

Temporal Bone Trauma

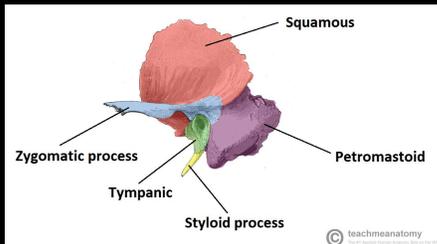
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Goals & Objectives

- Classify temporal bone fractures using the traditional and otic capsule classification methods
- Identify classification method which best predicts patient outcomes
- Recognize the most common complications associated with temporal bone fracture

Parts of Temporal Bone



Fracture Classification

- Traditional- categorized in regard to position of the fracture relative to petrous ridge
- Newer fracture classification categorizes fractures relative to involvement of the otic capsule

Traditional Classification

- Based on experimental fractures produced in cadavers
- Similar to clinically observed fractures
- Anatomic fracture location used in an attempt to predict clinical sequelae

Clinical sequelae

- CHL
- SNHL
- VII nerve paralysis
- CSF leak / meningitis
- Vertigo
- Vascular – carotid dissection, pseudoaneurysm, sigmoid sinus thrombosis
- Acquired cholesteatoma

Why does it matter?

- Importance of fracture classification is to try to predict clinical sequelae and clinical outcome
- More recent studies suggest that the traditional classification system fails to reliably predict any complication

How do I report T-bone fractures?

I report both classifications:

E.G. "There is a longitudinal petrous temporal bone fracture which traverses the middle ear cavity but spares the otic capsule structures."

- Traditional classification gives a better "visual picture" of fracture
- Otic capsule classification system better predicts patient morbidity

Fracture Classification-Traditional

- Longitudinal = Parallel to long axis of petrous temporal bone
- Transverse = Perpendicular to long axis of petrous temporal bone
- In truth most fractures are complex with a somewhat serpiginous course
- In 1992, a revised classification system included an oblique fracture

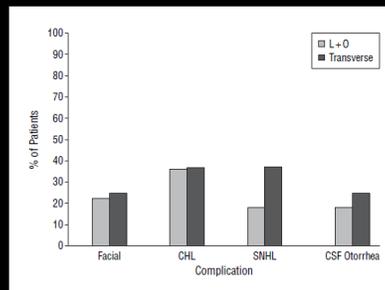
New Classification

- Otic capsule sparing
vs
- Otic capsule violating
- Several studies support better predictive ability for serious clinical outcome using new classification system

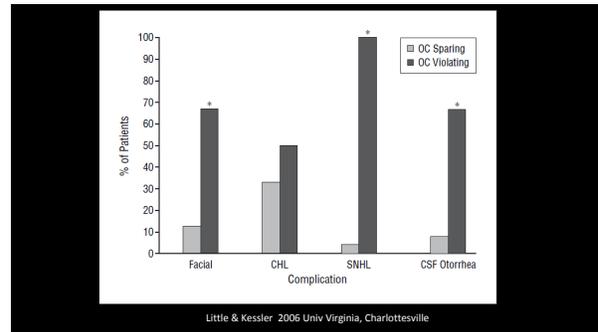
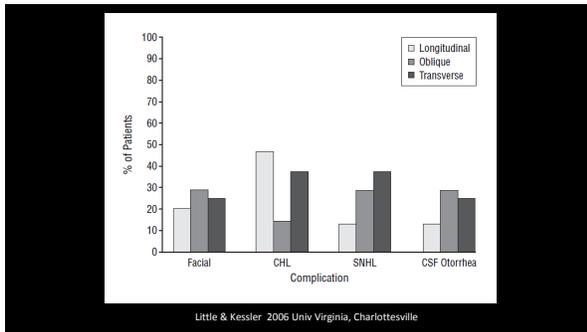
Table. Demographics of the Temporal Bone Fracture Population*

Variable	Value
Demographic ratio	
Male-female	19:11
Unilateral-bilateral	28:1
Right-left	14:16
Cause	
Motor vehicle crash	14 (47)
Fall	10 (33)
Assault	4 (10)
Old system	
Longitudinal fracture	15 (50)
Transverse fracture	8 (27)
Oblique fracture	7 (23)
New system	
Otic capsule-sparing fracture	24 (80)
Otic capsule-violating fracture	6 (20)

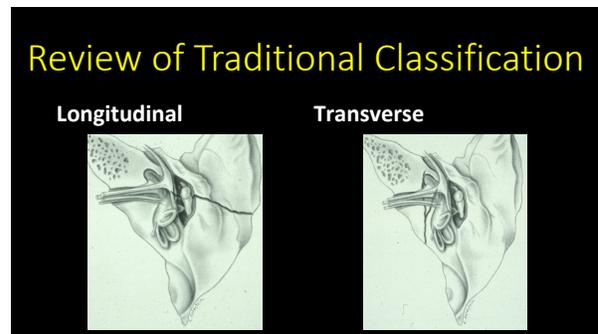
Little & Kessler 2006 Univ Virginia, Charlottesville



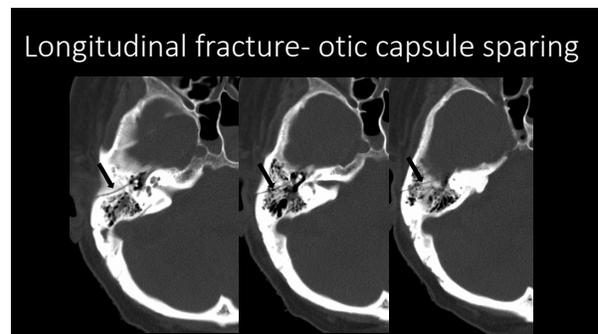
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- Pts with otic capsule violating fx**
- 5x more likely to have facial nerve injury
 - 25x more likely to have SNHL
 - 8x more likely to have CSF leak



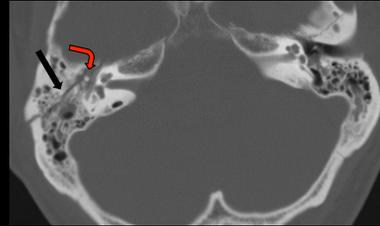
- Longitudinal Fracture**
- Most common, due to temporoparietal trauma
 - Commonly associated squamous T-bone fx
 - Usu involves the TM, EAC w hemotympanum
 - Often involves ossicles
 - May involve CN VII
 - May extend to carotid canal



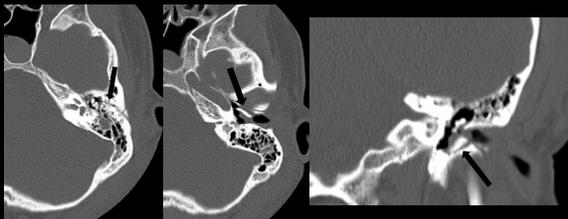
Conductive Hearing Loss

- Hemotympanum
- TM damage
- Ossicular derangement
- Anterior EAC fx and subsequent stenosis

Longitudinal fracture with hemotympanum



EAC fracture requiring canalplasty



EAC fractures

- Direct trauma can result in a localized fracture of the mastoid and/or EAC
- Indirect trauma via a blow to the mandible can result in an anterior wall EAC fx

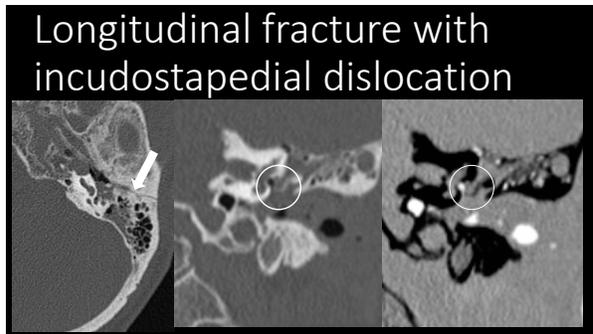
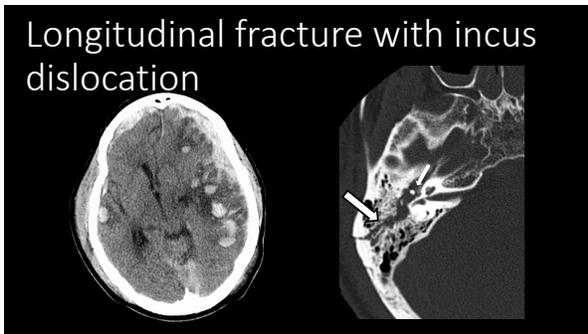
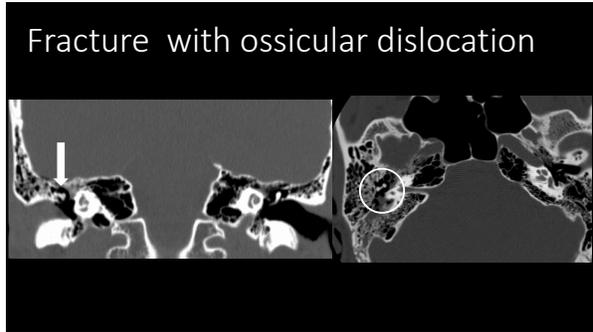
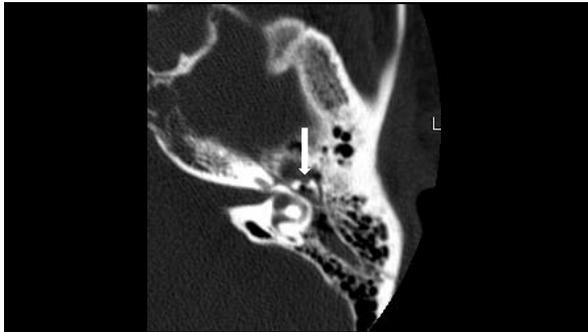
Ossicular Derangement

1. Incudostapedial joint subluxation
2. Complete incus dislocation
3. Fracture of stapes arch
 - Fracture of malleus
 - Isolated malleoincudal subluxation

May also be noise induced or secondary to barotrauma

Malleoincudal subluxation





Transverse Fracture

- Less common, due to frontal or occipital impact
- Ossicles and TM usually spared
- Higher incidence of VII paralysis
 - ** often immediate and complete
- Labyrinthine involvement common
- Can transect IAC
- May have acute complete SNHL & vertigo

SNHL

- Fracture IAC (Transection of CN VIII)
- Fracture involving cochlea
- Labyrinthine concussion

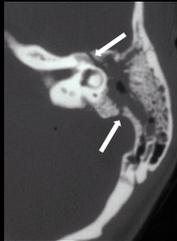
Vertigo

- Fracture IAC (Transection CN VIII)
- Transection of vestibule or vestibular aqueduct
- Labyrinthine concussion
- Perilymph fistula

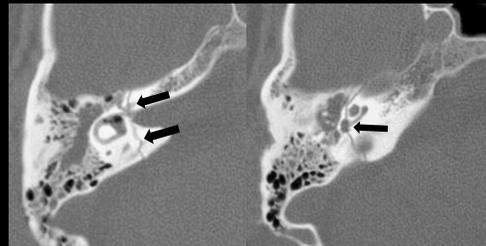
Facial Nerve Paralysis

- Results from:
 - * Transection
 - * Intra-neuronal hematoma
 - * Impingement / ischemia

Transverse otic capsule sparing fracture

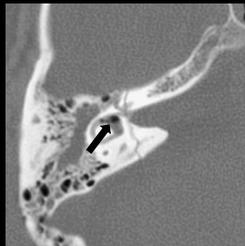


Transverse otic capsule violating fracture

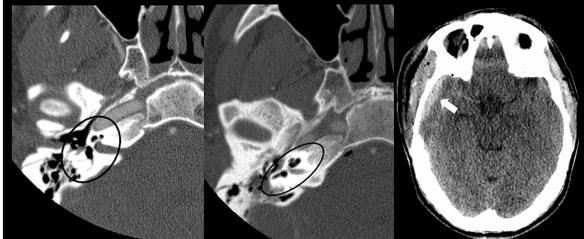


Perilymph fistula

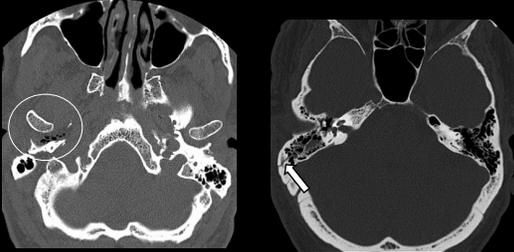
- Disruption of oval or round window
- Pneumolabyrinth
- Persistent vertigo and fluctuating sensorineural hearing loss



Longitudinal fracture with pneumolabyrinth



Air in TMJ associated with T-bone fracture



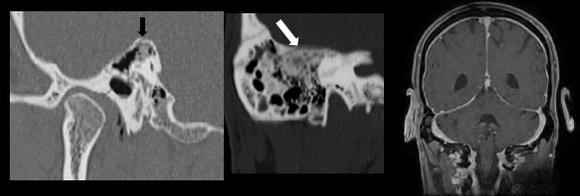
CSF Leak

- Results from disruption of tegmen and dura
- CSF otorrhea if TM disrupted
- CSF rhinorrhea if TM intact
- Can result in meningitis

Complex fracture with tegmen disruption

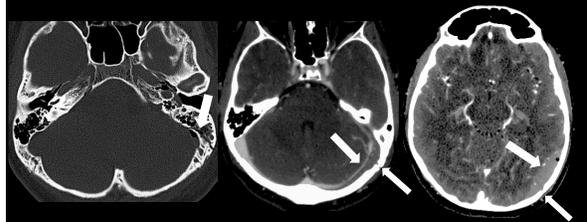


Fracture with tegmen involvement and CSF leak

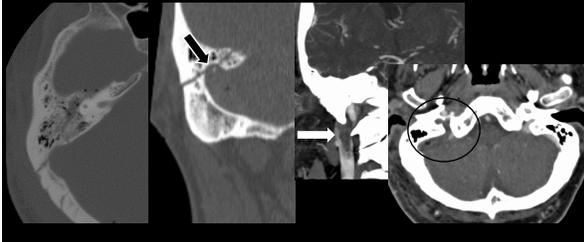


Vascular Sequelae

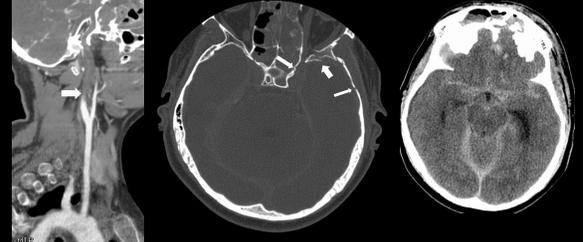
Lambdoid diastasis, longitudinal fracture, epidural hematoma & venous thrombosis



Longitudinal fracture with sigmoid/IJ thrombosis



Squamous T-bone fx, skull base fx, ICH and occlusive cervical ICA dissection



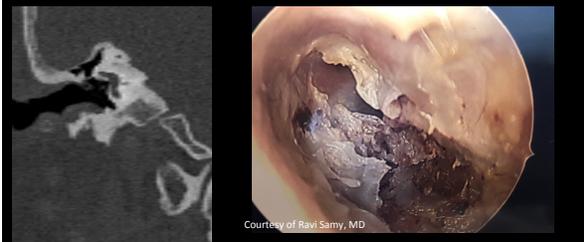
T-bone fx, sphenoid fx, ICA dissection



Acquired Cholesteatoma

- Occurs in longitudinal or mixed fracture
- Secondary to invasion of squamous epithelial debris into EAC or middle ear along fracture line
- Can be very aggressive

EAC Cholesteatoma



Thanks for your attention!

