Diagnostic Imaging of Malignant Tumors in the Orofacial Region

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KEYWORDS

• Malignancy • Diagnosis • Clinical correlations • Radiographic features • Tumors

KEY POINTS

- Malignancies often have serious consequences, including disfigurement and death.
- All radiographs should be examined for signs of malignant lesions.
- Characteristic appearances of malignant lesions include ill-defined borders, asymmetric appearance, destruction of adjacent bone and cortical borders, and radiolucency with pieces of trapped bone.
- All bony lesions should be visualized completely and, where possible, in 3 dimensions.
- Histopathologic examination is generally the gold standard for final diagnosis of malignant lesions.

INTRODUCTION

This article highlights the radiographic features of malignant lesions and presents the clinical correlations that may aid in the initial diagnosis of orofacial malignancies.

The word "malignant" comes from the Latin *malignare*, meaning "to act wickedly" (*mal* = "bad"). Cancer appears when a stimulus triggers abnormal changes to the chromosomes within cells. The initial stage that can be detected by histopathologic examination is called dysplasia (abnormality) and there are multiple evolutionary stages known, such as carcinoma in situ, primary neoplasm, and secondary or metastatic neoplasm. Most changes take place at the subcellular level and manifest themselves as uncontrolled multiple cell divisions and persistence of old cells while young cells do not mature and differentiate. The clinically visible aspect is usually a late one,

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illustrated by the cancerous growth, tumor, or mass. It may be at this point that radiographically evident changes also occur.

In contrast to a benign lesion, a malignant tumor is characterized by uncontrolled growth potential, an aggressive and invasive nature, and the ability to metastasize. If a tumor arises de novo it is called a primary tumor, and if it originates from a distant tumor it is referred to as secondary or metastatic. Metastases share the tissues of the primary tumor, but they occur in a different and, frequently, distant location. Metastases illustrate the spread of cancer cells, usually traveling through the blood or lymph vessels, and can invade and develop in any other anatomic region. Often, the first site of neoplastic invasion is the nearby lymph nodes.

According to the National Cancer Institute, "head and neck cancers, which include cancers of the oral cavity, larynx, pharynx, salivary glands and nose/nasal passages, account for 3% of all malignancies in the US." Cancers of the oral cavity represent 85% of all head and neck cancers,[1] the eighth most common malignancy in males and 15th most common in females. Estimates for 2015 are far from gratifying. The Oral Cancer Foundation and American Cancer Society estimate in 2015 that 43,000 to 45,000 new cases of oral and oropharyngeal cancers with 8000 to 8650 deaths (approximately 1 per hour) will occur in the United States.[2] An estimated 1 in 92 adults will be diagnosed with oral or pharyngeal cancer in their lifetime.[3]

There are multiple and varied risk factors involved in the development of head and neck cancerous lesions. For example, the use of tobacco and alcohol is strongly related to oral cancer. According to the American Cancer Society, "3 out of 4 people with oral cancer have used tobacco, alcohol or both." It is said that combining the use of tobacco and alcohol will increase the risk of a malignancy by 15 times.[4]

Viruses have been also implicated in the development of oral and oropharyngeal cancer and, of these, human papillomavirus (HPV) types 16 and 18 are strongly associated and are thought to cause about half of all oropharyngeal cancer cases. HPV is a common virus, and in most instances the person's immune system will clear the HPV infection. Only 1% of those infected will display a lack of immune response.[2,4,5]

Sun exposure is also a risk factor for developing skin cancers, manifesting itself in the orofacial region as lip cancer. Furthermore, diets that lack vegetables and fruits, personal history of cancer, betel nut chewing, and other unspecific or minor risk factors are researched, known, and cited.[4] At one time a controversy regarding the relationship between mouthwash use and increased risk for developing oral cancer arose, but proved to have no scientific evidence.[6]

Demographic characteristics have changed over the years. Historically, cancer usually affected older people and, with respect to oral cancers, mostly male smokers or heavy drinkers. The newly recognized HPV16 association with oropharyngeal cancer should eventually shed some light on the more recent reports of changes in age, gender, and race of persons with oral cancer.

Radiology can be a valuable tool in the detection and diagnosis of malignant disease, as intraosseous malignancies, in addition to those that start peripherally but later invade bone, can cause detectable changes in the calcified structures of the teeth and bone. Many of the changes to bone brought about by malignancies either tend to be lytic or cause alterations to the normal trabecular pattern. The characteristic irregular and spike patterns of resorption of the roots of teeth are other changes to calcified structures that may originate from a malignancy.

Although malignancies represent a small fraction of both the common and uncommon lesions of the jaws, early detection is of constant and significant concern