



Assessing the Impact of Human Papillomavirus on Head and Neck Cancer Development

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Description

Head and Neck Cancers (HNC) comprise a diverse group of malignancies that affect the mouth, throat, larynx, nasal cavity and sinuses. Historically, tobacco and alcohol use have been recognized as the primary risk factors for these cancers. However, over the past few decades, a significant change has occurred in understanding the etiology of head and neck cancer, particularly the role of Human Papillomavirus (HPV). HPV, a sexually transmitted virus, is now recognized as a key factor in the development of a subset of head and neck cancers, especially oropharyngeal cancers. Human Papillomavirus (HPV) is a group of more than 200 related viruses, of which about 40 types are known to infect mucosal areas such as the cervix, anus and oral cavity. High-risk HPV strains, particularly HPV-16 and HPV-18 are involved in the development of various cancers, including cervical, anal and head and neck cancers. HPV-induced cancers are driven by the viral oncoproteins, E6 and E7, which interfere with the normal function of tumor suppressor genes, particularly p53 and Retinoblastoma protein (pRb).

These proteins are essential for regulating cell cycle progression and promoting apoptosis and their inactivation results in uncontrolled cell proliferation and accumulation of genetic mutations causing carcinogenesis. In the case of head and neck cancers, HPV is most commonly associated with cancers of the oropharynx, which includes the tonsils and the base of the tongue. HPV-related Oropharyngeal Cancers (OPC) are characterized by a distinct molecular profile and tend to occur in younger, non-smokers, differentiating them from the traditional tobacco and alcohol-related head and neck cancers. HPV-induced oropharyngeal cancers are often less severe and have a better prognosis compared to those caused by major risk factors. The epidemiology of HPV-related head and neck cancers has undergone significant changes over the past few decades. Historically, the incidence of head and neck cancers was predominantly associated with alcohol and tobacco use. However, since the 1980s, there has been a marked increase in the incidence of oropharyngeal cancers,

particularly among young men, which is largely attributed to HPV infection.

Data from the United States and other Western countries have shown that HPV-related oropharyngeal cancers have become the most common type of head and neck cancer, surpassing cancers of the larynx and oral cavity. In contrast to traditional head and neck cancers, which are more common in older individuals with a history of smoking and alcohol use, HPV-positive cancers typically occur in younger, healthier individuals with no significant history of tobacco or alcohol consumption. HPV-16 is the most prevalent strain responsible for these cancers, accounting for approximately 90% of HPV-positive head and neck cancer cases.

The recognition of HPV as a major factor in head and neck cancer has important clinical effects, particularly in terms of diagnosis, prognosis and treatment. HPV-related head and neck cancers, particularly oropharyngeal cancers require distinct diagnostic approaches. While common risk factors such as tobacco and alcohol use are often absent in HPV-positive patients, the diagnosis is typically confirmed through molecular testing for the presence of high-risk HPV DNA or RNA in tumor tissue. The detection of HPV-16 DNA by Polymerase Chain Reaction (PCR) or p16INK4A immunohistochemistry can help identify HPV-positive tumors and guide appropriate management.

HPV-positive head and neck cancers generally have a better prognosis compared to their HPV-negative equivalents. Several studies have demonstrated that HPV-positive oropharyngeal cancers respond better to treatment and are associated with higher survival rates. For instance, the five-year survival rate for HPV-positive oropharyngeal cancer is estimated to be around 80%-90%, while the survival rate for HPV-negative cases is significantly lower. This improved prognosis is thought to be due to the distinct molecular characteristics of HPV-positive tumors, which tend to be less cooperative and more responsive to radiation and chemotherapy. The treatment of HPV-related head and neck cancers generally involves surgery, radiation therapy and chemotherapy.

Conclusion

Human Papillomavirus (HPV) has raised as a major factor in the development of head and neck cancers, particularly oropharyngeal cancers. The understanding of HPV's role in carcinogenesis has transformed the landscape of head and neck cancer epidemiology, diagnosis, treatment and prevention. HPV-positive head and neck cancers are more common in younger, healthier individuals who do not have common risk factors like tobacco and alcohol use. These cancers generally have a better prognosis and respond more favorably to treatment. The development of HPV vaccines provides a potential strategy for preventing HPV-related cancers and ongoing studies into treatment reduction and immunotherapy shows possibility for further improving outcomes in HPV-positive patients.

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