

Value of Imaging in Head and Neck Tumors



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KEYWORDS

• Imaging • Head and neck • Oncology

KEY POINTS

- Imaging is an integral part of management of patients with head and neck cancers. Imaging provides information for accurate staging, therapy selection, therapy assessment, detection of recurrence, and predicting survival outcomes.
- Computed tomography (CT) or magnetic resonance imaging (MRI) is useful for primary tumor staging. Ultrasonography and positron emission tomography (PET)/CT are more useful for identifying neck nodal metastasis, and PET/CT is useful for detecting distant metastasis. MRI is useful for detecting perineural spread, marrow, skull base, and intracranial involvement.
- Posttherapy assessment is performed using CT/MRI or PET/CT. PET/CT is increasingly used for posttherapy assessment because of superior sensitivity and specificity, especially in patients treated with chemoradiation therapy. Fluorodeoxyglucose PET/CT is usually performed 12 weeks after completion of therapy.
- The best value of imaging in follow-up is when it is used with clinical assessment and suspicion for disease recurrence.

INTRODUCTION: NATURE OF THE PROBLEM

Head and neck cancers constitute approximately 3% of all cancers in the United States,¹ with approximately 52,000 new cases diagnosed every year.² Head and

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neck cancer include cancers that have developed in the nasal cavity, sinuses, lips, mouth, salivary glands, paranasal sinuses, pharynx, throat, or larynx. Most head and neck cancers (90%–95%) are squamous cell carcinomas arising from mucosal linings of the upper aerodigestive tract. Other rare cancers that may involve the head and neck include salivary tumors, thyroid cancers, lymphoma, and melanoma.

Tobacco and alcohol use are the most important risk factors for most head and neck cancers. Approximately 75% of head and neck cancers are caused by tobacco and alcohol use. Infection with certain types of human papillomavirus causes more than half of all cases of oropharyngeal cancer.

Early diagnosis and accurate staging are essential for treatment planning and can strongly influence prognosis. In addition, early identification of tumor recurrence can often be treated with additional surgery or reirradiation. A combination of history, physical examination, endoscopy, and tissue sampling has historically been the mainstay of diagnosis and staging. The use of advanced imaging with computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET)/CT has greatly improved staging, therapy assessment, and monitoring for disease recurrence.

PREIMAGING PLANNING

Relevant Anatomy

The anatomy of the head and neck is a broad and complex subject, which is best appreciated when taken into context with the primary malignancy of interest. This review is by no means exhaustive but rather highlights the important structures from an imaging perspective as pertain to tumor spread and stage.

Sinonasal

- Malignant neoplasms include squamous cell carcinoma, adenoid cystic carcinoma, adenocarcinoma, olfactory neuroblastoma (esthesioneuroblastoma), melanoma, and lymphoma.
- The sinonasal cavity begins at the nostrils and ends at the posterior nasal septum, which separates it from the nasopharynx. The nasal cavity contains 3 medial bony projections, known as the turbinates, which originate in the lateral walls.³
- The paranasal sinuses consist of the maxillary, ethmoid, frontal, and sphenoid sinuses. The maxillary sinuses form the inferior margin of the nasal cavity, whereas the superior maxillary sinus forms the orbital floor and contains the infraorbital groove, through which the infraorbital nerve runs. The frontal sinuses anteriorly contribute to the orbital roof. The sphenoid sinus posteriorly forms the nasopharynx roof. The ethmoid sinus forms the superior lateral and medial walls of the nasal cavity.³
- The most common malignancy is squamous cell carcinoma. It may originate in the maxillary sinuses (60%–70%), followed by the nasal cavity (20%–30%), then the ethmoid sinuses (10%–15%), and rarely, in the frontal or sphenoid sinuses (1%).^{4–7}
- The second most common malignancy, adenocarcinoma, most commonly originates in the ethmoid sinus.
- Tumor can invade in several different directions⁵:
 - From the maxillary antrum posterolaterally to the pterygoid plates, pterygopalatine fossa, and infratemporal fossa
 - From the pterygopalatine fossa to the orbit via the inferior orbital fissure or to the middle cranial fossa via the foramen rotundum

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