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Smoking Cessation and Periodontal Health: Recovery after Tobacco Addiction

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Annotation: This study was aimed at assessing the effect of quitting smoking traditional and electronic cigarettes on the condition of periodontal tissues and functional indicators of the salivary glands. The study involved 82 patients with chronic generalized periodontitis. Patients were divided into 3 groups: smokers of traditional cigarettes, smokers of electronic cigarettes and non-smokers. All patients underwent comprehensive treatment of periodontal diseases using “SPLAT” hygiene products . The groups of smokers were divided into subgroups depending on whether they quit smoking or continued to use tobacco products.

The gingival bleeding index, periodontal pocket depth, periodontal index and salivary flow rate were assessed. The results showed that patients who quit smoking traditional or e-cigarettes had a statistically significant reduction in the intensity of gingival bleeding, a decrease in the depth of periodontal pockets and an improvement in periodontal index scores compared to those who continued to smoke. In addition, quitting smoking contributed to the normalization of the secretory activity of the salivary glands.

Thus, comprehensive treatment of periodontal diseases using “SPLAT” hygiene products in combination with smoking cessation is an effective approach to achieve stable remission and improve oral health. Quitting smoking is important in the prevention and treatment of inflammatory periodontal diseases.

Introduction. Smoking is a unique modifiable risk factor for the development of many serious diseases, such as cardiovascular diseases, chronic obstructive pulmonary disease (COPD), malignancies and other chronic non-communicable diseases. Scientific research shows that quitting smoking significantly reduces the risk of death from cardiovascular disease, reducing it by 50%. In comparison, chronic use of antihypertensive drugs reduces this risk by only 25-35%, and the use of statins by 25-42% [2,5,18,21].

Many people, especially young people, have misconceptions about smoking, often due to lack of information about its harms and the influence of tobacco company marketing. Here are some common myths about smoking [3,6,10,12]:

Myth 1: “When smoking a pipe, a person does not inhale smoke into the lungs, so the risk of cancer is low.” Disclaimer: Although smoking a pipe does not actually inhale smoke into the lungs, it does not reduce the risk of cancer. In fact, the risk of developing cancer of the mouth, pharynx, esophagus and stomach is significantly higher with pipe smoking than with cigarette smoking. Research shows that pipe smoking increases the risk of upper gastrointestinal cancer by 8.7 times, oral and pharynx cancer by 12.6 times, and esophageal cancer by 7.2 times.

Myth 2: “Hookah is not harmful to health.” Disclaimer: Research shows that hookah can be just as dangerous as cigarettes, if not more so. When smoking a hookah, a person takes from 50 to 200 puffs, which corresponds to smoking about 100 cigarettes. One hookah refill contains an average of 6.25 mg of nicotine, while one cigarette contains 0.8 mg. In addition, during the long process of hookah smoking, when the temperature of the coal reaches about 600°C, carbon monoxide enters the lungs 40 times more than when smoking cigarettes, which can cause burns to the respiratory tract.

Myth 3: "If you have been smoking for a long time, there is no point in quitting" or "Giving up cigarettes after many years of smoking is too much stress." Disclaimer: Even after years of smoking, quitting tobacco brings significant health benefits. Within 2 days after stopping smoking, taste and olfactory functions are restored, and after 3 months blood circulation and respiratory function improve. After 5 years, the risk of myocardial infarction is reduced by 2 times compared to those who continue to smoke, and after 10 years, the risk of developing lung cancer decreases by 30-50%.

Myth 4: "Smoking tobacco helps relieve anxiety and reduce stress." Disclaimer: In fact, the feeling of relief associated with smoking is not caused by stress reduction, but by nicotine addiction. Nicotine stimulates the production of dopamine, causing a temporary feeling of pleasure. Over time, the number of nicotinic receptors increases, which requires more and more cigarettes to achieve the same level of satisfaction, exacerbating stress and irritability. People who smoke experience higher levels of stress in stressful situations compared to non-smokers.

Myth 5: "A woman with a thin cigarette looks elegant." Disclaimer: In fact, smoking can seriously affect your health and appearance. Women who smoke lose an average of 14.5 years of life and their skin ages faster, becoming grayish in color and wrinkled. In addition, smoking during pregnancy is associated with the risk of infertility, pregnancy complications and harm to the baby's health. Smoking affects the health of the unborn baby, increasing the risk of congenital diseases and breathing problems in the newborn.

Myth 6: "If you quit smoking, you will get fat." Disclaimer: Weight gain after quitting smoking is not related to the refusal itself, but with a change in habits and an increase in appetite. When you stop smoking, your sense of taste and smell is restored, which can increase your appetite. However, with the right approach, including medication and behavioral therapy, this effect can be controlled and minimized.

Smoking requires not only financial costs, but also a significant amount of time. If smoking one cigarette takes 5 minutes, and a person smokes 20 cigarettes a day, this leads to the following time costs:

- **For 1 day**: 5 minutes × 20 cigarettes = 100 minutes (or 1 hour 40 minutes).
- **For 1 month**: 100 minutes × 30 days = 3000 minutes, which is 50 hours.
- **For 1 year**: 50 hours × 12 months = 600 hours, or 37.5 days.
- If we consider a long period:
- **Over 20 years**: 600 hours × 20 years = 12,000 hours, which is equivalent to 750 days (or 2.9 years) of continuous time.
- **Over 40 years**: 12,000 hours x 2 = 24,000 hours, which is 1,500 days (or 5.8 years) of continuous time.

Thus, smoking takes up a significant amount of time throughout one's life that could be spent on more productive and enjoyable activities.

However, one of the most often ignored aspects of the harm of smoking is its impact on the oral cavity and periodontium. The harmful effects of smoking on the human body are well known to the medical community. However, due attention is not always paid to the fact that smoking has a serious negative effect on the tissues of the oral cavity [1,9,10,17,19]

By their location, the organs and mucous membranes of the oral cavity are first exposed to the toxic and carcinogenic components of tobacco smoke. This creates the preconditions for the development of a wide range of pathological processes in this area [3, 5,7,11,13].

Smoking causes damage and inflammation of the oral mucosa, changing its color and texture. Under the influence of harmful substances from tobacco, the microflora of the oral cavity is disrupted, which contributes to an increase in the number of opportunistic bacteria. All this increases the risk of the

occurrence and progression of dental diseases such as periodontitis, caries, leukoplakia and even oncological lesions [4, 6,8,14].

Numerous studies confirm that smoking has a negative impact on the function of the salivary glands and the quality of saliva. Under the influence of harmful substances contained in cigarette smoke, the protective macromolecules, enzymes and proteins of saliva are damaged, which reduces its protective properties. This contributes to the development of pathological processes in the oral cavity, including cancer [1,5,12,14].

Unfortunately, many smokers underestimate the harmful impact of their bad habit on the oral cavity condition [1,15,16,20]. Increasing public awareness of this problem is an important task for healthcare professionals. In this regard, an integrated approach to the prevention of diseases associated with smoking, based on early diagnosis and timely application of measures to stop or prevent tobacco consumption, is of particular relevance.

Purpose of the study: to evaluate the dynamics of the periodontal condition of patients after quitting smoking to justify the effectiveness of measures for the prevention and treatment of periodontal diseases associated with tobacco addiction.

Materials and methods. The studies were conducted in 2022-2024. on the basis of the Department of Propaedeutics of Therapeutic Dentistry of the Tashkent State Dental Institute and the Andijan State Medical Institute. The study included 82 tobacco-dependent patients with infectious periodontal pathology, who, depending on smoking experience and type, were randomly divided into 3 groups. Group 1 consisted of patients who used cigarettes - 40 people, Group 2 - patients who used electronic cigarettes - 32 people, and Group 3 - 10 people who used vapes. All patients underwent clinical, radiological and statistical research methods. The average age of the patients was 30±0.6 years.

In patients with various types of smoking, preventive measures were carried out aimed at a phased cessation of smoking, which has a beneficial effect on the condition of the periodontium:

1. Primary examination:

- ✓ assessment of the type and degree of nicotine addiction (Fagerström test);
- ✓ determination of the speed of unstimulated salivation;
- ✓ clinical examination of the condition of the oral cavity and periodontium.

2. First stage (1-4 weeks):

- ✓ For smokers of standard cigarettes:
- ✓ replacing cigarettes with nicotine-containing substitutes (chewing gum, patches);
- ✓ monitoring the rate of salivation.
- ✓ For e-cigarette users:
- ✓ gradual reduction in the strength of the vape liquid
- ✓ monitoring of salivation rate;
- ✓ dental observation, professional oral hygiene;
- ✓ motivational support for the patient, counseling on a healthy lifestyle.

3. Second stage (4-8 weeks):

- ✓ For smokers of standard cigarettes:
- ✓ gradual reduction in the dose of nicotine in substitutes;
- ✓ control of salivation rate and periodontal condition;
- ✓ For e-cigarette users:

- ✓ complete cessation of electronic cigarettes;
- ✓ dynamic monitoring of the periodontal condition;
- ✓ professional oral hygiene, if necessary - periodontal treatment

4. Third stage (8-12 weeks):

- ✓ complete refusal of nicotine-containing substitutes;
- ✓ assessment of restoration of the secretory function of the salivary glands;
- ✓ control examinations and professional hygiene;
- ✓ consolidation of smoking cessation, prevention of relapse.

This step-by-step scheme will allow you to smoothly reduce nicotine addiction, minimizing the negative impact on the periodontal condition. Dental monitoring and support for the patient at all stages will contribute to successful smoking cessation.

Gingival bleeding was determined using the method of H.P.Muhlemawn, S.Son. (SBI) (1971), tooth mobility was determined according to N.F.Danilevsky (1998), the depth of the periodontal pocket was determined using a special graduated probe, when assessing oral hygiene was used the Green-Vermilion index (OHI-S) (G.Green, I.R.Vermillion 1964), to assess the state of the inflammatory-destructive process in the periodontium was used the Periodontal Index (Russel A., 1956), the extent and severity of inflammation in the periodontium was judged by papillary-marginal alveolar index (PMA) according to Parma K. (1960), studied the prevalence of caries CFE (caries prevalence index) according to WHO , Clinical visual examination and a survey to determine the main complaints and anamnesis was conducted to investigate the condition of oral cavity mucosa in patients.To study the rate of salivation in patients, saliva was collected on an empty stomach or at least 2 hours after a meal, and the rate of salivation was determined in ml/min. Additionally, a study was conducted of the rate of unstimulated salivation over time (before smoking, 15, 30, 45 and 60 minutes after smoking/using e-cigarettes and vapes).

For statistical processing, parametric (average value, error of the average value M+m, Student's t distribution, probability of differences P) and nonparametric processing of results were used. When statistically processing the results, the computer program Excel for Microsoft was used.

Results and discussion. Among cigarette smokers, one of the most common complaints before treatment was chronic cough with sputum production. Smokers also reported symptoms such as shortness of breath, pain or discomfort in the chest, especially during physical activity, as well as deterioration of the sense of smell and taste, bad breath, discoloration of teeth and the appearance of dense dental plaque. There were also pains experienced while eating and talking, as well as speech impairment, viscous and cloudy saliva, bleeding gums and strong mobility of the teeth.

In addition to complaints associated with generalized periodontitis, this group of smokers also had other symptoms. A significant proportion of patients (75-80%) complained of paresthesia in the oral cavity and taste distortions, expressed in a decrease in taste sensitivity to sweet, salty and, to a lesser extent, to sour.

During an objective examination, characteristic signs of periodontal inflammation were observed - a swollen, brightly colored gingival margin with a cyanotic tint easily bleeding during probing. The phenomena of congestive hyperemia of the interdental marginal and part of the alveolar gums, abundant supra- and subgingival dental deposits from periodontal pockets were determined. The teeth were significantly mobile and easily moved, although the degree of mobility did not correspond to the depth of the periodontal pockets. The teeth were colored from light brown to dark, depending on the length of smoking.

Patients using electronic cigarettes and vapes had less severe complaints. Despite popular belief that e-cigarettes and vapes are safer alternatives to traditional smoking, research shows that their use is also associated with a number of negative health effects.

Users of electronic nicotine delivery systems often complained of irritation of the upper respiratory tract, headache, dizziness, and nausea. Cases of pulmonary disease have been reported with the use of these devices.

Data on the oral health of e-cigarette and vape users showed that they had problems with dry mouth mucosa and tongue, which was caused by the action of the steam and the chemicals contained in it. This led to the appearance of painful ulcers, stomatitis and glossitis.

The results of studying clinical indicators of periodontal condition in patients with types of smoking, depending on age, are presented in Table 1.

As can be seen from Figure 1, individuals with an intact periodontium have spontaneous bleeding of the gums that is not related to inflammation (injury to the alveolar gum). Intergroup differences in the intensity of bleeding were established: in patients of group 1 it was 2.38 ± 0.02, in patients of groups 2 and 3 the indicators did not have intergroup differences, since the bleeding indicator in group 2 was 1.04 ± 0.0 2 points, in group 3 1.04 ±0.0 3 points (P<0.05).

At the same time, a high dental mobility score was established for patients with 1 group 4,23 0.03 points, which corresponded to the displacement of the teeth in the vestibulooral and mediodital directions of more than 1 mm, as well as the displacement of the teeth in all directions**.**

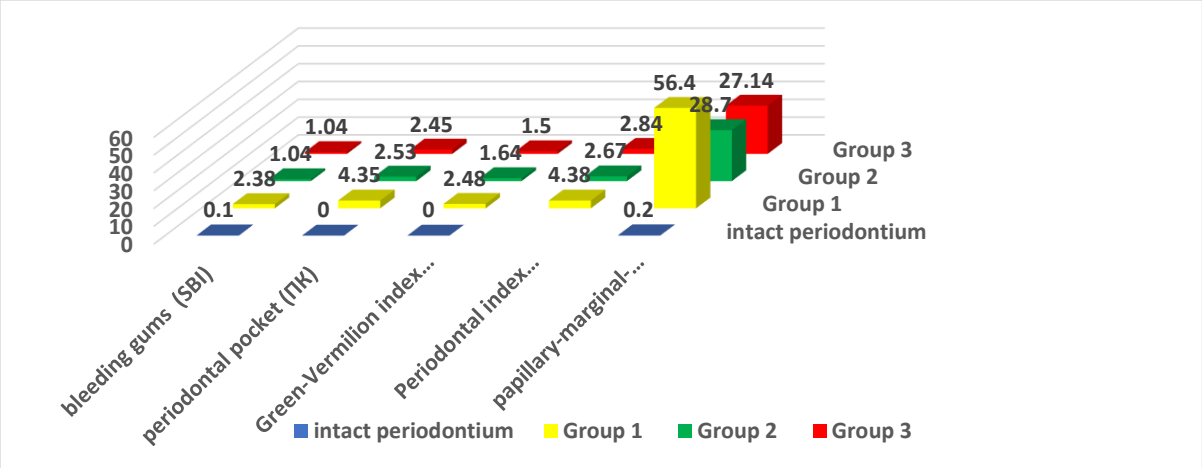

Figure 1. Score assessment of index indicators of destructive-inflammatory periodontal disease in patients with different types of smoking

Intergroup differences in the intensity of tooth mobility were established: in patients of group 1 it was 4.38 ± 0.02, in patients in groups 2 and 3 the indicators did not have intergroup differences, since the index of tooth mobility in group 2 was 2.54 ± 0.0 2 points, in group 3 2.48 ±0.0 3 points (P<0.05).

The results of the study of the depth of the PC showed that the depth of the periodontal pocket, according to the applied scoring scale in the studied groups of patients, ranged from 4.35±0.17; 2.53 ±0.0 2; 2.45 ± 0.23 (P<0.05) points, which corresponded to group 1 patients having moderate severity of periodontitis. Indicators of groups 2 and 3 indicated a mild severity of the inflammatory process in the periodontium.

When studying oral hygiene, it was found that the OHI - S scores were high in group 1 of patients, which indicated the poor condition of the patients' oral cavity. In 3 groups of patients, the indicators ranged from 2.48±0.01; 1.64 ±0.0 2; 1.50 ±0.1 9 (P <0.05). In patients in groups 2 and 3, the indicators were identical, which indicated an unsatisfactory condition of the oral cavity.

The overall severity of inflammatory-destructive periodontal disease according to the PI index according to the point scale we adopted was 4.38±0.02 points. In the studied groups of patients, the value of the PI index was determined at levels of 4.38±0.02; 2.67 ±0.0 2; 2.84 ±0.0 5 (P<0.05).

The scores we obtained for clinical manifestations in patients who smoke cigarettes are consistent with the literature data on the severe and aggressive course of generalized periodontitis caused by smoking. Clinical indicators of users of electronic cigarettes and vapes indicate a mild severity of inflammatory processes in the periodontium.

At the same time, a detailed assessment of the clinical manifestations of generalized periodontitis and their assessment in points allowed for an intergroup comparison of the studied indicators and to establish the heterogeneity of the clinical manifestations of generalized periodontitis in the compared groups.

The radiological picture was expressed more in patients of 1 group. The leading radiological signs of periodontitis in patients were the disappearance of the cortical plate and the appearance of osteoporosis, the presence of various destructive changes in the bone tissue of the alveolar process.

In smokers, the rate of salivation immediately after smoking was 0.73±0.01 ml/min, after 15 minutes - 1.23±0.02 ml/min, after 30 minutes - 1.02±0.16 ml/min, after 45 minutes - 0.81±0.01 ml/min, after 60 minutes - 0.62±0.008 ml/min. In e-cigarette users, the rate of salivation immediately after smoking was 0.77±0.01 ml/min, after 15 minutes - 1.26±0.01 ml/min, after 30 minutes - 1.09±0.01 ml/min , after 45 minutes - 0.84±0.02 ml/min, after 60 minutes - 0.64±0.01 ml/min. Smokers in both groups showed a significant increase in salivary flow rate 15 minutes after smoking/using an e-cigarette (P<0.001). After 60 minutes, the indicators tended to return to their original values.

All groups of patients underwent complete sanitation of patients, recommendations were given for quitting smoking, training in oral hygiene and consultations on the use of additional hygiene products were provided.

As part of this study, dental rehabilitation of patients with periodontal diseases was carried out. At the first stage, patients were prescribed “SPLAT Blackwood” toothpaste, which has a whitening and refreshing effect due to the content of juniper extract. After the course of treatment, patients switched to using “SPLAT Professional Active” toothpaste, aimed at the comprehensive restoration of periodontal tissue. The “SPLAT ULTRA COMPLETE” line of brushes was used as a means of mechanical cleaning, providing thorough cleaning and a gentle effect on the tissues of the oral cavity.

To assess the effectiveness of the measures taken, patients were re-examined after 6 months, which included a clinical examination, determination of hygienic and periodontal indices.

Analysis of the data obtained demonstrated a statistically significant improvement in periodontal condition in all groups of patients. Thus, in group 1, the intensity of gum bleeding decreased by 1.0 points, amounting to 1.38±0.02. In groups 2 and 3, this indicator reached 0.88±0.02 and 0.82±0.03 points, respectively (P<0.05).

The results of the study of PC depth showed changes within 2.45±0.17; 2.23 ±0.0 2;2.15 ± 0.23 (P<0.05) points.

When studying oral hygiene, changes in group 1 were found to be 1.67 ± 0.02, while in groups 2 and 3 its values were identical and amounted to 0.98 ± 0.02 and 1.20 ± 0 .19 points, which indicates a satisfactory condition of periodontal tissues (P<0.05).

Similar dynamics were observed in the PI index, which in the 1st group was 2.38±0.02, and in the 2nd and 3rd groups decreased to 2.17±0.02 and 2.14±0.05 points accordingly (P<0.05).

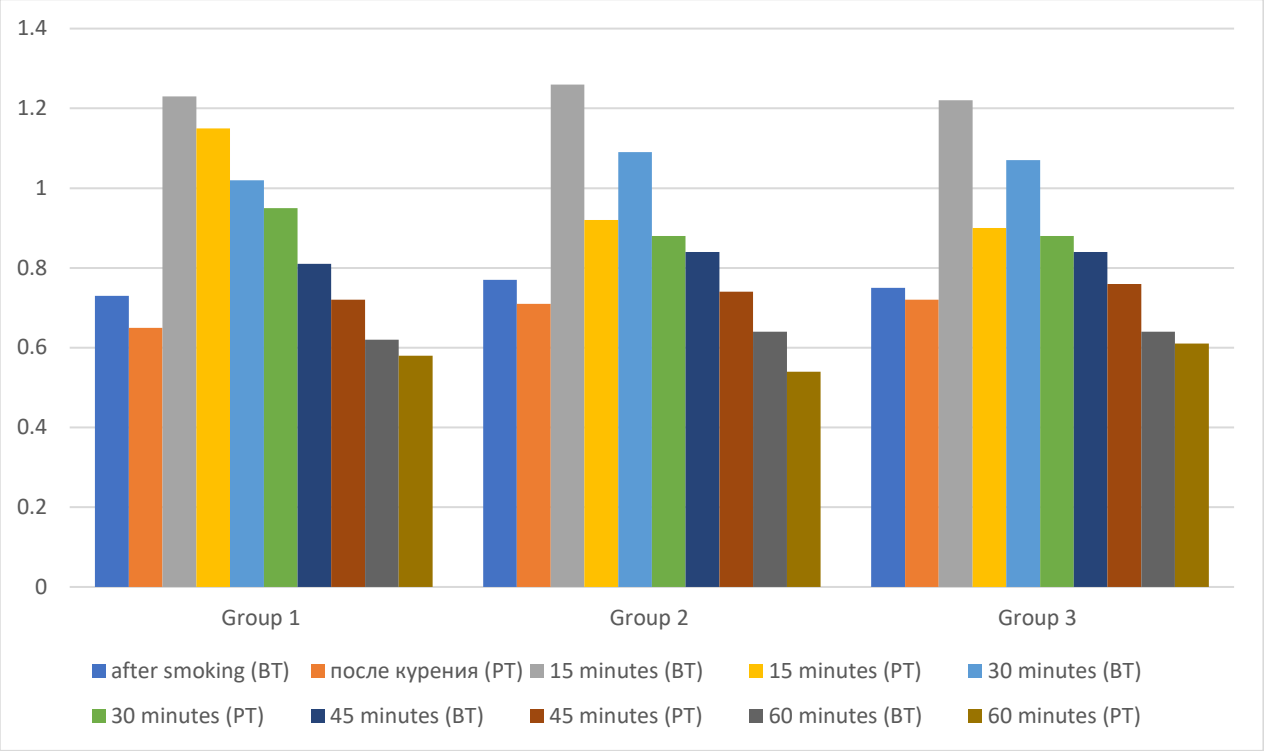

Figure 2. State of salivary flow rate before and after treatment in patients with different types of smoking

After 6 months of quitting smoking, patients in both groups showed a significant improvement in salivary performance. Thus, in cigarette smokers, the salivation rate immediately after quitting tobacco averaged 0.65±0.02 ml/min, reaching a peak of 1.15±0.03 ml/min after 15 minutes and decreasing to 0.55±0. 01 ml/min at the end of the hour. For e-cigarette users, similar rates were 0.71±0.01, 1.92±0.02 and 0.54±0.01 ml/min, respectively (Figure 2). The study demonstrated that quitting smoking, both traditional and electronic cigarettes, leads to a gradual restoration of the function of the salivary glands and normalization of the rate of salivation. Salivation rates in patients of both groups were almost equal to the level of non-smokers, which indicates the body's high ability to regenerate when exposure to tobacco smoke ceases. These results indicate the importance of motivating smokers to quit smoking to improve oral health.

Conclusion. A comprehensive study has demonstrated significant positive changes in the condition of periodontal tissues and functional indicators of the salivary glands in patients after quitting smoking traditional cigarettes, electronic cigarettes and vapes.

The use of oral hygiene products from the "SPLAT" line in combination with professional dental procedures provided a statistically significant reduction in the intensity of gum bleeding, a decrease in the depth of periodontal pockets and an improvement in the periodontal index. These changes were more pronounced in groups where patients stopped smoking compared to those who continued to use tobacco products.

In addition, quitting smoking contributed to the normalization of the secretory activity of the salivary glands. In patients who quit smoking, the rate of salivation was restored to a level close to that of non-smokers. This fact indicates the body's high ability to regenerate when eliminating the negative effects of tobacco smoke.

Thus, comprehensive treatment of periodontal diseases using "SPLAT" hygiene products in combination with smoking cessation is an effective approach to achieve stable remission and improve oral health. The results obtained highlight the importance of motivating smokers to quit smoking for the prevention and treatment of inflammatory periodontal diseases.

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