Clinical Evaluation

HISTORY

The evaluation of any neck mass begins with a careful history. The history should be taken with the differential diagnosis in mind [see Table 1] because directed questions can narrow down the diagnostic possibilities and focus subsequent investigations. For example, in younger patients, one would tend to look for congenital lesions, whereas in older adults, the first concern would always be neoplasia.

The duration and growth rate of the mass should be determined: malignant lesions are far more likely to exhibit rapid growth than benign ones, which may grow and shrink. Next, the location of the mass in the neck should be determined. This is particularly important for differentiating congenital masses from neoplastic or inflammatory ones because each type usually occurs consistently in particular locations. In addition, the location of a neoplasm has both diagnostic and prognostic significance. The possibility that the mass reflects an infectious or inflammatory process should also be assessed. One should check for evidence of infection or inflammation (e.g., fever, pain, or tenderness); a recent history of tuberculosis, sarcoidosis, or fungal infection; the presence of dental problems; and a history of trauma to the head and neck. Masses that appear inflamed or infected are far more likely to be benign.

Finally, factors suggestive of cancer should be sought: a previous malignancy elsewhere in the head and neck (e.g., a history of skin cancer, melanoma, thyroid cancer, or head and neck cancer); night sweats (suggestive of lymphoma); excessive exposure to the sun (a risk factor for skin cancer); smoking or excessive alcohol consumption (risk factors for squamous cell carcinoma of the head and neck); nasal obstruction or bleeding, otalgia, odynophagia, dysphagia, or hoarseness (suggestive of a malignancy in the upper aerodigestive tract); or exposure to low-dose therapeutic radiation (a risk factor for thyroid cancer).

PHYSICAL EXAMINATION

Examination of the head and neck is challenging in that much of the area to be examined is not easily visualized. Patience and practice are necessary to master the special instruments and techniques of examination. A head and neck examination is usually performed with the patient sitting in front of the physician. Constant repositioning of the

Table 1 Etiology of Neck Mass

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
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<tbody>
<tr>
<td>Inflammatory and infectious disorders</td>
<td>Acute lymphadenitis (bacterial or viral infection)</td>
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<td></td>
<td>Subcutaneous abscess (carbuncle)</td>
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<td></td>
<td>Infectious mononucleosis</td>
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<td>Cat-scratch fever</td>
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<td>Acquired immunodeficiency</td>
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<td></td>
<td>syndrome</td>
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<td>Tuberculous lymphadenitis (scrofula)</td>
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<td>Fungal lymphadenitis (actinomycosis)</td>
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<td></td>
<td>Sarcoma</td>
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<td>Congenital cystic lesions</td>
<td>Thyroglossal duct cyst</td>
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<td>Branchial cleft cyst</td>
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<td></td>
<td>Cystic hygroma (lymphangioma)</td>
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<td>Vascular malformation (hemangioma)</td>
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<td>Laryngcele</td>
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<td>Benign neoplasms</td>
<td>Salivary gland tumor</td>
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<td>Thyroid nodules or goiter</td>
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<td></td>
<td>Soft tissue tumor (lipoma, sebaceous cyst)</td>
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<td></td>
<td>Chemodectoma (carotid body tumor)</td>
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<td></td>
<td>Neurogenic tumor (neurofibroma, neurilemoma)</td>
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<td></td>
<td>Laryngeal tumor (chondroma)</td>
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<tr>
<td>Malignant neoplasms</td>
<td>Primary Salivary gland tumor</td>
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<tr>
<td></td>
<td>Thyroid cancer</td>
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<td></td>
<td>Upper aerodigestive tract cancer</td>
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<tr>
<td></td>
<td>Soft tissue sarcoma</td>
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<tr>
<td></td>
<td>Skin cancer (melanoma, squamous cell carcinoma, basal cell carcinoma)</td>
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<tr>
<td></td>
<td>Lymphoma</td>
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<td></td>
<td>Metastatic Upper aerodigestive tract cancer</td>
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<tr>
<td></td>
<td>Skin cancer (melanoma, squamous cell carcinoma)</td>
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<tr>
<td></td>
<td>Salivary gland tumor</td>
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<tr>
<td></td>
<td>Thyroid cancer</td>
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<tr>
<td></td>
<td>Adenocarcinoma (breast, GI tract, genitourinary tract, lung)</td>
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<tr>
<td></td>
<td>Unknown primary</td>
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</table>

Assessment of a Neck Mass
Assessment of a Neck Mass

Patient presents with a neck mass

Obtain clinical history
Determine
- Duration and growth rate of mass
- Location of mass
Ask about
- Factors suggestive of infection or inflammatory disorder
- Factors suggestive of cancer

Formulate initial diagnostic impressions

Diagnosis is probable, and further diagnostic investigation is unnecessary
Consider investigative studies:
Biopsy: Fine-needle aspiration (FNA) is preferred method.
Imaging studies: Not routinely called for, but ultrasonography, CT, MRI, arteriography, angiography, and plain x-rays are sometimes helpful. Consultation with a head and neck radiologist is desirable.

Diagnosis is uncertain, or further information is needed or desired
FNA is diagnostic or confirmatory

Inflammatory or infectious disorder
Treat medically. Drain abscesses.

Congenital cystic lesion
These include
- Thyroglossal duct cysts and branchial cleft cysts (treated surgically)
- Cystic hygromas and hemangiomas (treated expectantly)

Benign neoplasm
These include
- Salivary gland tumors
- Thyroid nodules and goiters
- Soft tissue tumors
- Chemodectomas
- Neurogenic tumors
- Laryngeal tumors
Treat surgically. (Observation is appropriate in some cases.)

Malignant neoplasm
Determine whether cancer is primary or metastatic.

Perform physical examination of head and neck
Look for
- Asymmetry
- Signs of trauma
- Skin changes
- Movement of mass on deglutition
- Bruit
- Vocal changes
Attempt to determine source of mass, and assess its physical characteristics. Examine the following areas in detail:
- Cervical lymph nodes
- Skin
- Thyroid
- Salivary glands
- Oral cavity and oropharynx
- Larynx and hypopharynx
- Nasal cavity and nasopharynx

FNA yields negative or inconclusive results
Repeat FNA or perform open biopsy.
These include
• Lymphoma  • Thyroid cancer
• Upper aerodigestive tract cancer
• Soft tissue sarcoma  • Skin cancer
Treat with surgery, radiation therapy, and/or chemotherapy, as appropriate.

**Primary neoplasm**

- Metastatic squamous cell carcinoma: Perform selective neck dissection, and consider adjuvant radiation therapy.
- Metastatic adenocarcinoma: Perform neck dissection (selective or other), and consider adjuvant radiation therapy.
- Metastatic melanoma: Perform full-thickness excision and SLN biopsy; if there are positive SLNs or lymph nodes are palpable, perform modified neck dissection.

**Metastatic tumor**

**Primary is known**

**Primary is unknown**

Evaluate nasopharynx, larynx, esophagus, hypopharynx, and tracheobronchial tree endoscopically.
Biopsy nasopharynx, tonsils, and hypopharynx.
Perform unilateral neck dissection followed by irradiation of neck, entire pharynx, and nasopharynx.
head is necessary to obtain adequate visualization of the various areas. Gloves must be worn during the examination, particularly if the mucous membranes are to be examined. Good illumination is essential. The time-honored but cumbersome head mirror has been largely supplanted by the headlight (usually a high-intensity halogen lamp). Fiberoptic endoscopy with a flexible laryngoscope and a nasopharyngoscope has become a common component of the physical examination for evaluating the larynx, the nasopharynx, and the paranasal sinuses, especially when these areas cannot be adequately visualized with more standard techniques [see 2:4 Head and Neck Diagnostic Procedures].

The examination should begin with inspection for asymmetry, signs of trauma, and skin changes. One should ask the patient to swallow to see if the mass moves with deglutition. Palpation should be done both from the front and from behind. Auscultation is performed to detect audible bruits. One should also ask about the patient’s voice, changes in which may suggest either a laryngeal tumor or recurrent nerve dysfunction from locally invasive thyroid cancer.

During the physical examination, one should be thinking about the following questions: What structure is the neck mass arising from? Is it a lymph node? Is the mass arising from a normally occurring structure, such as the thyroid gland, a salivary gland, a nerve, a blood vessel, or a muscle? Or is it arising from an abnormal structure, such as a laryngocele, a branchial cleft cyst, or a cystic hygroma? Is the mass soft, fluctuant, easily mobile, well-encapsulated, and smooth? Or is it firm, poorly mobile, and fixed to surrounding structures? Does it pulsate? Is there a bruit? Does it appear to be superficial, or is it deeper in the neck? Is it attached to the skin? Is it tender?

The following areas of the head and neck are examined in some detail.

### Cervical Lymph Nodes

Enlarged lymph nodes are by far the most common neck masses encountered. The cervical lymphatic system consists of interconnected groups or chains of nodes that parallel the major neurovascular structures in the head and neck. The skin and mucosal surfaces of the head and neck all have specific and predictable nodes associated with them. The classification of cervical lymph nodes has been standardized to comprise six levels [see Table 2 and Figure 1]. Accurate determination of lymph node level on physical examination and in surgical specimens not only helps establish a common language among clinicians but also permits comparison of data among different institutions.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Classification of Cervical Lymph Nodes</th>
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<tbody>
<tr>
<td>Level</td>
<td>Nodes</td>
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<tr>
<td>I</td>
<td>Submental nodes</td>
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<tr>
<td>II</td>
<td>Upper internal jugular chain nodes</td>
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<tr>
<td>III</td>
<td>Middle internal jugular chain nodes</td>
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<tr>
<td>IV</td>
<td>Lower internal jugular chain nodes</td>
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<tr>
<td>V</td>
<td>Spinal accessory nodes</td>
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<tr>
<td>VI</td>
<td>Transverse cervical nodes</td>
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<td>Tracheoesophageal groove nodes</td>
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The location, size, and consistency of lymph nodes furnish valuable clues to the nature of the primary disease. Other physical characteristics of the adenopathy should be noted as well, including the number of lymph nodes affected, their mobility, their degree of fixation, and their relation to surrounding anatomic structures. One can often establish a tentative diagnosis on the basis of these findings alone. For example, soft or tender nodes are more likely to derive from an inflammatory or infectious condition, whereas hard, fixed, painless nodes are more likely to represent metastatic cancer. Multiple regions of enlarged lymph nodes are usually a sign of systemic disease (e.g., lymphoma, tuberculosis, or infectious mononucleosis), whereas solitary nodes are more often due to malignancy. Firm, rubbery nodes are typical of lymphoma. Low cervical nodes are more likely to contain metastases from the thyroid or a primary source other than the head and neck, whereas upper cervical nodes are more likely to contain metastases from the head and neck.

The submental and submandibular nodes (level I) are palpated bimanually. Metastases to level I are commonly from the lips, the oral cavity, or the facial skin. The three levels of internal jugular chain nodes (levels II, III, and IV) are best examined by gently rolling the sternocleidomastoid muscle between the thumb and the index finger. Level II and level III lymph nodes are common sites for lymph node metastases from primary cancers of the oropharynx, the larynx, and the hypopharynx. Metastases in level IV lymph nodes can arise from cancers of the upper aerodigestive tract, cancers of the thyroid gland, or cancers arising below the clavicle (Virchow’s node). Nodal metastases in the posterior triangle (level V) can arise from nasopharyngeal and thyroid cancers as well as from squamous cell carcinoma or melanoma of the posterior scalp and the pinna of the ear. The tracheoesophageal groove nodes (level VI) or control nodes are then palpated.

### Skin

Careful examination of the scalp, the ears, the face, the oral cavity, and the neck will identify potentially malignant skin lesions, which may give rise to lymph node metastases.

### Thyroid Gland

The thyroid gland is first observed as the patient swallows; it is then palpated and its size and consistency assessed to determine whether it is smooth, diffusely enlarged, or nodular and whether one nodule or several are present. If it is unclear whether the mass is truly thyroid, one can clarify the point by asking the patient to swallow and watching to see whether the mass moves. Signs of superior mediastinal syndrome (e.g., cervical venous engorgement and facial edema) suggest retrosternal extension of a thyroid goiter. Elevation of the arms above the head often causes such signs in a patient with a substernal goiter (a positive Pemberton sign). The larynx and trachea are examined, with special attention to the cricothyroid membrane, over which Delphian nodes can be palpated. These nodes can be a harbinger of thyroid or laryngeal cancer.

### Major Salivary Glands

Examination of the paired parotid and submandibular glands involves not only palpation of the neck but also an
intraoral examination to inspect the duct openings. The submandibular glands are best assessed by bimanual palpation, with one finger in the mouth and one in the neck. They are normally lower and more prominent in older patients. The parotid glands are often palpable in the neck, though the deep lobe cannot always be assessed. A mass in the region of the tail of the parotid must be distinguished from enlarged level II jugular nodes. The oropharynx is inspected for distortion of the lateral walls. The parotid (Stensen’s) duct may be found opening into the buccal mucosa, opposite the second upper molar.

**Oral Cavity and Oropharynx**

The lips should be inspected and palpated. Dentures should be removed before the mouth is examined. The buccal mucosa, the teeth, and the gingiva are then inspected. The patient should be asked to elevate the tongue so that the floor of the mouth can be examined and bimanual inspection performed. The tongue
should be inspected both in its normal position in the mouth and during protrusion.

Most of the oropharyngeal contents are easily visualized if the tongue is depressed. Only the anterior two thirds of the tongue is clearly visible on examination, however. The base of the tongue is best visualized by using a mirror. In most persons, the tongue base can be palpated, at the cost of some discomfort to the patient. The ventral surface of the tongue must also be carefully inspected and palpated.

The hard palate is examined by gently tilting the patient’s head backward, and the soft palate is inspected by gently depressing the tongue with a tongue blade. The movement of the palate is assessed by having the patient say “ahh.”

The tonsils are then examined. They are usually symmetrical but may vary substantially in size. For example, in young patients, hyperplastic tonsils may almost fill the oropharynx, but in adult patients, this is an uncommon finding. Finally, the posterior pharyngeal wall is inspected.

Larynx and Hypopharynx

The larynx and the hypopharynx are best examined by indirect or direct laryngoscopy. A mirror is warmed, and the patient’s tongue is gently held forward to increase the space between the oropharyngeal structures. The mirror is carefully introduced into the oropharynx without touching the base of the tongue. The oropharynx, the larynx, and the hypopharynx can be visualized by changing the angle of the mirror.

The lingual and laryngeal surfaces of the epiglottis are examined. Often, the patient must be asked to phonate to bring the endolarynx into view. The aryepiglottic folds and the false and true vocal cords should be identified. The mobility of the true vocal cords is then assessed: their resting position is carefully noted, and their movement during inspiration is recorded. Normally, the vocal cords abduct during breathing and move to the median position during phonation. The larynx is elevated when the patient attempts to say “eeeee”; this allows one to observe vocal cord movement and to better visualize the piriform sinuses, the postcricoid hypopharynx, the laryngeal surface of the epiglottis, and the anterior commissure of the glottic larynx. Passage of a fiberoptic laryngoscope through the nose yields a clear view of the hypopharynx and the larynx. This procedure is well tolerated by almost all patients, particularly if a topical anesthetic is gently sprayed into the nose and swallowed, thereby anesthetizing both the nose and the pharynx.

Nasal Cavity and Nasopharynx

The nasopharynx is examined by depressing the tongue and inserting a small mirror behind the soft palate. The patient is instructed to open the mouth widely and breathe through it to elevate the soft palate. With the patient relaxed, a warmed nasopharyngeal mirror is carefully placed in the oropharynx behind the soft palate without touching the mucosa.

The nasal septum, the choanae, the turbinates, and the eustachian tube orifices are systematically assessed. The dorsal of the soft palate, the posterior nasopharyngeal wall, and the vault of the nasopharynx should also be assessed. The exterior of the nose should be carefully examined, and the septum should be inspected with a nasal speculum. Polyps or other neoplasms can be mistaken for turbinates.

Careful evaluation of the cranial nerves is essential, as is examination of the eyes (including assessment of ocular movement and visual activity), the external ear, and the tympanic membrane.

Additional Areas

The remainder of the physical examination is also important, particularly as regards the identification of a possible source of metastases to the neck. Other sets of lymph nodes—especially axillary and inguinal nodes—are examined for enlargement or tenderness. Women should undergo complete pelvic and rectal examinations. Men should undergo rectal, testicular, and prostate examinations; tumors from these organs may metastasize to the neck, albeit rarely.

Initial Diagnostic Impressions

Having obtained a comprehensive history and performed a physical examination, one is likely to have a better idea of whether the neck mass is inflammatory, benign, or malignant. In some patients, the findings are clear enough to strongly suggest a specific disease entity. For example, a rapidly developing mass that is soft and tender to palpation is most likely a reactive lymph node from an acute bacterial or viral illness. A slow-growing facial mass associated with facial nerve deficits is probably a malignant parotid tumor. A thyroid nodule with an adjacent abnormal lymph node in a young patient probably represents thyroid cancer. In an elderly patient with a substantial history of smoking and alcohol use, a neck mass may well be a metastasis from squamous cell carcinoma in the aerodigestive tract.

The initial diagnostic impressions and the degree of certainty attached to them determine the next steps in the workup and management of a neck mass; options include empirical therapy, ultrasonographic scanning, computed tomography (CT), fine-needle aspiration (FNA), and observation alone. For example, in a patient with suspected bacterial lymphadenitis from an oral source, empirical antibiotic therapy with close follow-up is a reasonable approach. In a patient with a suspected parotid tumor, the best first test is a CT scan: the tumor probably must be removed, which means that one will have to ascertain the relation of the mass to adjacent structures. In a patient with suspected metastatic cancer, FNA is a sensible choice: it will confirm the presence of malignancy and may suggest a source of the primary cancer.

Investigative Studies

Neck masses of suspected infectious or inflammatory origin can be observed for short periods. Most neck masses in adults, however, are abnormal, and they are...
often manifestations of serious underlying conditions. In most cases, therefore, further diagnostic evaluation should be rigorously pursued.

**BIOPSY**

Whether or not the history and the physical examination strongly suggest a specific diagnosis, the information obtained by sampling tissue from the neck mass is often highly useful. In many cases, biopsy establishes the diagnosis or, at least, reduces the diagnostic possibilities. At present, the preferred method of obtaining biopsy material from a neck mass is FNA, which is generally well tolerated and can usually be performed without local anesthesia. Although FNA is, on the whole, both safe and accurate, it is an invasive diagnostic procedure and carries a small but definable risk of potential problems (e.g., bleeding and sampling error). Accordingly, FNA should be done only when the results are likely to influence treatment.

FNA reliably distinguishes cystic from solid lesions and can often diagnose malignancy. It has in fact become the standard for making treatment decisions in patients with thyroid nodules and for confirming the clinical suspicion of a cystic lesion. FNA is also useful in patients with a known distant malignancy in whom confirmation of metastases is needed for staging and for planning therapy, as well as in patients with a primary tumor of the head and neck who are not candidates for operation but in whom a tissue diagnosis is necessary for appropriate nonsurgical therapy to be initiated. In addition, FNA is helpful in dealing with overly anxious patients in whom the clinical index of suspicion for a neoplasm is low and the head and neck examination is negative: negative biopsy results tend to reassure these patients and allow the surgeon time to follow the mass more confidently. (Of course, negative FNA results should not be considered the end point of any search and do not rule out cancer.)

Several studies have shown FNA to be approximately 90% accurate in establishing a definitive diagnosis. Lateral cystic neck masses that collapse on aspiration usually represent hygromas, branchial cleft cysts, or cystic degeneration of a metastatic papillary thyroid cancer. Fluid from these masses is sent for cytologic examination. If a palpable mass remains after cyst aspiration, a biopsy of the solid component should be done; the morphology of the cells will be better preserved.

If an extensive physical examination has been completed and the FNA is not diagnostic, one may have to perform an open biopsy to obtain a specimen for histologic sections and microbiologic studies. It is estimated that open biopsy eventually proves necessary in about 10% of patients with a malignant mass. In an open biopsy, it is important to orient skin incisions within the boundaries of a neck dissection; the incisions can then, if necessary, be extended for definitive therapy or reexcised if reoperation subsequently proves necessary. Crossing incisions should never be situated over vessels.

A case in which lymphoma and metastatic squamous cell carcinoma are diagnostic possibilities constitutes a special situation. FNA alone is often incapable of determining the precise histologic subtype for lymphoma, but it is usually capable of distinguishing a lymphoproliferative disease from metastatic squamous cell carcinoma. This is a crucial distinction, in that the two neoplasms are treated in drastically different ways.

If a lymphoma is suspected, FNA is typically followed by open biopsy, frozen-section confirmation, and submission of fresh tissue to the pathologist. The intact node is placed in normal saline and sent directly to the pathologist for analysis of cellular content and nodal architecture and identification of lymphocyte markers. If, however, metastatic squamous cell carcinoma is suspected, FNA usually suffices for establishing the diagnosis and formulating a treatment plan, which often includes chemotherapy and radiation initially. In this setting, performing an open biopsy can lead to significant wound healing complications; there is no need to incur this risk when FNA is all that is necessary to initiate treatment.

**IMAGING**

Diagnostic imaging should be used selectively in the evaluation of a neck mass; imaging studies should be performed only if the results are likely to affect subsequent therapy. Such studies often supply useful information about the location and characteristics of the mass and its relation to adjacent structures. Diagnostic imaging is particularly useful when a biopsy has been performed and a malignant tumor identified. In such cases, these studies can help establish the extent of local disease and the presence or absence of metastases.

Ultrasonography of the neck reliably differentiates solid masses from cystic ones and is especially useful in assessing congenital and developmental cysts. It is a valuable noninvasive technique for vascular lesions and clearly delineates thyroid and parathyroid abnormalities. CT is also useful for differentiating cysts from solid neck lesions and for determining whether a mass is within or outside a gland or nodal chain. In addition, CT scanning can delineate small tongue-base or tonsillar tumors that have a minimal mucosal component. Magnetic resonance imaging (MRI) provides much the same information as CT. T2-weighted gadolinium-enhanced scans are particularly useful for delineating the invasion of soft tissue by tumor: endocrine tumors are often enhanced on such scans. CT/positron emission tomography (PET) scanning is increasingly employed in the diagnosis and staging of both primary and metastatic head and neck malignancies, including squamous cell carcinoma, thyroid cancer, lymphoma, and melanoma. PET-positive, radioiodine-negative, metastatic thyroid cancers are more aggressive.

Arteriography is useful mainly for evaluating vascular lesions and tumors fixed to the carotid artery. Angiography is helpful for evaluating the vascularity of a mass, its specific blood supply, or the status of the carotid artery, but it provides very little information about the physical characteristics of the mass. Plain radiographs of the neck are rarely helpful in differentiating neck masses, but a chest x-ray can often confirm a diagnosis (e.g., in patients with lymphoma, sarcoidosis, or metastatic lung cancer). A chest x-ray is also important in any patient with a new diagnosis of cancer to determine if pulmonary metastases are present. It is also an essential component of preoperative evaluation for any patient older than 40 years.

It is important to communicate with the radiologist: an experienced head and neck radiologist may be able to offer the surgeon valuable guidance in choosing the best diagnostic test in a specific clinical scenario. Furthermore, providing the
radiologist with a detailed clinical history facilitates interpretation of the images.

**Management of Specific Disorders**

**Inflammatory and Infectious Disorders**

Acute infection of the neck (cervical adenitis) is most often the result of dental infection, tonsillitis, pharyngitis, viral upper respiratory tract infection, or skin infection. Lymph node enlargement is a frequent finding that may reflect any of a number of infectious disorders. The most common cause of this symptom is an acute infection of the mouth or pharynx. In this situation, the enlarged lymph nodes are usually just posterior and inferior to the angle of the mandible. Signs of acute infection (e.g., fever, malaise, and a sore mouth or throat) are usually present. A constitutional reaction, tenderness of the cervical mass, and the presence of an obvious infectious source confirm the diagnosis. Treatment should be directed toward the primary disease and should include a monospot test for infectious mononucleosis.

Neck masses may also derive from subcutaneous abscesses, infected sebaceous or inclusion cysts, or multiloculated carbuncles (most often occurring in the back of the neck in a patient with diabetes mellitus). The physical characteristics of abscesses make recognition of these problems relatively straightforward.

On occasion, primary head and neck bacterial infections can lead to infection of the fascial spaces of the neck. A high index of suspicion is required in this situation: such infections are sometimes difficult to diagnose. Aggressive treatment with antibiotics and drainage of closed spaces is indicated to prevent overwhelming fasciitis.

Various chronic infections (e.g., tuberculosis, fungal lymphadenitis, syphilis, cat-scratch fever, and AIDS) may also involve cervical lymph nodes. Certain chronic inflammatory disorders (e.g., sarcoidosis) may present with cervical lymphadenopathy as well. Because of the chronic lymph node involvement, these conditions are easily confused with neoplasms, especially lymphomas. Biopsy is occasionally necessary; however, skin tests and serologic studies are often more useful for establishing a diagnosis. Treatment of these conditions is primarily medical; surgery is reserved for complications.

**Congenital Cystic Lesions**

**Thyroglossal Duct Cysts**

Thyroglossal duct cysts are remnants of the tract along which the thyroid gland descended into the neck from the foramen cecum [see Figure 2]. They account for about 70% of all congenital abnormalities of the neck. Thyroglossal duct cysts may be found in patients of any age but are most common in the first decade of life. They may take the form of a lone cyst, a cyst with a sinus tract, or a solid core of thyroid tissue. They may be so small as to be barely perceptible, as large as a grapefruit, or anything in between. Thyroglossal duct cysts are almost always found in the midline, at or below the level of the hyoid bone; however, they may be situated anywhere from the base of the tongue to the suprasternal notch. They occasionally present slightly lateral to the midline and are sometimes associated with an external fistula to the skin of the anterior neck. They are often ballotable and can usually be moved slightly from side to side but not up or down; however, they do move up and down when patients swallow or protrude the tongue.

Thyroglossal duct cysts must be differentiated from dermoid cysts, lymphadenomegaly in the anterior jugular chain, and cutaneous lesions (e.g., lipomas and sebaceous cysts). Operative treatment is almost always required, not only because of cosmetic considerations but also because of the high incidence of recurrent infection, including abscess formation. About 1% of thyroglossal duct cysts contain cancer; papillary cancer is the neoplasm most commonly encountered, followed by squamous cell carcinoma. About 25% of patients with papillary thyroid cancer in thyroglossal duct cysts have papillary thyroid cancer in other parts of the thyroid gland as well. About 10% have nodal metastases, which in some cases are bilateral.

**Branchial Cleft Cysts**

Branchial cleft cysts are vestigial remnants of the fetal branchial apparatus from which all neck structures are
derived. Early in embryonic development, there are five bran-
chial arches and four grooves (or clefs) between them. The
internal tract or opening of a branchial cleft cyst is situated at
the embryologic derivative of the corresponding pharyngeal
groove, such as the tonsil (second arch) or the piriform sinus
(third and fourth arches). The second arch is the most
common area of origin for such cysts. The position of the cyst
tract is also determined by the embryologic relation of its arch
to the derivatives of the arches on either side of it.

The majority of branchial cleft cysts (those that develop from
the second, third, and fourth arches) tend to present as a bulge
along the anterior border of the sternocleidomastoid muscle,
with or without a sinus tract. Branchial cleft cysts may become
symptomatic at any age, but most are diagnosed in the first two
decades of life. They often present as a smooth, painless, slowly
enlarging mass in the lateral neck. Frequently, there is a history
of fluctuating size and intermittent tenderness. The diagnosis is
more obvious when there is an external fistulous tract and there
is a history of intermittent discharge. Infection of the cyst may
be the reason for the first symptoms.

Treatment consists of complete surgical removal of the cyst
and the sinus tract. Any infection or inflammation should be
treated and allowed to resolve before the cyst and the tract
are removed.

**Cystic Hygromas (Lymphangiomas)**

A cystic hygroma is a lymphangioma that arises from
vestigial lymph channels in the neck. Almost always, this
condition is first noted by the second year of life; on rare
occasions, it is first diagnosed in adulthood. A cystic hygroma
may present as a relatively simple thin-walled cyst in the floor
of the mouth or may involve all the tissues from the floor of
the mouth to the mediastinum. About 80% of the time, there
is only a painless cyst in the posterior cervical triangle or in
the supraclavicular area. A cystic hygroma can also occur,
however, at the root of the neck, in the angle of the jaw
(where it may involve the parotid gland), and in the midline
(where it may involve the tongue, the floor of the mouth, or
the larynx).

The typical clinical picture is of a diffuse, soft, doughy,
irregular mass that is readily transilluminated. Cystic hygro-
mas look and feel somewhat like lipomas but have less
well defined margins. Aspiration of cystic hygromas yields
straw-colored fluid. They may be confused with angiomas
(which are compressible), pneumatocles from the apex of
the lung, or aneurysms. They can be distinguished from vas-
cular lesions by means of arteriography. On occasion, a cystic
hygroma grows suddenly as a result of an upper respiratory
tract infection, infection of the hygroma itself, or hemorrhage
into the tissues. If the mass becomes large enough, it can
compress the trachea or hinder swallowing.

In the absence of pressure symptoms (i.e., obstruction of
the airway or interference with swallowing) or gross defor-
mity, cystic hygromas may be treated expectantly. They tend
to regress spontaneously; if they do not, complete surgical
excision is indicated. Excision can be difficult because of the
numerous satellite extensions that often surround the main
mass and because of the association of the tumor with vital
structures such as the cranial nerves. Recurrences are
common; staged resections for complete excision are often
necessary.
observation are often sufficient. FNA often yields unrepresentative results in patients with a history of radiation exposure, in whom there is approximately a 40% chance that one of the nodules present contains cancer.

Surgery for thyroid nodules involves excisional biopsy consisting of at least total lobectomy [see 2:9 Thyroid and Parathyroid Procedures]; enucleation is almost never indicated. The surgical approach of choice for most patients with Graves disease or multinodular goiter is subtotal or total thyroidectomy or total lobectomy on one side and subtotal lobectomy on the other (Dunhill’s operation). Treatment of thyroid cancer is discussed elsewhere [see Primary Malignant Neoplasms, Thyroid Cancer, below].

**Soft Tissue Tumors (Lipomas, Sebaceous Cysts)**

Superficial intracutaneous or subcutaneous masses may be sebaceous (or epidermal inclusion) cysts or lipomas. Final diagnosis and treatment usually involves simple surgical excision, often done as an office procedure with local anesthesia.

**Chemodectomas (Carotid Body Tumors)**

Carotid body tumors belong to a group of tumors known as chemodectomas (or, alternatively, as glomus tumors or nonchromaffin paragangliomas), which derive from the chemoreceptive tissue of the head and neck. In the head and neck, chemodectomas most often arise from the tympanic bodies in the middle ear, the glomus jugulare at the skull base, the vagal body near the skull base along the inferior ganglion of the vagus, and the carotid body at the carotid bifurcation. They are occasionally familial and sometimes occur bilaterally.

A carotid body tumor presents as a firm, round, slowly growing mass at the carotid bifurcation. Occasionally, a bruit is present. The tumor cannot be separated from the carotid artery by palpation and can usually be moved laterally and medially but not in a cephalocaudal plane. The differential diagnosis includes a carotid aneurysm, a branchial cleft cyst, a neurogenic tumor, and nodal metastases fixed to the carotid sheath. The diagnosis is made by means of CT scanning or arteriography, which demonstrate a characteristic highly vascular mass at the carotid bifurcation. Neurofibromas tend to displace, encircle, or compress a portion of the carotid artery system, events that are readily demonstrated by carotid angiography.

Biopsy should be avoided. Chemodectomas are sometimes malignant and should therefore be removed in most cases to prevent subsequent growth and pressure symptoms. Fortunately, even malignant chemodectomas are usually low grade; long-term results after removal are excellent on the whole. Vascular surgical experience is desirable, in that bleeding may occur and clamping of the carotid artery may result in a stroke. Expectant treatment may be indicated in older or debilitated individuals. Radiotherapy may be appropriate for patients with unresectable tumors.

**Neurogenic Tumors (Neurofibromas, Neurilemmomas)**

The large number of nerves in the head and neck renders the area susceptible to neurogenic tumors. The most common of such tumors, neurilemmomas (schwannomas) and neurofibromas, arise from the neurilemma and usually present as painless, slowly growing masses in the lateral neck. Neurilemmomas can be differentiated from neurofibromas only by means of histologic examination.

Given the potential these tumors possess for malignant degeneration and slow but progressive growth, surgical resection is indicated. This may include resection of the involved nerves, particularly with neurofibromas, which tend to be more invasive and less encapsulated than neurilemmomas.

**Laryngeal Tumors**

In rare cases, a chondroma may arise from the thyroid cartilage or the cricoid cartilage. It is firmly fixed to the cartilage and may present as a mass in the neck or as the cause of a progressively compromised airway. Surgical excision is indicated.

**Primary Malignant Neoplasms**

**Lymphomas**

Cervical adenopathy is one of the most common presenting symptoms in patients with Hodgkin and non-Hodgkin lymphoma. The nodes tend to be softer, smoother, more elastic, and more mobile than nodes containing metastatic carcinoma would be. Rapid growth is not unusual, particularly in non-Hodgkin lymphoma. Involvement of extranodal sites, particularly Waldeyer’s tonsillar ring, is often seen in patients with non-Hodgkin lymphoma; enlargement of these sites may provide a clue to the diagnosis. The diagnosis is usually suggested by FNA, then confirmed via excisional biopsy of an intact lymph node. The precise histologic subtype cannot be determined by FNA alone. Open biopsy must ultimately be done and fresh tissue must be submitted for analysis by histology, immunohistochemistry, and electron microscopy.

Lymphoma is treated by means of radiation therapy, chemotherapy, or both, depending on the disease’s pathologic type and clinical stage.

**Thyroid Cancer**

The approach to suspected thyroid cancer differs in some respects from the approach to benign thyroid disease. The operation of choice for papillary thyroid cancer that is occult (< 1 cm in diameter) and confined to the thyroid gland and for follicular thyroid cancer that is minimally invasive (i.e., exhibiting only capsular invasion) is thyroid lobectomy; the prognosis is excellent. The procedure of choice for papillary, follicular, Hürthle cell, and medullary thyroid cancer is total or near-total thyroidectomy (when it can be done safely) [see 2:9 Thyroid and Parathyroid Procedures]. Patients who present with thyroid nodules and have a history of radiation exposure or a family history of thyroid cancer should also undergo total or near-total thyroidectomy because about 40% of them will have at least one focus of papillary thyroid cancer. Total thyroidectomy decreases recurrence and permits the use of iodine-131 (131I) to scan for and treat residual disease; it also makes serum thyroglobulin and calcitonin assays more

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sensitive for diagnosing recurrent or persistent differentiated thyroid tumors of follicular or parafollicular cell origin.

Patients with medullary thyroid cancer should undergo meticulous elective (prophylactic) or therapeutic bilateral central neck dissection. All patients with medullary thyroid cancer should be screened for ret proto-oncogene mutations on chromosome 10, as well as for pheochromocytoma. Therapeutic modified neck dissection is indicated for all patients with thyroid cancer and palpable nodes laterally. Prophylactic modified neck dissection is indicated for patients with medullary thyroid cancer and either primary tumors larger than 1.5 cm or evidence of central neck node involvement.

Patients with anaplastic thyroid cancer are probably best treated with a combination of chemotherapy and radiation therapy, in conjunction with the removal of as much of the neoplasm as can safely be excised. Most patients with thyroid lymphoma should receive chemotherapy, radiation therapy, or both.

Upper Aerodigestive Tract Cancer

Many localized tumors of the aerodigestive tract may be cured with surgery alone. Treatment of locally advanced squamous cell cancers, however, often necessitates a multimodality approach. Such an approach has traditionally consisted of surgery followed by radiation therapy, but recent data indicate that concurrent chemoradiotherapy has an additional beneficial effect as an adjuvant measure.

Chemoradiotherapy is also employed for unresectable disease, and induction chemotherapy may be administered preoperatively to reduce operative morbidity. Among the chemotherapeutic agents active against head and neck squamous cell cancers are the taxanes, cisplatin and fluorouracil, and various newer targeted agents (e.g., epidermal growth factor receptor antagonists).

Treatment planning for such patients may depend on the tumor’s location and stage, the patient’s age, and the presence and severity of associated medical conditions, among other factors. Consultation with a specialist in this field is generally required. Therefore, cancers involving the nose, the paranasal sinuses, the nasopharynx, the floor of the mouth, the tongue, the palate, the tonsils, the piriform sinus, the hypopharynx, or the larynx are best managed by an experienced head and neck oncologic surgeon in conjunction with a radiation therapist and a medical oncologist.

Soft Tissue Sarcomas

Malignant sarcomas are not common in the head and neck. The sarcomas most frequently encountered include the rhabdomyosarcoma seen in children, fibrosarcoma, liposarcoma, osteogenic sarcoma (which usually arises in young adults), and chondrosarcoma. The most common head and neck sarcoma, however, is malignant fibrous histiocytoma (MFH). MFH is seen most frequently in the elderly and extremely rarely in children, but it can arise at any age. It is often difficult to differentiate pathologically from other entities (e.g., fibrosarcoma). MFH can occur in the soft tissues of the neck or involve the bone of the maxilla or the mandible. The preferred treatment is wide surgical resection; adjuvant radiation therapy and chemotherapy are being studied in clinical trials.

Rhabdomyosarcoma, usually of the embryonic form, is the most common form of sarcoma in children. It generally occurs near the orbit, the nasopharynx, or the paranasal sinuses. The diagnosis is confirmed by biopsy. A thorough search for distal metastases is made before treatment—consisting of a combination of surgical resection, radiation therapy, and chemotherapy—is begun.

Skin Cancer

Basal cell carcinomas are the most common of the skin malignancies [see 3:4 Malignant Skin Lesions]. These lesions arise in areas that have been extensively exposed to sunlight (e.g., the nose, the forehead, the cheeks, and the ears). Treatment consists of local resection with adequate clear margins. Metastases are rare, and the prognosis is excellent. Inadequately excised and neglected basal cell carcinomas may ultimately spread to regional lymph nodes and can cause extensive local destruction of soft tissue and bone. For example, basal cell carcinoma of the medial canthus may invade the orbit, the ethmoid sinus, and even the brain. Periauricular basal cell carcinoma can spread across the cartilage of the ear canal or into the parotid gland. In such cases of locally advanced basal cell cancer or nodal involvement with tumor, patients may require more extensive surgical treatment (i.e. modified neck dissection), and postoperative radiation therapy is often administered to optimize local control and reduce the risk of recurrence.

Squamous cell carcinoma also arises in areas associated with extensive sunlight exposure; the lower lip and the pinna are the most common sites. Unlike basal cell carcinoma, however, squamous cell carcinoma tends to metastasize regionally and distally. This tumor must also be excised with an adequate margin.

Melanoma is primarily classified on the basis of depth of invasion (as quantified by Clark level or Breslow thickness), location, and histologic subtype, though the prognosis is closely related to the thickness of the tumor [see Metastatic Tumors, Metastatic Melanomas, below]. In addition to the typical pigmented, irregularly shaped skin lesions [see 3:4 Malignant Skin Lesions], malignant melanoma may also arise on the mucous membranes of the nose or the throat, on the hard palate, or on the buccal mucosa. The treatment of choice is wide surgical resection. Radiation therapy, chemotherapy, and immunotherapy may also be considered.

METASTATIC TUMORS

Any surgeon who is managing patients with head and neck cancers must have a thorough understanding of neck dissections and should have sufficient training and experience to perform these operations in the appropriate clinical circumstances.

Classification of Neck Dissections

There are two classification systems for neck dissections. The first is based on the indications and goals of surgery. An elective (or prophylactic) neck dissection is done when the neck
is clinically negative (that is, when no abnormal lymph nodes are palpable or visible on diagnostic imaging). A therapeutic neck dissection is done to remove all palpable and occult disease in patients with suspicious lymph nodes discovered via physical examination or CT scanning.

The second system is based on the extent and type of dissection. Comprehensive neck dissections include the classic radical neck dissection, as well as the modified radical (or functional) neck dissection [see Figure 3]. In a radical neck dissection, the sternocleidomastoid muscle, the internal and external jugular veins, the spinal accessory nerve, and the submaxillary gland are removed, along with all lymph node-bearing tissues. The modified radical or functional neck dissection is a modification of the radical neck dissection in which the lymphatic tissue from these areas is removed but the functional structures are preserved. Selective neck dissections involve the removal of specific levels of lymph nodes [see Figure 1]. The rationale for selective dissections is that several head and neck cancers consistently metastasize to specific localized lymph node regions. The following are examples of selective neck dissections: suprahypoid neck dissection (levels I and II); supramohyoid neck dissection (levels I, II, and III); lateral neck dissection (levels II, III, and IV); and posterolateral neck dissection (levels II, III, IV, and V).

Metastatic Squamous Cell Carcinomas

The basic principle in the management of metastatic squamous cell carcinoma is to treat all regional lymph node groups at highest risk for metastases by means of surgery or radiation therapy, depending on the clinical circumstances. Selective lymph node dissection can be performed along with wide excision of the primary tumor at the time of the initial operation. For example, carcinomas of the oral cavity are treated with supramohyoid neck dissection, and carcinomas of the oropharynx, the hypopharynx, and the larynx are treated with lateral neck dissection. If extranodal extension or the presence of multiple levels of positive nodes is confirmed by the pathologic findings, the patient should receive adjuvant bilateral neck radiation therapy for 4 to 6 weeks after operation.

Metastatic Adenocarcinomas

Adenocarcinoma in a cervical node most frequently represents a metastasis from the thyroid gland, the salivary glands, or the gastrointestinal (GI) tract. The primary tumor must therefore be sought through endoscopic and radiologic study of the bronchopulmonary tract, the GI tract, the genitourinary tract, the salivary glands, and the thyroid gland. Other possible primary malignancies to be considered include breast and pelvic tumors in women and prostate cancer in men.

If the primary site is controlled and the patient is potentially curable or if the primary site is not found and the neck disease is the only established site of malignancy, neck dissection is the appropriate treatment. Postoperative adjuvant radiation may also be considered. If the patient has thyroid cancer and palpable nodes, lateral neck dissection and ipsilateral central neck dissection are recommended.

Overall survival is low—about 20% at 2 years and 9% at 5 years—except for patients with papillary or follicular thyroid cancer, who have a good prognosis. Two factors associated with a better prognosis are unilateral neck involvement and limitation of disease to lymph nodes above the cricoid cartilage.

Metastatic Melanomas

If the patient has a thin melanoma (Breslow thickness < 1 mm; Clark level I, II, or III), full-thickness excision with 1 cm margins should be done. Patients with intermediate-thickness melanomas (Breslow thickness 1 to 4 mm; Clark level IV) should have a full-thickness excision with at least a

**Figure 3** Cross section of the neck shows the structures removed in a classic radical neck dissection (right) and in a modified radical neck dissection (left).
1.5 cm margin. These patients also have a definable risk of lymph node spread and thus should be concurrently staged with lymphatic mapping and sentinel lymph node (SLN) biopsy. All patients with intermediate-thickness melanomas and positive SNLs and all melanoma patients with palpable lymph nodes should undergo complete staging with full-body CT/PET scans. If no other disease is found, modified neck dissection should be performed to obtain optimal local disease control. Because these tumors may metastasize to nodes in the parotid region, superficial parotidectomy is often included in the neck dissection, particularly in the case of melanoma located on the upper face or the anterior scalp. Consultation with a medical oncologist is indicated for all patients with intermediate-thickness or thick (Breslow thickness > 4 mm; Clark level V) melanomas; immunotherapy or chemotherapy may be considered. Radiation therapy is often considered in patients with extensive local or nodal disease, following adequate surgical resection.

**Metastases from an Unknown Primary Malignancy**

Management of patients with an unknown primary malignancy is challenging for the surgeon. It is helpful to know that when cervical lymph nodes are found to contain metastatic squamous cell carcinoma, the primary tumor is in the head and neck about 90% of the time. Typically, such patients are found to have squamous cell carcinoma on the basis of FNA of an abnormal cervical lymph node; this finding calls for an exhaustive review of systems, as well as a detailed physical examination of the head and neck.

If no primary tumor is identified, the patient should undergo endoscopic evaluation of the nasopharynx, the hypopharynx, the esophagus, the larynx, and the tracheobronchial tree under general anesthesia. Biopsies of the nasopharynx, the tonsils, and the hypopharynx often identify the site of origin (though there is some debate on this point). If the biopsies do not reveal a primary source of cancer, the preferred treatment is unilateral neck dissection, followed by radiation therapy directed toward the neck, the entire pharynx, and the nasopharynx. In 15 to 20% of cases, the primary cancer is ultimately detected. Overall 5-year survival in such cases ranges from 25 to 50%.

If a malignant melanoma is found in a cervical lymph node but no primary tumor is evident, the patient should be asked about previous skin lesions, and a thorough repeat head and neck examination should be done, with particular attention to the scalp, the nose, the oral cavities, and the sinuses. An ophthalmologic examination is also required. If physical examination and radiographic studies find no evidence of metastases, modified neck dissection should be performed on the involved side.

Metastatic adenocarcinoma in a cervical lymph node with no known primary tumor is discussed elsewhere [see Metastatic Adenocarcinomas, above]. The most common primary sites in the head and neck are the salivary glands and the thyroid gland. The possibility of an isolated metastasis from the breast, the GI tract, or the genitourinary tract must also be rigorously investigated. If no primary site is identified, the patient should be considered for protocol-based chemotherapy and radiation therapy, directed according to what the primary site is most likely to be in that patient.

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