

Instrumentation and Techniques for Examination of the Ear, Nose, Throat, and Sinus

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KEYWORDS

• Patient history • Ear • Nose • Instrumentation

Optimal and accurate management of any patient depends on a detailed history and thorough physical examination. The information garnered dictates the definitive management of the patient. The importance of obtaining a detailed patient history cannot be overemphasized because it is the basis on which the examiner places all available information for the physical examination. Adequate examination of the head and neck, particularly the upper aerodigestive tract, presents a unique challenge because much of the area to be examined is not easily accessible to direct visualization. A comprehensive system, therefore, must be developed for both obtaining the history and the clinical examination to minimize the possibility of missing the underlying pathologic condition. The examiner must develop an approach to the examination of the head and neck that allows the patient to feel comfortable while the physician performs a complete and thorough evaluation. Hence a rapport must be established with the patient before proceeding with the examination in an orderly manner. The examiner should also be prepared by ensuring that all necessary instrumentation to facilitate the process is available and accessible. The physician should be familiar with the variety of instruments and techniques, as each patient may present a unique challenge. A knowledgeable

and adaptable examiner builds confidence and comfort in the patient.

RELEVANT ANATOMY

Knowledge of surgical anatomy is essential for the accurate diagnosis and successful surgical management of all patients. A familiarity with the anatomy allows for a more comprehensive examination and an accurate diagnosis. The anatomy presented here is far from exhaustive, but highlights the areas accessible throughout examination.

Ear

The ear is divided into the external, middle, and inner ear. The external ear comprises the auricle and the external auditory canal, which terminates at the tympanic membrane. The middle ear or tympanic cavity is an irregular space in the temporal bone that houses the auditory ossicles (malleus, incus, and stapes) and communicates with the nasopharynx via the Eustachian tube. The inner ear lies medial to the middle ear, and contains the auditory and vestibular apparatus.¹

The pinna has a cartilaginous skeleton that is thrown into folds and is covered by adherent skin. There is soft fibrofatty tissue but no cartilage in the lobule. The blood supply is derived mainly from the posterior auricular artery and the

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superficial temporal artery. The veins accompany the corresponding arteries. Lymphatic drainage is to the preauricular, mastoid, and superficial cervical lymph nodes. The sensory nerves are the great auricular and the auriculotemporal nerve.

The external auditory canal is a sinuous conduit, which is about 4 cm in length from the adult tragus. It has an outer third portion that is cartilaginous and contains a thin layer of subcutaneous tissue between the skin and cartilage. The inner portion is osseous and is formed primarily by the tympanic ring, and contains very scant soft tissue between the skin, periosteum, and bone. The average length of the adult external auditory canal is 2.5 cm. Because of the oblique position of the tympanic membrane, the posterosuperior part of the canal is about 6 mm shorter than the antero-inferior portion. Related to the meatus, in front of the osseous portion is the condyle of the mandible, with the mastoid air cells lying posteriorly. Branches of the posterior auricular, internal maxillary, and temporal vessels supply blood to the external auditory canal. Lymphatic drainage is similar to that of the pinna, and the sensory supply is provided by the auriculotemporal nerve and the auricular branch of the vagus nerve.^{1,2}

The tympanic membrane is a thin fibrous membrane, which is oval in shape and has a depressed central part called the umbo, wherein the handle of the malleus attaches to the membrane. The lateral process of the malleus is located in the superior-anterior region, and is identified as a prominent bony point from which the anterior and posterior malleolar folds project. Superior to these folds is the lax pars flaccida, which lacks the radial and circular fibers present in the larger pars tensa and forms the remainder of the eardrum. The tympanic membrane is thickened at its circumference and is slotted into a groove, the tympanic sulcus. The blood supply is derived from the deep auricular and tympanic artery. The nerve supply is from the auriculotemporal and glossopharyngeal nerves.

The tympanic cavity is an air-filled space in the petrous bone, containing the bony ossicles (malleus, incus, and stapes). The tympanic membrane bulges into the cavity within millimeters of the promontory on the medial wall. Posterosuperior to the promontory is the oval window, closed by the stapes. The roof of the cavity is the tegmen tympani. The floor is a thin plate of bone separating the cavity from the jugular fossa and the carotid canal. The anterior wall is perforated by the opening of the bony portion of the eustachian tube. The posterior wall is deficient superiorly where the aditus leads into the antrum. Below the aditus, the fossa incudis and the pyramid are

located. The chorda tympani emerges through a canal in the posterior wall that is located close to the posterior margin of the tympanic membrane.

The blood supply of the middle ear is derived from the tympanic branch of the maxillary, stylo-mastoid, and stapedia arteries. Venous drainage is toward the pterygoid plexus and superior petrosal sinus. The nerve supply is from the tympanic plexus with inputs from the glossopharyngeal nerve, facial nerve, and twigs from the sympathetic plexus.^{1,2}

Nose and Paranasal Sinuses

External nose

The external nose has an anterior dorsum and 2 lateral projections. The apex is called the tip; the septum divides the nose into the anterior nares, is pyramidal in shape, and has a bony, cartilaginous, and membranous framework. The nasal bones articulate superiorly with the nasal part of the frontal bone and with each other laterally, and with the nasal process of the maxilla. Superiorly, the paired nasal bones are attached to the frontal bone and superolaterally, they are connected to the lacrimal bones. Inferolaterally, they are attached to the ascending processes of the maxilla. Posterosuperiorly, the bony nasal septum comprises the perpendicular plate of the ethmoid. The vomer lies posteroinferiorly, in part forming the choanal opening into the nasopharynx. The floor consists of the premaxilla and the palatine bones.

The chief arterial supply of the external nose is from the facial artery through the angular artery and superior labial arteries anteriorly, as well as branches of the anterior ethmoidal artery. The lymphatic drainage is to the submandibular lymph nodes. The nerve supply is provided by the external nasal nerve and branches of the infraorbital nerve.

The nasal septum consists of the nasal septal cartilage, the nasal crest of the maxilla, the nasal crest of the palatine bone, the vomer, and the perpendicular plate of the ethmoid bone. The lateral nasal wall is formed by the prominent nasal turbinates. The lateral nasal wall is formed by the superior, middle, and inferior turbinates as well as the corresponding meati. The ostiomeatal complex is an area of the anterior middle meatus, which is paramount in the understanding of sino-nasal disease and endoscopic sinus surgery. The ostiomeatal complex refers collectively to several middle meatal structures, including the uncinat process, ethmoid infundibulum, hiatus semilunaris, and the ostia of the anterior ethmoid, maxillary, and frontal sinuses.^{1,3,4}

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