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Wpływ palenia tytoniu na zdrowie jamy ustnej

Influence of tobacco smoking on oral health

Streszczenie

Palenie tytoniu uznaje się za najczęściej występujący nałóg na świecie i w Polsce. W dymie tytoniowym zawarte jest około 4000 związków chemicznych, z czego około 40 to substancje rakotwórcze.

Palenie tytoniu wpływa na pogorszenie stanu jamy ustnej, ma niekorzystny wpływ na stan błony śluzowej jamy ustnej i uznawane za jeden z najważniejszych czynników ryzyka rozwoju raka jamy ustnej. Substancje zawarte w dymie tytoniowym powodują niedotlenienie tkanek, co pogarsza gojenie ran i regenerację błony śluzowej. Miejscowe działanie wysokiej temperatury powoduje powstawanie oparzeń i owrzodzeń na błonie śluzowej. U palaczy obserwuje się zmniejszone wydzielanie śliny, co sprzyja rozwojowi próchnicy, grzybic oraz chorób przyzębia. Palenie wpływa na wzrost flory bakteryjnej patogennej dla tkanek przyzębia, zaburza mechanizmy obronne tkanek, zwiększoną utratę zębów i destrukcję kości wyrostka zębodołowego. U palaczy poddanych leczeniu implantoprotetycznemu istnieje zwiększone ryzyko wystąpienia zapalenia tkanek okołowszczepowych i utraty implantu. Ponadto u osób palących obserwuje się zmianę zabarwienia zębów, śluzówki, wypełnień i uzupełnień protetycznych, halitozę, czyli przykry zapach z ust oraz zaburzone odczuwanie smaku. Zaprzestanie palenia powoduje ustąpienie lub zahamowanie rozwoju większości wymienionych zmian.

Stomatolog jest często pierwszą osobą, która dostrzega problem związany z następstwami palenia. Największe ryzyko jakie niesie ze sobą palenie w aspekcie zdrowia jamy ustnej, jest rak jamy ustnej. W związku z tym konieczne jest zachowanie przez stomatologów czujności onkologicznej, umożliwiającej jego wczesne wykrycie. Zadaniem całego zespołu stomatologicznego jest edukacja pacjenta na temat szkodliwego wpływu palenia papierosów na zdrowie i życie, uświadomienie związku palenia ze zmianami w jamie ustnej, a także wsparcie w walce z nałogiem.

Słowa kluczowe: palenie, zdrowie jamy ustnej, błona śluzowa jamy ustnej, rak jamy ustnej.

Abstract

Tobacco smoking is considered the most frequent addiction both in Poland and all over the world. Tobacco smoke contains about 4,000 chemical compounds, 40 of which are carcinogens.

Tobacco smoking leads to deterioration of the oral cavity condition, exerts a harmful influence on the oral mucosa and is considered as one of the most important risk factors in the development of oral cancer. The substances contained in tobacco smoke cause tissue anoxia, which negatively affects wound healing and mucosa regeneration. Local application of high temperature results in burns and ulceration in the mucosa. The reduced salivation observed in smokers facilitates the development of caries, fungal infections and periodontitis. Smoking leads to an increased growth of the bacterial flora pathogenic for the periodontium, affects tissue protective mechanisms, causes an increase in dental loss and bone destruction in the alveolar process. Smokers undergoing implant prosthetic treatment face a greater risk of the periimplant tissue inflammation and implant failure. Moreover, changes in the colour of teeth, mucosa, fillings and implants, as well as halitosis and taste disorders, are observed in smokers. Smoking cessation results in the reversal of most described symptoms.

The dentist is often the first person to perceive the problem related to the consequences of smoking. The greatest risk for the oral health posed by smoking is oral cancer. It is thus necessary for dentists to remain alert to the signs of cancer to enable its early diagnosis. The task of the whole dental team is to educate patients on the harmful influence of cigarette smoking on health and life, making them aware of the relationship between smoking and the changes in the oral cavity, and to support them in their struggle with addiction.

Keywords: smoking, oral health, mouth mucosa, oral cancer.

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INTRODUCTION

Tobacco smoking is considered the most frequent addiction both in Poland and all over the world. The World Health Organization (WHO) recognized nicotine smoking as a chronic disease that requires prophylactic activities and treatment. Tobacco smoke contains about 4,000 chemical compounds, many of which exert a harmful influence on the human organism, including carcinogenic effect. According to the latest studies by WHO, tobacco smoking causes death of ca. 50% of addicted smokers as a result of cardiovascular and pulmonary diseases, as well as cancer [1]. It is assessed that there are about a billion of tobacco smokers in the world. The research results published by the Centre for the Study of Public Opinion show that in Poland 31% of adults smoke cigarettes, a great majority of whom (82%) are addicts – their number reaches ca. 9 million. It is noteworthy that Poland belongs to the countries with the highest cigarette consumption in the world, which translates into an equally high index of smoking-related mortality. Men between 45-54 years of age smoke most frequently. The statistical Pole spends ca. 2,000 PLN a year on smoking, while the treatment of patients with smoking-related diseases costs the Polish State about 18 billion PLN every year. Despite a growing awareness of the harmful effects of smoking, the number of smokers in Poland has remained at the same level for 5 years [2,3,4]. The negative influence of tobacco smoke concerns also "passive" smokers, i.e. people who inhale smoke staying in one room with active smokers. Cigarettes are the cause of every fifth death, and smokers live approximately 17 years shorter than non-smokers. According to the WHO study, tobacco smoking is the cause of 6 million deaths a year in the world [1].

Smoking causes numerous negative health effects, including those affecting the oral cavity, which is most exposed to the harmful influence of tobacco smoke. A very bad oral health condition is observed in 16% of smokers, and only in 4% of non-smokers [5]. From the point of view of harmful effects and potential health risk, smoking exerts the greatest influence on the oral mucosa condition due to the risk of oral cancer. Smoking is also significantly connected with periodontopathies, which frequently lead to teeth loss and increase the risk of cardiovascular diseases.

Mucosal abnormalities and cigarette smoking

The mouth mucosa is a physiological barrier protecting from injurious factors. The mucosa is the first tissue directly affected by tobacco smoke at its highest concentration. The smoke contains numerous substances exerting a harmful influence on the mucosa condition. One of them is nicotine, the substance responsible for the development of tobacco addiction, which damages the integrity of the oral mucosa cells. Nicotine, disrupting the function of the mucosa, exposes it to the influence of external factors, including carcinogens also present in tobacco smoke [6]. Other components of tobacco smoke, such as carbon monoxide and hydrogen cyanide, also negatively affect the mucosa. Carbon monoxide reacts with haemoglobin, which reduces the amount of oxygen delivered to tissues, while hydrogen cyanide leads to local immunity impairment. As a result of reduced blood flow and parietal thrombus formation in mucosal capillaries, wounds heal slower and the regenerative capacity of the mucosa weakens. Therefore in smokers the process of wound healing is much more difficult than in non-smokers. In addition, the mouth mucosa is exposed to high temperatures produced during smoking, which lead to erythroplakia, burns and disorders in mucosa keratinisation [7-8].

Among the smoking-related mucosal abnormalities, because of the potential death risk, oral cancer and leukoplakia often leading to cancer development are the most important.

Leukoplakia

Leukoplakia is defined as a white patch or plaque on the mucosa, which cannot be removed by rubbing nor identified clinically as any other disease. It may also assume the form of ulcers and cracks. Leukoplakia occurs most often in men between 40-60 years of age and appears in different localizations in the mouth. In smokers leukoplakia occurs much more frequently than in non-smokers. The occurrence of leukoplakia depends, among others, on the number of cigarettes smoked daily, the duration of addiction and simultaneous alcohol abuse. Leukoplakia constitutes an increased risk of dysplasia or cancer development, and therefore is considered a precancerous condition. Research showed that dysplasia occurs in 12% of patients with leukoplakia, while 5% of lesions transform into cancer within 5 years. The risk of cancerous transformation in an area of leukoplakia depends on many factors, such as age and gender of the patient, lesion type and localisation. Leukoplakia localisations in the oral cavity most predisposed to cancer development are the floor of the mouth and the lateral surfaces of the tongue. The risk of cancerous transformation of leukoplakia also increases with the number of smoked cigarettes. Early diagnosis and appropriate treatment of leukoplakia, including complete smoking cessation, is an important element of cancer prophylaxis and to a large extent prevents the development of oral cancer. Leukoplakia is often observed to regress after smoking cessation [9-12].

Oral cancer

As it has been mentioned, tobacco smoke contains numerous carcinogens. The most dangerous are polycyclic aromatic hydrocarbons, nitrosamines, cadmium, nickel, as well as radioactive lead and polonium isotopes [13]. Epidemiological studies showed the connection of cigarette smoking to respiratory, urinary and digestive cancer. Due to direct exposure to carcinogens, neoplasms, including malignant ones, and particularly cancer, develop also in the oral cavity. Histologically speaking, the most frequent cancer of the oral cavity is squamous cell carcinoma, which most often develops on the lateral surface of the tongue. It is estimated that ca. 25-30% of oral cancer cases are related to smoking or chewing tobacco, which at the same time constitute the main causes of the development of these cancers. It has been shown that 90% of oral cancer patients smoke or used to smoke cigarettes. The risk of oral cancer in smokers is estimated as ca. 3.4% and increases with the time of exposure to tobacco smoke [14].

Continuation of smoking in patients with oral cancer reduces the chances of survival as tobacco smoke enhances metastatic potential of cancer cells [15]. Moreover, menthol added to cigarettes to take away their unpleasant taste and smell increases penetration of nicotine and some

carcinogens into the mucosa and intensifies the carcinogenic effect of tobacco smoke [16].

It should be stressed that the treatment of craniofacial cancer is often related to a considerable face tissue loss, which causes a decrease in patients' quality of life, their self-esteem and may lead to severe depression. Malignant neoplasms in the oral cavity are often diagnosed too late, which reduces the chances of full recovery and survival time [17].

Other frequent disorders observed in the mucosa of smokers are the so-called smoker's melanosis and nicotine stomatitis. These disorders are usually benign, do not require treatment and recede after smoking cessation.

Smoker's melanosis

Smoking-related hyperpigmentations in the mouth mucosa or on the lips are observed mainly in women and it is believed that they are related to female sex hormones. This disorder is present in 25% of smokers, with varying intensity. Brown discoloration of the mucosa is caused by the accumulation of the pigment melanin, produced as a protective agent against harmful factors. Smoker's melanosis tends to recede after smoking cessation [18].

Nicotine stomatitis

Nicotine stomatitis (stomatitis nicotinica), also called smoker's palate, manifests itself as whitish-grey foci, likened to cobblestones, that appear on the palate in addicted cigar and cigarette smokers. The affected palate is thickened and hyperkeratotic. On its surface, one can often observe inflamed duct openings of minor salivary glands in the form of red papule-like elevations. Those lesions are caused by local exposure to high temperature. There is a minor risk of the described lesions becoming malignant [19].

In smokers reduced salivary secretion is observed, which leads to the feeling of dryness in the mouth, i.e. xerostomia. The dried mucosa is more susceptible to local injuries, which in smokers heal much slower than in non-smokers. A reduced saliva amount is also conducive to fungi multiplication [20].

Candidiases

Candidiasis of the oral mucosa is most frequently caused by the opportunistic yeast-like fungi of the Candida genus, mainly by the species *Candida albicans*. The fungi can persist in the oral cavity for years, producing no symptoms. When favourable conditions for their growth occur, candidiasis symptoms are observed: white deposits on the oral mucosa easily removable by rubbing with a swab. Apart from reduced salivation, the factor conducive to this type of mycosis in smokers is the decreased local immunity. It is estimated that candidiases occur more often in smokers than in non-smokers, some studies, however, do not confirm such a correlation [21-26].

Apart from causing oral mucosa lesions, smoking increases the risk of caries and exerts a damaging influence on periodontal tissues, leading to early teeth loss.

Periodontal disorders

Tobacco smoking is considered an important risk factor causing periodontal diseases and modifying their course. Pipe and cigar smoking, as well as tobacco chewing are also indicated as factors conducive to periodontopathies [27].

A number of studies show that the percentage of preserved teeth in smokers was lower than in non-smokers, and the percentage of teeth lost was higher in people with cigarette smoking addiction. Also, greater destruction of alveolar process bone and greater epithelial attachment loss was observed in smokers. The risk of severe periodontopathies is also much higher in smokers than in non-smokers. In addition, the disease intensity is higher in tobacco smokers.

Periodontitis develops under the influence of nicotine and tarry substances. Due to a reduced self-cleaning ability of the oral cavity resulting from saliva deficiency in tobacco smokers, more subgingival dental plaque, and consequently more bacteria pathogenic for periodontal tissues, are accumulated. Smoking is conducive to a decrease in dental plaque pH, which additionally contributes to mineralisation of dental deposits and formation of both supra- and subgingival calculus. The presence of calculus leads to gingivitis and periodontitis. In smokers an increase in the number of bacteria potentially pathogenic for periodontium is observed. The organism's response to pathogenic factors is much weaker, which causes a less effective control of oral microorganisms. The studies by Semlali et al. showed that even a single exposure to tobacco smoke results in a significant dysregulation in morphology and function of gingival fibroblasts. In addition, cigarette smoke inhibits the growth of epithelial cells and disrupts their migration, which negatively affects periodontal wounds healing [28, 29]. The systemic effect of nicotine leads to a decreased tissue blood flow. Adrenal glands are stimulated to produce more adrenaline and noradrenaline that make peripheral blood vessels contract. This results in a change of gingival blood flow. During examination of periodontal tissues with a periodontal probe, less bleeding from periodontal pockets is observed in patients suffering from chronic periodontitis, which can mask the disease symptoms. The contraction of blood vessels causes a decrease in the amount of oxygen delivered to periodontal tissues. In the hypoxic tissues inflammation develops; enzymes that destroy the periodontal ligament appear, which leads to the destruction of the teeth roots connection to the bone, teeth looseness and eventually their loss. The stress enhanced by the effect of nicotine also exerts a negative influence on periodontium, which considerably increases the risk of periodontal diseases. Tobacco smoking cessation significantly improves the condition of periodontium, reduces the risk of periodontal diseases and enhances the treatment effectiveness [30-34].

Implant prosthetic treatment

The basis for implant stability is its correct osseointegration, i.e. the connection of an implant with the bone. Research showed that in smokers this process is disrupted in comparison to non-smokers, and therefore tobacco smoking is considered one of the main factors responsible for implant treatment failures. Periimplantitis is one of the most frequent causes of implant loss. This pathological condition is a symptom of a disrupted equilibrium between pathogenic microorganisms and the host's immunity. Smoking addiction contributes to an increase in the incidence of periimplantitis, chronic mucosal inflammation and enhances the risk

of peri-implant bone resorption. The more cigarettes the patient smokes daily, the greater bone loss around the implant is. Bacteria are undoubtedly the main cause of periimplantitis, but smoking also contributes to the development of the disease, modifying the immune capacity of the host. The growth of oral bacterial flora combined with a diminished tissue blood flow, reduced regenerative capacity and diminished ability to produce new bone, caused by smoking, easily lead to implant loss. Smoking cessation significantly reduces the risk of implant failure. Planning implant treatment, the patient should be informed by the dentist about all the factors that influence the success of implant prosthetic treatment. The patient should be aware that smoking cessation considerably enhances the chance of maintaining implants embedded in the bone [35-39].

Smoking causes also other effects apparent in the oral cavity; they are less important to health than those described above, but considerably decrease the patient's quality of life. They include: teeth discoloration, halitosis, and taste disorders.

Teeth discoloration

Tobacco smoking causes changes in the colour of the skin, mucosa, teeth and dental fillings. Teeth, prosthetic devices and fillings are also discoloured yellow and grey. Discoloration related to tobacco smoking is external and caused by the accumulation of pigments on the teeth surfaces. The substances present in tobacco smoke, such as vinyl chloride, tarry particles, acetone, hydrogen cyanide, etc. penetrate the enamel and dentine, causing a local change in the colour of dental tissues. The yellowish colour of teeth and face skin diminishes the patient's self-esteem and negatively affects his or her wellbeing. If the patient continues to smoke, dental bleaching is also ineffective, as some time later teeth will revert to their yellow and grey colour [40].

Halitosis

Another disorder caused by tobacco smoking is halitosis, i.e. bad breath. The term halitosis comes from the Latin word halitus – smell, and the Greek one osis – a chronic disorder. It is a complaint that concerns many people: adults and children, women and men. The causes of halitosis may be local or systemic; the latter include the diseases of respiratory, digestive, and urinary systems, haematological diseases, psychiatric diseases, vitamin deficiencies and medicines. The local causes are: reduced saliva secretion, smoking, diet (consumption of onion, garlic, alcohol), and bad oral hygiene. Tobacco smoking causes reduced salivation, which is conducive to halitosis. A greater incidence of oral candidiasis in smokers also leads to bad breath. An increasing importance in the aetiology of halitosis is ascribed to white fungal coating of the tongue. Tobacco smoking addicts often use mouth fresheners to mask the unpleasant smell. However, they contain sugars and citric acid, which, along with hygienic negligence, additionally increase the risk of caries [41-43].

Taste disorders

The correct taste perception is one of the most important sense impressions, while numerous studies show that in smokers it is distorted (dysgeusia). The sense of taste exerts a great influence on the physical and psychological wellbeing in humans. Taste buds located on the tongue are responsible for taste perception. In the case of reduced salivation in smokers the sense of taste is distorted, which leads to the patients' discomfort. It was shown that in 85% of addicted smokers the threshold of taste for saltiness is 12-14 times higher than in non-smokers [44].

Summary

Research conducted over the years clearly shows a negative influence of tobacco smoking on the oral health status. Smoking is responsible for the diseases of the mucosa, including oral cancer, periodontal diseases leading to teeth loss and enhancing the risk of, among others, cardiovascular diseases; it affects the appearance of teeth and face skin, causes bad breath and mycoses, and exerts a negative effect on the course of implant prosthetic treatment.

The dentist is often the first person to perceive the problem related to the consequences of smoking. The greatest risk for the oral health posed by smoking is oral cancer. It is thus necessary for dentists to remain alert to the signs of cancer to enable its early diagnosis. The task of the whole dental team is to educate patients on the harmful influence of cigarette smoking on health and life, making them aware of the relationship between smoking and the changes in the oral cavity, and to support them in their struggle with addiction.

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