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Tobacco smoking as risk factor of laryngeal cancer

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Abstract:

Introduction: Laryngeal cancer is one of the most common type of head and neck cancers. It develops due to spontaneous mutation or influence of external factors (physical, biological and chemical). Cigarette smoking is primary chemical risk factor of laryngeal cancers.

Purpose: The aim of the review was to present a role of tobacco smoking in the causation of laryngeal cancer.

State of knowledge: Many of studies performed past years confirmed the correlation between tobacco addiction and head and neck cancers. 75% of all head and neck cancers are caused by cigarette smoking, which contains thousands of chemicals. More than 60 of them are known as carcinogens.

Summary: Laryngeal cancer is the most common head and neck cancer. The prevalence of laryngeal cancer is increased by several carcinogens including tobacco smoking, which is known as the major risk factor of this type of cancers.

Keywords: tobacco; laryngeal cancer; larynx; squamous cell carcinoma

Laryngeal cancer

Head and neck cancers are considered to be a relatively rare malignant neoplasm, representing 1,8% of all new cancer cases in Poland. It is estimated that laryngeal cancer is more common in men than in women and it is more common with increased age. Approximately more that 90% of new diagnosed concern people aged 50 and more[1].

The most common histological type of this cancer is squamous cell carcinoma (95% of all cases). Other laryngeal malignancies include: sarcoma, adenocarcinoma, carcinoma verrucous and undifferentiated carcinoma. The symptoms of disease mostly depends which region of larynx is affected by cancer. In general symptoms of larynx cancer include: hoarseness, dysphagia, sore throat, stridor and hemoptysis [2].

Laryngeal cancer usually develops slowly. In Poland detected most often in advanced stage, requires combined therapy. The strategy of treatment depends on localization of malignant lesion, staging of tumour and potential metastases.[3] In limited stage (T1, T2) of laryngeal cancer, patients can be treated with larynx- preservation surgery or radiation therapy. The survival outcome is similar. In advanced stage of cancer (T3, T4) total laryngectomy combined with radiation therapy is recommended.[4]

Risk factors

In pathogenesis of laryngeal cancer a number risk factors have been implicated. Cigarette smoking is the main risk factor in this type of cancer and the risk of laryngeal cancer increases in direct proportion to the size of the exposure and its duration. More over many of studies suggest that alcohol consumption, Human Papillomavirus (HPV), gastroesophageal reflux disease (GERD), age and sex, environment pollution, radiotherapy and genetic predispositions are considered to be responsible for the larynx cancer as well.[5]

Studies shown that risk of developing larynx cancer is 30 time higher among people who smoke for many years than those who do not smoke. However, the probability of laryngeal cancer is 330 time higher in case of both alcohol and tobacco use.[6,7]

Tobacco using is the risk factor not only the laryngeal cancers. In general tobacco increases the risk of sinonasal, nasopharyngeal and lung cancer. It is responsible for cancers of digestive tract (esophagus, stomach and large intestine), pancreas, liver, cervix, ovary and skin cancers.[8]

Tobacco

The primary risk factor of laryngeal cancer is the exposure of the mucous membrane to the components of tobacco. Cigarette smoke affect the immune system by triggering an inflammatory chronic response in the epithelial tissue of larynx, which increases over the years due to repeated exposure to smoke.[9]

It is estimated that tabaco smoke contains over 4000 toxic substances, about 60 of them possess strong mutagenic activity. Nicotine have immunosuppressive effects on the innate immune response. It decreases neutrophils phagocytic activity and affects chemotaxis, kinesis, and cell signaling. Moreover nicotine is responsible for suppression of the programmed cell-death (apoptosis) mechanism, which is an important factor of the malignant cells survival.[10]

The most dangerous carcinogens are nitrosamines, polycyclic aromatic hydrocarbons and aromatic amines which have the potential to damage DNA. Those particles have been implicated as the major mutagenic carcinogens responsible for DNA adduct formation. The formation of DNA adduct is the result of interaction of cytochrome P450 enzymes and carcinogens. In this process unreactive carcinogen is converted to form that binds DNA. Increased amounts of DNA adducts are associated with early phase of carcinogenesis. The resulting alternations may lead to creation of the tumor.[11]

Among all tobacco smoke's carcinogens, mutagenic activity of polycyclic aromatic hydrocarbons has been extensively studied. It is responsible for mutation in the p53 gene, which is tumor suppressor gene that inhibits the development and growth of tumors. Mutation in the

p53 gene is more common in smokers than in nonsmokers. Laryngeal tumors caused by tobacco smoke have an increased level G to T transversions.[12]

Summary

Many of studies performed past years confirmed the correlation between tobacco addiction and head and neck cancers. It is estimated that 2500 new cases of laryngeal cancers are diagnosed annually and it occurs seven times more often in men than women. Tobacco smoke contains many toxic compounds that can cause laryngeal cancer due to genetic mutations of p53 gene, impairment of immune response, DNA damage. Unfortunately, despite of well-educated society, nicotine addiction is still serious problem, which in long term is the most dangerous risk factor of laryngeal cancers.

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