regeneration, positive patient feedback related to the painlessness and overall comfort of the procedures, and savings in time and effort for the dentist confirm the advantages of AIR-FLOW® Perio and allow us to recommend this technique as an effective method for the comprehensive treatment of inflammatory periodontal diseases against the background of primary hypothyroidism.

CONCLUSIONS

1. With insufficient analysis or inattention to the details of local dental status and insufficient understanding of the peculiarities of the influence of general somatic pathology, standardized treatment methods may prove to be ineffective.

2. In our opinion, the discussion should not focus on the goal of non-surgical treatment, as it is constant and not subject to debate. The discussion should focus on choosing the most optimal personalized method of removing biofilm, taking into account the characteristics introduced into the course of periodontitis by the concomitant pathology – primary hypothyroidism.

3. In such cases, the main task should be the most atraumatic and gentle removal of biofilm and subgingival calculus, taking into account the characteristics of periodontal tissues, which are extremely vulnerable to mechanical damage.

4. The results of studies of the condition of periodontal tissues after treatment demonstrate a significant reduction in patient complaints, elimination of signs of inflammatory processes, and a reduction in the depth of periodontal pockets.

5. AIR-FLOW® Perio technology (erythritol granule size 14 μm) painlessly and effectively removes biofilm in hard-to-reach areas without traumatizing soft tissues or damaging tooth structure,

i.e. it is minimally traumatic, which is especially important in cases where inflammatory periodontal diseases occur against a background of thyroid hormone deficiency.

6. This protocol is effective for both therapeutic and prophylactic purposes and can be used in patients with implants, orthopedic and orthodontic structures.

DECLARATION

Conflicts of interest and financial disclosures

The author declares that he has no conflict percent and there was no external source of funding for the research in question.

Ethical approval

The study was approved by the Institutional Ethics Committee and was conducted in accordance with the Declaration of the World Medical Association.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Source of funding

The work was not funded.

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