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# Clinical and Endoscopic Examination of the Head and Neck

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## Abstract

Head and neck neoplasms present with variable signs and symptoms, depending on their site of origin and extension pattern. Thorough clinical examination, aided by modern endoscopic devices, is a cornerstone of the pre- and post-therapeutic evaluation of the patient suffering head and neck cancer. This chapter reviews the possibilities, but also the limitations of the clinical examination for each of the major subsites in the head and neck region.

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## 1 Introduction

Head and neck neoplasms present with variable signs and symptoms, depending on their site of origin and extension pattern. Thorough clinical examination, aided by modern endoscopic devices, is a cornerstone of the pre- and post-therapeutic evaluation of the patient suffering head and neck cancer. This chapter reviews the possibilities, but also the limitations of the clinical examination for each of the major subsites in the head and neck region.

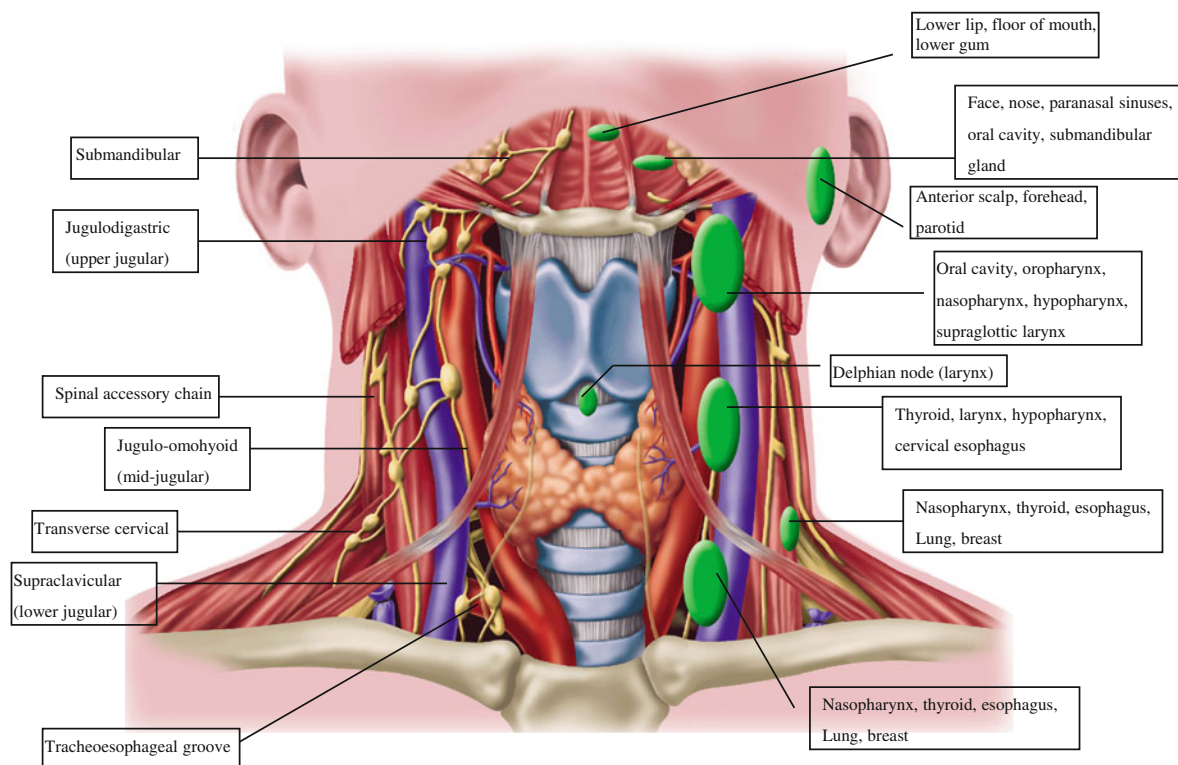
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## 2 Neck

Clinical examination still remains an important method of assessing regional lymph nodes. The presence of a clinically palpable, unilateral, firm, enlarged lymph node in the adult should be considered metastatic until proven otherwise. External examination of the neck represents an important

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**Fig. 1** The regional lymph nodes of the head and neck region; the major regional lymphatic chains are annotated on the *left*. These regional lymph node groups drain a specific primary site as first echelon lymph nodes (indicated on *right*)

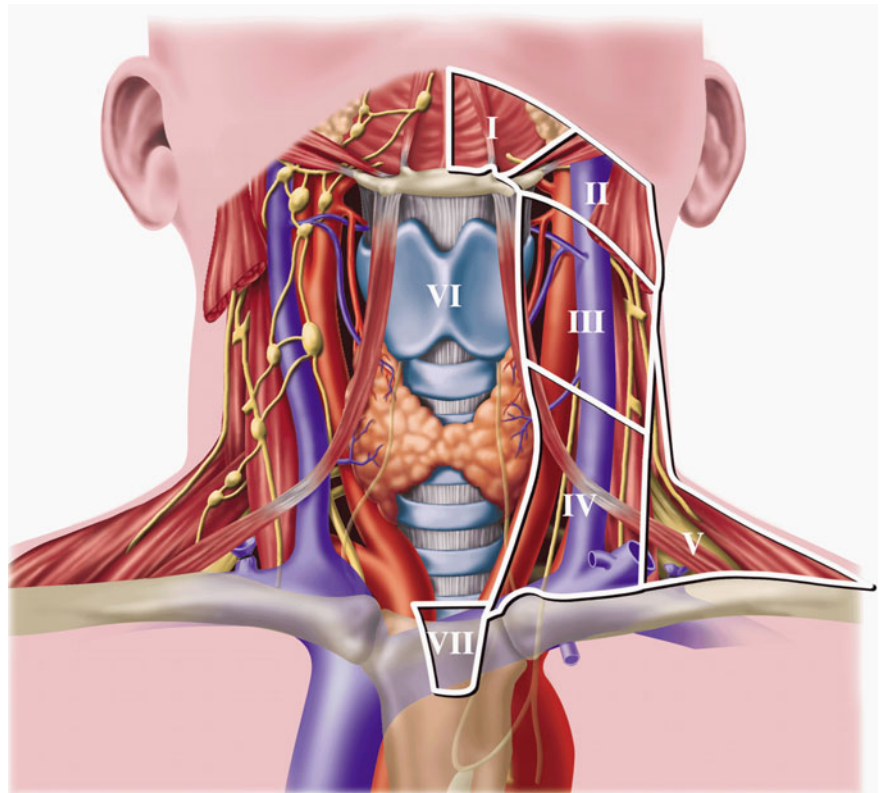
starting point in the examination of the patient. It is important to remember that some cervical masses may escape the very best surgical palpation. It is essential that an orderly and systematic examination of the lymphatic fields on both sides of the neck is performed (Stell and Maran 1972).

Regional lymphatic drainage from the mucosa of the upper aerodigestive tract, salivary glands, and the thyroid gland occurs to specific regional lymph node groups (Shah 1990). They should be appropriately addressed in treatment planning for a given primary site. The major lymph node groups of the head and neck are shown in Fig. 1. Cervical lymph nodes in the lateral aspect of the neck primary drain the mucosa of the upper aerodigestive tract. These include the submental and submandibular group of lymph nodes located in the submental and submandibular triangles of the neck. Deep jugular lymph nodes include the jugulodigastric, jugulo-omohyoid, and supraclavicular group of lymph nodes adjacent to the internal jugular vein. Lymph nodes in the posterior triangle of

the neck include the accessory chain of lymph nodes located along the spinal accessory nerve and the transverse cervical chain of lymph nodes in the floor of the posterior triangle of the neck. The retropharyngeal lymph nodes are at risk of metastatic dissemination from tumors of the pharynx. The central compartment of the neck includes the Delphian lymph node overlying the thyroid cartilage in the midline draining the larynx, and the perithyroid lymph nodes adjacent to the thyroid gland. Lymph nodes in the tracheoesophageal groove provide primary drainage to the thyroid gland as well as the hypopharynx, subglottic larynx, and cervical esophagus. Lymph nodes in the anterior superior mediastinum provide drainage to the thyroid gland and the cervical esophagus.

The localization of a palpable metastatic lymph node often indicates the potential source of a primary tumor. In Fig. 1 the regional lymph node groups draining a specific primary site as first echelon lymph nodes are depicted.

**Fig. 2** Level system of cervical lymph nodes: seven levels are distinguished (labeled I–VII)



In order to establish a consistent and easily reproducible method for description of regional cervical lymph nodes, providing a common language between the clinician, the pathologist, and radiologist, the Head and Neck Service at Memorial Sloan-Kettering Cancer Center has described a leveling system of cervical lymph nodes (Fig. 2). This system divides the lymph nodes in the lateral aspect of the neck into five nodal groups or levels. In addition, lymph nodes in the central compartment of the neck are assigned Levels VI and VII.

- **Level I: Submental group and submandibular group.** Lymph nodes in the triangular area bounded by the posterior belly of the digastric muscle, the inferior border of the body of the mandible, and the hyoid bone.
- **Level II: Upper jugular group.** Lymph nodes around the upper portion of the internal jugular vein and the upper part of the spinal accessory nerve, extending from the base of the skull up to the bifurcation of the carotid artery or the hyoid bone. Surgical landmarks: base of skull superiorly, posterior belly of digastric muscle anteriorly, posterior

border of the sternocleidomastoid muscle posteriorly, and hyoid bone inferiorly.

- **Level III: Mid-jugular group.** Lymph nodes around the middle third of the internal jugular vein.
- **Surgical landmarks:** hyoid bone superiorly, lateral limit of the sternohyoid muscle anteriorly, the posterior border of sternocleidomastoid muscle posteriorly, and the caudal border of the cricoid cartilage inferiorly.
- **Level IV: Lower jugular group.** Lymph nodes around the lower third of the internal jugular. Surgical landmarks: cricoid superiorly, lateral limit of the sternohyoid muscle anteriorly, posterior border of the sternocleidomastoid muscle posteriorly, and clavicle inferiorly.
- **Level V: Posterior triangle group.** Lymph nodes around the lower portion of the spinal accessory nerve and along the transverse cervical vessels. It is bounded by the triangle formed by the clavicle, posterior border of the sternomastoid muscle, and the anterior border of the trapezius muscle.
- **Level VI: Central compartment group.** Lymph nodes in the prelaryngeal, pretracheal, (Delphian),

**Table 1** N staging of lymph node metastasis from squamous cell carcinoma of the head and neck except nasopharynx (UICC, International Union Against Cancer 2009)

Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, <3 cm in greatest dimension
N2a	Metastasis in single ipsilateral lymph node >3 cm but <6 cm in greatest dimension
N2b	Metastasis in multiple ipsilateral lymph nodes, none >6 cm in greatest dimension
N3	Metastasis in a lymph node >6 cm in greatest dimension

paratracheal, and tracheocephalic groove. The boundaries are: hyoid bone to suprasternal notch and between the medial borders of the carotid sheaths.

- *Level VII: Superior mediastinal group.* Lymph nodes in the anterior superior mediastinum and tracheoesophageal grooves, extending from the suprasternal notch to the innominate artery.

Some nodes in the neck are more difficult to palpate than others. Thus the retropharyngeal and highest parajugular nodes are almost impossible to detect by palpation until they are very large.

Structures in the neck which may be mistaken for enlarged lymph nodes are the transverse process of the atlas, the carotid bifurcation and the sub-mandibular salivary gland.

Physical examination of the neck for lymph node metastasis has a variable reliability (Watkinson et al. 1990). A meta-analysis comparing computed tomography (CT) with physical examination (PE) yielded the following results: sensitivity, 83 (CT) versus 74% (PE); specificity, 83 (CT) versus 81% (PE); and accuracy, 83 (CT) versus 77% (PE). Overall, PE identified 75% of pathologic cervical adenopathy; this detection rate increased to 91% with addition of CT (Merritt et al. 1997).

The American Joint Committee on Cancer and the International Union against Cancer has agreed upon a uniform staging system for cervical lymph nodes. The exact description of each N stage of lymph node metastasis from squamous carcinomas of the head and neck is described in Table 1. Squamous carcinomas of the nasopharynx and well-differentiated thyroid carcinomas have a different biology and cervical metastases from these tumors are assigned different staging systems.

An enlarged metastatic cervical lymph node may be the only physical finding present in some patients whose primary tumors are either microscopic or occult at the time of presentation. A systematic search

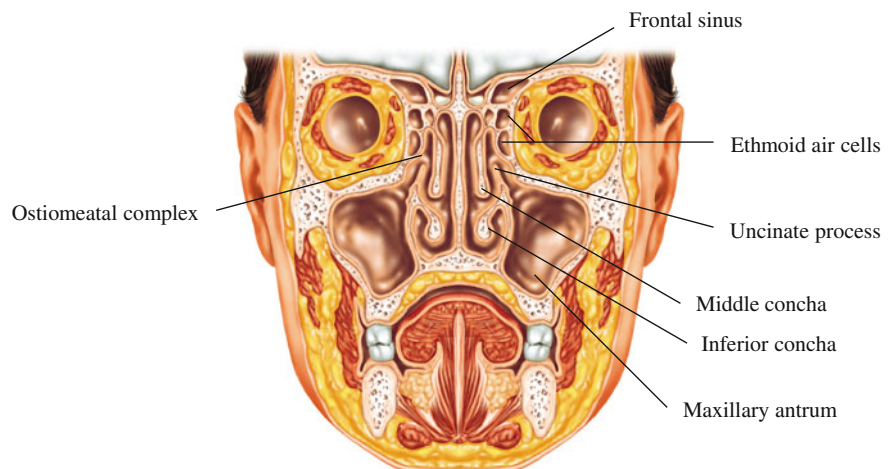
for a primary tumor should be undertaken in these patients prior to embarking upon therapy for the metastatic nodes. If a thorough head and neck examination, including fiberoptic nasolaryngoscopy, CT or MRI-study, and PDG-PET scan, fails to show a primary tumor, then the diagnosis of metastatic carcinoma to a cervical lymph node from an unknown primary is established.

### 3 Nose and Paranasal Sinuses

The nasal cavity is the beginning of the upper airway and is divided in the midline by the nasal septum. Laterally, the nasal cavity contains the nasal conchae, the inferior concha being part of the nasal cavity, and the superior and middle conchae being composite parts of the ethmoid complex. The nasal cavity is surrounded by air containing bony spaces called paranasal sinuses, the largest of which, the maxillary antrum, is present on each side. The ethmoid air cells occupy the superior aspect of the nasal cavity, and separate it from the anterior skull base at the level of the cribriform plate. Superoanteriorly, the frontal sinus contained within the frontal bone forms a bil-oculated pneumatic space. The sphenoid sinus at the superoposterior part of the nasal cavity is located at the roof of the nasopharynx. The adult ethmoid sinus is narrowest anteriorly in a section known as the ostiomeatal complex and this is the site of drainage of the maxillary and frontal sinuses (Fig. 3).

Since all of the paranasal sinuses are contained within bony spaces, primary tumors of epithelial origin seldom produce symptoms until they are of significant dimensions, causing obstruction, or until they have broken through the bony confines of the involved sinus cavity. Tumors of the nasal cavity often produce symptoms of nasal obstruction, epistaxis, or obstructive pansinusitis early during the

**Fig. 3** Coronal section through maxillofacial region, showing proximity of orbit and anterior cranial fossa to nasal cavity and paranasal sinuses. Disease of the sinuses and nasal cavity may spread directly into adjacent structures with catastrophic results



course of the disease. Unilateral epistaxis, obstruction, or sinusitis should raise the index of suspicion regarding the possibility of a neoplastic process. Tumors of the maxillary antrum may present with symptoms of obstructive maxillary sinusitis. Swelling of the upper gum or loose teeth may be the first manifestation of a malignant tumor of the maxillary antrum. Locally advanced tumors may present with anesthesia of the skin of the cheek and upper lip, diplopia, proptosis, nasal obstruction, epistaxis, a mass in the hard palate or upper gum, or a soft tissue mass in the upper gingivobuccal sulcus. Advanced tumors may present with trismus and visible or palpable fullness of the cheek. Trismus usually is a sign of pterygoid musculature invasion. Epistaxis may be the first manifestation of tumors of the ethmoid or frontal sinus. This may be accompanied by frontal headaches or diplopia. Occasionally anosmia may be present in patients with esthesioneuroblastoma. Anesthesia in the distribution of the fifth cranial nerve or paralysis of the third, fourth, or sixth cranial nerve may be the first manifestation of a primary tumor of the sphenoid sinus. Although sinonasal malignancy is rare, persistent nasal symptoms should always be investigated, particularly if unilateral. Tumors of the nasal cavity and paranasal sinuses are the most challenging to stage. Endoscopic evaluation of the nasal cavity is crucial in accurate clinical assessment of an intranasal lesion. Fiber optic flexible endoscopy provides adequate visualization of the lower half of the nasal cavity. Therefore, lesions presenting in the region of the inferior turbinate, middle meatus, and

the lower half of the nasal septum can be easily visualized by office endoscopy.

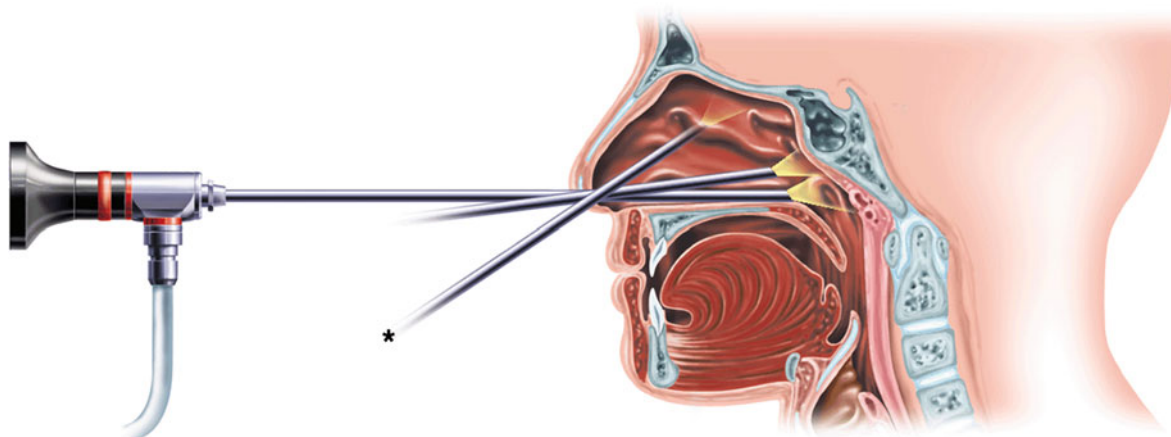
Rigid endoscopic evaluation with telescopes generally requires adequate topical anesthesia as well as shrinkage of the mucosal surfaces of the interior of the nasal cavity with the use of topical cocaine. A set of 0, 30, 70, and 90° telescopes should be available for appropriate evaluation of the interior of the nasal cavity (Fig. 4). Diagnostic nasal endoscopy allows the characterization of intranasal anatomy and identification of pathology not otherwise visible by traditional diagnostic techniques, such as the use of a headlight, speculum, and mirror (Bolder and Kennedy 1992; Levine 1990).

## 4 Nasopharynx

The nasopharynx is the portion of the pharynx bounded superiorly by the skull base and the sphenoid and laterally by the paired tori of the eustachian tubes, with the Rosenmüller's fossa. Anteriorly the posterior choanae form the limit of the space, and inferiorly an artificial line drawn at the level of the hard palate delimits the nasopharynx from the oropharynx.

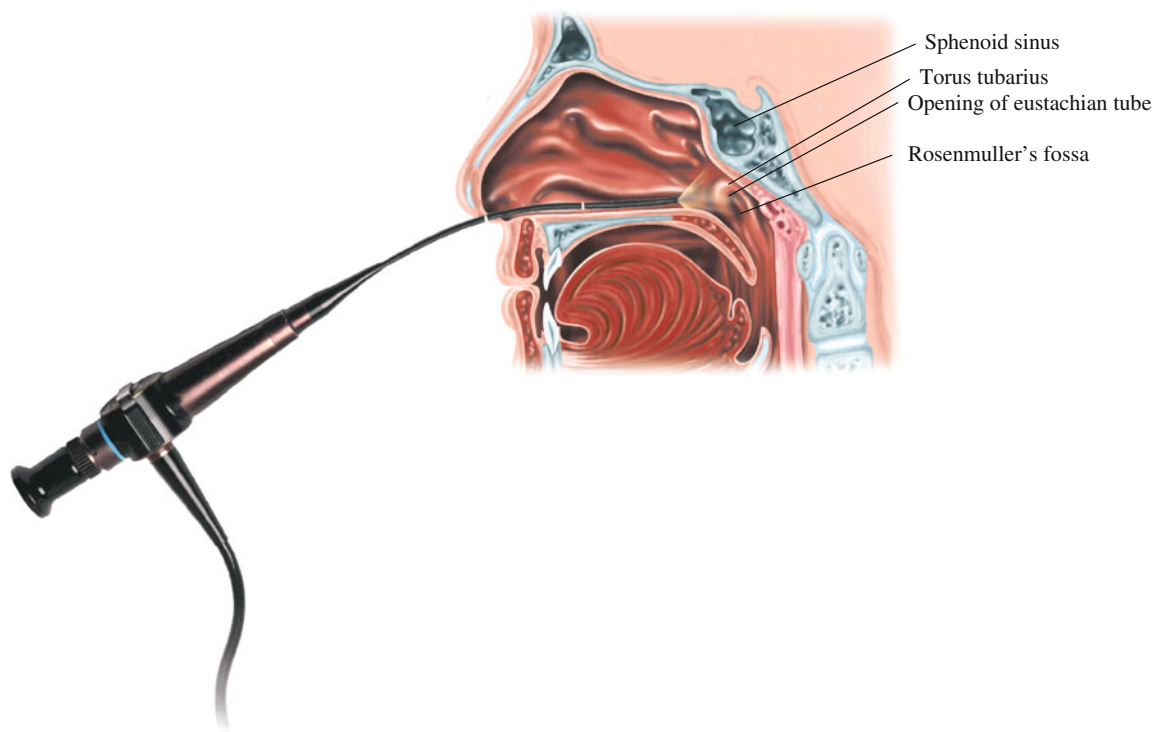
Presenting symptoms of nasopharyngeal cancer may include a neck mass, epistaxis, nasal obstruction, otalgia, decreased hearing, or cranial neuropathies. Approximately 85 percent of patients have cervical adenopathy and 50 percent have bilateral neck involvement (Lindberg 1972). Serous otitis media may occur due to Eustachian tube obstruction. Cranial





**Fig. 4** The rigid endoscope allows for detailed examination of the nasal cavity. The scope can be rotated laterally under the *middle* turbinate into the posterior aspect of the *middle* meatus

(*asterisk*). An excellent view of the *middle* turbinate, uncinate process, and surrounding mucosa can be obtained



**Fig. 5** Examination of nasopharynx with flexible scope

nerve VI is most frequently affected but multiple cranial nerves may be involved.

Nasopharyngeal carcinoma has a tendency for early lymphatic spread. The lateral retropharyngeal lymph node (of Rouvier) is the first lymphatic filter

but is not palpable. The common first palpable node is the jugulodigastric and/or apical node under the sternomastoid which are second echelon nodes. Bilateral and contralateral lymph node metastases are not uncommon.

Nasendoscopy (Fig. 5) using the flexible scope gives a good view of the nasal floor, the walls of the nasopharynx and the fossa of Rosenmüller. Nasopharyngeal tumors in any quadrant including the fossa of Rosenmüller can be seen and accurately biopsied. For the nasopharynx, also rigid 0 and 30° sinus endoscopes can be similarly used in the clinical setting. Under anesthesia, should this be necessary, these are the scopes of choice for visual assessment and biopsy.

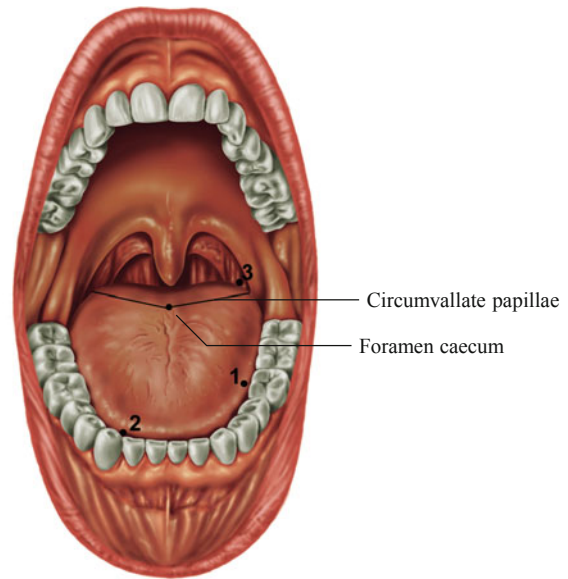
Evidence of lower cranial nerve deficits may be apparent from palatal or glossal paralysis and atrophy. A full evaluation of the remaining cranial nerves should include visual assessment and examination of the tympanic membranes.

## 5 Oral Cavity

The oral cavity extends from the vermillion borders of the lips to the junction of the hard and soft palates superiorly and to the line of the circumvallate papillae inferiorly. Within this area are the lips, buccal mucosa, alveolar ridges with teeth and gingiva, retromolar trigone, floor of mouth, anterior two-thirds of the tongue, and hard palate (Fig. 6).

All mucosal surfaces of the mouth require thorough and systematic examination. The oral cavity is lined by a mucous membrane which is a non-keratinizing stratified squamous epithelium and is therefore pink. It contains taste buds and many minor salivary glands. All mucosal surfaces should be examined using tongue blades under optimal lighting conditions.

The clinical features of the primary tumors arising in the mucosal surface of the oral cavity are variable. The tumor may be ulcerative, exophytic, or endophytic, or it may be a superficial proliferative lesion. Most patients with a mouth cancer present with a painful ulcer. Squamous carcinomas with excessive keratin production and verrucous carcinomas present as white heaped-up keratotic lesions with varying degrees of keratin debris on the surface. Bleeding from the surface of the lesion is a characteristic for malignancy and should immediately raise the suspicion for a neoplastic process. Endophytic lesions have a very small surface component but have a substantial amount of soft tissue involvement beneath the surface.



**Fig. 6** Oral cavity and oropharynx. The posterior limits of the oral cavity are the anterior tonsillar pillars, the junction of the anterior two-thirds and posterior one-third of the tongue (i.e. the circumvallate papillae) and the junction of the hard and soft palate. The soft palate and the tonsil are therefore part of the oropharynx. Carcinoma of the anterior two-thirds of the tongue is the most frequent site for a mouth cancer and the lateral border (1) is the most common location. Carcinoma of the floor of the mouth most commonly occurs anteriorly either in the midline or more usually to one side of the midline (2). Carcinoma of the oropharynx most commonly occurs in the slit between tonsil and base of tongue, at the level of the anterior tonsillar pillar (3)

Oral salivary tumors may present as a nodule, a non-ulcerative swelling or more usually as an ulcerative lesion. Metastatic tumors may also present as submucosal masses. Mucosal melanoma shows characteristic pigmentation.

Macroscopic lesions should be evaluated for mobility, tenderness and be palpated with the gloved finger to detect submucosal spread. This is particularly important in tongue lesions extending posteriorly into the posterior third and tongue base. The distance from the tumor to the mandible and the mobility of the lesion in relation to the mandible are critical elements in determining the management of perimandibular cancers. The indications for examination under anesthesia include an inadequate assessment of the extent of the disease by history and physical examination and imaging, or the presence of symptoms referable to the trachea, larynx, hypopharynx, and

esophagus that need endoscopic assessment. It is not cost-effective screening to perform panendoscopy on all patients with oral cavity cancer (Benninger et al. 1993; Hordijk et al. 1989).

Palpation of the neck is of course essential in the assessment of a patient with mouth cancer. Neck nodal disease is the single most important factor determining the method of treatment, and also prognosis is determined by the presence of metastatic nodes. Full examination of the neck must be carried out to detect any lymph node metastases and each level must be carefully palpated, particularly the upper and middle deep cervical nodes deep to the sternomastoid, from behind the patient, using the tips of the fingers. Carcinoma of the oral tongue has the greatest propensity for metastasis to the neck among all oral cancers. The primary echelon of drainage is level II but other levels may be also involved.

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## 6 Oropharynx

The oropharynx is that part of the pharynx which extends from the level of the hard palate above to the hyoid bone below. The anterior wall of the oropharynx is formed by the base or posterior third of the tongue bounded anteriorly by the v-shaped line of circumvallate papillae (Fig. 6). When present, the initial symptoms of oropharyngeal cancer are often vague and non-specific, leading to a delay in diagnosis. Consequently, the overwhelming majority of patients present with locally advanced tumors.

Presenting symptoms may include sore throat, foreign-body sensation in the throat, altered voice or referred pain to the ear that is mediated through the glossopharyngeal and vagus nerves. Over two-thirds of patients present with a neck lump. As the tumor grows and infiltrates locally, it may cause progressive impairment of tongue movement which affects speech and swallowing.

Most tumors of the oropharynx can be easily seen with good lighting, but those originating in the lower part of the oropharynx and tongue base are best viewed with a laryngeal mirror. The patient should be asked to protrude the tongue, to rule out injury to the hypoglossal nerve. Trismus is a sign of invasion of the masticator space. Sensory and motor function should be assessed, particularly mobility of the tongue

as well as fixation. Fiberoptic nasopharyngeal endoscopy has greatly enhanced the ease of examination of these tumors, particularly in assessing the lower extent of the tumor and also the superior extent if the nasopharynx is involved. The extent of involvement is often underestimated on inspection, and bimanual palpation of the tumor must be undertaken in all patients. Careful palpation should be carried out to estimate the extent of infiltration, but this examination may be limited by patient tolerance; thorough palpation under general anesthetic is advisable. Advanced tumors that cause trismus may also be better assessed under a general anesthetic. A detailed examination and biopsy under general anesthetic may be the only accurate method of assessing the extent of tumors such as those of the tongue base that may be in a submucosal location.

Examination of the neck must be carried out systematically and each level must be carefully palpated to detect lymph node enlargement or deep invasion of the tumor.

Nodal metastases from squamous cell carcinomas are typically hard and when small are generally mobile. As they enlarge, those in the deep cervical chain initially become attached to the structures in the carotid sheath and the overlying sternomastoid muscle with limitation in vertical mobility, but later become attached to deeper structures in the prevertebral region with absolute fixation.

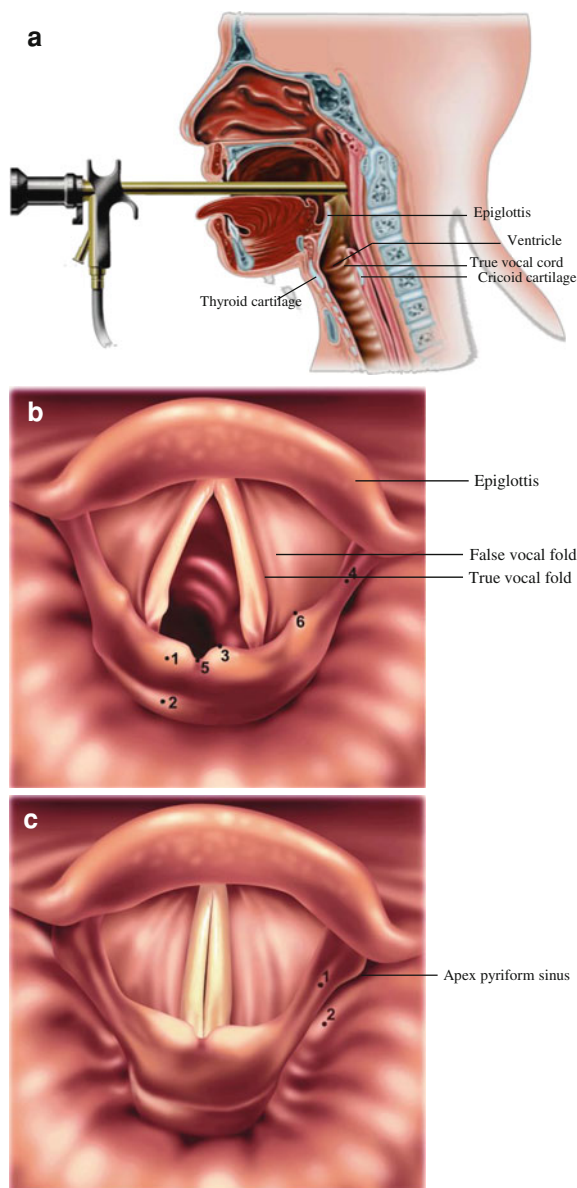
Lymphomas on the other hand have a rubbery consistency and are generally larger and multiple with matting together of adjacent nodes. Cystic degeneration in a metastatic jugulodigastric node from a squamous carcinoma of the oropharynx may have a similar presentation to a brachial cyst but the latter is a far less likely diagnosed in the older patient.

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## 7 Larynx

The larynx communicates with the oropharynx above and the trachea below. Posteriorly it is partly surrounded by the hypopharynx. It may be functionally divided into three important areas. The supraglottis contains epiglottis, aryepiglottic folds, arytenoids, false cords, and includes the laryngeal ventricle. The glottis includes the vocal cords and anterior commissure and posterior commissure. The subglottis is





**Fig. 7** Indirect laryngoscopy with Hopkins rod telescope. **a** Sagittal view. **b** View during quiet breathing. The arytenoid cartilages (1) articulate with facets on the superior surface of the posterior arch of the cricoid cartilage (2). A small mass of cartilage, the corniculate cartilage (3), usually articulates with the apex of the arytenoid and is located within the inferomedial part of the aryepiglottic fold (4). In the midline the mucosa forms a shallow notch between the two corniculate cartilages, known as the posterior commissure (5). On the lateral aspect of the corniculate cartilages, within the aryepiglottic folds, are the cuneiform cartilages (6). During laryngoscopy the corniculate and cuneiform cartilages appear as small paired swellings in the aryepiglottic folds lying on either side of the posterior commissure. **c** View during phonation. The aryepiglottic folds (1) define the anteromedial border of the pyriform fossae (2)

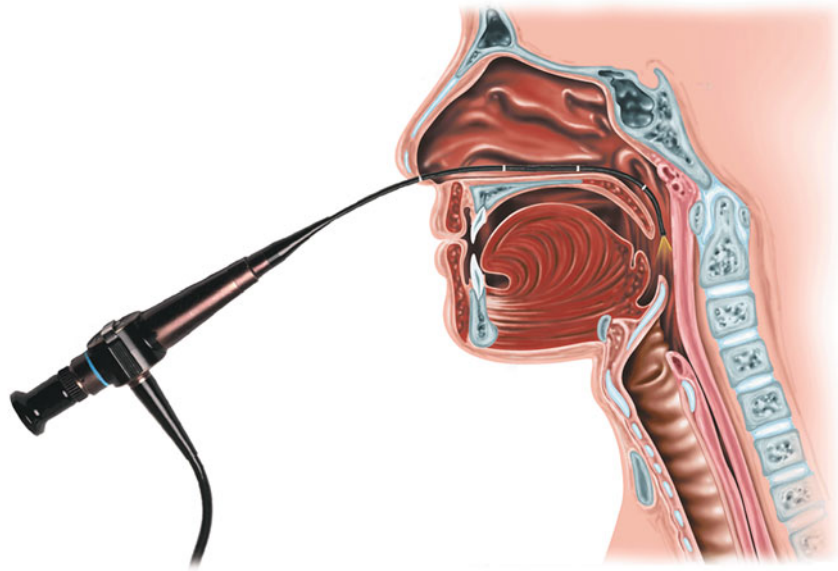
limited by the undersurface of the true cords to the inferior margin of the cricoid cartilage (Fig. 7a).

Patients with primary tumors of the larynx usually present with complaints of hoarseness of voice, discomfort in the throat, dysphagia, odynophagia, sensation of something stuck in the throat, occasional respiratory obstruction, hemoptysis, or with referred pain in the ipsilateral ear. Hoarseness is an early symptom of glottic cancer but may be seen later in advanced supraglottic or subglottic tumors indicating spread to the vocal cord, arytenoid, or cricoarytenoid joint. Submucosal spread within the paraglottic space can occur from these sites to produce hoarseness without mucosal irregularity. Dyspnoea and stridor occur with bulky supraglottic tumors or in the presence of vocal cord fixation. In most instances the diagnosis is made by a thorough clinical examination which includes mirror examination of the larynx for adequate assessment of the surface extent of the primary tumor and mobility of the vocal cords.

Examination must be carried out carefully to identify the possible spread of tumor beyond the larynx either directly or by metastasis to the regional lymph nodes. A neck mass almost always indicates lymphatic metastasis but may result from direct extension of the tumor into the soft tissues of the neck. The most frequent site of secondary deposits is the ipsilateral deep cervical chain, usually in the upper/middle region (level II, III). Glottic tumors rarely metastasize, while deposits in the lymph nodes are more frequent from supraglottic lesions. Examination must include an assessment of the number, mobility, and level of the lymph nodes. Some anterior swelling of the larynx, by widening or by penetration of tumor through the cricothyroid membrane, may be felt.

The use of the 70 or 90° Hopkins rod telescope (Fig. 7a) allows a high resolution view of the larynx. It allows assessment of vocal cord function, high quality photography, and is the ideal instrument for videostroboscopy of the larynx. The clinical appearance of a normal larynx seen through a rigid telescope is shown in Fig. 7b. This view of the normal larynx provides adequate visualization of all the anatomic sites of the supraglottic and glottic larynx as well as the hypopharynx. The dynamic function of the larynx should also be observed and recorded by asking the patient to phonate. During phonation, the vocal cords adduct while the pyriform sinuses are opening up, revealing their apices (Fig. 7c). Stroboscopy is useful

**Fig. 8** Flexible laryngoscopy. Fiberoptic laryngeal nasendoscopy provides a clear image of the larynx, laryngopharynx, and base of tongue



for the differentiation of functional from anatomical defects (Sercarz et al. 1992) and has been employed in the early detection of glottic cancer. In the latter setting, preservation of the mucosal wave suggests that a lesion is not invasive (Zhao 1992).

Technological advance is producing increasingly smaller diameter fiberoptic endoscopes for examination of the human body. The flexible nasendoscope can be used to examine the postnasal space, pharynx, and larynx, down to the level of the vocal cords. Flexible nasolaryngoscopy (Fig. 8) is generally carried out in a normal anatomical position and during normal respiration, unlike the rather distorted position achieved by indirect laryngoscopy or the use of the Hopkins rods. Additionally, flexible endoscopy can be used to directly observe the pharyngeal phase of swallowing, giving complementary information to that obtained by videofluoroscopy. Test swallows of milk or colored food can be examined (Logemann 1983).

Direct laryngoscopy under general anesthesia is the only reliable way to assess mucosal lesions of the larynx and pharynx (Phelps 1992; Parker 1992), and more often enables adequate biopsies to be sampled than with flexible techniques (Ritchie et al. 1993). If a tumor is detected, its limits in all directions should be determined both by sight and palpation.

The introduction of the operating microscope has facilitated detailed examination of the larynx (Kleinsasser 1965) (Fig. 9). Use of various telescopes

(0, 30, 70, and 120°) provides an excellent and detailed view of the lesion.

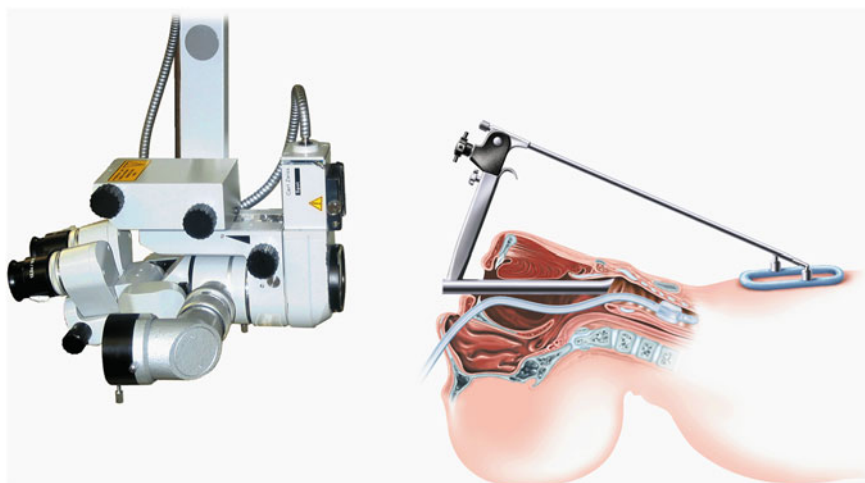
Clinical examination is limited by the fact that certain areas of the larynx are inaccessible to both visualization and palpation; nevertheless involvement of these structures has an important bearing on staging as well as on management. Information from radiological imaging and operative endoscopy must be utilized in conjunction with physical findings to obtain an accurate pretreatment TNM staging record. Particularly supraglottic tumors are frequently understaged because the pre-epiglottic and paraglottic spaces cannot be assessed clinically.

## 8 Hypopharynx and Cervical Esophagus

The hypopharynx links the oropharynx superiorly to the larynx and esophagus below. Its boundaries are roughly the hyoid and valleculae above and the cricoid below. Common sites for squamous cell cancers are the pyriform sinuses, the posterior pharyngeal wall and the postcricoid space.

Patients with primary tumors of the hypopharynx usually present with the complaints of discomfort in the throat, dysphagia, odynophagia, sensation of something stuck in the throat, referred pain in the ipsilateral ear, hemoptysis, hoarseness of voice, or

**Fig. 9** The arrangement for stable microlaryngoscopy. After placement of the laryngoscope the laryngostat is attached and the tension tightened until the view is just adequate. The microscope is then brought into position and focused



shortness of breath. In most instances, diagnosis is made by a thorough clinical examination including mirror examination of the hypopharynx and larynx, as well as either rigid telescopic or fiberoptic nasolaryngopharyngoscopic examination for adequate clinical assessment of the primary tumor.

While clinical examination permits the diagnosis of a primary tumor of the hypopharynx, direct laryngoscopy and esophagoscopy under general anesthesia are essential for accurate assessment of the tumor extent and to obtain a biopsy for histologic diagnosis.

The important features to be assessed during endoscopic examination under anesthesia include the site of origin of the primary tumor, and its local extension to the other sites within the hypopharynx and adjacent regions.

In patients with a malignant tumor of the upper respiratory or upper digestive tract, it is advisable to perform flexible esophagogastroduodenoscopy; the detection rate of a synchronous primary tumor is about 3–13% (Levine and Nielson 1992).

## 9 Salivary Glands

The parotid glands are located in close proximity to the cartilage of the external auditory canal. Anteriorly the gland abuts both the lateral and posterior border of the ramus of the mandible and the overlying masseter muscle, while inferiorly it rests medially on the posterior belly of the digastric muscle, as well as the

sternocleidomastoid muscle laterally. Medially the parotid is adjacent to the parapharyngeal space, while superiorly it reaches the arch of the zygoma. The facial nerve courses through the parotid gland. The parotid gland is arbitrarily divided into a 'superficial' and 'deep' lobe by the plane of the facial nerve. Numerous lymph nodes are localized within, and adjacent to, the capsule of the parotid gland, serving as the first echelon drainage for the temporal scalp, portions of the cheek, the pinna, and the external auditory canal. For this reason, the parotid gland may harbor metastatic cutaneous malignancy from these sites.

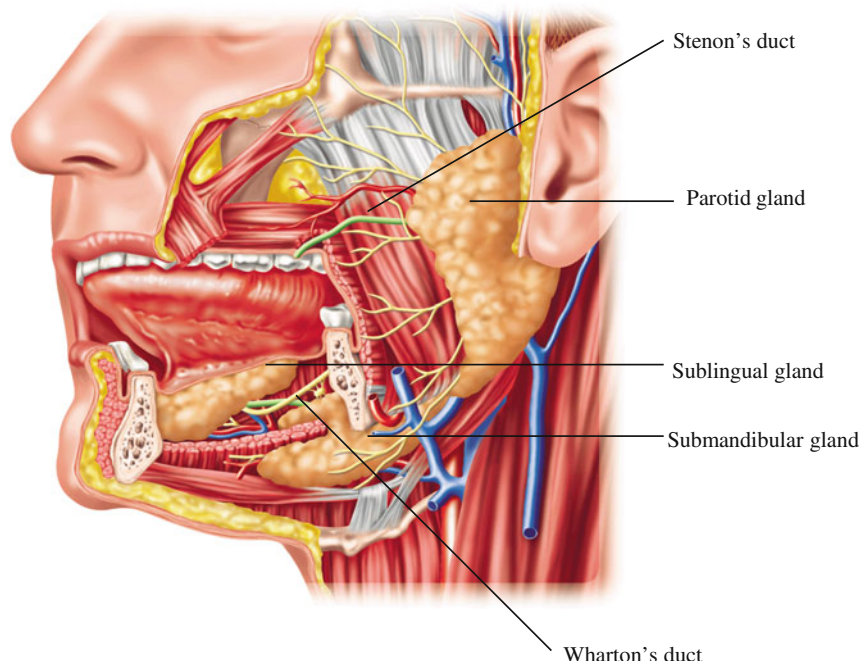
The submandibular glands are located in the anterior triangle of the neck, and are bounded superiorly and laterally by the body of the mandible. The mylohyoid muscle is located anterior to the gland, while the hyoglossus muscle lies medial to the gland. The submandibular (Wharton's) duct exists the gland medial to the mylohyoid muscle, then courses anteriorly and superiorly into the anterior floor of mouth (Fig. 10).

Located beneath the mucosa of the floor of the mouth, the small sublingual glands drain directly into the oral cavity through numerous small ducts.

The majority of neoplastic lesions of salivary glands appear as a lump without other symptoms.

Swellings in the retromandibular sulcus, the immediate preauricular region, and over the masseter are, in most cases, of parotid gland origin. Although about 10% of parotid gland tumors arise medial to the plane of the facial nerve in the deep 'lobe' of the

**Fig. 10** Anatomic relations of the parotid, submandibular, and sublingual salivary gland



gland, more than three-fourths of these deep lobe tumors will present as a typical parotid mass.

In the parotid gland pleomorphic adenomas present as round, firm, reasonable well-demarcated tumors, with a tendency to nodularity as they grow. Their site of election is between the ascending ramus of the mandible anteriorly, and the mastoid process and sternomastoid posteriorly, usually in the tail of the gland. Occasionally they arise in the immediate preauricular region, where they tend to be small. Warthin's tumors lie almost invariably in the lower pole of the gland, are ovoid in shape, and vary in consistency between soft and firm, depending on whether or not they have been exposed to previous inflammation; these tumors can occur bilaterally.

Weakness or paralysis of the facial nerve in a previously untreated patient almost always indicates that a tumor is malignant (Spiro et al. 1975; Borthune et al. 1986). Careful assessment should be made of the facial nerve and the nerves traversing the nearby carotid space (cranial nerve IX and XII) if a deep lobe or parapharyngeal space tumor is suspected.

It is often difficult to distinguish between a tumor arising within the submandibular gland or an enlarged node close to the gland or on its outer surface.

Bimanual palpation is essential to differentiate between the two, since a node lying on the outer surface of the salivary gland is unlikely to be palpated by a finger in the mouth, whereas a tumor of the gland itself is more readily compressible bimanually. Pleomorphic adenomas of the submandibular gland are usually large, quite hard, and nodular, but may be confused with a slowly growing malignancy such as an adenoid cystic carcinoma. Submandibular gland neoplasms also need evaluation of the lingual and hypoglossal nerves.

The assessment of intraoral minor salivary gland neoplasms depends on the location of the tumor. Palatal lesions are the most common, usually giving the appearance of being fixed, whether they are benign or malignant, because of the tight adherence of the mucous membrane to bone. Tumors of the hard or soft palate are often fusiform, firm to hard in consistency and nodular. Again the distinction between mixed tumor and adenoid cystic carcinoma may be difficult to make.

A salivary gland tumor arising from the deep lobe of the parotid gland, or from a minor salivary gland in the parapharyngeal space, may cause secondary displacement of the palatonsillar region.



Swelling detectable both in the pharynx and parotid region indicates a very bulky tumor originating from within the deep lobe of the parotid gland. This parotid swelling can be visible externally, but the technique of bimanual palpation will elicit the characteristic sign of ballottement between the examining fingers, typical of masses occupying such a wide area. The absence of both a visible swelling in the parotid gland and ballottement suggests an origin exclusively in the parapharyngeal space.

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## 10 Thyroid Gland

The thyroid gland lies within the pretracheal fascia in the front of the neck, and consists of two symmetrical lobes united in the midline by an isthmus that overlies the second to fourth tracheal rings (Fig. 1). There is often a pyramidal lobe, which may extend as high as the top of the thyroid cartilage.

The incidence of palpable thyroid nodules is estimated at only 4–7% of the general adult population. They occur more frequently in women and they are increasing with age (Mazzaferrri et al. 1988). Slightly less than 5% of thyroid nodules are found to be malignant (Gharib and Goellner 1993). Most patients with differentiated carcinoma present with a palpable nodule in the thyroid gland of varying size, consistency, and local extent. The primary tumor may present as a solitary, well-defined, intrathyroidal discrete palpable nodule or it may manifest with diffuse involvement of the thyroid gland with or without extrathyroid extension and fixation to the structures in the central compartment of the neck, or it may present as multiple palpable nodules. The most common location of palpable metastatic lymph nodes from thyroid cancer is at levels III, IV, or V in the lateral neck. Procedures commonly used for the initial evaluation of thyroid nodules are: ultrasound, radio-nuclide imaging, and fine-needle aspiration biopsy (FNAB).

Anaplastic carcinoma of the thyroid gland usually manifests in the older population with a very short history of a rapidly enlarging thyroid mass. Physical examination reveals a diffusely enlarged firm to hard ill-defined thyroid mass with significant extrathyroid extension to adjacent soft tissues. The mass appears fixed and inseparable from the laryngotracheal–esophageal complex.

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## 11 Role of Imaging Studies

The clinical evaluation allows to appreciate the mucosal layer of the head and neck region quite well. However, the deep extent of potentially infiltrating lesions can only be judged indirectly. Some regions, such as the base of the skull, pterygopalatine and infratemporal fossa, orbits and brain are beyond clinical evaluation, but critical management decisions have to be made based on the involvement of these structures; imaging findings are of the utmost importance in such cases. Perineural and/or perivascular spread, eventually leading to tumor progression or recurrences at distance from the primary tumor can often only be detected by imaging.

Metastatic adenopathies can be identified, sometimes still in a subclinical stage or at places not accessible for clinical examination, such as the retropharyngeal or paratracheal lymph nodes. Also, information on extranodal tumor spread and the relation to critical structures such as the carotid arteries, is necessary for determining the optimal patient management, and can be deduced from imaging studies.

Imaging is needed in submucosal lesions, covered by an intact mucosa. The origin and extent of such lesions is often difficult to determine based on the clinical evaluation alone. Imaging may provide important clues to the diagnosis, as representative biopsies may be difficult to obtain in deep-seated lesions.

All these findings can profoundly influence the staging and management of the patient with head and neck cancer. Finally, imaging may be used to monitor tumor response and to try to detect recurrent or persistent disease before it becomes clinically evident, possibly with a better chance for successful salvage.

The single most important factor in the optimal use of all this information is the mutual cooperation between the radiologist and the physicians in charge of patient care.

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## References

- Benninger MS, Enrique RR, Nichols RD (1993) Symptom-directed selective endoscopy and cost containment for evaluation of head and neck cancer. *Head Neck* 15:532–536



- Bolder WE, Kennedy DW (1992) Nasal endoscopy in the outpatient clinic. *Otolaryngol Clin North Am* 25:791–802
- Borthune A, Kaalhus O, Vermund H (1986) Salivary gland malignant neoplasms: treatment and prognosis. *Int J Radiat Oncol Biol Phys* 12:747–754
- Gharib H, Goellner JR (1993) Fine needle aspiration biopsy of the thyroid: an appraisal. *Ann Int Med* 118:282–289
- Hordijk GJ, Bruggink T, Ravasz LA (1989) Panendoscopy: a valuable procedure? *Otolaryngol Head Neck Surg* 101:426–428
- Kleinsasser O (1965) Weitere technische entwicklung und erste ergebnisse der 'endolaryngealen microchirurgie'. *Zeitschrift für Laryngologie, Rhinologie und Otologie* 44:711–727
- Levine HL (1990) The office diagnosis of nasal and sinus disorders using rigid nasal endoscopy. *Otolaryngol Head Neck Surg* 102:370–373
- Levine B, Nielson EW (1992) The justifications and controversies of panendoscopy-a review. *Ear Nose Throat J* 71:335–343
- Lindberg RD (1972) Distribution of cervical lymph node metastases from squamous cell carcinoma of the upper respiratory and digestive tracts. *Cancer* 29:1446–1450
- Logemann JA (1983) Evaluation and treatment of swallowing disorders. College Hill Press, San Diego
- Mazzaferri EL, de los Santos ET, Rofagha-Keyhani S (1988) Solitary thyroid nodule: diagnosis and management. *Med Clin North Am* 72:1177–1211
- Merritt RM, Williams MF, James TH et al (1997) Detection of cervical metastasis. A meta-analysis comparing computed tomography with physical examination. *Arch Otolaryngol Head Neck Surg* 123:149–152
- Parker R (1992) Laryngoscopy, microlaryngoscopy and laser surgery. In: McGregor IA, Howard DJ (eds) *Rob and smith's operative surgery: head and neck*, part 2, 4th edn. Oxford, Butterworth, pp 451–463
- Phelps PD (1992) Carcinoma of the larynx-the role of imaging in staging and pre-treatment assessments. *Clin Radiol* 46:77–83
- Ritchie AJ, McGuigan J, Stenvenson HM et al (1993) Diagnostic rigid and flexible oesophagoscopy in carcinoma of the oesophagus: a comparison. *Thorax* 48:115–118
- Sercarz JA, Berke GS, Ming Y et al (1992) Videostroboscopy of human vocal fold paralysis. *Ann Otol Rhinol Laryngol* 101:567–577
- Shah JP (1990) Patterns of nodal metastases from squamous carcinomas of the upper aerodigestive tract. *Am J Surg* 160:405–409
- Spiro RH, Huvos AW, Strong EW (1975) Cancer of the parotid gland: a clinicopathologic study of 288 primary cases. *Am J Surg* 130:452–459
- Stell PM, Maran AGD (eds) (1972) Pre-operative considerations. In: *Head and neck surgery*. William Heinemann Medical, London, p 6
- UICC, International Union Against Cancer (2009) TNM classification of malignant tumors, 7th edn. Wiley, New York, p 37
- Watkinson JC, Johnston D, James D et al (1990) The reliability of palpation in the assessment of tumours. *Clin Otolaryngol* 5:405–410
- Zhao R (1992) Diagnostic value of stroboscopy in early glottic carcinoma. *Chung Hua Yi Xue* 72:175–176

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