
Problems in Family Practice

Evaluation of Neck Masses

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This paper presents the general principles for evaluation of a neck mass. Included are a differential diagnosis according to patient age and location of the neck mass, and a differential diagnosis of neck masses related to the variety of anatomic structures found in the neck. Also included is a detailed discussion of the history and physical examination appropriate for evaluation of neck masses. Subsequently, the various tests which may be appropriately applied to the evaluation of neck masses are described.

Neck masses require a thorough and thoughtful evaluation; a hasty decision for open biopsy is inadvisable. When any significant question regarding diagnosis and therapy arises, the patient should be referred to a competent head and neck specialist.

Among the numerous challenges encountered in family practice, the evaluation of an isolated neck mass is relatively infrequent. It is important, however, that the physician approach this problem with an appreciation of its potential complexity. The neck is a compact avenue congested with a variety of structures. Neoplastic and infectious disease involving any of the cervical organ systems may result in an isolated neck mass.

The diagnostic work-up for a neck mass should

progress from consideration of the most probable causes and advance toward the more obscure. It is the purpose of this paper to assist the physician in organizing a logical approach toward diagnosis and treatment of neck masses.

Diagnostic Considerations

There are some broad principles to be kept in mind as one initially encounters a patient with a neck mass.

The patient's age In children aged 1 to 15 years, neck masses tend to be infectious lymphadenitis or

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Table 1. Neck Masses, Listed by Anatomic Unit Involved and General Nature of Presentation

Anatomic Unit	Acute Infection and Inflammation	Subacute and Chronic Infection and Inflammation	Anatomic Derangement and Benign Tumor	Malignancy
Skin and Subcutaneous Tissues	Furuncle	Comedone	Lipoma Sebaceous cyst Dermoid cyst Thyroglossal duct cyst Branchial cleft cyst	Basal cell Squamous cell Melanoma Cutaneous metastases Teratoma
Vasculature and Deep Neck Spaces	Lateral pharyngeal space infection Carotid sheath infection Ludwig angina	Arteritis	Tortuous vessels Aneurysm Arterio-venous fistula Carotid body tumor Angiomatous tumors Paragangliomas	Hemangiopericytoma
Lymph Nodes and Lymphatics	Bacterial Streptococcus Staphylococcus Brucella Tularemia Diphtheria Syphilis (1° and 2°) Pasteurella Viral Herpes zoster Coxsackie Cytomegalovirus Measles Rubella Mumps Trachoma	Mycobacterial Tuberculosis Atypical Parasites Toxoplasmosis Leishmania Bacterial Leprosy Actinomycosis Fungal Histoplasmosis Coccidiomycosis Sporotrichosis Blastomycosis Miscellaneous Cat scratch Sarcoidosis Drug induced Serum sickness	Benign reactive lymphadenopathy Cystic hygroma Hamartoma	Lymphoma Metastatic carcinoma
Thyroid	Thyroiditis (viral, bacterial)	Thyroiditis (Hashimoto's radiation)	Goiter Adenoma Follicular cyst	Carcinoma Lymphoma
Parathyroid			Adenoma Cysts	Carcinoma
Larynx-Pharynx	Laryngopyocele Acute laryngeal dislocation (cricothyroid joint)	Relapsing polychondritis Gout	Laryngocele Chondroma Post traumatic asymmetry	Carcinoma
Neuro-Muscular	Masseteric hypertrophy	Myositis ossificans	Traumatic hematoma	Sarcoma

Table 1. Neck Masses, Listed by Anatomic Unit Involved and General Nature of Presentation, continued

Anatomic Unit	Acute Infection and Inflammation	Subacute and Chronic Infection and Inflammation	Anatomic Derangement and Benign Tumor	Malignancy
Neuro-Muscular	Torticollis Neuroma Neurofibroma			
Bone	Dental abscess	Actinomycosis (jaw) Osteomyelitis (vertebral)	Fibrous dysplasia Odontogenic tumors Reparative granuloma Prominent transverse process (1st cervical vertebra) Eosinophilic granuloma	Sarcoma Metastatic tumors Myeloma
Thymus			Thymic cyst	Thymoma
Salivary Glands	Mumps Abscess	Sjögren syndrome Metabolic—(alcoholic, diabetic, nutritional)	Hemangioma Pleomorphic adenoma	Carcinoma Lymphoma
Parotid	Obstruction (stone, tumor, trauma)	Heavy metal toxicity	Warthin's tumor	Metastatic tumors
Submandibular	Iodide toxicity	Chronic sialadenitis		
Sublingual				

congenital benign neoplasms. In young adults from 15 to 35 years of age, lymphoma increases in probability, but infection and benign lesions predominate. In adults over 35 years, there is an increasing probability of metastatic carcinoma.

Location of the mass A mass at the midline of the neck almost always reflects benign disease. The exceptions are carcinoma in a thyroglossal duct cyst (rare) and the "delphian" node (a midline node at the level of the cricothyroid membrane which can be the first evidence of metastatic carcinoma from the larynx). A mass in the anterolateral portion of the neck (anterior to the sternomastoid muscle) in children is usually benign lymphadenopathy or a congenital lesion. In adults, however, there is a high likelihood of neoplasm. A mass in the postero-lateral portion of the neck (behind the sternomastoid muscle) in children usually indicates lymph nodes reacting to pharyngitis or scalp infection. A mass in that location in adults usually represents lymph nodes responding to scalp infection or metastasis from nasopharyngeal carcinoma.

Primary thyroid disease comprises over 50 percent of all neck masses. If benign thyroid disease

is excluded, 80 percent of adult lateral neck masses are malignant.¹

If the mass is cancer in a lymph node, there is an 85 percent probability that the primary tumor is a squamous cell carcinoma of the upper airway.

The most common malignant neck masses in children are lymphoma (54 percent), followed by sarcoma (20 percent), and other assorted rare tumors (26 percent).²

The neck contains an impressive array of anatomic structures. Each of these structures, when affected by disease, can give rise to a mass lesion. In the most general terms, the evaluation of a neck mass initially attempts to differentiate between those caused by acute infection, subacute or chronic infection, anatomic derangement, benign tumor, or frank malignancy (Table 1).

Clinical Evaluation

Recognizing the great variety of potential pathology, evaluation must be guided by *clinical im-*

pressions. After considering the factors of age, location, physical characteristics, and associated symptoms, one fashions a work-up tailored to the individual situation. For example, if the patient is a healthy 20-year-old with an infected tooth and a large tender ipsilateral sub-mental lymph node, it is appropriate to initiate systemic antibiotics and request dental consultation. However, a 55-year-old alcoholic who presents with a 4 cm neck mass and a two-month history of dysphagia requires a work-up which immediately considers the high possibility of hypopharyngeal carcinoma.

During initial evaluation, the physician should attempt to differentiate between an infectious and a neoplastic mass. When the weight of clinical evidence points toward acute infectious disease, one should attempt to locate the source of infection and initiate early treatment. This can usually be accomplished during the first visit as the common primary infections are easily visualized (skin, teeth, tonsils). Treatment includes appropriate attention to the primary focus, systemic antibiotics, and local application of heat. When a chronic infection seems more likely, a battery of tests can be considered and ordered in sequential fashion beginning with those of the most favorable cost-benefit ratio. In this situation, the physician frequently will be uneasy because there may be no clinical evidence to help differentiate between chronic lymphadenitis and lymphoma. The one-to-two weeks spent undertaking a methodical evaluation is appropriate and probably will not adversely affect the few patients who ultimately are proven to have lymphoma. It has been the author's experience that during this time some questionable masses have gone on to declare themselves by "pointing," thus greatly assisting direction of treatment and evaluation.

As with any disease process, it is best to proceed according to the time honored format.

History

Symptoms Related to the Neck Mass

Duration A short time course (days to weeks) suggests infectious disease. An intermediate

(weeks to months) time course is consistent with chronic infection or neoplasm. A more prolonged history (years) suggests a benign or congenital lesion.

Pain and tenderness In general, neoplastic masses are painless and non-tender while the opposite is true of infectious processes.

Change in size It seems this sign is particularly difficult for patients to judge. Often people tend to deny change because they fear its significance. Obviously, a rapid increase in size suggests acute infection or neoplastic disease. Another possible cause for rapid change is hemorrhage into a cyst—not uncommon with thyroid adenomas.

Prior history The possibility of previous local trauma and prior excision of moles or skin lesions must be explored.

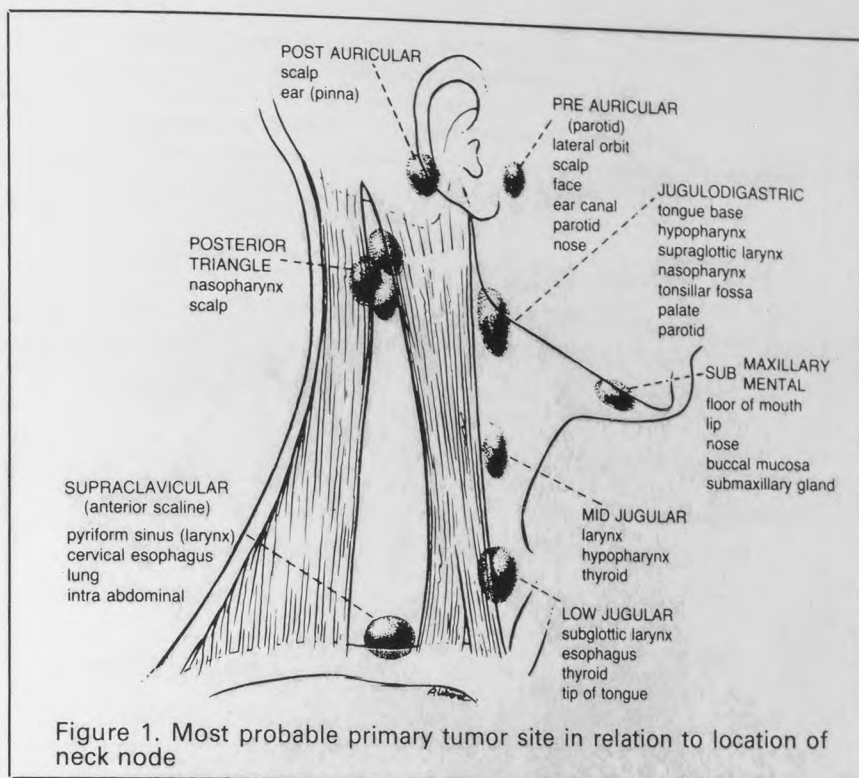
Regional Symptoms (Ears, Nose, and Throat)

Pain The patient should be carefully questioned to elicit signs of pathology within the head and neck. Most commonly encountered would be dental pain and sore throat. Ear pain (referred otalgia) is particularly significant. Lesions affecting the oral cavity, nasopharynx, hypopharynx, larynx, and esophagus can present with *unilateral* ear pain in the absence of otologic pathology. Facial pain may reflect sinus involvement or infiltration of the trigeminal nerve by the disease process.

Dysphagia Difficulty in swallowing often accompanies hypopharyngeal lesions; this may be subtly manifested as a change to a more liquid diet.

Hoarseness Persisting voice change of more than three weeks duration requires careful evaluation of the larynx. The hoarseness may be an early sign of laryngeal carcinoma. Neoplastic infiltration of the recurrent laryngeal nerve (mediastinal nodes, thyroid carcinoma) will also cause hoarseness, in this instance a sign of advanced disease.

Unilateral hearing loss Pathologic processes in the nasopharynx may cause unilateral serous otitis by involvement of the eustachian tube. The presence of unilateral serous otitis is unusual in an adult. A thorough evaluation is essential.



Systemic Symptoms

Weight loss When seen in association with head and neck malignancy, weight loss is often the result of diminished dietary intake due to primary pathology. Less frequently, it reflects distant dissemination of the tumor.

Fever, chills, malaise, and diaphoresis These symptoms are usually indicators of infectious disease, although lymphoma must be considered.

Physical Examination

The neck mass Examination of the neck is best accomplished in two parts. The patient should be seated while the examiner stands. Palpation while facing the patient is best for posterior masses (behind the sternomastoid muscle). Standing behind the patient, the examiner's hands fall more nat-

urally into the anterior neck space and the supraclavicular fossa.

Size The examiner should note and record the size of the mass. This can be done with calipers or a cloth ruler. Indistinct margins suggest cellulitis, deep neck infection, or infiltrating malignancy.

Location The position of a pathologic lymph node can assist the examiner in predicting the location of the related primary process (Figure 1). It is also possible to relate age and location to predict the nature of the mass (Figure 2).

Erythema and induration These findings are usually consistent with infection. Advanced metastatic tumor may also present this way.

Fixation Fixation to surrounding structures is characteristic of both infection and neoplasm. The time course will help differentiate in this instance. Acute infection with fixation should have developed rapidly (seven to ten days), while neoplastic fixation would require many weeks.

Bruit A bruit may be encountered in arterio-

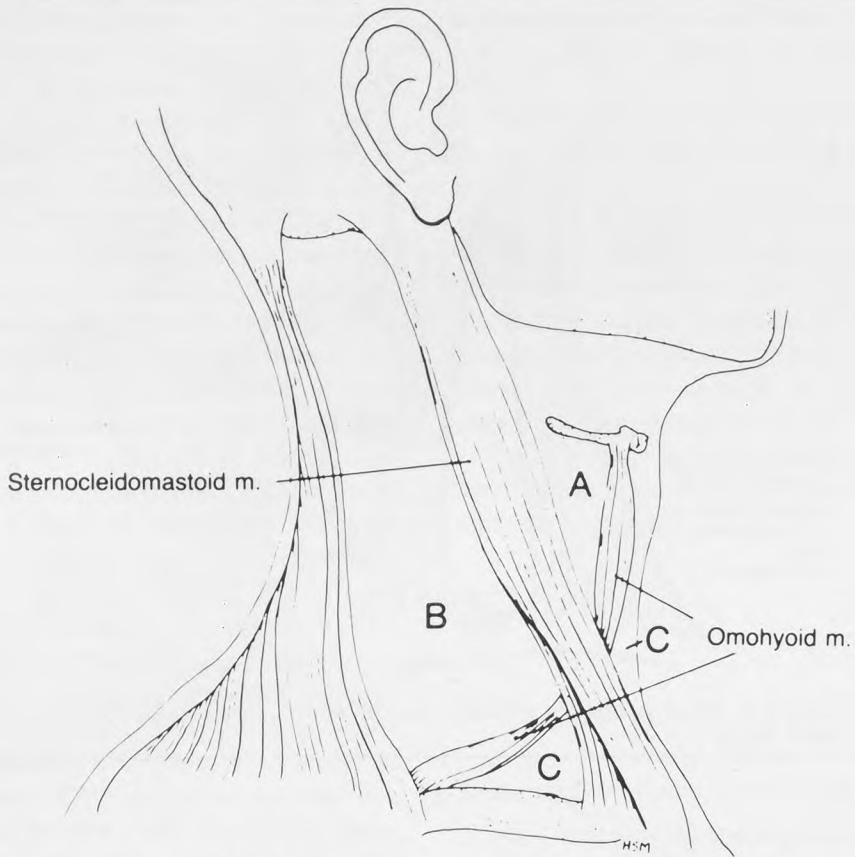


Figure 2. Differential diagnosis of neck masses by age group and anatomic location

Key to Figure

Zone	Child	Adult
A	Branchial cyst	Metastatic carcinoma from upper aerodigestive tract
	Dermoid cyst Thyroglossal cyst	Primary tumor of parotid or submaxillary gland Inflammatory node (acute or chronic including tuberculosis)
B	Nonspecific lymphadenopathy Lymphoma	Zenker diverticulum (rare) Laryngocele (rare)
	Infectious disease (pharyngitis, dental abscess, tuberculosis, cat scratch disease)	Carotid artery aneurysm (rare) Chemodectoma (rare)
C	Infectious lymphadenopathy (pharynx, adenoids, scalp)	Lymphoma Nasopharyngeal tumor
	Lymphoma Neurofibroma	Local skin infection Neurofibroma
C	Cystic hygroma	Thyroid lesion
	Thyroid lesion Branchial cyst or sinus Lymphoma	Metastatic carcinoma (laryngeal, pulmonary, gastrointestinal) Aneurysm of the aorta or great vessels

Table 2. Correlations Between Cranial Nerve Deficits and Pathologic Conditions

Cranial Nerve Deficit	Head and Neck Pathology
Olfactory (I)	Obstructing nasal or sinus tumor
Optic (II)	Sinus tumor invading orbit
Oculomotor (III, IV, VI)	Nasopharyngeal tumor invading skull base
Trigeminal (V)	Sinus tumor, nasopharyngeal tumor
Facial (VII)	Parotid tumor, acoustic neuroma
Auditory (VIII)	Acoustic neuroma
Glossopharyngeal (IX)	Jugular foramen tumor
Vagus (X)	Jugular foramen, thyroid, mediastinal tumor
Accessory (XI)	Jugular foramen tumor
Hypoglossal (XII)	Jugular foramen tumor

venous malformations, vascular neoplasms (chemodectoma), and aneurysmal changes of the carotid system.

General Head and Neck Examination

A complete assessment of the cutaneous and mucosal surfaces of the head and neck is essential. Techniques used in this examination include otoscopy, indirect nasopharyngoscopy, indirect laryngoscopy, and bimanual palpation. The structures to be examined include the scalp, ears, conjunctivae, nose, nasopharynx, oral cavity, base of tongue, salivary glands, hypopharynx, larynx, and thyroid gland.

It is not uncommon for head and neck disorders to cause disturbances of cranial nerve function. The list shown in Table 2 is incomplete but indicates the interrelationships.

General Physical Examination

When disorders affecting the head and neck become generalized there are certain organ systems which are most likely to be involved: (1) chest; (2)

major node groups (axilla, groin); (3) liver-spleen; and (4) skin surface.

Laboratory Tests and Special Studies

Supplemental tests for evaluation of neoplasm should be ordered only after a thorough head and neck examination. Different types of tests will be appropriate depending on the clinical setting and the physician's general impression as to whether the neck mass is infectious or neoplastic in origin. If an infectious neck mass is suspected, further studies may include basic laboratory tests (complete blood count, sedimentation rate, fasting blood sugar); x-ray films (sinus, lateral neck, mastoid, chest); skin tests (tuberculin, coccidioides, histoplasmin); serologic tests (Monospot, toxoplasmosis, VDRL, viral); bacteriologic studies (stains, cultures); and tissue studies (stains, culture). If a neoplasm is suspected, further evaluation may include laboratory studies (complete blood count, thyroid function tests, electrophoresis, VDRL, Epstein-Barr titers); x-ray films (plain films, tomography, sialography, CT scan, angiography, chest, barium swallow); scans (gallium,

thyroid, salivary, co-bleomycin, ultrasound); and biopsy.

Additional Diagnostic Procedures

Needle Aspiration There is increasing acceptance of needle aspiration for the diagnosis of enigmatic masses. Certainly aspiration is well established in the evaluation of infectious masses. Purulent material may be obtained for microbiologic examination including: Gram stain; fungal (KOH) stain and culture; aerobic and anaerobic cultures; and acid-fast stain and culture.

Thin needle aspiration in solid tumors has been used extensively and with good success in Europe. There is a growing acceptance in the United States. The major criticism has been a theoretical concern regarding tumor seeding in the needle track. Large series have refuted this argument.^{3,4} In solid tumors, thin needle aspiration using the proper technique is a very useful diagnostic tool. The primary requisites are good cytologic processing and a cytopathologist with considerable experience. Given these, a moderately high degree of reliability (80 to 90 percent) is possible.

Neck Node Biopsy To some degree, controversy lingers over the timing of neck node biopsy. Some surgeons continue to push for early excision of the node because it rapidly provides a diagnosis. The vast majority of head and neck surgeons insist on an exhaustive search for the primary tumor prior to open biopsy of the neck. This was the conviction of the eminent head and neck surgeon Hayes Martin in the 1930s.⁵ The relevance of his opinion was recently confirmed in a study of 714 radical neck dissections at the University of Iowa. In this study of head and neck cancer patients, it was clearly documented that neck biopsy had two undesirable effects: (1) an increase of local recurrence rate; and (2) an increased incidence of distant metastases.⁶

A methodical search for the primary tumor will be unrevealing in a small portion of cases. In this group it is then reasonable to proceed to open neck biopsy. The patient should be prepared for a radical neck dissection—the neck node is excised and submitted for immediate frozen section; if positive for squamous cell carcinoma, the incision is extended, and a neck dissection is completed. Only by this method will the deleterious effects listed above be avoided.

Referral

Among the significant responsibilities of the family physician is appropriate referral. To select a qualified surgeon for this problem, the following major criteria are suggested. (1) The surgeon (most often an otolaryngologist) should be particularly facile in assessing all structures of the head and neck, especially the nasopharynx, hypopharynx, and larynx. (2) He must have specialized training in the management of head and neck pathology. (3) He must have at his disposal adequate clinical facilities to carry out appropriate diagnosis and treatment.

Conclusion

The preceding discussion underscores the vast array of diagnostic possibilities within the general category of neck masses. In daily practice the great majority will fall into the group of infectious nodes, lipomas, furuncles, and thyroid enlargement. For the most part, a very direct therapeutic approach is practical and appropriate. However, if the mass fails to respond to simple treatment or if the initial diagnostic effort fails to clearly define an answer, it is imperative that the patient be referred to a competent head and neck surgeon for a thorough evaluation.

References

1. Winegar LK, Griffin W: The occult primary tumor. *Arch Otolaryngol* 98:159, 1973
2. Jaffe BF: Pediatric head and neck tumors: A study of 178 cases. *Laryngoscope* 83:1644, 1973
3. Frable WJ, Frable MAS: Thin-needle aspiration biopsy. *Cancer* 43:1541, 1979
4. Kline TS, Neal HS: Needle aspiration biopsy: A critical appraisal. *JAMA* 239:36, 1978
5. Martin H: *Surgery of Head and Neck Tumors*. New York, Hoeber and Harper, 1957, p 29
6. McGuirt WF, McCabe BF: Significance of node biopsy before definitive treatment of cervical metastatic carcinoma. *Laryngoscope* 88:594, 1978