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Critical Changes in the Staging of Head and Neck Cancer

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The many changes made to the head and neck (HN) chapters of the eighth edition of the American Joint Committee on Cancer (AJCC) and Union for International Cancer Control (UICC) cancer staging manuals have resulted in confusion from clinicians and radiologists. These changes have even raised concerns for validity. In prior staging manual updates, the changes made largely provided simplification of more complex staging details. The current eighth edition of the AJCC/UICC staging manuals introduced greater granularity to HN tumor staging. This reflects the current understanding of pathophysiology of these cancers and is necessary to create a more accurate prognosis for these patients. The most commonly encountered example of manual changes is the separate staging of viral-associated oropharyngeal squamous cell carcinoma from tobacco and alcohol use-associated squamous cell carcinoma. While anatomic imaging is critical for HN cancer staging, and frequently outweighs clinical examination, some changes to staging make it impossible for a stage to be assigned until surgical resection is performed. In all, the AJCC/UICC eighth edition changes, the impact on radiologists, and the rationale behind the changes will be discussed. Additionally, opportunities for radiologists to contribute to research that may influence the next edition of AJCC/UICC cancer staging manuals will be proposed.

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Cancer staging is largely an anatomically based description of patient tumor burden. In the American Joint Committee on Cancer (AJCC)/Union for International Cancer Control (UICC) cancer staging manuals, staging is described by the primary tumor, nodal disease, and distant (metastatic) spread, which are designated as T, N, and M, respectively (1,2). Oncologists designate a final clinical stage, termed *cTNM*, after combining information from the physical examination, radiology findings, fine-needle aspiration, sentinel node biopsy, and other diagnostic tests. Following tumor resection, the clinical *c* is replaced with the prefix *p* using T and/or N information from the final pathologic examination. For some tumors, the cTNM or pTNM may be combined with additional specific factors, such as age (eg, with differentiated thyroid cancer) or Gleason score (prostate cancer), to determine the patient's overall anatomic stage or prognostic group from 0 to IV. Using this scale, stage 0 represents in situ disease, while stage IV is the worst prognosis and typically used when metastatic disease is evident. The prognostic groups are designed to be an accurate representation of a patient's prognosis from their tumor. That is, each specific group, I through IV, should have accurate outcome prediction for a patient in that group. All patients in the same prognostic group should have similar survival rates (that is, there is good hazard consistency), and there should be excellent hazard discrimination, meaning that there should be different survival rates across the different stage groupings. There should also be an even distribution of patients across the stage groups. The combination of these features (accurate outcome prediction, good hazard consistency, good hazard discrimination, and balanced distribution) for each tumor pathologic type is referred to as the *Groome criteria* and describes an ideal staging system (3).

Radiologists participating on tumor boards will be familiar with the TNM and prognostic stages to provide

information to patients about their prognosis and to consider treatment options or determine patient eligibility for clinical trials. Another important use of the system is that cancer registries can collect this data, as well as additional information about patient or tumor biologic, genetic, and pathologic features. While these additional factors may not currently affect prognostic staging, data are collected to promote a more robust understanding of tumors and allow future iterations of the staging system. New cancer staging manuals, which are collated every 7 to 8 years, also incorporate findings from published studies reporting large patient groups and different clinical, pathologic, radiologic, or biologic features that result in characterizing better outcomes. This is the basis for the substantial changes made to the eighth edition AJCC cancer staging manual (AJCC8) as compared with the seventh edition (AJCC7), which was released in 2010 (Tables 1, 2) (1,4). The updates to the head and neck (HN) section, which forms part II of XVIII of AJCC8, were developed in collaboration with the UICC, whose eighth edition cancer staging manual (UICC8) went into use in January 2017 (2).

AJCC8 Critical Changes

Oropharyngeal Squamous Cell Carcinoma

Human papilloma virus (HPV)-associated oropharyngeal squamous cell carcinoma (OPSCC) is one of the most common types of HN mucosal squamous cell carcinoma (SCC), most often associated with HPV type 16 (HPV-16), and less often, HPV-18. While rapidly emerging over the last 25 years, during a time of declining tobacco use, HPV is estimated to cause 18 000 new cancers in 2019 (5,6). While it is possible to detect HPV DNA in primary HPV-associated OPSCC tumors or their nodal metastases with in situ hybridization and polymerase

Abbreviations

AJCC = American Joint Committee on Cancer, EBV = Epstein-Barr virus, ENE = extranodal extension, HN = head and neck, HPV = human papilloma virus, NPC = nasopharyngeal carcinoma, OPSCC = oropharyngeal SCC, SCC = squamous cell carcinoma, UICC = Union for International Cancer Control

Summary

The anatomically based American Joint Committee on Cancer and Union for International Cancer Control staging systems incorporate new details that require either clinical examination or pathologic evaluation; however, head and neck tumor staging still requires careful radiologic evaluation and documentation in the report so that all clinically available information can be combined by the oncologist or surgeon to most accurately stage disease in patients.

Key Points

- A new, separate staging system for human papilloma virus (HPV)-mediated oropharyngeal squamous cell carcinoma (OPSCC) was necessary, because with the prior staging system many patients who were designated as stage IV had an overall survival of around 90%.
- For radiologists reviewing tumor OPSCC staging scans and involved with tumor boards, it is critical to be aware of the tumor p16 and HPV status prior to offering a nodal designation.
- While staging extranodal extension (ENE) is a clinical finding, radiology can be critical in suggesting the presence of ENE and in providing supportive evidence of suspected ENE in difficult clinical examinations.
- More than 90% of unknown primary squamous cell carcinoma detected at fine-needle aspiration of a nodal mass in the absence of a clinically evident primary source are due to HPV-related OPSCC.

chain reaction testing, both methods are time-consuming, expensive, and difficult to perform. In situ hybridization can also be used to detect HPV RNA, where probes are used to detect transcriptionally active E6 and/or E7 oncogenes with high sensitivity and specificity, although is a technically challenging test to perform (7–9).

It has been observed that most HPV-associated oropharyngeal tumors have upregulation of a cyclin-dependent kinase inhibitor, known as p16. Identification of this marker has allowed a cheaper and more reliable immunohistochemistry test to be used to determine likely HPV association. An OPSCC that is p16 positive at immunohistochemistry is likely to be due to HPV and has also been shown to have a better prognosis than p16 negative, which is often associated with tobacco and alcohol OPSCC (10). It is important to note that many tumors may be p16 positive, including skin, lung, oral cavity, and laryngeal SCC, but this does not indicate an HPV association and, importantly, does not portend a better prognosis for these tumors (11). Therefore, there is little utility in performing p16 analyses for tumors outside the oropharynx, except for nodal masses, to identify a clinically occult primary source. Additionally, while HPV may be found in association with around 4% of nonoropharyngeal tumors, there is no clear improved prognosis for these tumors as there is for HPV-associated OPSCC (12).

The AJCC7 designated stage III disease when one metastatic OPSCC node is identified and stage IV disease for more than one node or a node larger than 3 cm. HPV-mediated OPSCC

has a tendency to present with multiple or large nodes. These nodes, when using the prior staging system, were frequently designated as stage IV despite an overall survival rate of around 90% for these patients. It was for this reason that a new staging system was necessary. The new staging system was largely crafted using data from the ICON-S data (International Collaboration on Oropharyngeal Cancer Network for Staging) (13). Registry data from seven European and North American institutions were used in defining the new staging system, which proposed a radical change in the staging system for p16 positive and/or HPV-mediated OPSCC. The study found no survival difference for HPV-mediated tumors when nodal disease was N1 to N2b using AJCC7 criteria, and therefore new criteria were designated in AJCC8. In AJCC8, it is stated that all ipsilateral nodal disease is to be designated as N1, bilateral or contralateral nodes are to be designated as N2, and nodes that are larger than 6 cm are to be designated as N3. These criteria mirror the nodal criteria for nasopharyngeal carcinoma (NPC). With no survival difference for patients with T4a and T4b, the existing criteria were combined to create one T4. Additionally, the final prognostic groupings that have also been incorporated into AJCC8 have likely been a source of confusion for physicians on tumor boards and those who stage disease in patients. Stage I is determined by T1–2 and N0–1, stage II by T1–2 and N2 or T3 and N0–2, and stage III by T4 or N3. Stage IV is reserved for patients with metastatic disease. Thus, patients with a small primary tumor and multiple ipsilateral nodes who would have been previously staged as T1N2b, stage IVA would now be staged as T1N1, stage I (Figs 1, 2). This more accurately reflects their excellent prognosis and results in quite a stage shift overall for these patients. Now, with AJCC8 staging, up to 80% of patients with p16 positive and/or HPV-mediated OPSCC will be stage I with a 90% 5-year overall survival. A small percentage of patients will have metastatic disease and be stage IV with a 20% 5-year overall survival. This demonstrates an imbalance of patients across the stage groups which is one criticism of this new system, although it reflects the patient group better than the AJCC7 (3,14).

To increase the complexity of HPV-mediated and/or p16-positive OPSCC further, a distinct pathologic staging system was also devised for patients undergoing definitive surgical therapy (15). This system diverges completely from the clinical nodal system, with the removal of N3 grouping, and N1 being defined by the presence of four or fewer positive nodes, and N2 being defined as the presence of more than four malignant nodes. Laterality of nodal disease is not a consideration for the pathologic nodal table, which likely arose from frequent unilateral-only neck dissections. This is, however, a departure from prior staging systems where the clinical and pathologic tables generally follow the same principles of tumor pathophysiology. This nodal designation has raised some concerns in this regard; however, at many institutions OPSCC remains treated with definitive chemoradiation therapy which obviates this somewhat confusing pathologic nodal category (14).

For radiologists who review tumor OPSCC staging scans and are active on tumor boards, it is critical to be aware of the tumor p16 and HPV status prior to offering a nodal designation, and less critical for tumor categorization. If an OPSCC tumor is known

Table 1: Critical Changes in AJCC8 for Head and Neck Cancer Staging

Tumor Type	T Designation	N Designation
Oropharyngeal SCC		
HPV-related oropharyngeal SCC	New staging system for T, N, and prognostic groupings and used when oropharyngeal primary tumor is p16 or HPV positive	New clinical nodal table as follows: cN1: ipsilateral nodes cN2: bilateral or contralateral nodes; and cN3: nodes > 6 cm
	T4 no longer divided into T4a and T4b	New pathologic nodal table if neck dissection performed
Non-HPV oropharyngeal SCC	No changes	Addition of clinical ENE which determines N3b status
		New pathologic nodal table which also incorporates pathologic ENE
Nasopharyngeal carcinoma	Pterygoid muscle involvement now T2, previously included as part of <i>masticator space</i> and designated as T4	Level IV and Vb nodes now designated N3 disease with removal of term <i>supraclavicular fossa</i>
	Invasion to prevertebral muscles clarified as T2	Nodal masses > 6 cm also N3, removed N3a/N3b
	Invasion to parotid now T4	
Oral cavity	Lip SCC now staged under cutaneous carcinomas of HN	Uses the non-HPV, non-EBV nodal table
	Extrinsic muscle involvement no longer determines T4	
	DOI is new pathologic criterion for determining T status	

Note.—DOI = depth of invasion, EBV = Epstein-Barr virus, ENE = extranodal extension, HN = head and neck, HPV = human papilloma virus, SCC = squamous cell carcinoma.

Table 2: Additional AJCC8 Changes to Head and Neck Cancer Staging

Tumor Type	Staging Changes
HPV-mediated oropharyngeal SCC	Marked change to prognostic groupings: N1 = stage I, N2 = stage II, N3 = stage III. Stage IV only if M1 disease
Unknown primary tumors	Part of new chapter on lymph nodes with new direction as to how to stage these tumors
	Directs pathologic evaluation of nodes to first determine whether p16 positive favoring HPV-mediated OPSCC
	No T category is assigned if node is HPV and EBV negative unless a skin primary site is clinically strongly favored
Cutaneous carcinoma of HN	New chapter and T category table for all skin lesions including lesions of the external dry lip (vermillion), but excluding eyelid tumors
Thyroid carcinoma	Thyroid-differentiated carcinoma chapter has been moved out of HN section to the Endocrine section of AJCC8
	For prognostic grouping to distinguish between stage I and stage II, the age has been changed from 45 years to 55 years
Soft-tissue sarcomas	New chapter in AJCC8 and is included in the Soft-Tissue Sarcoma section of AJCC8, not the HN section

Note.—AJCC = American Joint Committee on Cancer, EBV = Epstein-Barr virus, HN = head and neck, HPV = human papilloma virus, OPSCC = oropharyngeal squamous cell carcinoma, SCC = squamous cell carcinoma.

to be p16 positive, then this new nodal table should be used, whereby all ipsilateral, unilateral nodes are designated N1, bilateral or contralateral nodes are designated N2, and nodal masses

that are greater than 6 cm are designated N3. Additionally, it is important to be aware that there might be a change to the final pathologic designation (pTNM) and therefore also the prognostic

stage grouping after neck dissection. The only alteration to the T category that occurs if an OP-SCC is p16 positive and/or HPV mediated is that there are no separate T4a and T4b categories. The terminology in this portion of AJCC8 can be disconcerting, as specific structures, for example the skull base, are no longer specifically listed as T4 criteria, but abbreviated in the table. T4 is described as “tumor invades the larynx, extrinsic muscles of tongue, medial pterygoid, hard palate or mandible, or beyond” (HPV-mediated [p16 positive] Oropharyngeal Cancer chapter) (1).

Non-HPV, Non–Epstein-Barr Virus Nodal Disease

Metastatic nodal SCCs that are HPV negative from any site in the HN, and are also not due to NPC, are subject to an important change to the nodal designation. The size, number, and laterality of nodal disease which determined N1–N3 in AJCC7 is foundationally unchanged in AJCC8; however, an additional clinical criterion of extranodal extension (ENE) of tumor has been added. Previously termed *extracapsular extension* or *extranodal spread*, pathologic ENE is well-recognized as deeming poor prognosis for SCC, but it has not previously been part of the clinical or pathologic tables until AJCC8 (16,17).

Pathologic determination of ENE follows neck dissection and is described as a 2 mm or less microscopic ENE or more than 2 mm for major ENE, but both carry the same significance for pN designation. A single ipsilateral ENE node less than or equal to 3 cm is pN2a, but one ipsilateral node of greater than 3 cm with ENE, any contralateral node with ENE, or multiple nodes with any ENE is designated pN3b.

In addition to this new pathologic ENE, AJCC8 also introduced the clinical ENE designation. This is a specific clinical examination finding of overt tumor spread by fixation of the nodal mass to adjacent structures such as skin or muscles or evidence of nerve dysfunction suggesting nerve invasion (1). The designation of clinical ENE results in cN3b designation which determines a prognostic grouping of stage IVB and thus is a critical finding for upstaging tumors. Imaging may provide supportive

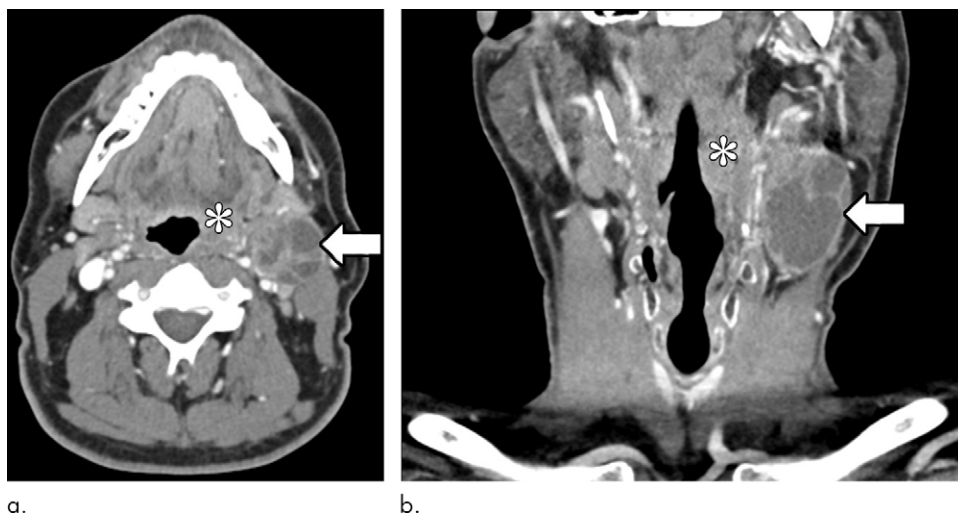


Figure 1: (a) Axial and (b) coronal contrast-enhanced CT images in a 58-year-old man presenting with a left neck mass show a cystic and solid 3.2-cm level 2A nodal mass (arrow). At fine-needle aspiration, this proved to be a p16 positive squamous cell carcinoma (SCC), and biopsy of the left tonsil (*) proved the primary site to be a small oropharyngeal SCC, which was also p16 positive. With AJCC7 staging, this would be categorized as T1N2a, stage IVA. With AJCC8 staging, this is T1N1 or stage I disease.

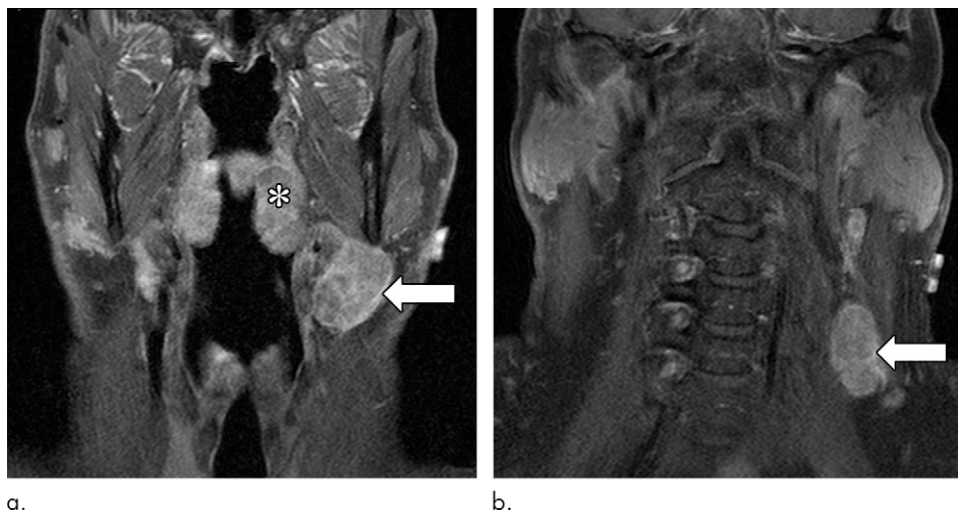


Figure 2: (a, b) Coronal postcontrast T1-weighted with fat saturation MR images in a 51-year-old man who is HIV positive. At clinical examination, left tonsillar enlargement (*) was noted, in addition to multiple enlarged left nodal masses (arrow). These were all shown to be fluorodeoxyglucose avid at PET/CT. MRI was performed prior to determining p16 status, and thus a nodal designation was not possible. If p16 negative this would be N2b because of the presence of multiple ipsilateral nodes and stage IVA. If p16 positive (which it was later determined to be), this is N1 disease, stage I.

evidence of this clinical ENE, but as a review of research publications prior to AJCC8 development showed inconsistent data and overall poor accuracy for predicting ENE with imaging, this could not be incorporated into AJCC8 nodal tables. A key tenet of AJCC is that “stage migration” should be avoided. When there is doubt, the clinician assigning tumor stage should always assign the lesser of possible stages and until imaging proves to be more accurate for ENE; nodal disease should not be “upstaged” by imaging alone (1,18).

The radiology literature has multiple definitions for what constitutes CT or MRI findings of ENE, including indistinct nodal margins, irregular nodal capsular enhancement, interruption in the nodal capsule, or infiltration into the perinodal fat or into adjacent muscle (19–30) (Fig 3). Several additional MRI signs

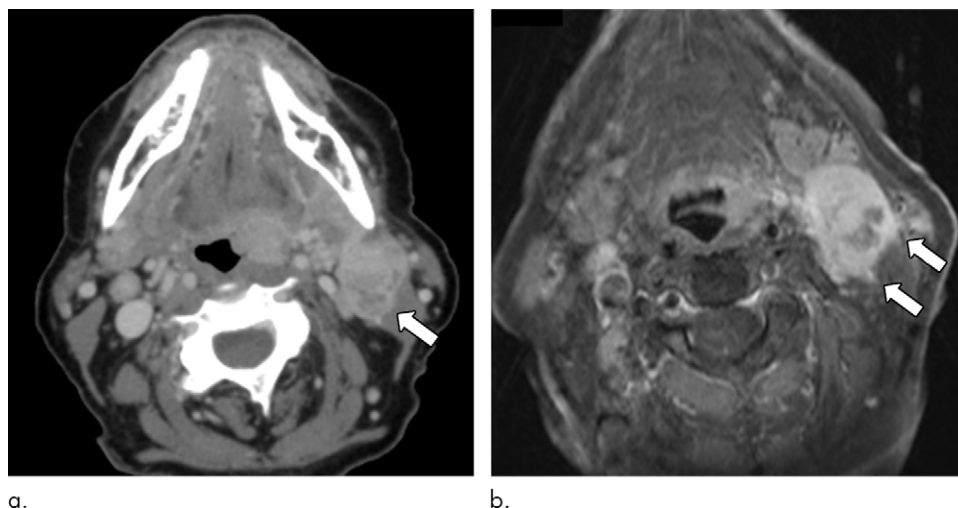


Figure 3: (a) Axial contrast-enhanced CT image and (b) contrast-enhanced fat-saturated T1-weighted MR image in 60-year-old woman with a 40 pack-year smoking history presenting with a left neck mass which at fine-needle aspiration was found to be p16 negative. This large heterogeneously enhancing mass at level 2A has an irregular border and is infiltrating the sternocleidomastoid muscle (arrows). Irregular nodal contours are suspicious for extranodal extension (ENE), but infiltration of tissues is more accurate for tumor spread. In addition to the examination finding of a fixed left neck mass (clinical ENE), the patient had a left tonsillar mass also. This was formally staged as T1N3b, stage IVB p16-negative oropharyngeal squamous cell carcinoma.

have been articulated such as the “vanishing border” sign where the fat space between node and adjacent tissues is obliterated on T1-weighted images, “flare” sign with high signal in interstitial tissues around and extending from the node on fat-suppressed T2-weighted images, and the “shaggy margin” sign where there is irregular or interrupted enhancement at the periphery of the nodes on axial gadolinium-enhanced T1-weighted images (30). Some reports indicate that ENE is more common in the presence of nodal necrosis and in nodes larger than 16 mm or larger than 20 mm, while others find no correlation with nodal size (19,21,22,23). A more recent CT study, published after the release of AJCC8, examined patients with HPV-mediated OPSCC and suggested a positive predictive value for major pENE of only 44%–55% (31). Such studies suggest that while imaging may be readily able to determine large volume ENE, akin to that detected at clinical examination, it is currently not able to reach the accuracy of pathologic examination, and thus clinicians are unlikely to incorporate this into staging.

There has also been conflicting evidence as to whether ENE is relevant for prognosis in p16-positive and/or HPV-mediated OPSCC, and so ENE was not incorporated into the nodal criteria for these tumors (19,20). Since the time that AJCC8 was created, there have been further publications suggesting that pathologic ENE is indeed associated with a poorer prognosis for HPV-mediated OPSCC (19,21), which may contribute to changes to the next AJCC edition. Two recent articles have also evaluated the prognostic value of radiologically determined ENE in nonsurgically treated HPV-mediated OPSCC with conflicting results, adding further to the debate on inclusion of radiology in nodal ENE designation and in HPV-mediated tumor staging (22,23).

Unknown Primary Tumors

A new chapter (chapter 6) within AJCC8 covers nodal disease and unknown primary tumors. This chapter is important to

understand for those radiologists participating on tumor boards and as a reminder for radiologists reading imaging studies where a new neck mass is the first manifestation of HN cancer. An unknown primary tumor is defined as SCC detected from fine-needle aspiration of a nodal mass in the absence of a clinically evident primary source (1) (chapter 6). More than 90% of unknown primary tumors are determined to be HPV-related OPSCC (32,33). As a radiologist evaluates a new neck mass, the first consideration in an adult must be carcinoma, and if fine-needle aspiration has already been performed, the scan should be evaluated looking carefully for a primary oropharyngeal tumor site. As HPV-related tumors de-

velop from the depth of the tonsil, rather than from surface dysplasia, it is not unusual that tonsillar asymmetry may be readily apparent to a radiologist while not initially evident at clinical examination (Fig 4). In the presence of a level 2 nodal mass, it is important to carefully evaluate the ipsilateral palatine and lingual tonsil for subtle asymmetry which may be the primary tumor site to direct surgeons to biopsy or tonsillectomy. Determination of the true primary can markedly limit the radiation field used for therapy.

Since OPSCC is the most common primary tumor for unknown primary tumors, the initial recommended testing on a nodal fine-needle aspiration sample is immunohistochemistry for p16. If p16 is negative, then Epstein-Barr virus (EBV)-encoded RNA should be sought at in situ hybridization to detect an occult NPC. If p16 is positive and no oropharyngeal primary is clearly found at CT, MRI, PET/CT, or tonsillectomy, then HPV-in situ hybridization is still recommended because p16 can be positive in non-HPV-related, nonoropharyngeal tumors, including up to 30% of skin cancers. If a skin primary site is suspected, evaluation of the nodal disease for ultraviolet light DNA damage can also be performed to distinguish from an unknown mucosal primary site (34).

HPV and p16-positive nodes without pathologic confirmation of a primary site are determined to be T0, and the nodal table for p16-positive disease is used for staging. Similarly, EBV-encoded RNA-positive nodes without a confirmed primary site are T0 and staged using the nodal table for NPC. p16-positive or p16-negative tumors that are not shown to be HPV-related by in situ hybridization do not get a T category because their primary site is unknown (Fig 5).

Nasopharyngeal Carcinoma

NPC is most often related to EBV, although there are currently no separate staging systems for viral-associated and

non-EBV NPC, due to the relative rarity of the latter disease process, limiting robust patient numbers to determine a separate staging. The changes in AJCC8 to NPC clinical nodal and tumor categories are relatively straightforward. Most large volume studies evaluating the epidemiology, treatment, and staging are from Hong Kong and China, reflecting their geographic and genetic predilection for this tumor. Since AJCC7 publication, it has been demonstrated that invasion of the medial and lateral pterygoid and the prevertebral muscles does not portend as poor a prognosis as previously thought (35). Involvement of the pterygoid muscles was previously categorized as T4 and has now been reduced to T2. It is only when a tumor spreads more widely, and specifically, lateral to the lateral pterygoid and into the parotid gland that this infiltration is designated T4. The terms *masticator space* and *infratemporal fossa* which were part of the AJCC7 terminology have been removed and replaced with specific-named soft-tissue structures to simplify and clarify staging.

For NPC clinical nodal criteria, the use of the triangle of Ho for supraclavicular nodes has been removed. This clinical supraclavicular triangle is formed with the clavicle as the triangle base and the triangle apex where the neck meets the shoulder. Such an anatomic definition of nodal localization is not readily applied to radiologic nodal evaluation. In AJCC8, the triangle of Ho is not used for N3 nodes, but now those nodes located below the caudal border of the cricoid cartilage, and effectively in levels IV and VB, are designated N3 disease. Nodal masses larger than 6 cm are also in this N3 category with removal of the prior separate N3a and N3b groups. In AJCC8, N3 now determines a prognostic stage grouping of IVA, rather than IVB (Fig 6).

Oral Cavity

In AJCC7 and in the initial printing of AJCC8 and UICC8, the chapter that described oral cavity tumor staging was titled "Oral Cavity" (chapter 7); however, the lip portion was subsequently removed, and such tumors are now staged using the tables presented in the new AJCC8 chapter "Cutaneous Carcinoma of Head and Neck" (chapter 15). Tumors arising from the external dry lip, or vermillion (where lipstick is applied), are considered cutaneous carcinomas. Tumors arising from the inner lip, which is a wet mucosal surface, are still considered to be oral cavity tumors.

Oral cavity tumor staging has undergone a substantial alteration, with removal of the criterion of extrinsic muscle

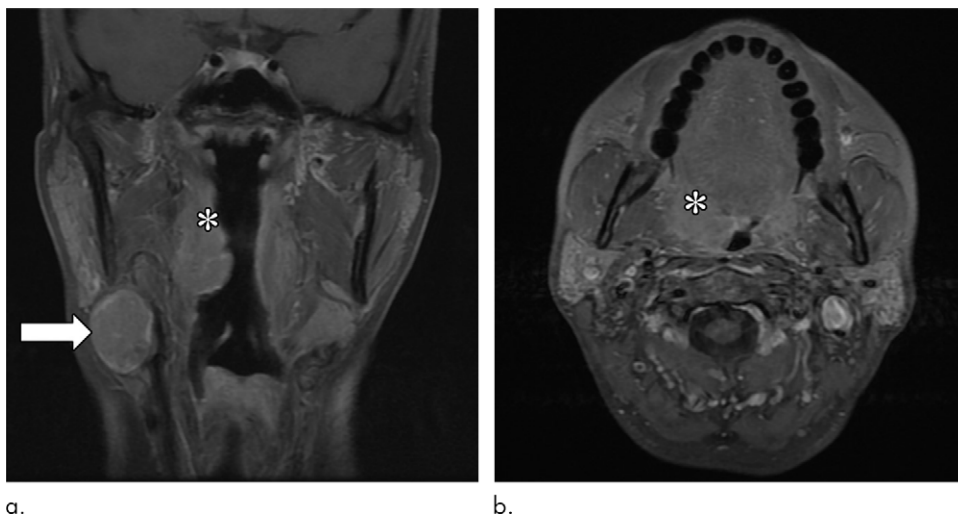


Figure 4: (a) Coronal and (b) axial postcontrast T1-weighted fat-saturated MR images in a 45-year-old woman with a right neck mass which at fine-needle aspiration revealed p16-positive squamous cell carcinoma. At clinical examination, no primary mass was evident, although at imaging the solid right level 2A node (arrow) led to careful imaging inspection of the ipsilateral asymmetrically enlarged palatine tonsil (*). At tonsillectomy, a primary tumor was evident in the deep aspect of this tonsil. This is a less subtle example of asymmetric tonsillar size and heterogeneous enhancement that strongly suggests the primary site even when clinical examination is unrevealing.

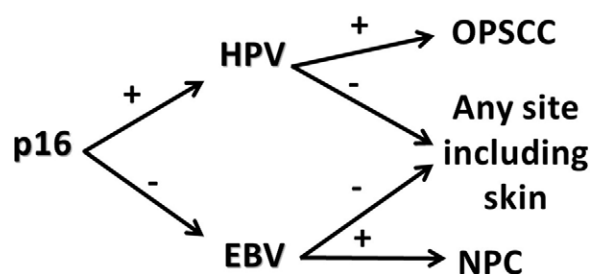


Figure 5: Flowchart for pathologic evaluation of unknown primary squamous cell carcinomas (SCCs), as recommended in AJCC8. p16 status is determined by immunohistochemistry. Epstein-Barr virus (EBV) is Epstein-Barr virus–encoded RNA found at in situ hybridization. There are also uncommon EBV and human papilloma virus (HPV) negative nasopharyngeal carcinoma (NPC) and rare EBV-negative but HPV-positive NPC. Up to 30% of skin SCC are p16 positive, HPV negative. OPSCC = oropharyngeal SCC.

invasion for T4 category, which is most relevant for oral tongue malignancies. This is a criterion that was frequently determined by radiologic evaluation since pathologists often have difficulty distinguishing extrinsic from intrinsic muscle invasion. In addition, in recognition of the prognostic significance of deeply invasive tumors a new criterion was added, called *depth of invasion* which supplements the measure of tumor diameter (36,37). Depth of invasion is a pathologic measurement at surgical resection of the spread of tumor below the basement membrane. This is distinct from the total thickness of the tumor. Exophytic tumors might have minimal deep invasion despite being large in diameter, while endophytic tumors might have substantial invasion while a smaller diameter. It remains to be proven the accuracy of CT and MRI for determining depth of invasion and therefore permitting more accurate preoperative tumor staging for oral cavity lesions (Fig 7).

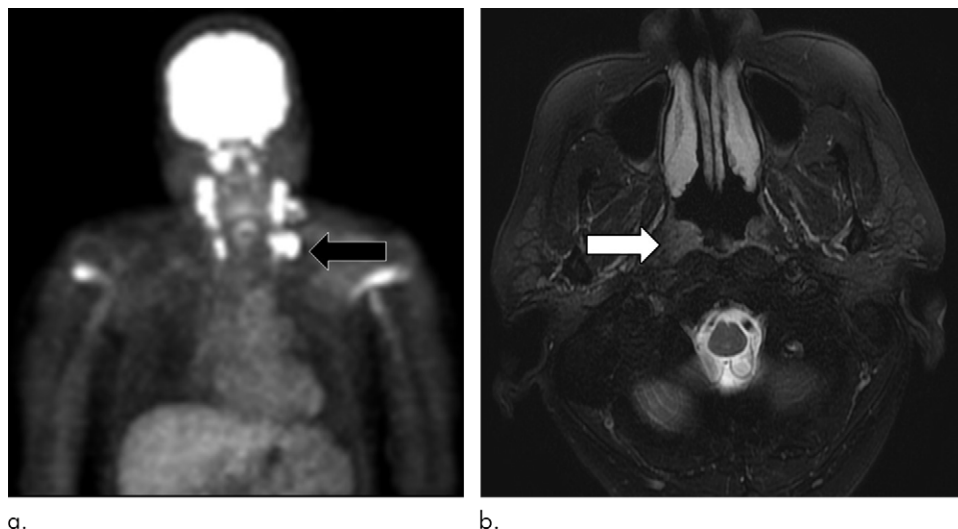


Figure 6: (a) Coronal plane fluorodeoxyglucose (FDG) PET study in a 63-year-old man with 2-year history of enlarging left neck masses demonstrates multiple foci of uptake of FDG in the neck correlating with extensive bilateral adenopathy extending to the supraclavicular fossa (arrow). Fine-needle aspiration demonstrated p16-negative, p63-positive, Epstein-Barr virus strongly positive nasopharyngeal carcinoma. The low-neck adenopathy below the caudal border of the cricoid cartilage designates N3 disease, while the primary site shown on (b) axial fat-saturated T2-weighted MR image is a small right-sided T1 lesion without deep invasion (arrow).

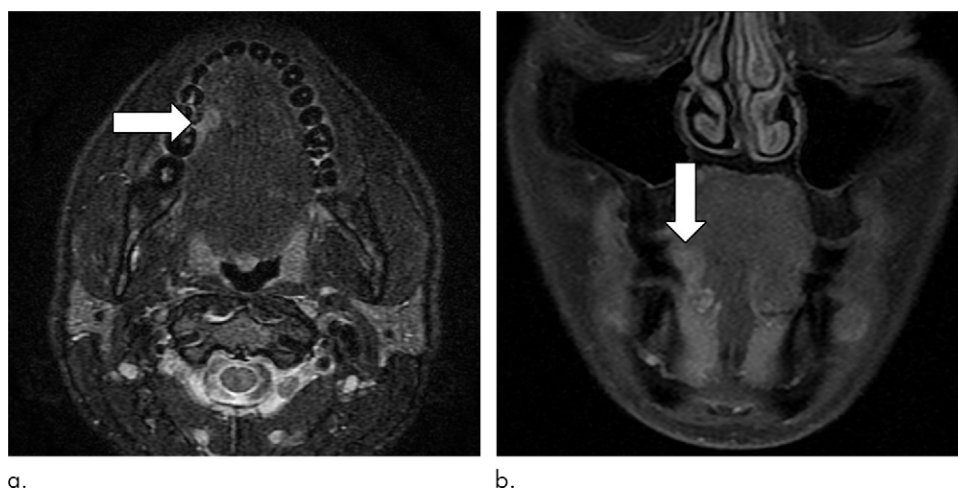


Figure 7: (a) Axial fat-saturated T2-weighted MR image and (b) coronal postcontrast T1-weighted fat-saturated MR image in a 36-year-old woman with a right tongue ulcerative lesion demonstrate a small right lateral oral tongue squamous cell carcinoma (arrow), which at imaging was measured at 1.6 cm, which might suggest a T1 lesion as it is ≤ 2 cm. At resection, the greatest diameter was measured at 1.58 cm; however, depth of invasion was measured at 6 mm. Depth of invasion greater than 5 mm, but equal to or less than 10 mm increases the category to T2. Final staging pT2N0M0, stage II.

Chapters without Changes from AJCC7

While many of the changes as described may seem confusing, large portions of the HN section of AJCC8 remain unaltered from AJCC7 (1,4). For all non-HPV, non-EBV pharyngeal SCC, there are no changes to the T designation. Additionally, there have been no changes to the T designation for salivary neoplasms, and to nasal cavity and paranasal sinus tumors. These tumors are also evaluated using the new non-EBV, non-HPV nodal table. There are also changes to the T designation table for mucosal melanoma, although nodal staging for this aggressive malignancy is different from other HN tumors where N0 is the absence of nodal metastasis and N1 the presence of local nodal disease.

Conclusions

The implementation of the staging changes in AJCC8/UICC8 have not been smooth for many clinicians and radiologists. Many HPV-related OPSCC tumors, which were previously called stage IV in AJCC7, will now be stage I in AJCC8. While this has been disconcerting, this new staging more accurately reflects their markedly better prognosis as compared with non-HPV-related OPSCC. The presence of five different nodal category tables (three clinical for NPC, HPV, and all remaining nodes and two pathologic tables for HPV and all other nodes) requires that radiologists on tumor boards or reading staging scans should seek pathologic information from the patient charts if they wish to propose a nodal category. Some of the more subtle staging changes necessitate clinical examination, such as ENE of tumor, or pathologic information, such as oral cavity depth of invasion, for accurate staging. Nonetheless, much of HN tumor staging still requires careful radiologic evaluation and documentation in the report so that all clinically available information can be combined by the oncologist or surgeon to most accurately stage disease in our patients.

Disclosures of Conflicts of Interest:

C.M.G. Activities related to the present article: member of expert panel for head and neck; received meeting travel support from the American College of Surgeons. Activities not related to the present article: receives royalties from Elsevier-Amirsys. Other relationships: disclosed no relevant relationships.

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