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# THE EFFECT OF NICOTINE WITHDRAWAL ON HYGIENE AND ORAL HEALTH

# WPŁYW ABSTYNENCJI TYTONIOWEJ NA HIGIENĘ I ZDROWIE JAMY USTNEJ

**Agnieszka Markowska-Dyner**

**Streszczenie:** W niniejszym artykule zwrócono uwagą na wpływ abstynencji tytoniowej na higienę i zdrowie jamy ustnej. Przedstawiono wnioski podjętego tematu oraz wyniki analizy higieny i zdrowia jamy ustnej pacjenta jednego ze śląskich gabinetów stomatologicznych, który został objęty programem abstynencji nikotynowej. Choroba przyzębia, która często towarzyszy paleniu papierosów, bywa również przyczyną wielu innych dolegliwości, których skutki zagrażają zdrowiu a nawet życiu człowieka. Artykuł podkreśla znaczenie abstynencji tytoniowej w utrzymaniu odpowiedniej higieny i zdrowia nie tylko jamy ustnej, ale i całego organizmu.

## Abstract

**Introduction and purpose of the work.** There are many reports in the literature about the negative impact of smoking on oral hygiene and health. Periodontal disease, which most often occurs in smokers, is also a source of many other ailments that determine the health of a person. The nicotine withdrawal is observed in smokers in relation to hygiene and oral health. The process of nicotine withdrawal is long-lasting but brings tangible results, both in the aspect of hygiene and oral health. The aim of this work is to present the effects of nicotine withdrawal in individual stages of its process.

**State of knowledge.** According to numerous reports, smoking is one of the most important factors threatening the health of people in highly developed countries. It is a medical, social, moral and economic problem. Epidemiological data indicate that in Poland, 9 million people smoke cigarettes. In the world, active tobacco smokers are over 1 billion. It turns out that smoking kills as many as 5.8 million people around the world. Estimates indicate that this number could reach up to 8 million in 2030 [1, 2]. The Ministry of Health in

Poland calculated, that as a result of the tobacco addiction, up to 67,000 Poles die each year, e.g. only lung cancer caused by smoking kills about 20,000 people a year[3].In the light of the study carried out by TNS Polska for the Chief Sanitary Inspectorate, one in four Poles after the age of 15 is a smoker, and the number of smokers is decreasing every year. The epidemiological studies have demonstrated the significant effect of smoking on the oral cavity and the development of periodontal disease. At the same time, the literature of the subject have indicated the measurable effects of nicotine withdrawal - reducing the negative effects on oral health. In the short-term assessment, the negative effects reduction is rather more visible for society and the former smoker - namely the lack of unpleasant smell from the mouth, as well as the smell of clothes and hair, or the improvement of taste and smell. In the case of prolonged nicotine abstinence, there is a reduction in the risk of periodontal disease and mucous membrane diseases. Long-term discontinuation of smoking may cause significant improvement in periodontium and contribute to the regression of pathological lesions on the oral mucosa, as well as the lack of further progression of diseases resulting from smoking addiction.

**Summary.** The literature on the subject as well as the results of analyzes carried out in dental offices confirm that there is a measurable benefit to oral health through the use of nicotine withdrawal. Each stage characterized by a period of abstinence has benefits that cause the negative effects of smoking to regress. It is obvious that the patient's commitment and compliance with the dentist's instructions regarding the pharmacological support of the entire process, but also all preventive measures is very important.

**Słowa klucze:zdrowie, abstynencja nikotynowa, choroba przyzębia.**

**Keywords: health, nicotine withdrawal, periodontal disease.**

## INTRODUCTION

According to numerous reports, smoking is one of the dominant factors that pose a threat to illness and increases the risk of premature death - this problem mainly affects the society in highly developed countries. It is a medical, social, moral and economic problem. Epidemiological data indicate that in Poland, 9 million active smokers. In the world, active tobacco smokers are over 1 billion. It turns out that smoking kills as many as 5.8 million people around the world. Estimates indicate that this number could reach up to 8 million in 2030 [1, 2]. Based on the data of the Ministry of Health in Poland, as a result of smoking, up to 67 thousand Poles die - while lung cancer (recognized as a disease caused by smoking) kills an average of 20,000 people each year [3]. In the light of the study carried out by TNS Polska for the Chief Sanitary Inspectorate, one in four Poles after the age of 15 is a smoker, and the number of smokers is decreasing every year. The epidemiological studies have demonstrated the significant effect of smoking on the oral cavity and the development of periodontal disease.

Smoking is one of the most common addictions. The effect of smoking on the risk of, e.g. cardiovascular and respiratory diseases as well as malignant tumors have been described in the literature for many years. Epidemiological research also indicates the significant impact of smoking on hygiene and oral health, including the previously mentioned development of periodontal diseases and their effects.

According to the literature of the subject, the smoker's mouth has a very rapid loss of connective and bone tissue. Smoking is also associated with the loss of durability of the tissue connection resulting in increased tooth mobility. The mentioned effects depend on, among others from the length and frequency of smoking. However, this does not mean, that passive smokers are not considered at all in this issue. According to the literature, people who are

exposed to environmental tobacco smoke belong to the group of greater risk of periodontal disease than people who are not subject to such exposure[4].

In the classification of periodontal disease in Poland, the first group of diseases are gingival diseases associated with plaque. If this unit is not treated, it may lead to the development of periodontitis. Periodontal disease affects all age groups, but most often they cause tooth loss after 40 years of age. Periodontal disease develops as a result of the disturbance of the balance between the periodontal plaque pathogens and the host defense mechanisms.

Factors modulating the host's immunity and increasing the susceptibility to periodontal disease were divided into two groups: determinants that we have no influence on (age, sex, social status and genetic factor)and the risk factors (microflora, stress, diabetes, osteoporosis and systemic diseases with congenital or acquired immunodeficiencies and smoking) [5].

The literature on the subject as well as the results of analyzes carried out in dental offices confirm that there is a measurable benefit to oral health through the use of nicotine withdrawal. In the short-term assessment, the negative effects reduction is rather more visible for society and the former smoker - namely the lack of unpleasant smell from the mouth, as well as the smell of clothes and hair, or the improvement of taste and smell. In the case of prolonged nicotine withdrawal, there is a reduction in the risk of periodontal disease and mucous membrane diseases. Long-term discontinuation of smoking may cause significant improvement in periodontium and contribute to the regression of pathological lesions on the oral mucosa, as well as the lack of further progression of diseases resulting from smoking addiction.

The purpose of the work is to draw attention to the possibility of obtaining measurable effects of nicotine withdrawal in a given time. There is a need to highlight the problems associated with smoking, among others periodontal disease, but also the possibility of getting rid of this disease and its consequences.

## KNOWLEDGE CONCERNING ON SIZE OF CIGARIES SMOKING IN POLAND AND EFFECTS OF SMOKING ON HEALTH AND HUMAN LIFE

Despite the fact that the phenomenon of smoking among Poles is decreasing, it is still one of the most common addictions and causes of discomfort and diseases. According to the Central Statistical Office in Poland, the first data on cigarette consumption in Poland dates back to 1923.At that time, sales of cigarettes per capita was approximately 500 units. When it comes to the number of cigarettes smoked, it can be stated that it had grown from World War II up to the 80th years of the twentieth century. At that time, the highest level of cigarette consumption has been recorded, which amounted to as much as 3,600 pieces per adult person[6], as well as the highest mortality rate due to lung cancer [7,8].It was not until the end of the nineties of the last century that the level of cigarette consumption decreased. Changes in the attitudes of Poles were the result of both the introduction of legislation and the government's curbing program, but also various educational and preventive activities helping to reduce smoking but also making the public aware of the negative health consequences of smoking [9]. The latest data on the tobacco industry cigarette sales indicate that the current process has a downward trend [3].

Ignorance of the composition of tobacco smoke and the awareness of what it is for the active organism as well as the passive smoker is very important. Well, tobacco smoke consists of 6,000 chemicals, many of which have been identified as toxic compounds, while 40 of them have a proven carcinogenic effect [10]. The most important compounds of tobacco smoke - in terms of toxicology and carcinogen - include: nicotine, carbon monoxide, nitric oxide, ammonia, formaldehyde, acetaldehyde, hydrogen cyanide, pyridine and volatile N-nitrosamines [11, 12].In tobacco products, nicotine is a strong addictive substance, the most

commonly used in the world in the form of cigarettes, cigars, chewing tobacco, pipe tobacco and snuff. Nicotine not only stimulates the sympathetic system, but also induces neurohormonal responses in the hypothalamus, exerting multidirectional biological activity of people exposed to tobacco smoke [13].It binds to nicotinic acetylcholine receptors that are involved in the process of memorizing and learning. These receptors activate acetylcholine, but it turns out that they are also stimulated by nicotine, which makes it a generator that causes recovery. The consequence of this is a sense of better concentration and memory, which leads to better results in learning. In addition, nicotine stimulates the secretion of dopamine in the nucleus accumbens, which is part of the human pleasure center, the main system associated with motivation and behavior control. At the same time, it is the biological basis for such phenomena as obsessions and addictions. Therefore, it is believed that the feeling of satisfaction felt while smoking or taking such drugs as cocaine, amphetamine and morphine, is related to the increase in dopamine in the nucleus accumbens. Another mechanism resulting from smoking is the inhibition of the monoamine oxidase B (MAO-B) enzyme in the brain, responsible for the breakdown of substances such as dopamine, serotonin and norepinephrine. They cause a better mood among people, that is why monoamine oxidase inhibitors are used as antidepressants, and nicotine can reduce depression in some people [4]. Thus, the probability of addiction is four times higher in people who are prone to depression. Analyzing the above structure of brain processes directly related to tobacco smoking, it should be stated that nicotine, having a psychoactivating effect of euphoric character, introduces an addiction, making it difficult to exit the addiction.

Smoking is not only a social, moral or economic problem. It is also a very important medical problem. The literature on the subject provides various ailments related to the effects of smoking cigarettes. The most worrying is the relationship between smoking and the development of cancer in the mouth[14]. Epidemiological studies indicate that in Poland, as well as in other European and American countries, almost 80% of the adult population requires improvement of oral hygiene, and 70% suffer from one of the forms of periodontal disease, from mild gingivitis to severe forms of the disease [15]. Many scientific studies also indicate that there is a correlation between diabetes and periodontal disease. The risk of periodontal disease in the group of patients suffering from diabetes is 15 times higher than in healthy people [16]. In general, the state of periodontium is worse among diabetics, and the duration of diabetes affects the deterioration of periodontal parameters over time. According to studies conducted by Lim, moderately advanced periodontitis occurs in 40% of diabetics, compared with 15% in healthy patients [17]. Most scientific studies have shown that insufficient control of glucose levels in blood leads to advanced progression of periodontal disease, but not all studies confirmed this relationship.

It is also appropriate to cite the results of research and observations of Żebrowski and co-authors [18]. They describe the influence of chronic periodontitis on the occurrence of cardiovascular diseases. They point to the existence of common risk factors in cardiovascular diseases and periodontitis, including age, education, male gender, socio-economic status, smoking, alcohol consumption, diabetes, hereditary overactivity of monocytes.The first reports on the relationship between periodontitis and cardiovascular diseases come from studies conducted by MacKenzie and Mallard, who noticed in patients with atherosclerosis the presence of significant bone loss in the alveolar ridge. Reports from other researchers pointed to the existence of a relationship between the occurrence of myocardial infarction and the presence of periodontopathy. It has been indicated, that there is a 25% higher risk of coronary heart disease in patients with inflammatory periodontitis [18].

Teeth surfaces are a place where bacteria that are components of plaque accumulate, and the number of bacteria on a single molar tooth may exceed $10^9$. This number depends on many factors, and above all on hygiene habits. Negligence in this area may lead to even a 10-

fold increase in the number of bacteria. Supragingival plaque is inhabited mainly by G(+) or relatively anaerobic bacteria. In the subgingival plaque, bacteria G(-), anaerobic bacteria predominate and initiate and sustain an inflammatory process. These microorganisms have the ability to penetrate into deeper tissue structures. The defensive mechanisms occurring in healthy periodontium do not allow the exceeded amount of bacteria to enter the bloodstream. The consequences of improper oral hygiene (e.g. increase in the number of bacteria and inflammatory reactions), creates conditions for the increased blood penetration by microorganisms. And in the case of advanced periodontal disease, even brushing may cause bacteraemia.

Herzberg et al. Discovered that some bacteria commonly found in dental plaque, *Streptococcus sanguis* and *Porphyromonas gingivalis*, after penetration into the blood, can induce adhesion and aggregation of thrombocytes through protein molecules associated with plaque activation (PAAP). This can lead to thrombus formation with all its negative effects. While examining atherosclerotic plaques using molecular biology methods, the presence of microorganisms characteristic of periodontal disease (*Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis, Prevotella intermedia, Bacteroides forsythus*) has been proved.The treatment of periodontal diseases in patients with ischemic heart disease with elevated CRP concentration resulted in a decrease in the concentration of this protein (an indicator and a risk factor of cardiovascular disease). Furthermore, in the course of chronic periodontitis, elevated fibrinogen levels in serum were observed as response to bacterial endotoxins. Also reportedelevated factor von Willebrand factor, which are the risk factors for coronary heart disease.

The periodontal disease is the result of the interaction between specific and nonspecific bacterial flora and host defense capabilities in tissues exposed to various local and systemic influences. The main determinant of susceptibility to the occurrence of periodontal disease is the genetic conditions of the immune-inflammatory response, while the habit of smoking may be an appropriate risk factor for periodontitis [20]. In vitro studies have shown that nicotine in high concentrations can cause so-called cell death - significantly inhibit fibroblast proliferation, reduce the production of fibronectin and collagen while promoting its degradation. Thus, nicotine increases the destruction of the so-called extracellular gums matrix [21].

Nicotine also weakens the immune system, has a negative effect on the process of narrowing blood vessels within the gum area. At the same time, nicotine stimulates the release of adrenal and peripheral catecholamines, causing vasoconstriction of the surface vessels, including those present in the gums, which promotes the formation of micro-clots and the closing of capillary lumen. The effect of changes in blood flow in the gums is the tendency to chronic periodontitis with less percentage of bleeding sites, which in turn promotes masking of the basic indicators of inflammation, which are swelling, redness and bleeding from the gums. Paradoxically, smokers seem to have a lower rate of gingival bleeding than non-smokers [4]. Studies conducted in the 1980s by Bergstrom (1988-89) and at the beginning of this century by Razawandi (2002) show that the inflammatory response in smokers is not synonymous with increased vascularization [22, 23].Smoking also affects the volume of the gingival fluid. The available results of studies carried out by Ustuna (2007) have shown that in people who smoke cigarettes the level of gingival fluid is significantly higher than in non-smokers. It would be worth pointing out that excessive gingival fluid may contribute to the destruction of periodontal tissues [24]. Also, the response to treatment of periodontitis in smokers is far less beneficial than in non-smokers or smokers in the past. During the treatment of smokers, there is a smaller reduction in the depth of the gingival pockets and slower regeneration of tissues. In addition, there was a negative effect of cigarette smoking on bone loss of the alveolar ridge, tooth mobility and missing teeth [4].

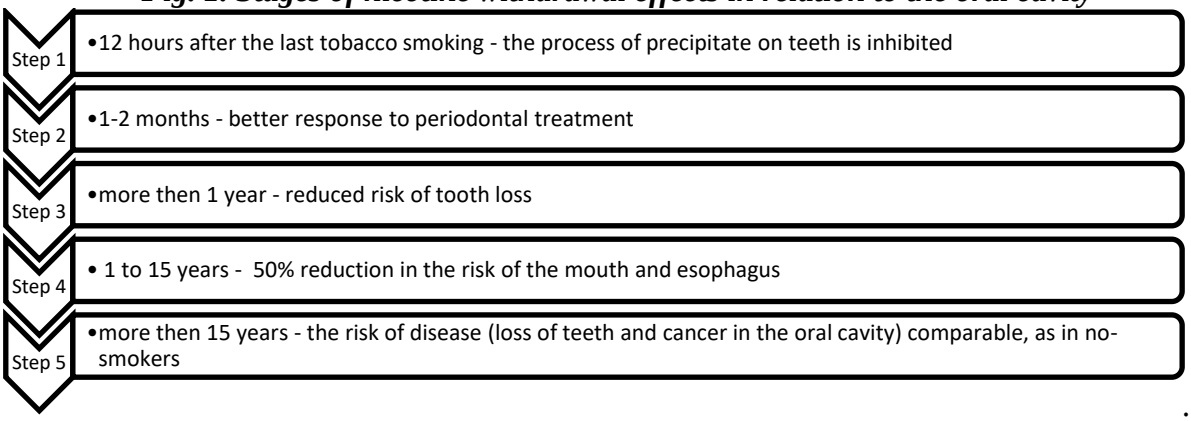
## TOBACCO ABSTINENT SYMPTOMS IMPACT ON THE ORAL HYGIENE AND HUMAN HEALTH IN LIGHT OF LITERATURE

The benefits of nicotine withdrawal are many. The human body begins to functioning better, the taste buds return to the optimal state, our physiognomy, skin tone and physical performance are not changed. These colloquial effects, often visible to the naked eye, are only part of the benefits of nicotine withdrawal.

Literature indicates the relationship between the extension of the period of nicotine abstinence and the reduction of negative effects on oral health. In the short-term and social perspective, a person who quits smoking gets rid of the already mentioned unpleasant smell sensation during the exhalation of the air and the tobacco smell on the clothes and hair, not forgetting the improvement of the sense of taste and smell. However, in the case of long-term nicotine abstinence, the risk of periodontal disease and mucosa decreases. Smoking cessation may result in a significant improvement in the periodontal condition, and contribute to reverse pathological changes in the mucous membrane of the mouth. In the Preshaw et al. study (2005), it have been found that smoking cessation has a beneficial effect on reducing the depth of periodontal pockets. and in patients during the first 3 months of the study, were performed to non-surgical periodontal treatment. After the 12-month abstinence, patients may achieve similar results for the treatment therapy used in periodontal diseases, as for those who did not smoke. Also, the increased risk of tooth loss decreases over time [4].

Dietrich et al. (2007) examined the effect of smoking cessation on reducing the risk of tooth loss in a group representing the medical community (over 40,000 people, including about 25,000 dentists). In the entire study group, the risk of tooth loss decreased with the duration of nicotine withdrawal, but was still elevated (even at least 10 years of non-smoking) compared to people who never smoked, e.g. for a period of abstinence less than a year compared to non-smokers, similar conditions were noted in the dentist population. Interesting research results were also presented by Nair et al. (2003), who analyzed the parameters of bleeding from the gingival pocket in people who smoked tobacco before they stopped smoking and a few weeks after they stopped smoking. It turned out that after 6 weeks after stopping smoking, the bleeding rate increased significantly (from 16% to 32% of the bleeding pockets).This is important evidence that tobacco smoking modifies the inflammatory process within the periodontal tissues, but these changes can be reversible after stopping smoking. As presented by Bergstrom et al. (2000) after 10 years of observation, quitting smoking has a beneficial effect on periodontal health and is an absolute condition for the health of the entire oral cavity. Some of the benefits of nicotine withdrawal are shown in Figure 1. There is a model modified for the purpose of this article, which based on the Collins model from 2009 [5].

***Fig. 1. Stages of nicotine withdrawal effects in relation to the oral cavity***

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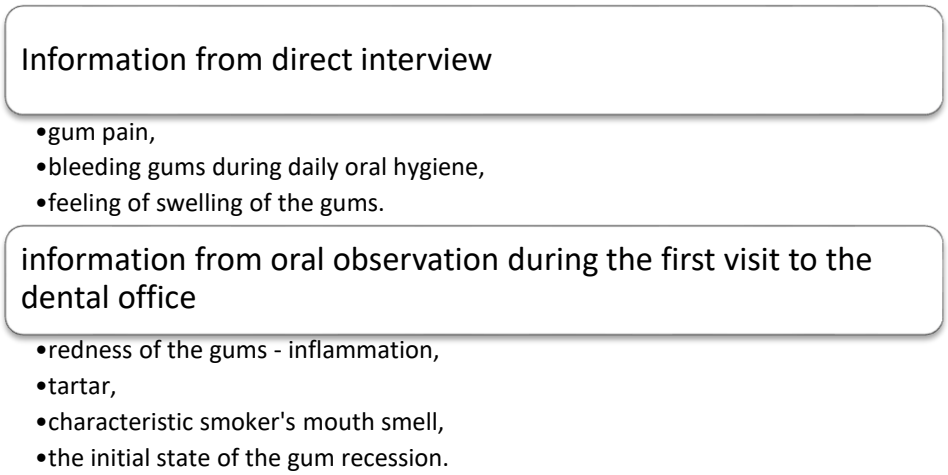
As can be seen from the information presented in Figure 1, the short-term cessation of smoking has a beneficial effect on the health of people addicted to nicotine.

**THE EFFECTS OF NICOTINE ABSTRACTION IN ASPEK HYGIENE AND ORAL HEALTH - CASE STUDY**

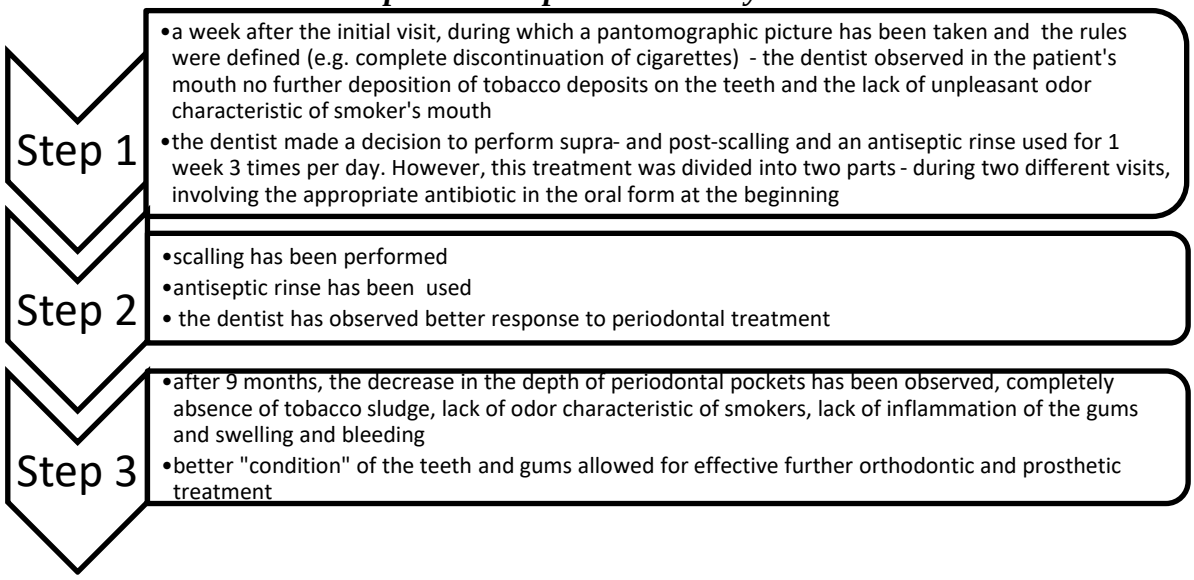
The abstinence process presented in this work has been carried out in one of the Silesian dental offices on a male patient, with internship of active cigarettes (on average about 20 cigarettes a day) exceeded 25 years. It is obvious, the nicotine withdrawal model, which is presented in the literature, and which should be divided into five stages and spread over a minimum of 15 years to speak about the spectacular effects, has been modified in this work. It presents, only the first three stages that have been implemented during the established year. The other two stages are will be implemented within a minimum of 14 years and depend on the preventive actions of the patient and conservative treatment. Thus, during the initial observation and the direct interview, a number of characteristic signs of the oral cavity of the smoker were noted in the dentist's office, and they are presented in figure 2.

***Fig. 2. Initial evaluation of the oral cavity of a patient smoking cigarettes***



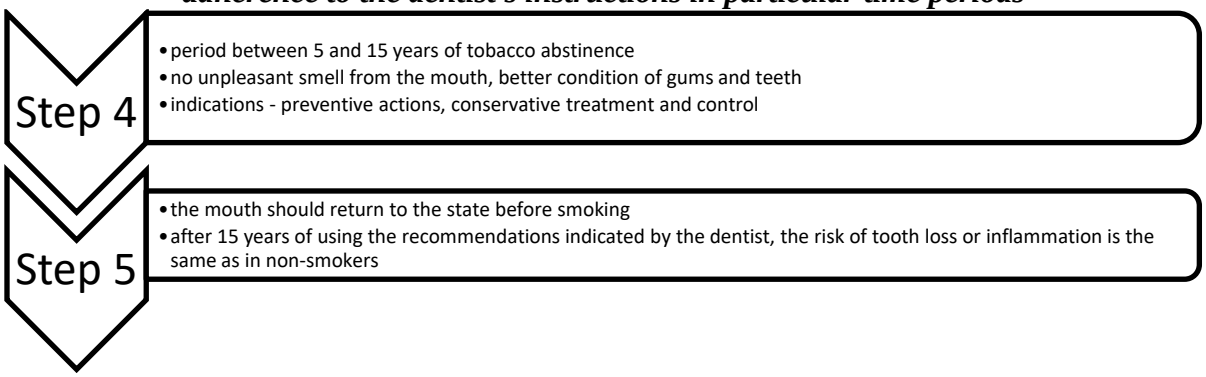

Next, the dentist together with the patient determined the elements of the nicotine abstinence process and the rules of conduct during its implementation. They contain dental activities within the dental office (treatment), pharmacological actions based on the use of appropriate medicines and prophylactic - carried out at home, work, etc. The dentist and the patient have established a five-stage of nicotine withdrawal process, which aims to completely reverse the presence of gums recession enabling orthodontic and prosthetic treatment. Figure 3 presents the first three stages of the nicotine withdrawal process and their effects in individual periods carried out directly with the dentist recommendations. Figure 4, in turn, presents the remaining two stages of the entire process, which have more preventive and control nature.

***Figure 3. The first 3 steps of the nicotine withdrawal process and effects in individual time periods completed within a year***




Gingivitis caused by the bacterial plaque located on the periphery of the gums caused the progression of inflammation and the beginning of the loss of the connective tissue attachment, which in turn leads to the formation of pathological periodontal pockets. Due to the bleeding of the gums and the risk of tooth loss during dental procedures (including scalling), the patient has been advised to take an antibiotic and use an antiseptic rinse.At the second and subsequent visit a decision was made to clean the characteristic of the smoker tartar, leaving the antiseptic rinse still in use. After 9 months from the first visit, the effects of nicotine withdrawal could be viewed with the naked eye. In the patient mouth the pathological periodontal lesions were reduced, the gums did not have characteristic edema and the patient did not complain of bleeding. The patient received a number of prophylactic recommendations - no smoking, keeping proper oral hygiene using the indicated tools (toothbrush, dental floss) and substance (toothpaste, mouthwash), control visits and conservative treatment in the dental office. Potential effects are presented in Figure 4.

***Fig. 4. The last two stages of the nicotine withdrawal process and possible effects of adherence to the dentist's instructions in particular time periods***




The last two stages of the nicotine withdrawal process are spread over time, which has not been verified in this article. Return to the oral cavity of a former smoker takes place in the first three stages of the nicotine withdrawal process. During this time, the greatest

intensification of both the treatment process by the dentist and preventive measures takes place, for which the patient is largely responsible for the success. After less than a year, measurable effects of nicotine abstinence are noticed, which absolutely improves the condition of both gums and teeth.

**SUMMARY**

Despite the many methods that support the release from tobacco addiction as well as the results of research, confirming the negative effects of this addiction still in the world is observed an upward trend due to the number of people addicted to tobacco. All actions promoting a healthy lifestyle also do not give spectacular results. Information on the number of people who will die every day in the near future due to complications of diseases resulting from cigarette smoking are alarming. As results from the research and analysis of literature quoted in this work, there is a possibility of measurable effects in the aspect of oral health and elimination of accompanying diseases, through appropriate nicotine withdrawal. Each stage characterized by a period of abstinence has benefits. In this process, it is very important to follow all the recommendations of the dentist, including specific preventive measures that would be supported by appropriate pharmacology and psychological care.

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