Head and Neck Cancer Staging
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Head and neck cancers represent a wide spectrum of potentially lethal malignancies involving the many different anatomic compartments extending from the skull base to the mediastinum. Most malignant tumors in these locations are histologically squamous cell carcinomas, with a small, but significant minority of cases consisting of minor salivary gland neoplasms. The major risk factor for malignancy in these locations is a history of smoking. However, alcohol abuse and HPV are also contributing factors.

Regardless of histology, the staging for these lesions is similar based upon the anatomic location of the primary site. Lesions typically spread via local invasion and via lymphatic channels to the cervical lymph nodes. It is important to note that lesions near the midline or that cross the midline can metastasize to contralateral lymph nodes. Additionally, identification of extracapsular spread is vital, as these lesions portend a worse prognosis and a higher risk of recurrence. Distant metastasis can be seen, most commonly to the lungs, then to the liver and bones.

Accurate staging is critical in these patients, as localized disease will be typically treated with local therapy (surgery or radiation therapy), while advanced disease tends to be treated with a combination of surgery and radiation therapy, with the possible addition of chemotherapy. MRI and PET/CT are similar in evaluating the local extent of a tumor. However, PET/CT is superior to MRI or CT alone in the detection of nodal metastasis or distant metastasis. This is especially true for lymph nodes that are normal by CT size criteria, but demonstrate increased metabolic activity. PET/CT is also excellent in identifying recurrent disease, especially given its ability to distinguish between post-treatment changes and early recurrence.
### Staging Overview of Oral Cavity and Lip Carcinomas

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Primary tumor is less than 2cm in greatest dimension. No evidence of nodal disease or distant metastasis.</th>
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</thead>
<tbody>
<tr>
<td>Stage 2</td>
<td>Primary tumor is greater than 2cm, but less than 4cm, in greatest dimension. No evidence of nodal disease or distant metastasis.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Primary tumor greater than 4cm in greatest dimension without direct invasion into adjacent structures OR nodal metastasis to a single ipsilateral lymph node less than 3cm in size. No evidence of distant metastases.</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Stage 4A: Moderately advanced local disease (including direct invasion into adjacent structures, such as cortical bone, floor of mouth, maxillary sinus, or skin) OR any nodal metastasis (ipsilateral, contralateral or both), none of which are greater than 6cm in size. No evidence of distant metastasis.</td>
</tr>
<tr>
<td></td>
<td>Stage 4B: Very advanced local disease (including direct invasion of the masticator space, pterygoid plates, or skull base) OR any nodal metastasis with a lymph node greater than 6cm in greatest dimension.</td>
</tr>
<tr>
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<td>Stage 4C: Characterized by distant metastasis.</td>
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#### Clinical Pearls:
- ***Stage I and Stage II lesions are typically treated with radiation therapy or surgery alone, depending on patient factors and local clinical expertise.***
- ***It is very important to differentiate between stage II and stage III lesions, as stage III (and stage IV) lesions cannot be typically treated with surgery or radiation therapy alone. These patients are candidates for combined surgical and radiation therapy with considerations for adjuvant chemotherapy.***
- ***PET/CT may be superior to MRI in identifying direct invasion of adjacent anatomical structures. Nevertheless, this is critical, as this can by itself upstage the patient.***
- ***Identification of nodal metastases is paramount, as this will obligate a lymph node dissection. In many cases where nodal status is determined to be negative, a lymph node dissection may not be performed.***
- ***PET/CT is superior to CT or MRI in the detection of nodal metastases, distant metastases and a second synchronous primary neoplasm.***
Figure 1. Tongue base squamous cell cancer (arrow) with a single level 2 FDG avid node (circled), SUVmax = 7: Stage 3.
Staging Overview of Nasal Cavity and Paranasal Sinus (except maxillary sinus) Cancers

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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</thead>
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<tr>
<td>Stage 1</td>
<td>Tumor isolated to one anatomic subsite/location with or without osseous destruction. No evidence of nodal disease or distant metastasis.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Tumor invading two adjacent anatomic subsites/locations, including two adjacent areas within the nasoethmoidal complex. No evidence of nodal disease or distant metastasis.</td>
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<tr>
<td>Stage 3</td>
<td>Primary tumor directly invades floor or medial wall of orbit, maxillary sinus, palate or cribiform plate OR nodal metastasis to a single ipsilateral lymph node less than 3cm in size. No evidence of distant metastases.</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Stage 4A: Moderately advanced local disease (including direct invasion into anterior orbital contents, skin, pterygoid plates, frontal or sphenoid sinus) OR any nodal metastasis (ipsilateral, contralateral or both), none of which are greater than 6cm in size. No evidence of distant metastasis. Stage 4B: Very advanced local disease (including direct invasion of the orbital apex, skull base, cranial nerves other than V2, nasopharynx or clivus) OR any nodal metastasis with a lymph node greater than 6cm in greatest dimension. Stage 4C: Characterized by distant metastasis.</td>
</tr>
</tbody>
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Clinical Pearls:
***Except for mucosal Stage I lesions, most cases are treated with combination of surgery and radiation therapy.***
***CT (and therefore PET/CT) is greater than MRI in identifying osseous destruction***
***Destruction of the skull base, pterygoid plates, cavernous sinus and nasopharyngeal involvement are typical contraindications to surgery.***
***It is very important to identify lymph node metastases, as the rate of lymph node involvement is low (less than 20%), and routine lymph node dissection is typically only performed in node positive patients.***
***PET/CT is superior to CT or MRI in the detection of nodal metastases, distant metastases and a second synchronous primary neoplasm.***
***PET/CT is very useful in the surveillance of these patients for locoregional recurrence, as the greatest morbidity and mortality in these patients is due to rapidly recurring local disease or direct extension into vital areas of the skull base.***
Figure 2. Left nasopharyngeal squamous cell cancer (arrow) with ipsilateral and contralateral pharyngeal spread (arrowheads) and several 3 cm level 2 nodes (circled). Stage 4A nasopharyngeal cancer.
## Staging Overview of Hypopharyngeal Cancers

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>Stage 1</td>
<td>Tumor isolated to one anatomic subsite/location and less than 2cm in greatest dimension. No evidence of nodal disease or distant metastasis.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Tumor extension into greater than one subsite/location of hypopharynx and/or measures greater than 2 cm, but not greater than 4 cm in greatest dimension. No evidence of nodal disease or distant metastasis.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Tumor greater than 4cm dimension or fixation of hemilarynx or esophageal invasion OR nodal metastasis to a single ipsilateral lymph node less than 3cm in size. No evidence of distant metastases.</td>
</tr>
</tbody>
</table>
| Stage 4 | Stage 4A: Moderately advanced local disease (including direct invasion into thyroid cartilage, cricoid cartilage, hyoid, or thyroid gland) OR any nodal metastasis (ipsilateral, contralateral or both), none of which are greater than 6cm in size. No evidence of distant metastasis.  
Stage 4B: Very advanced local disease (including direct invasion of the prevertebral fascia, mediastinum or carotid artery encasement) OR any nodal metastasis with a lymph node greater than 6cm in greatest dimension.  
Stage 4C: Characterized by distant metastasis. |

**Clinical Pearls:**

***It is important to identify advanced stage lesions (usually Stage 2 or greater), as these patients may be offered chemotherapy in addition to combined surgery and radiation.***

***Hypopharyngeal carcinomas have a propensity for skip lesions (skip metastasis) and recurrence at locations remote from the primary site.***

***Compared to other head and neck neoplasms, hypopharyngeal masses have increased rate of nodal and distant metastases.***

***PET/CT is superior to CT or MRI in the detection of nodal metastases, distant metastases and a second synchronous primary neoplasm.***

***Overall, PET/CT has a very high negative predictive value in excluding distant metastatic disease in the setting of a negative scan.***
Figure 3. 53 year old man with left piriform sinus hypopharyngeal squamous cell cancer (h), SUVmax = 12. There is prominent left level 2 adenopathy (n, arrow). Tumor extends inferiorly and apparently invades the left cricoid cartilage. A small midline level 6 node is noted(circled).
References: