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What are the four anatomic divisions of the temporal bone?

The squamous, petrous and tympanic divisions of the temporal bone. Note that the mastoid is formed by the squamous and petrous portions of the temporal bone, but may be considered an independent portion as well.

Three main bony projections also exist: the styloid process, zygomatic process, and mastoid process. In terms of the ear, the temporal bone contains the medial aspect of the external auditory canal, the middle ear, the inner ear, and the internal auditory canal.

What are the primary bones, muscles, and nerves of the middle ear?

Bones: Malleus, incus, stapes

Muscles: tensor tympani and stapedius

Nerves: Chorda Tympani, Jacobson nerve

Note that the tensor tympani is innervated by V3, whereas the chorda tympani is associated with cranial nerve VII/Facial nerve. The chorda tympani courses through the internal acoustic meatus with the facial nerve, travels through the middle ear along the tympanic membrane, and courses between the malleus and incus, eventually exiting the skull through the infratemporal fossa to join the pathway of the lingual nerve. Jacobson nerve is also termed the tympanic branch of the glossopharyngeal nerve.

What are the primary anatomic divisions of the cochlea?

The cochlea contains a bony ridge called the promontory, the modiolus centrally which contains the cochlear nerve and spiral ganglion, the apex also termed the cupola, the basal turn and the cochlear aqueduct which contains perilymphatic fluid. Note that perilymphatic fluid is contained within the cochlear aqueduct whereas endolymphatic fluid is contained within the vestibular aqueduct.

What are the names of the three semicircular canals?

Lateral (horizontal), superior and posterior semicircular canals. Note there is no medial semicircular canal. These are each positioned approximately 90 degrees to each other and help detect rotational acceleration.

True or false? The internal jugular vein courses through the posterior temporal bone.

True.

The geniculate ganglion is part of which cranial nerve?

The facial nerve. The geniculate ganglion is located at the first genu of the facial nerve in the petrous temporal bone.

What is Ramsay Hunt syndrome?

Ramsay Hunt syndrome is when varicella zoster virus reactivates within the geniculate ganglion, causing shingles of the facial nerve. Presents with triad of facial nerve palsy, ear pain, and painful vesicular rash

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of the external auditory canal and pinna as well as the tongue and hard palate. Sometimes this can also affect the vestibular cochlear nerve which is cranial nerve 8, and if so would also present with tinnitus and possible hearing loss. On imaging, look for abnormal facial nerve enhancement.

What are classic clinical symptoms and imaging findings associated with aberrant internal carotid artery syndrome?

Pulsatile tinnitus, otalgia, and conductive hearing loss are some of the classic clinical symptoms of aberrant internal carotid artery syndrome. On imaging look for an enhancing vessel in the middle ear, lateral to the cochlear promontory, with flow voids on MRI and avid arterial enhancement. This is most common in females and on the right side. The vessels that typically enlarge to form the aberrant internal carotid artery are the inferior tympanic artery and the caroticotympanic artery, but that may be beyond the scope of the Core Exam. A persistent stapedia artery is also associated with an aberrant internal carotid artery.

What are classic features of a persistent stapedia artery?

A persistent stapedia artery arises from the petrous aspect of the internal carotid artery and crosses the middle ear. This normally regresses, but if this is persistent, can also cause pulsatile tinnitus as well as conductive and sensorineural hearing loss. This has risk of causing hemorrhage during ear surgery if it is undiagnosed at time of surgery, and can be seen on otoscopic examination in many cases.

What are some additional causes of pulsatile tinnitus?

Pulsatile tinnitus and conductive hearing loss can also be seen with a lateral dehiscent jugular bulb in which the dehiscent jugular bulb has direct communication with the middle ear. Other causes of pulsatile tinnitus include masses such as a hemangioma or paraganglioma, a vascular aneurysm, or an arteriovenous fistula or malformation.

What are classic clinical and imaging features of a congenital cholesteatoma, also sometimes termed an epidermoid of the ear?

Look for a mass with fluid signal intensity with non-enhancement internally but possible peripheral enhancement. This is classically located about the petrous apex in a child with conductive hearing loss. Corresponding bone destruction may or may not be present on imaging. Note that cholesteatomas may be congenital or acquired, with acquired cholesteatomas often resulting from tympanic membrane perforation. On MRI, look for imaging features similar to epidermoid cysts with low T1 and high T2 signal, no enhancement of the mass proper, but possible thin peripheral enhancement may be seen.

What are classic clinical and imaging features of a glomus tympanicum paraganglioma?

This tumor is more common in middle aged females and is the most common middle ear tumor. Clinical symptoms include ear pain, pulsatile tinnitus and conductive hearing loss. Look for an enhancing mass lateral to the cochlear promontory that may encase or possibly destroy the ossicles of the ear. Unlike a glomus jugulare paraganglioma where you expect a dehiscent jugular bulb, the jugular bulb will classically be intact with a glomus tympanicum paraganglioma.