Temporal Bone Anatomy

C. Kirsch M.D.
ckirsch@mednet.ucla.edu

Assistant Professor of Neuroradiology
and Head and Neck Radiology
David Geffen School of Medicine at UCLA
Goals of this lecture

- To review the key anatomy in both the axial and coronal plane
- Test your knowledge of that anatomy
- The importance and relevance of the structure identified!
Axial CT Scan – Right side Key structures

- Internal carotid artery
Axial CT Scan – Right side

- Internal carotid artery
- Internal jugular vein
Axial CT Scan – Right side

- Internal carotid artery
- Internal jugular vein
- Sigmoid sinus
Internal auditory canal contains the intracranicule segment of the facial nerve (VII) and the vestibulocochlear nerve (VIII)
Axial CT Scan – Right side

Going to follow the course of the facial nerve!
First portion - fundus of the IAC
Facial Nerve- Key to T-bone!

Slides courtesy of Amerisys
Facial Nerve- Key to T-bone!

- Lateral semicircular canal
- Stapedius nerve
- Stylomastoid foramen fat
- Posterior auricular branch CN7
- Cervical branch CN7
- Greater superficial petrosal nerve
- Chorda tympani nerve
- Temporal branch CN7
- Zygomatic branch CN7
- Buccal branch CN7
- Mandibular branch CN7

Slides courtesy of Amerisys
Facial Nerve- Key to T-bone!

Solitary tract nucleus
Superior salivatory nucleus parasympathetics
Motor nucleus CN VII

Lateral SCC
Stapedius n.
Stylomastoid foramen
Extracranial motor CN 7

GSPN - lacrimal gland
Chorda tympani nerve - parasymp -SMG, SLG
Taste ant 2/3 tongue

Slides courtesy of Amerisys
Facial Nerve - Key to T-bone!

- Solitary tract nucleus
- Motor nucleus CN VII
- Superior salivatory nucleus parasympathetics
- GSPN - lacrimal gland
- Stapedius n.
- Chorda tympani nerve - parasymp - SMG, SLG
- Taste ant 2/3 tongue
- Lateral SCC
- Extracranial motor CN 7
- Stylomastoid foramen

Slides courtesy of Amerisys
Facial Nerve- Key components

- CN 6 nucleus & cisternal segment
- Superior salivatory nucleus - parasympathetic to lacrimal, SMG, SLG
- Solitary tract nucleus - ant 2/3 tongue
- Motor nucleus & facial colliculus CN 7
- GSPN
- Geniculate ganglion
- Labyrinthine segment CN 7
- Tympanic segment CN 7
- Posterior genu CN 7
- IAC

Slides courtesy of Amerisys
Facial Nerve- Key to T-bone!

- GSPN
- Geniculate ganglion
- Labyrinthine segment CN 7
- Tympanic segment CN 7
- Posterior genu CN 7
- IAC
- CN 6 cisternal segment
- Cisternal segment CN 7
- Motor nucleus CN 7
- Superior salivatory nucleus - parasympathetic to lacrimal, SMG, SLG
- CN 6 nucleus
- Facial colliculus
- Solitary tract nucleus - ant 2/3 tongue

Slides courtesy of Amerisys
Axial CT Scan – Right side

Labyrinthine (fallopian segment) of the facial nerve
Axial CT Scan – Right side

Anterior genu containing the geniculate ganglion of the facial nerve
Axial CT Scan – Right side

Tympanic (horizontal) segment of the facial nerve
Axial CT Scan – Right side

- Tympanic (horizontal) segment of the facial nerve
- GSPN - arising from the anterior genu
Axial CT Scan – Right side

Descending portion of facial nerve
In the stylomastoid foramen
Internal auditory canal contains the intracanicular segment of the facial nerve (VII) and the vestibulocochlear nerve (VIII) separated by the bony crista falciformis.
Coronal CT Scan – Right side

- Anterior genu, contains the geniculate ganglion of the facial nerve (VII)
• Labryinthine (fallopian) segment of the facial nerve (VII)
• Tympanic (horizontal segment of the facial nerve)
Coronal CT Scan – Right side

- Labryinthine (fallopian) segment of the facial nerve (VII)
- Tympanic (horizontal segment of the facial nerve)
Coronal CT Scan – Right side

Tympanic (horizontal) segment of the facial nerve (VII) (steering wheel!)
Coronal CT Scan – Right side

Posterior genu of facial nerve
Separates the descending portion from the horizontal tympanic segment
Coronal CT Scan – Right side

Descending portion of facial nerve
In the stylomastoid foramen
Axial CT Scan – Right side

Cochlea - 2.5 turns - apical turn - frequency heard here is?
The bony structure in the center is called the?
Axial CT Scan – Right side

Cochlea - 2.5 turns - apical turn - frequency heard here is low
The bony structure in the center is called the modiolus
Axial CT Scan – Right side

Cochlea - 2.5 turns - basal portion - frequency heard here is?
Axial CT Scan – Right side

Cochlea - 2.5 turns - basal portion - frequency heard here is high
Axial CT Scan – Right side

Cochlear aqueduct - containing perilymph that is in communication with the basal turn of the cochlea
Axial CT Scan – Right side

Cochlear aqueduct - containing perilymph that is in communication with the basal turn of the cochlea
Coronal CT Scan – Right side

Round window - adjust and dissipate the perilymphatic wave transmitted through the cochlea
Coronal CT Scan – Right side

Cochlea - 2.5 turns - basal portion - frequency heard here is high!
Coronal CT Scan – Right side

Cochlea - 2.5 turns - basal portion - frequency heard here is high!
Coronal CT Scan – Right side

Oval window - connected to vestibule and cochlear recess
Coronal CT Scan – Right side

Cochlea - mid portion - converts fluid motion to electrical impulses
Coronal CT Scan – Right side

Cochlea - apical turn
Coronal CT Scan – Right side

Cochlear aqueduct - containing perilymph that is in communication with the basal turn of the cochlea
Axial CT Scan – Right side

Cochlea - 2.5 turns - apical turn - frequency heard here is low!
The bony structure in the center is called the modiolus or osseous spiral lamina where the cochlear nerve travels.
• Posterior SCC respond to rotational and angular acceleration
• Vestibule - largest labyrinthine cavity containing both the utricle and saccule - detects position of head relative to gravity
Coronal CT Scan – Right side

Vestibule - largest labyrinthine cavity containing both the utricle and saccule - detects position of head relative to gravity
Ampulla - contains hair cells that are stimulated with angular movement
Coronal CT Scan – Right side

Superior, horizontal and posterior SCCs respond to rotational and angular acceleration
• Vestibular aqueduct containing the endolymphatic duct and sac
Superior SCC – responds to rotational or angular acceleration
Axial CT Scan – Left side

Superior SCC – responds to rotational or angular acceleration
Axial CT Scan – Left side

Superior SCC – responds to rotational or angular acceleration
Axial CT Scan – Left side

Both the superior and posterior SCC respond to rotational and angular acceleration.
Axial CT Scan – Right side
Axial CT Scan – Right side

- Ossicular chain - head of the malleus
- Incus body  space between is the malleoincudal joint
Axial CT Scan – Right side

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- Incus body  space between is the malleoincudal joint
Axial CT Scan – Right side

- Ossicular chain - head of the malleus
- Incus body  space between is the malleoincudal joint
- Anteror malleolar ligament
Axial CT Scan – Right side

- Incus short process
- Incus long process
Axial CT Scan – Right side

- Malleus neck
Axial CT Scan – Right side

- Malleus neck
- Incus lenticular process connected to the head of the stapes
Axial CT Scan – Right side

- Stapes anterior crus
- Stapes posterior crus
Axial CT Scan – Right side

- Tensor tympani muscle - tendon inserts on the malleus neck
- Incus lenticular process connects to head of the stapes
• Malleus neck
Axial CT Scan – Right side

- Incus lenticular process connects to head of the stapes
- Head of the stapes
Axial CT Scan – Right side

- Stapedius tendon arising from the pyramidal eminence and inserting on to the stapes
Axial CT Scan – Right side

- Manubrium of the malleus
Axial CT Scan – Right side

- Manubrium of the malleus
- Tympanic membrane
Coronal CT Scan – Right side

- Tympanic membrane
Coronal CT Scan – Right side

- Incus short process (little guy driving the car’s head!)
Coronal CT Scan – Right side

- Incus body (little guy driving the car’s body!)
Coronal CT Scan – Right side

- Incus long process (little guy driving the car’s long legs!)
Coronal CT Scan – Right side

- Incus lenticular process  (little guy driving the car’s articulating lower leg!)
- Articulating with the head of the stapes
Coronal CT Scan – Right side

- Incustapedial articulation
Coronal CT Scan – Right side

- Malleus head
Coronal CT Scan – Right side

- Malleus neck
Coronal CT Scan – Right side

- Tensor tympani tendon inserts onto malleus neck
Coronal CT Scan – Right side

- Tympanic membrane
Coronal CT Scan – Right side

- Lateral malleolar ligament
Coronal CT Scan – Right side

- Superior malleolar ligament
Coronal CT Scan – Right side

- Prussak’s space - lateral epitympanum
Coronal CT Scan – Right side

- Pars flaccida of the tympanic membrane
Coronal CT Scan – Right side

- Scutum
- Tympanic annulus
Coronal CT Scan – Right side

- Malleus manubrium within the tympanic membrane
Axial CT Scan – Right side

- Anterior epitympanic recess
- IAC
Axial CT Scan – Right side

- Anterior epitympanic recess
- Additus ad antrum
Axial CT Scan – Right side

- Additus ad antrum
- Mastoid antrum
Axial CT Scan – Right side

- Facial recess
Axial CT Scan – Right side

- Pyramidal eminence - with the 2nd posterior facial nerve genu
Axial CT Scan – Right side

- Sinus tympani
Axial CT Scan – Right side

- Cochlear promontory
Axial CT Scan – Right side
Axial CT Scan – Right side

- Round window
Axial CT Scan – Left side

- Horizontal SCC - responds to rotational or angular acceleration
Axial CT Scan – Left side
First of six axial bone CT images of the left temporal bone presented from superior to inferior shows the labyrinthine segment of the facial nerve canal as a C-shaped structure arching anterolaterally over the top of the cochlea.
In this image the labyrinthine segment CN7 canal terminates in geniculate fossa. The facial nerve canal turns abruptly at the geniculate fossa (anterior genu). The tympanic segment arises from geniculate fossa, coursing posterolaterally in axial plane, running under the lateral semicircular canal before turning 90 degrees inferiorly at posterior genu to become the mastoid segment.
At the level of the oval window, the mastoid segment is visible deep to the facial nerve recess. Notice the more medial pyramidal eminence and sinus tympani.
At the level of the oval window, the mastoid segment is visible deep to the facial nerve recess. Notice the more medial pyramidal eminence and sinus tympani.
Mastoid segment extends approximately 13 mm from posterior genu to stylomastoid foramen coursing inferiorly within posterior wall of middle ear cavity. Mastoid segment is related anteriorly to facial nerve recess and medially to stapedius muscle within pyramidal eminence on posterior wall of middle ear cavity.
At the level of the basal turn of the cochlea the mastoid segment of facial nerve is still visible. Both the nerve to stapedius muscle proximally and chorda tympani distally branch off the mastoid segment CN7.
At the level of the stylomastoid foramen, the "bell" of the stylomastoid foramen is just anteromedial to the mastoid tip. The mastoid tip protects the facial nerve from traumatic injury as it exits the skull base.
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coronal bone CT images of left temporal bone presented from posterior to anterior shows lower mastoid segment of the facial nerve (CN7) and stylomastoid foramen.
Coronal bone CT images of left temporal bone presented from posterior to anterior shows lower mastoid segment of the facial nerve (CN7) and stylomastoid foramen.
coronal bone CT images of left temporal bone presented from posterior to anterior shows lower mastoid segment of the facial nerve (CN7) and stylomastoid foramen.
At the level of the round window the posterior genu of the facial nerve can be seen just lateral to the pyramidal eminence. Notice the sinus tympani is medial to the pyramidal eminence.
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At the level of the oval window the tympanic segment of the facial nerve can be seen coursing under the lateral semicircular canal. Notice the fine bony covering (thin white line) surrounding the facial nerve. Also note the location relative to the upper margin of the oval window.
At the level of the oval window the tympanic segment of the facial nerve can be seen coursing under the lateral semicircular canal. A bony covering (thin white line) surrounds the facial nerve. Note the location relative to the upper margin of the oval window. In patients with oval window atresia, the facial nerve is found near or within the oval window niche.
At oval window the tympanic segment of the facial nerve can be seen coursing under the lateral SCC. A fine bony covering (thin white line) surrounds the facial nerve. Also note the location relative to the upper margin of the oval window.
At the level of the anterior margin of the oval window the tympanic segment of the facial nerve can be seen under the lateral semicircular canal.
At anterior margin of the oval window the tympanic segment of the facial nerve can be seen under the lateral SCC. Notice the fine bony covering (thin white line) surrounding the facial nerve is now not seen. The facial nerve canal bony covering in this area is normally incomplete.
At the level of the anterior margin of the oval window the tympanic segment of the facial nerve can be seen under the lateral semicircular canal. Notice the fine bony covering (thin white line) surrounding the facial nerve is now not seen. The facial nerve canal bony covering in this area is normally incomplete.
In the anterior middle ear cavity the labyrinthine segment of the facial nerve exits the internal auditory canal over the top of the cochlea.
The labyrinthine segment of the facial nerve exits the IAC over the top of the cochlea. The anterior tympanic segment of the facial nerve is also visible. Do not confuse the muscle-tendon of the tensor tympani in the cochleariform process with the facial nerve.
Remember - not to confuse the muscle-tendon of the tensor tympani in the cochleariform process with the facial nerve!
In the most anterior portion of middle ear cavity (where both the carotid and the cochlea are visible), the geniculate ganglion is seen within the geniculate fossa as an ovoid structure just above the cochlea.
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Thank-you!