Trauma to the Ear

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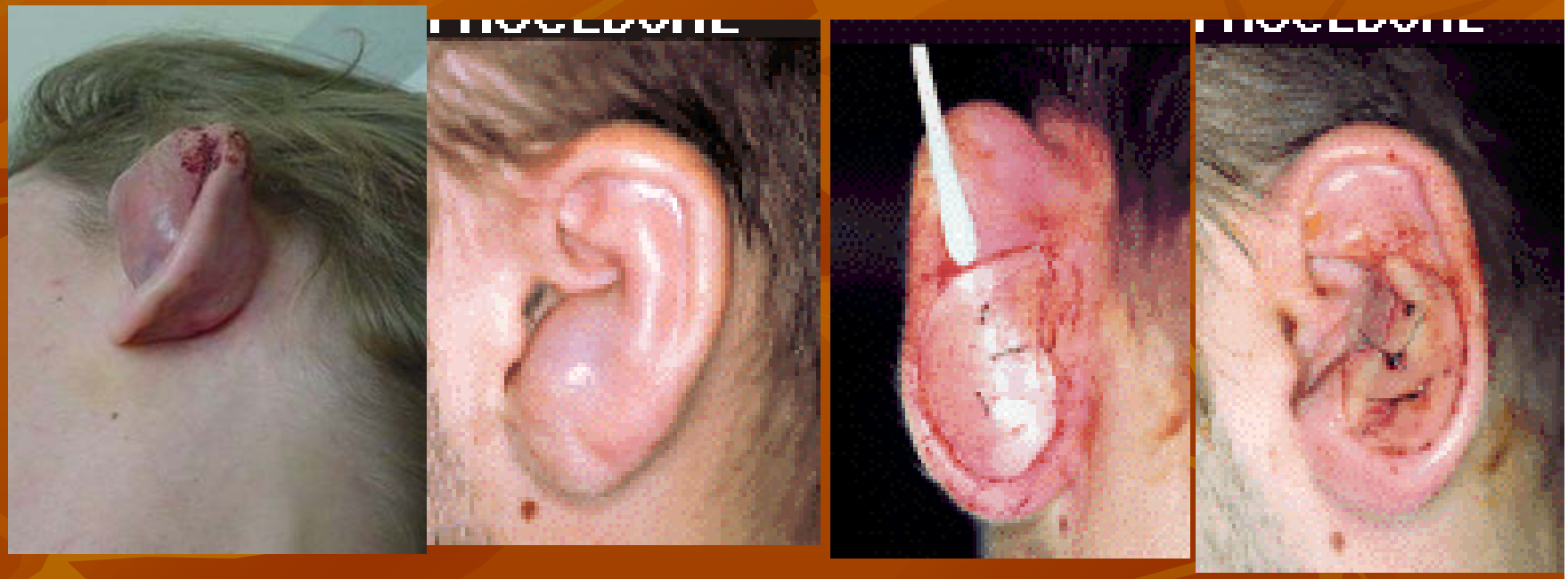
Mechanisms of Trauma

- Barotrauma (implosive/explosive, diving, slap, kiss….injury).
- Lightning.
- Burns and frostbite.
- Noise (impulse, steady state).
- Iatrogenic (otologic surgery, syringing, cochlear implants).

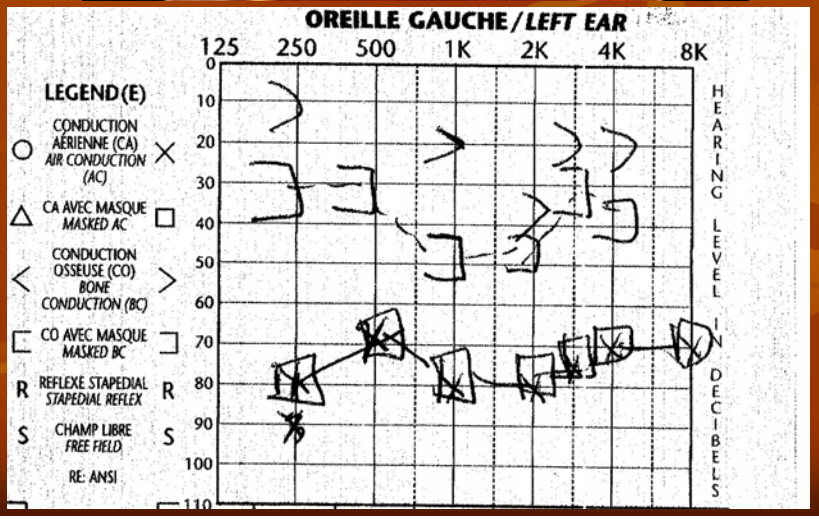
Auricle injuries

- Hematomas separate the perichondrium (blood supply) from the cartilage; excise fibrous tissue, apply pressure dressing , drain
- Avulsion: reimplantation requires favourable circumstances and possibly microvascular anastomosis



Case

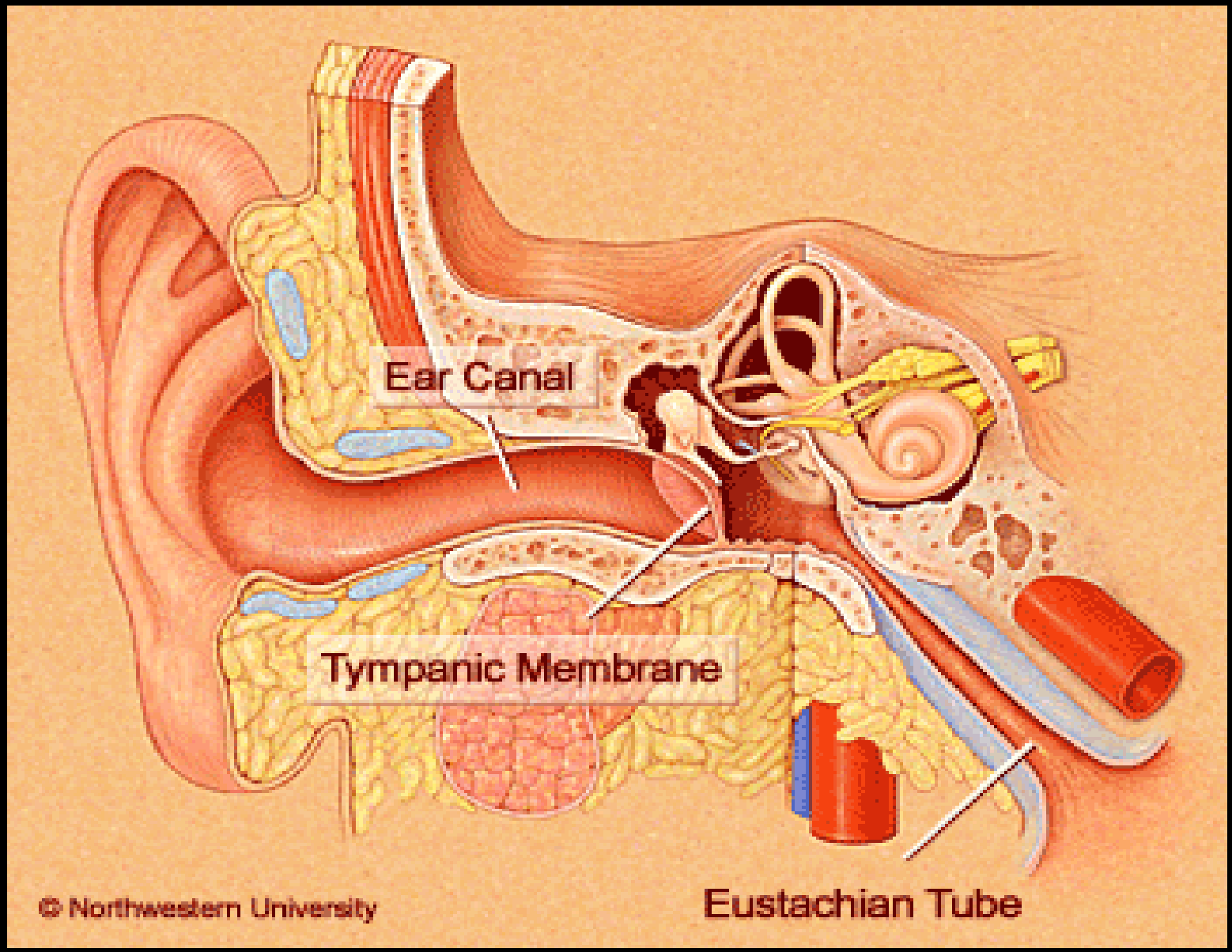
- 36 y/o female
- Slapped on L ear
- Bleeding
- Decreased hearing
- Dizziness
- ?Dx



Traumatic TM perf with cochlear damage

Barotrauma

- Diving, Valsalva, Sneezing….
- 60mmHg→ Otalgia
- 90mmHg→ ET dysfunction
- 120mmHg→ TM perforation
- Implosive/explosive
- Caisson disease (Decompression sickness, the bend) ?
  - Compression N→ soluble
  - Decompression N → Gas emboli→ back, joint, muscles → bend
  - Rx hyperbaric O2


Ear Canal
Tympanic Membrane
Eustachian Tube
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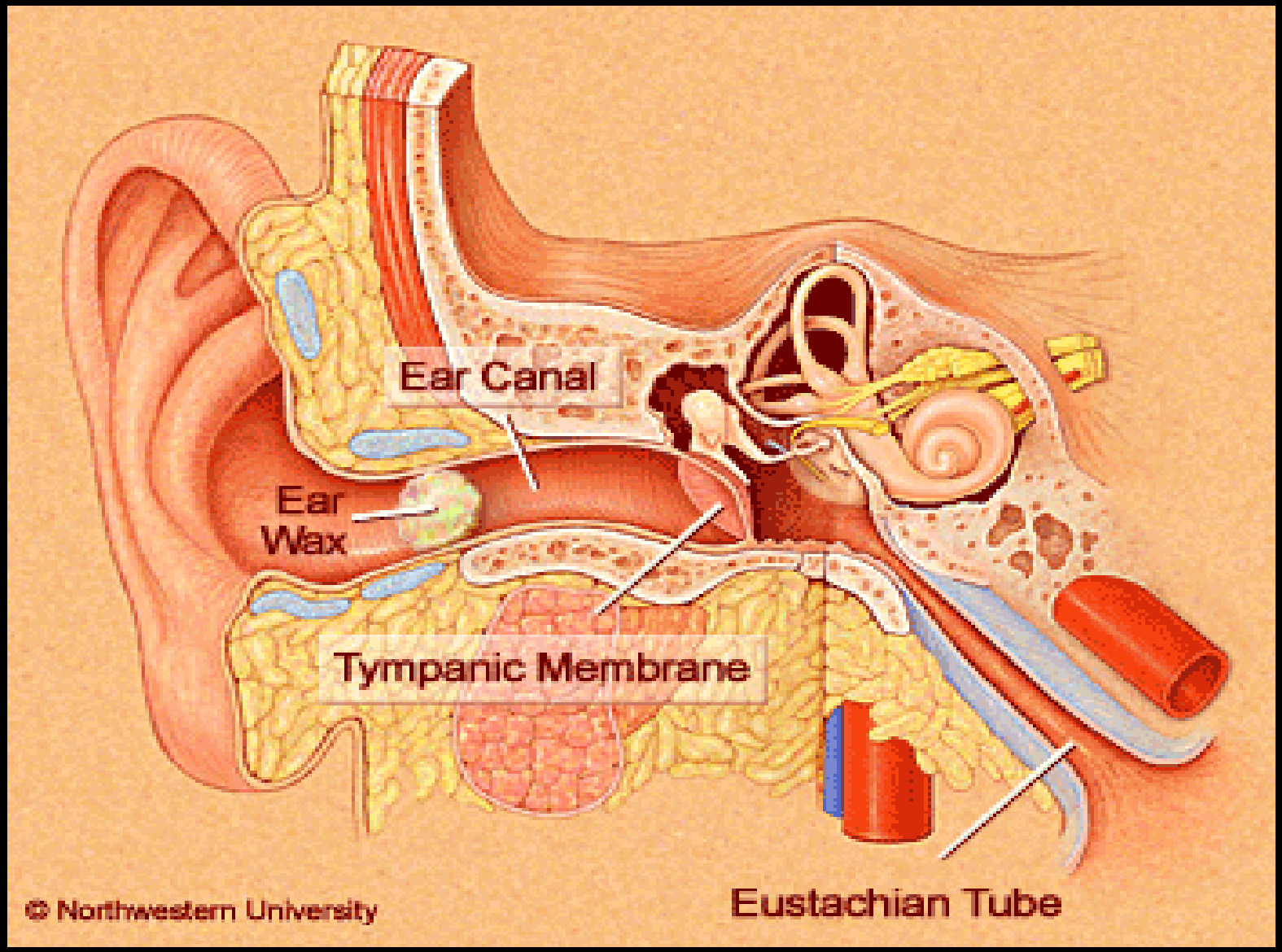
Ear Canal
Ear
Wax
Tympanic Membrane
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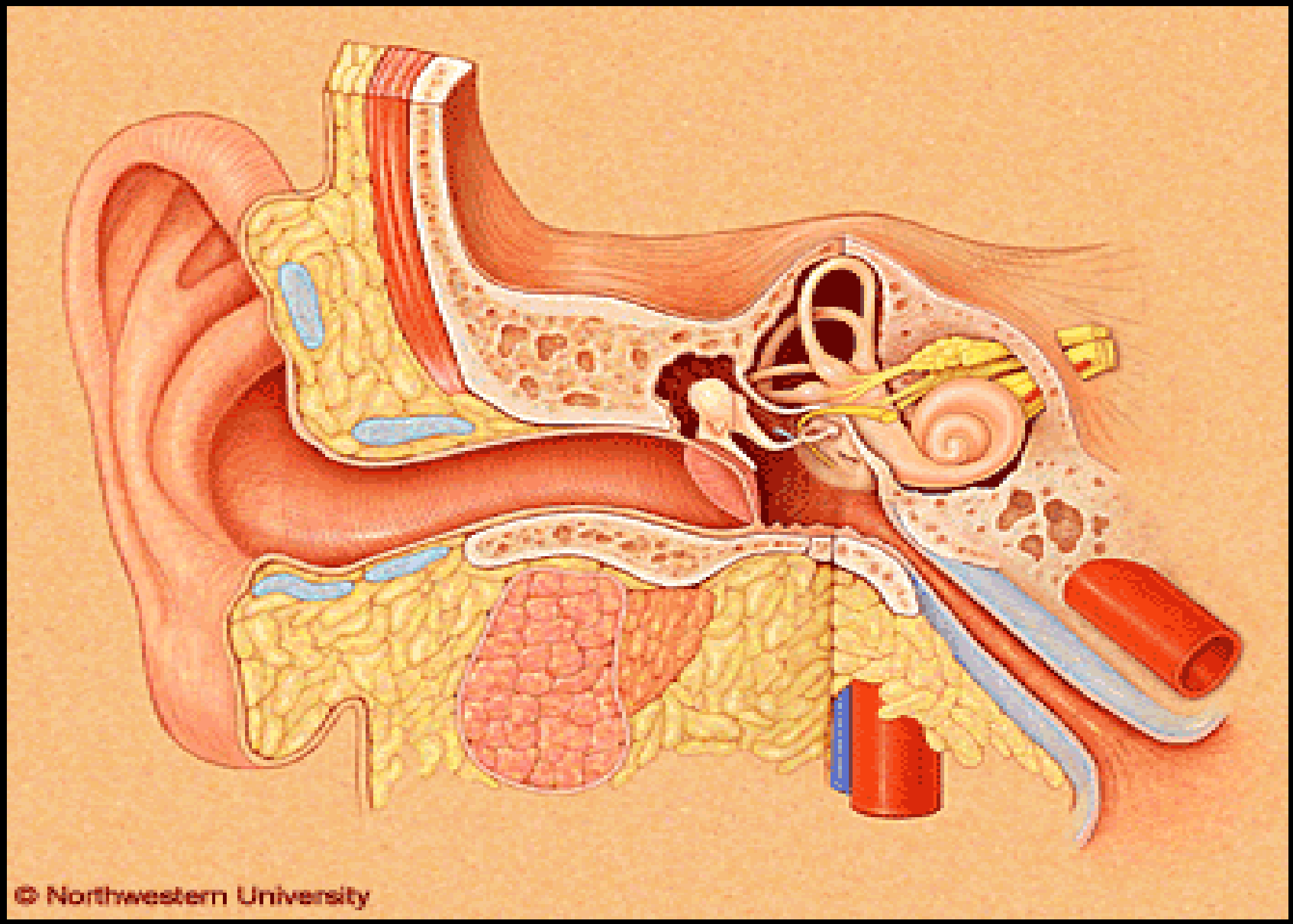
Eustachian Tube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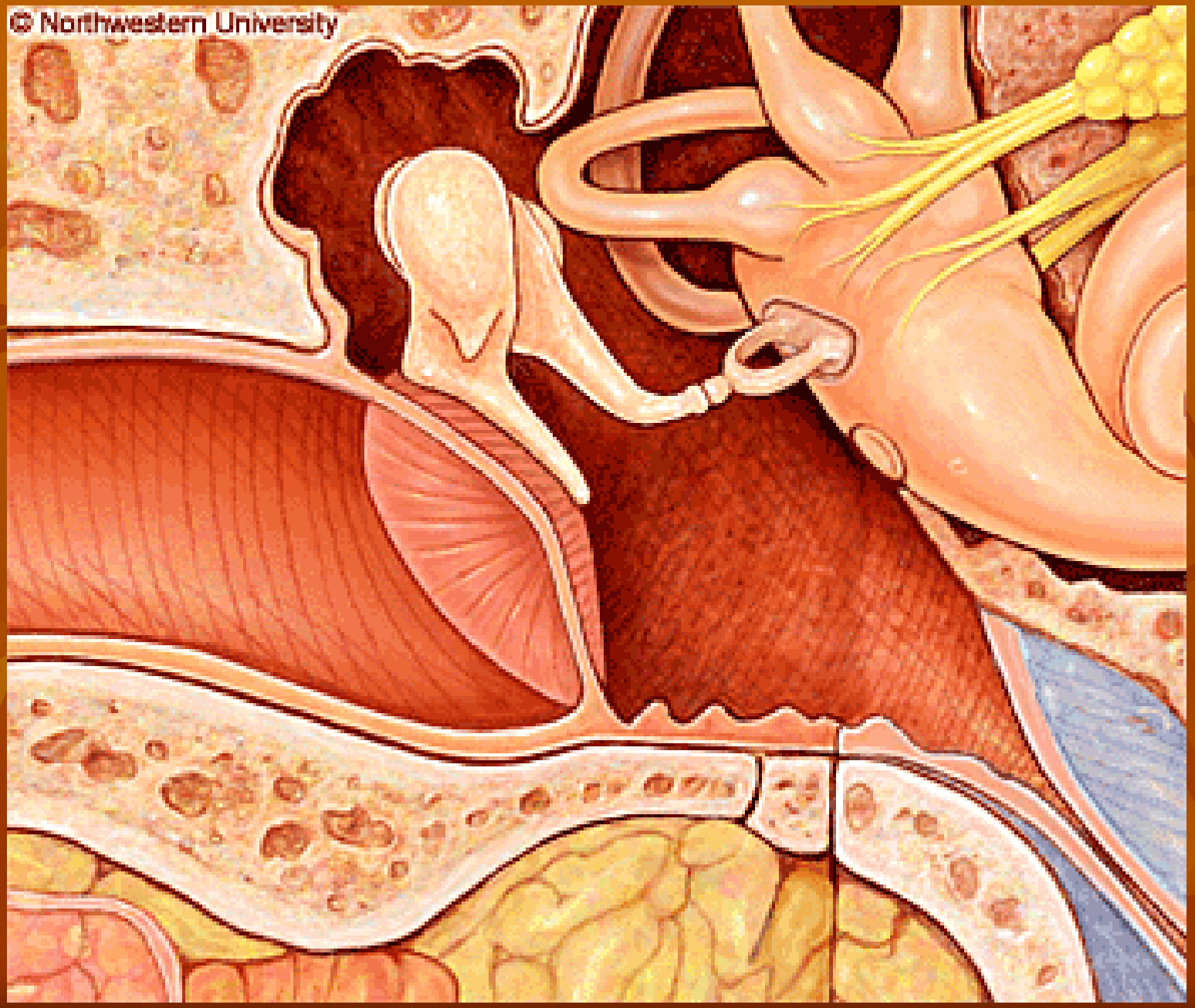
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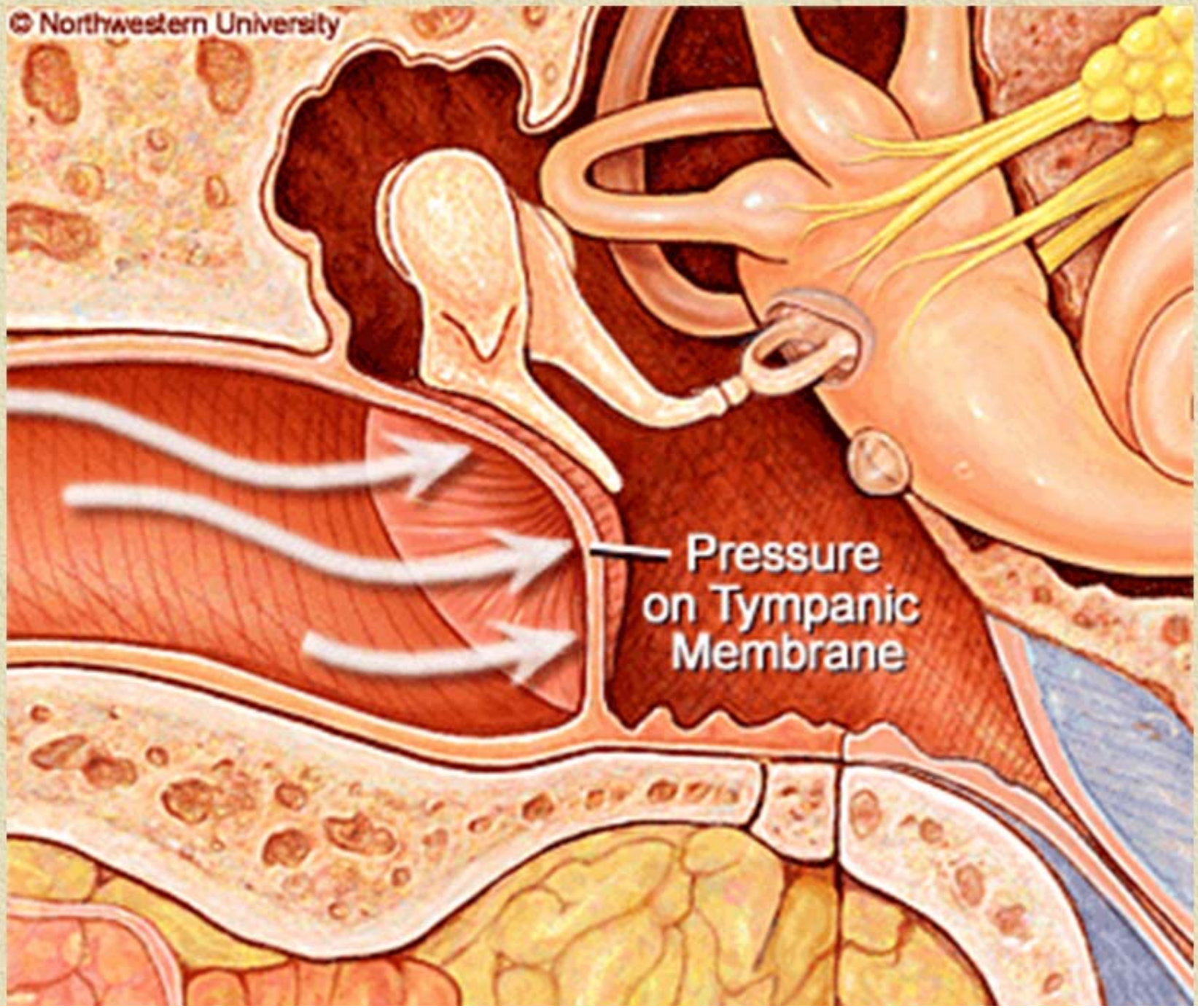
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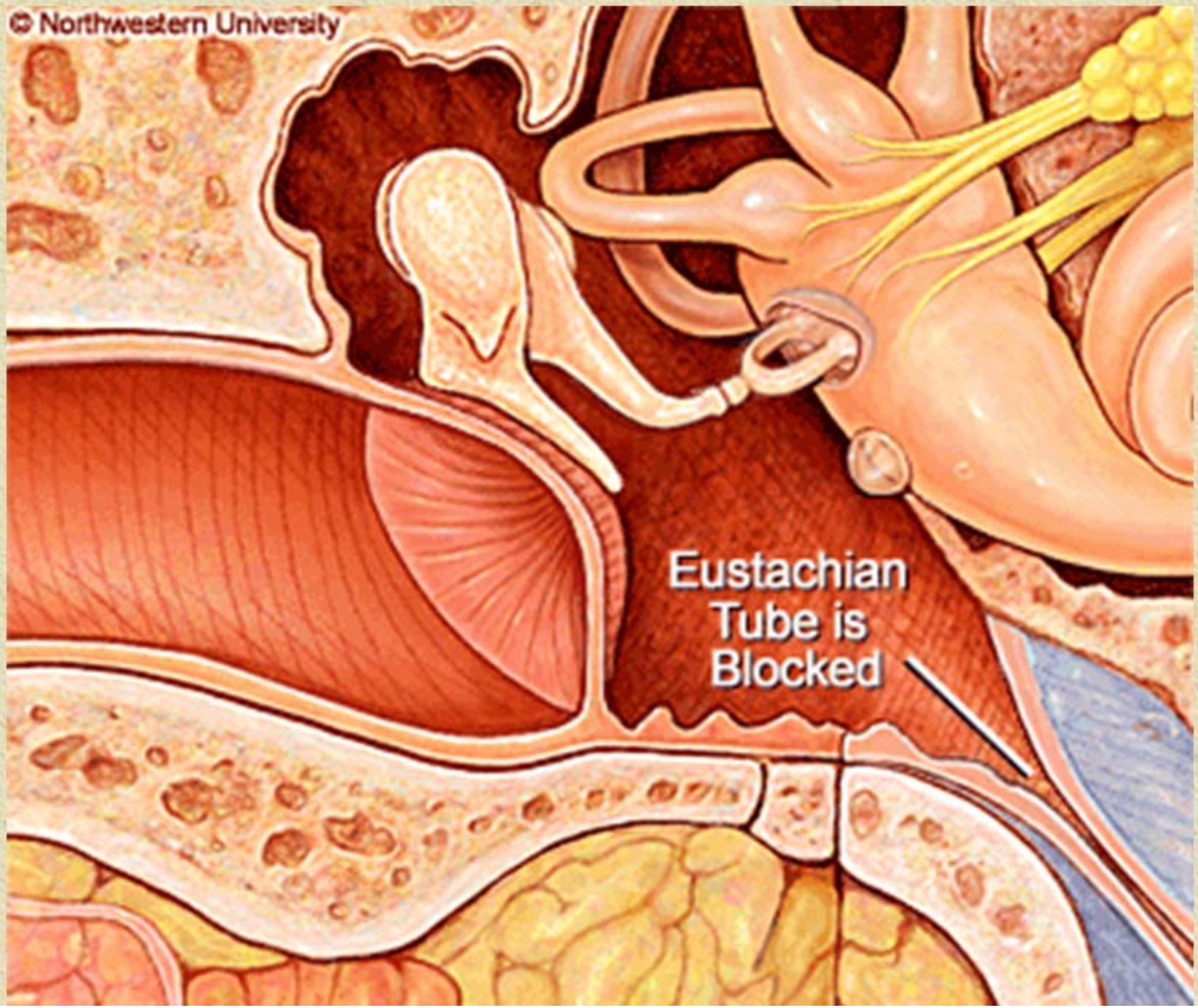
Pressure
on Tympanic
Membrane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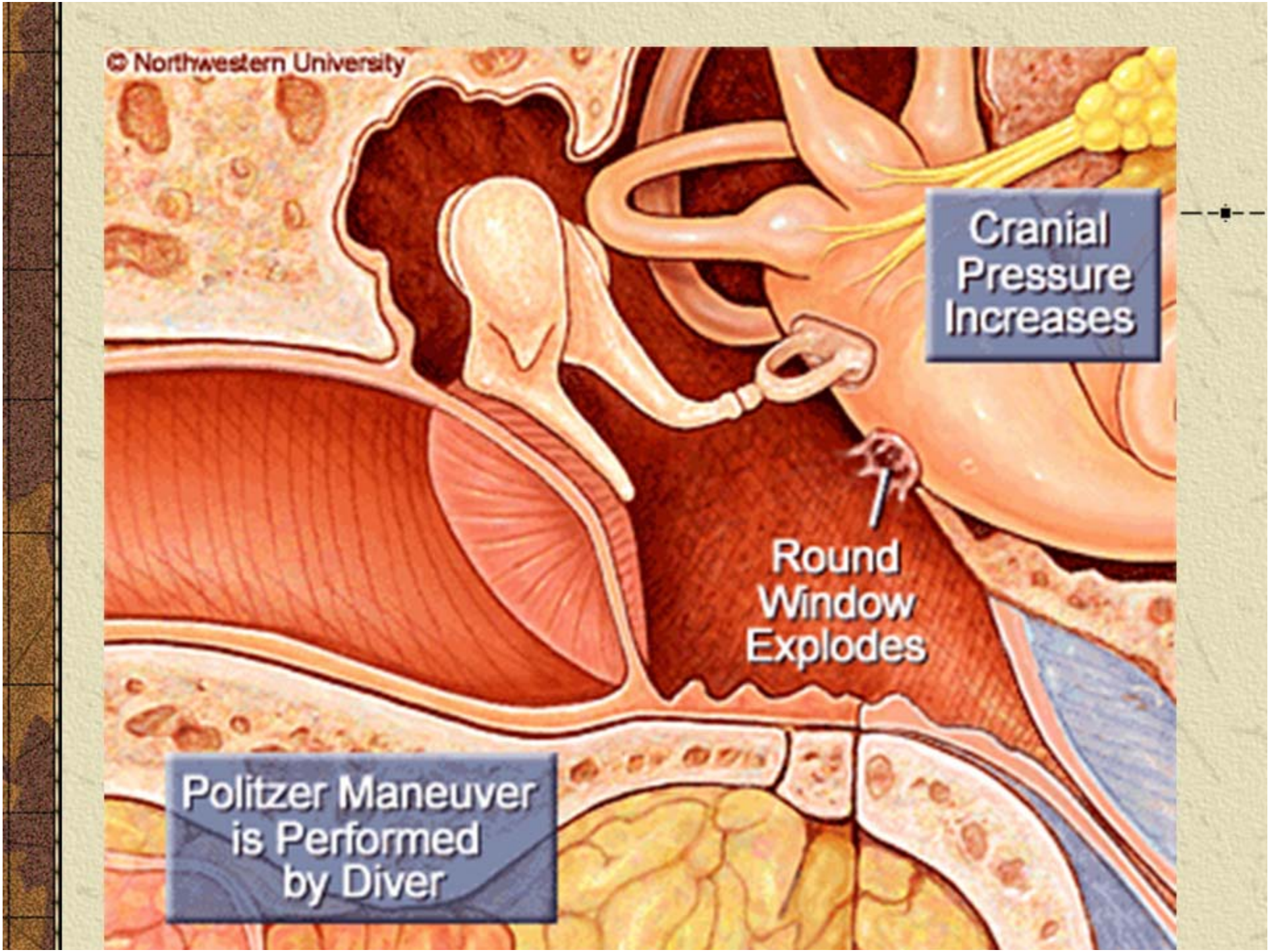
Eustachian
Tube is
Blocked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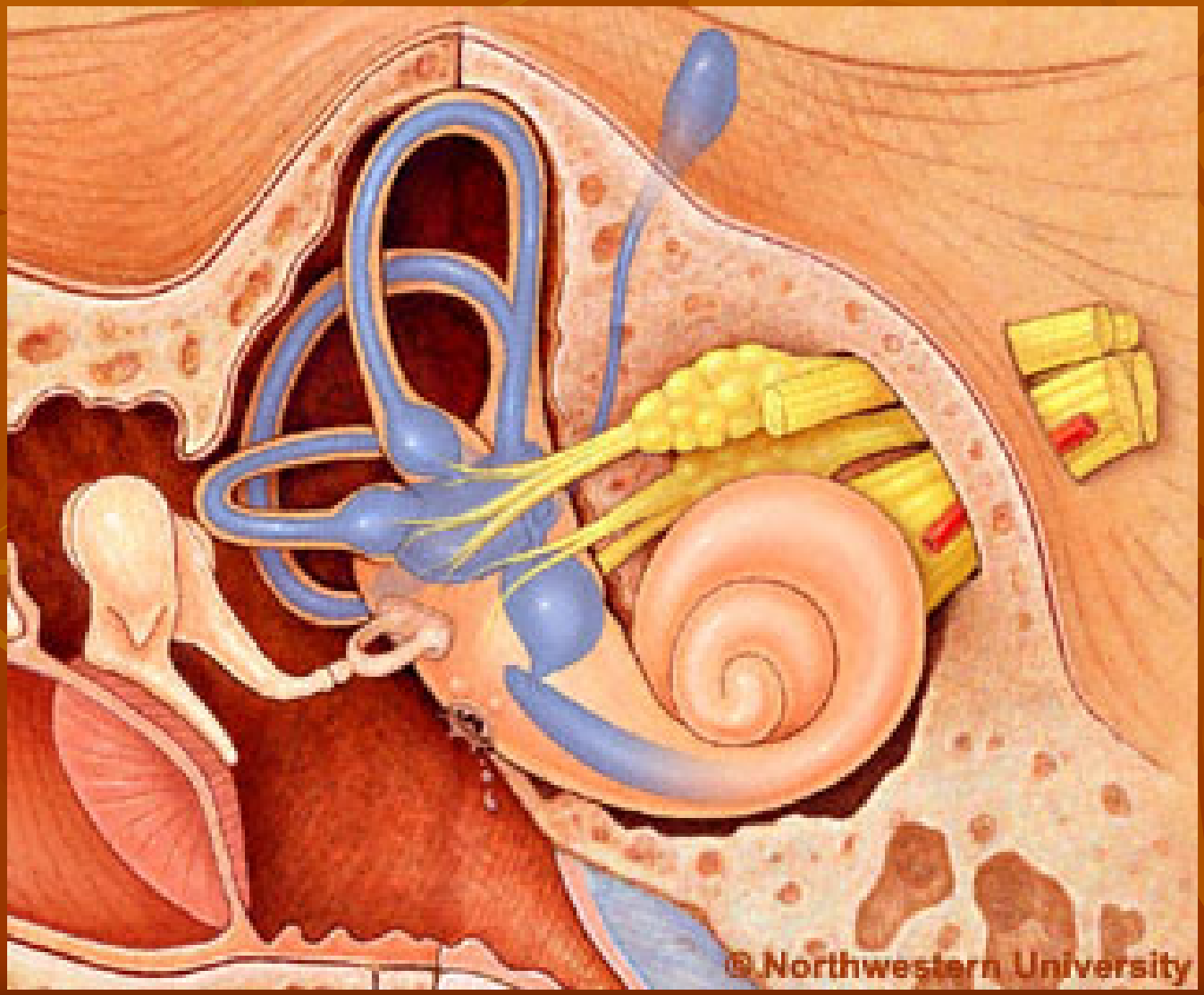
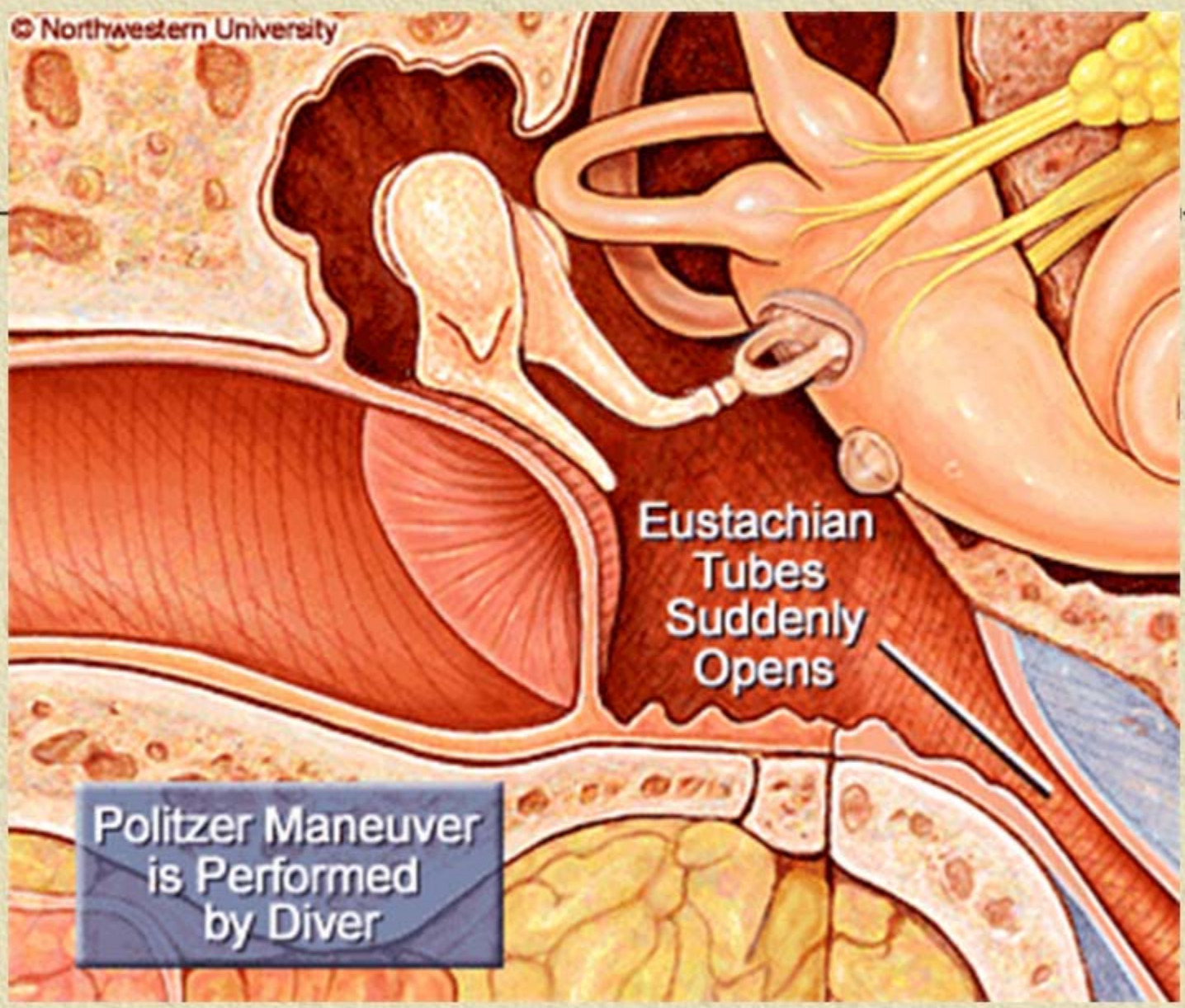
Cranial Pressure Increases
Round Window Explodes
Politzer Maneuver is Performed by Diver

Round window fistula

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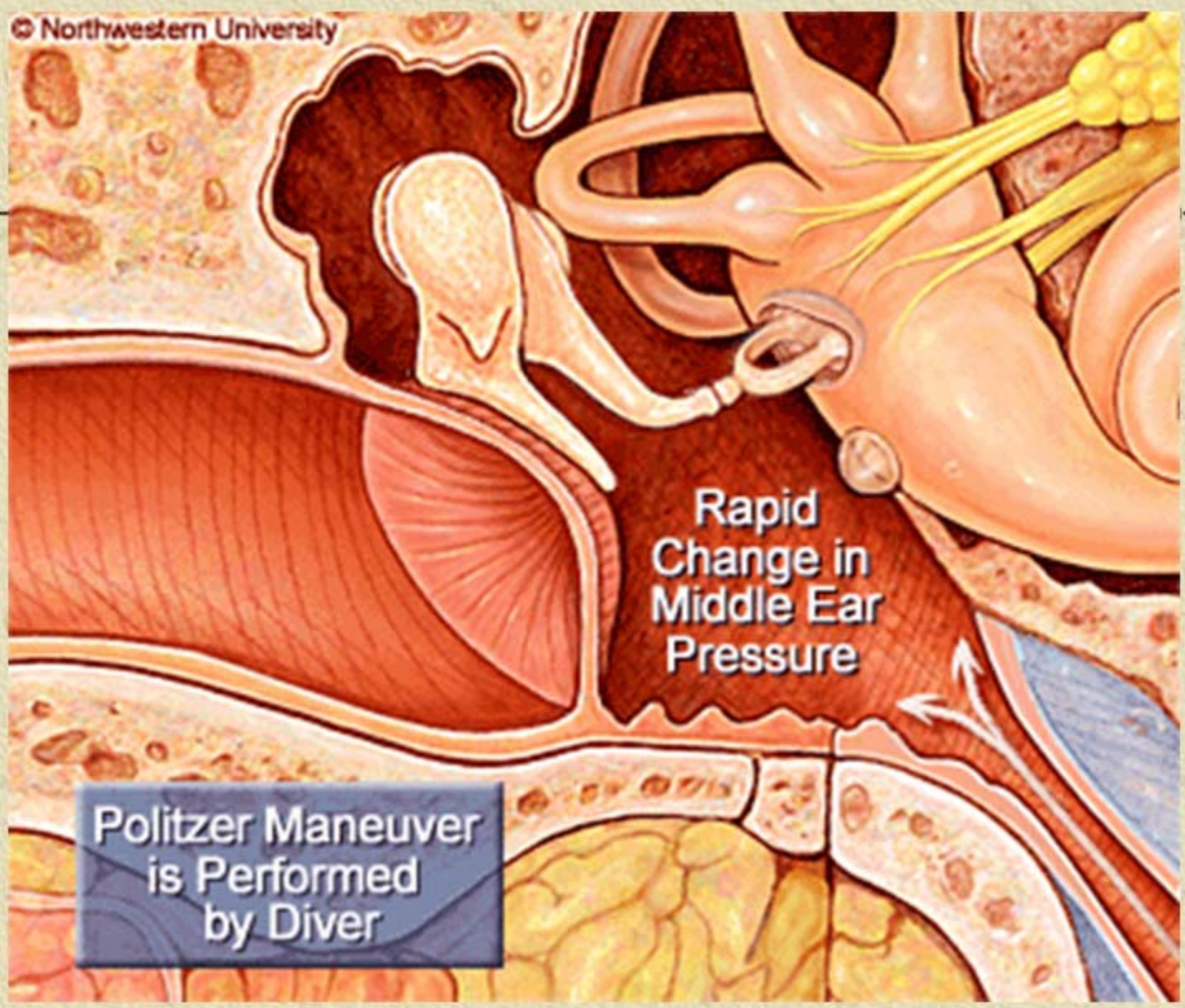
Eustachian Tubes Suddenly Opens
Politzer Maneuver is Performed by Diver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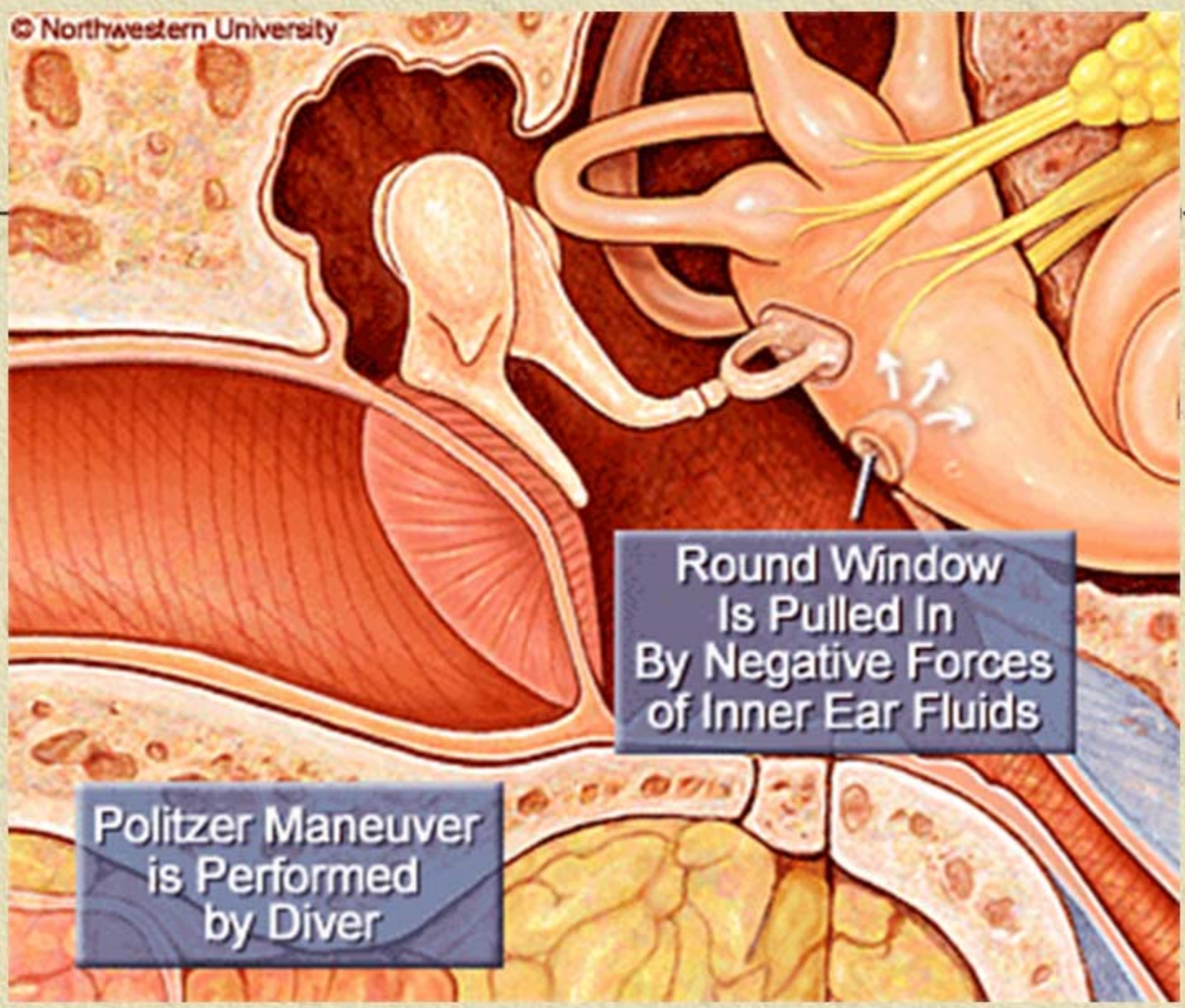
Rapid Change in Middle Ear Pressure
Politzer Maneuver is Performed by Diver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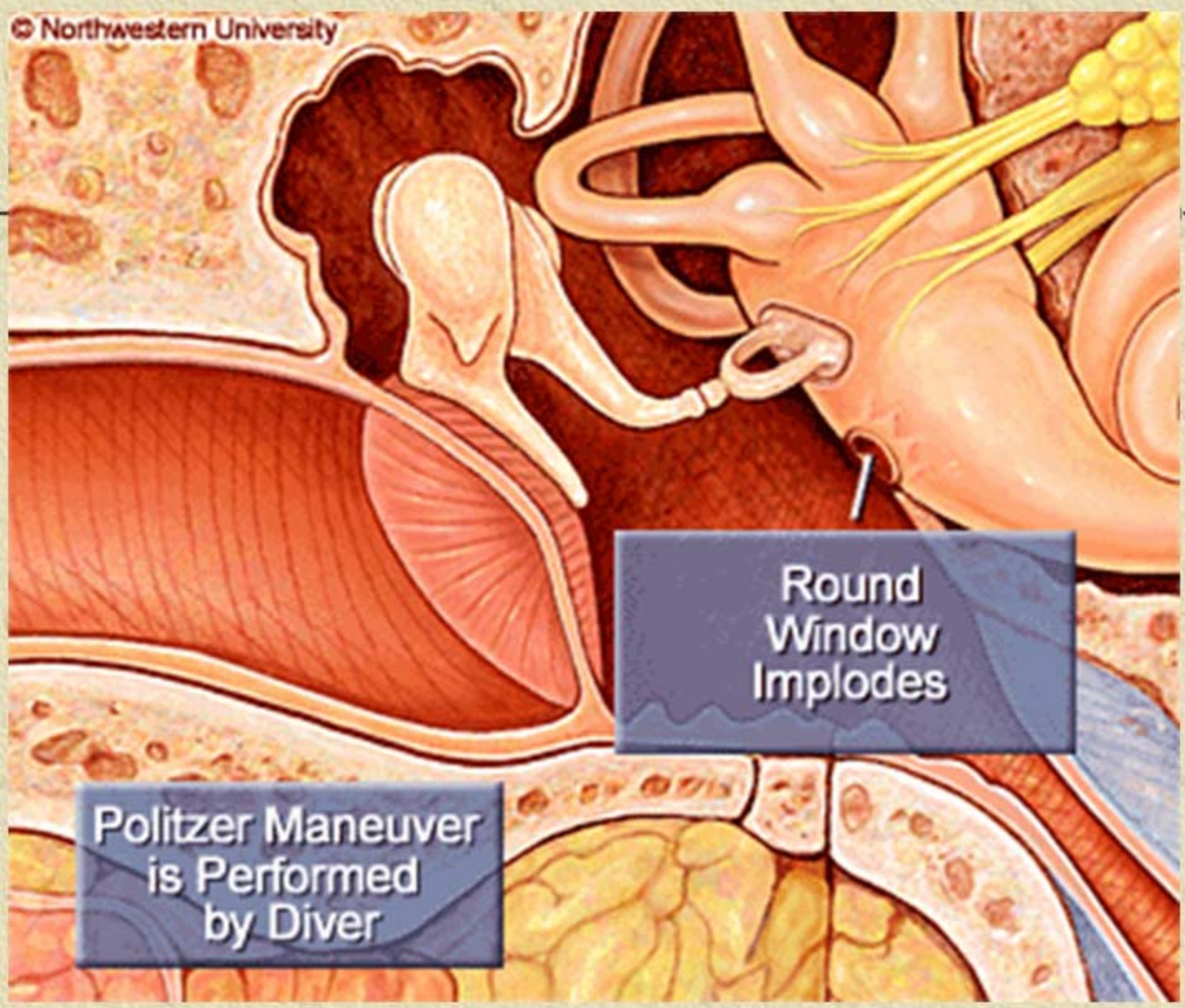
Round Window
Is Pulled In
By Negative Forces
of Inner Ear Fluids
Politzer Maneuver
is Performed
by Diver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Round Window Implodes
Politzer Maneuver is Performed by Diver

Perilymph fistula

- History – inciting event
  - Blow to the head
  - Sneezing
  - Bending over
  - Lifting a heavy object
  - Exposure to sudden changes in barometric pressure
    - Flying, SCUBA diving
- High risk population ?
  - Post stapedectomy
  - Inner ear anomalies
    - Mondini malformation
    - Large vestibular aqueduct

Perilymph fistula

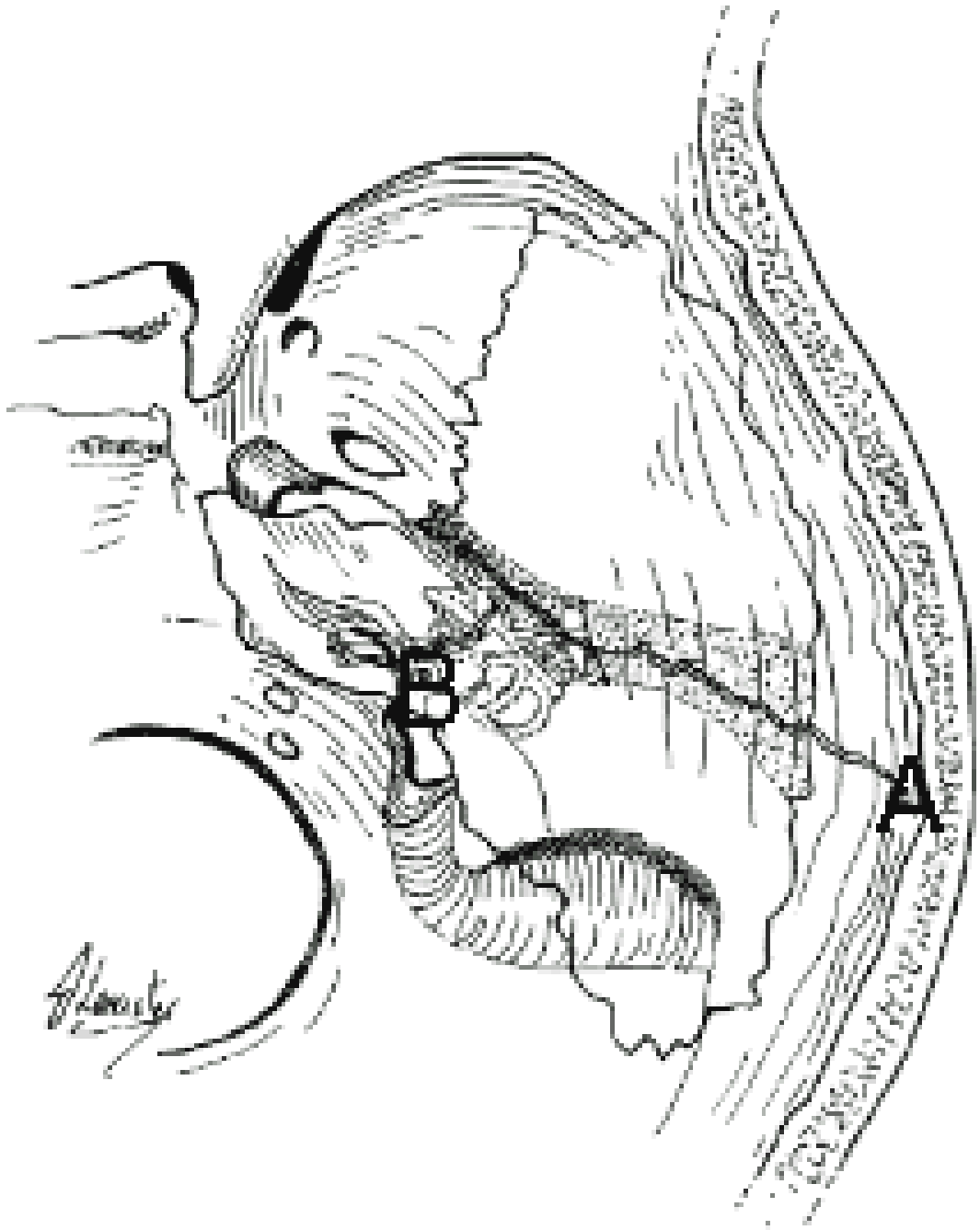
- Diagnosis
  - Definitive – intraoperative
  - Usually clinical
    - Audio - Sudden or rapid progressive hearing loss
    - R/o inflammatory process, neoplasia
      - (MRI, ESR, syphilis test)
    - Exam – Hennebert's sign (fistula test)
    - Tullio's phenomenon

Perilymph fistula

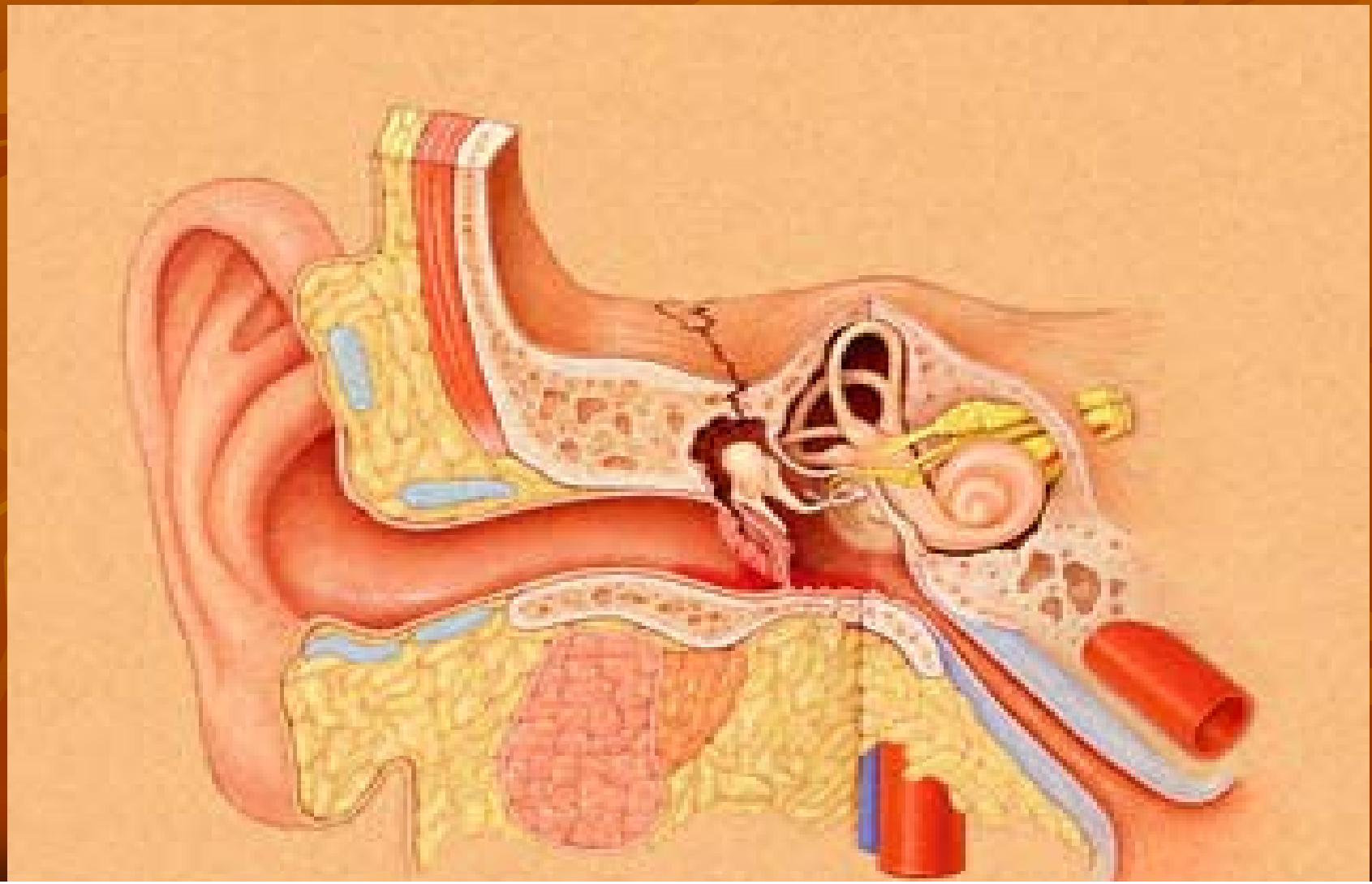
- Treatment
  - Strict bed rest
  - HOB elevated 30 degrees
  - Avoid lifting > 10 lbs.
  - Avoid straining or hard nose blowing
  - +/- stool softeners
  - Some suggest daily audio
- After 7 days
  - If improvement – 6 weeks of light activity
  - If no improvement – surgery
    - Middle ear exploration
    - Patching of perilymph fistula

Temporal bone fractures

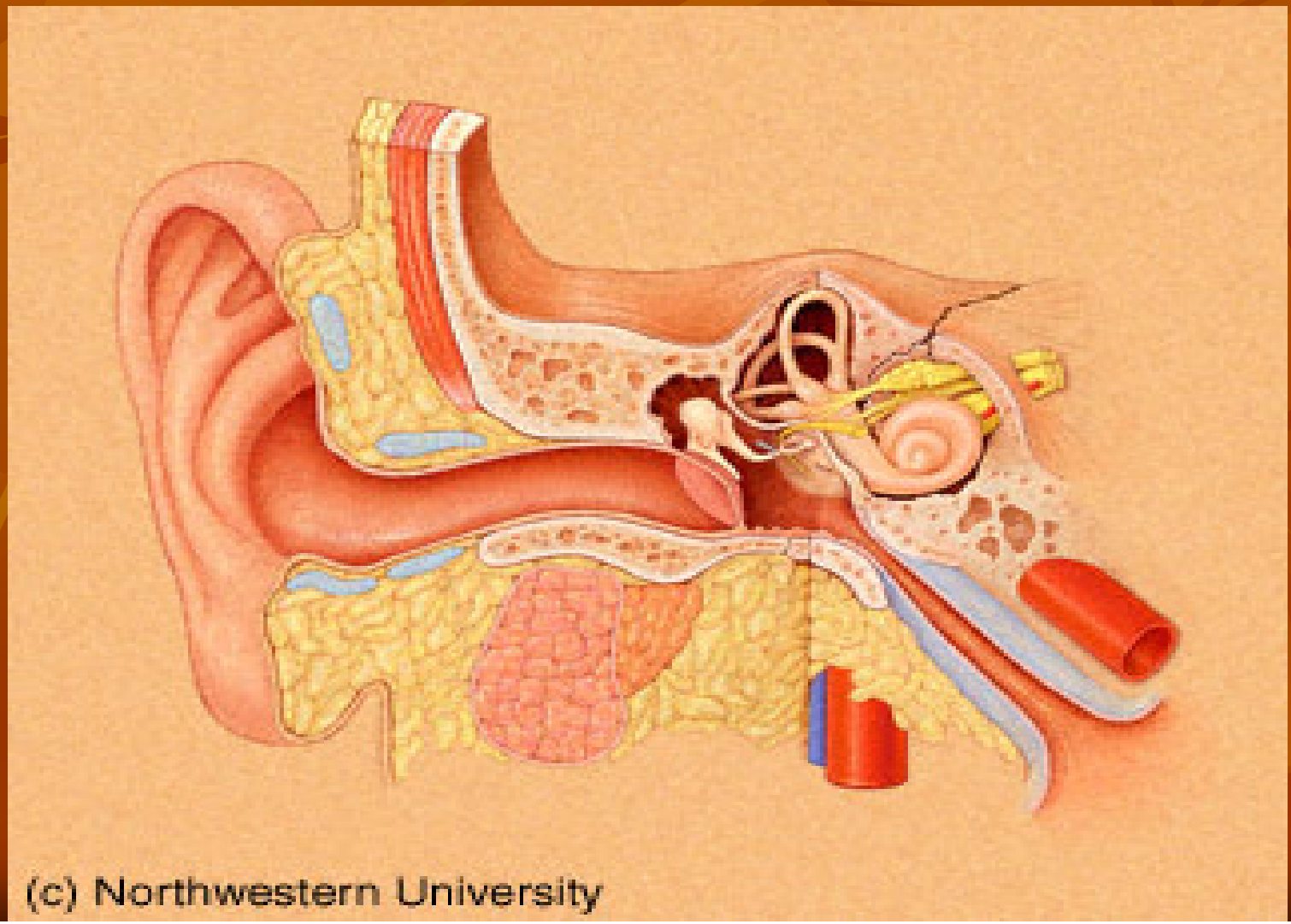
- 80% longitudinal, 20% transverse
- Defined with respect to the long axis of the petrous pyramid
- HRCT giving more detail
- Fractures have been shown to be complex, multiple and oblique
- Otic capsule sparing, or otic capsule violating


B
A

Longitudinal TB#
Otic capsule sparing



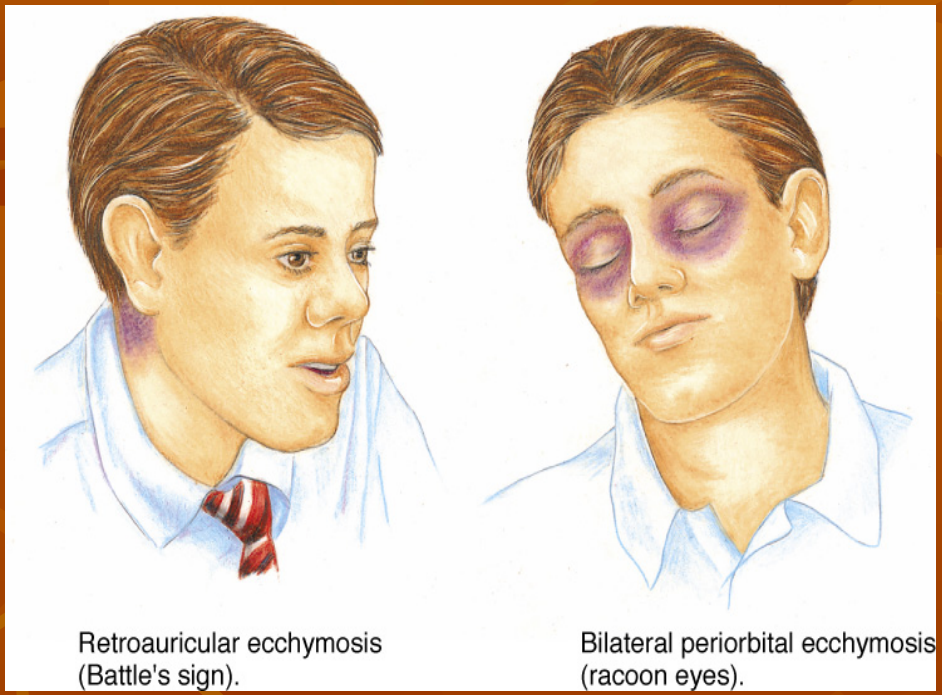
Transverse TB#
Otic capsule violating



Temporal bone fractures

Longitudinal	Transverse
Parietotemporal blows	Occipitofrontal blows
Run anterior to otic capsule	Cross otic capsule
Blood in EAC	Hemotympanum
TM perforation	Intact TM
CHL	Mixed HL
20% facial palsy	Vertigo
	50% facial palsy

Battle’s sign



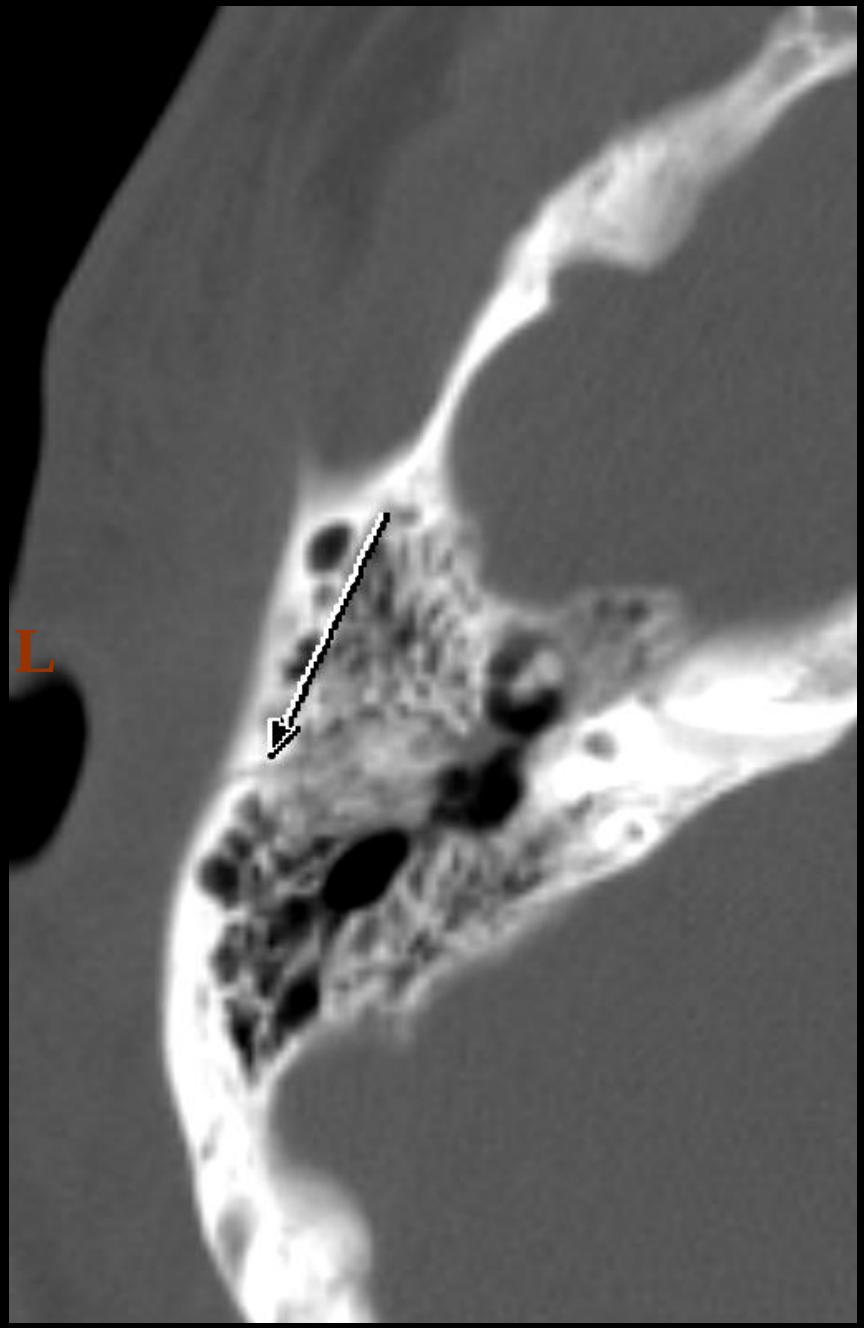
Retroauricular ecchymosis (Battle's sign).

Bilateral periorbital ecchymosis (racoon eyes).

Hemotympanum (transverse)

Imaging

- HRCT
- MRI (labyrinthine hemorrhage, cranial nerve,
- MRA conventional angiography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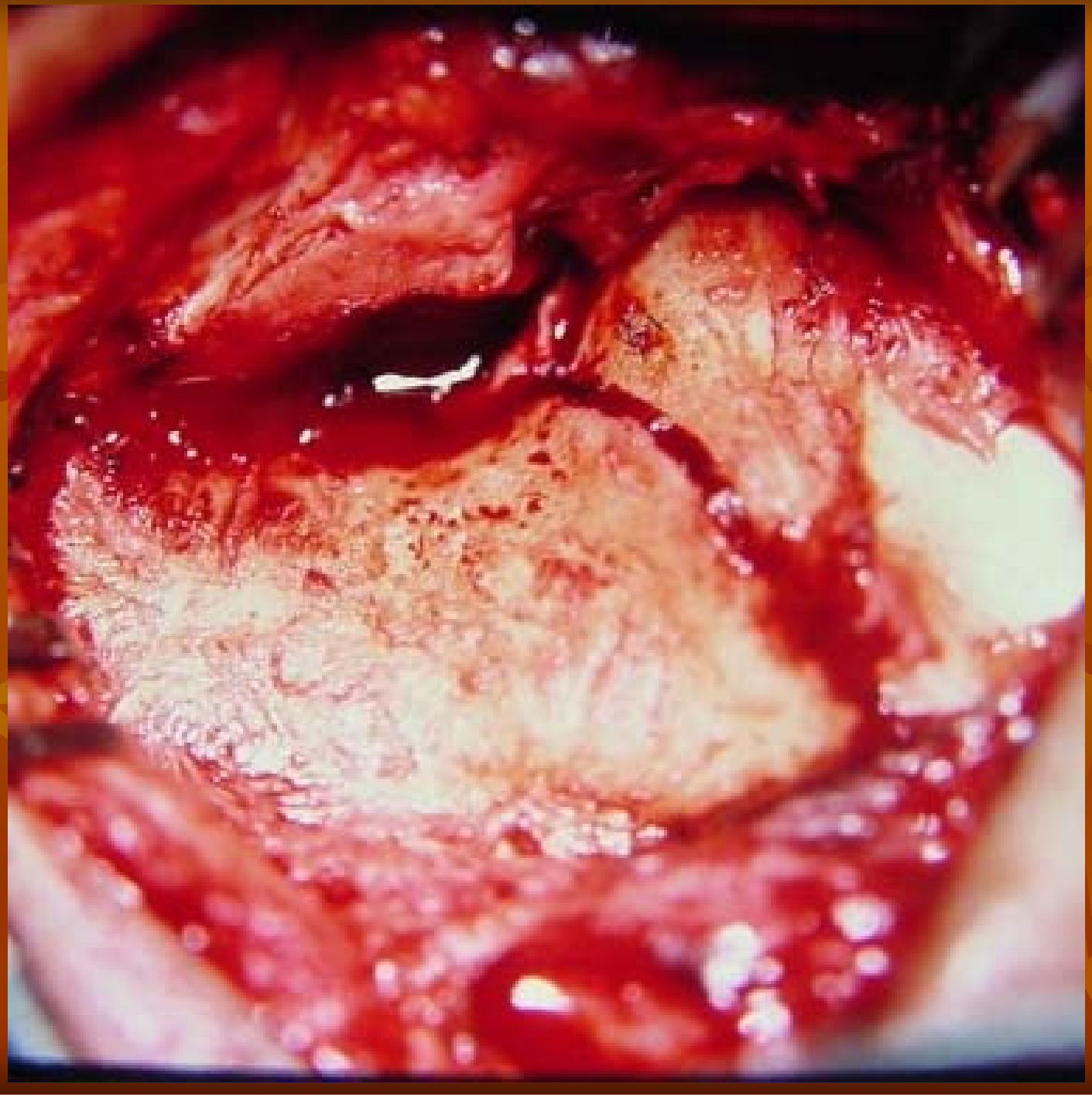
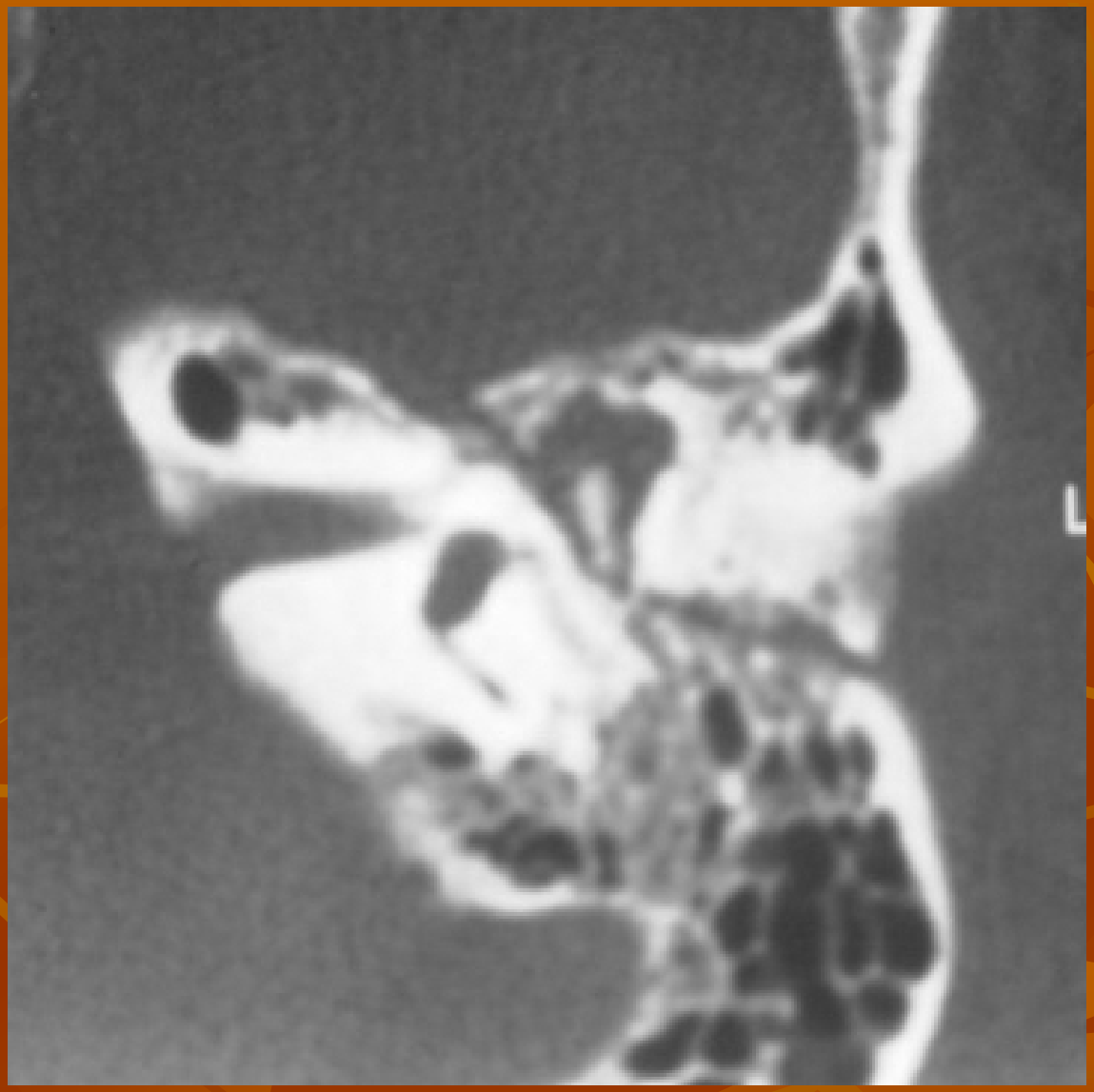
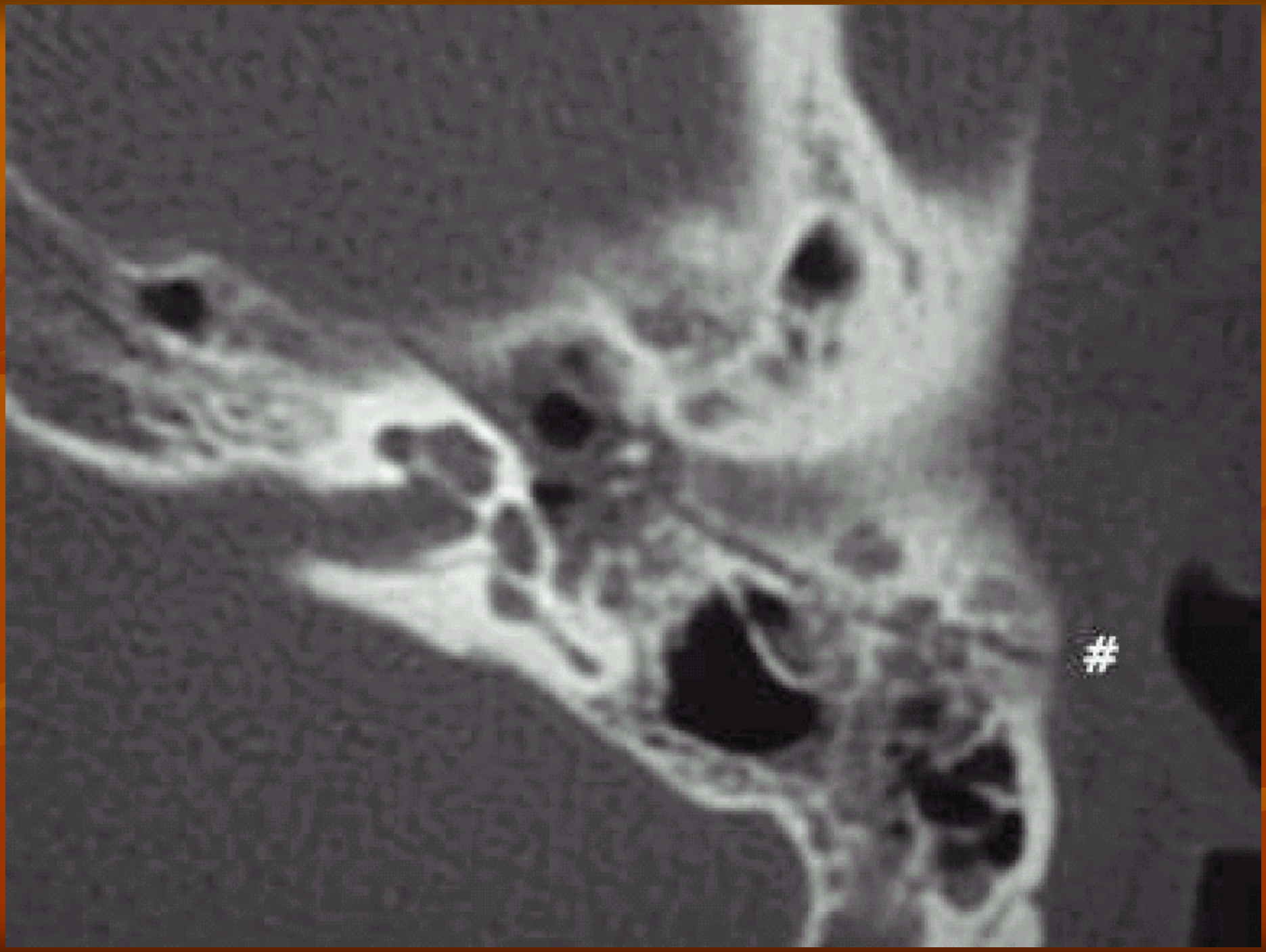


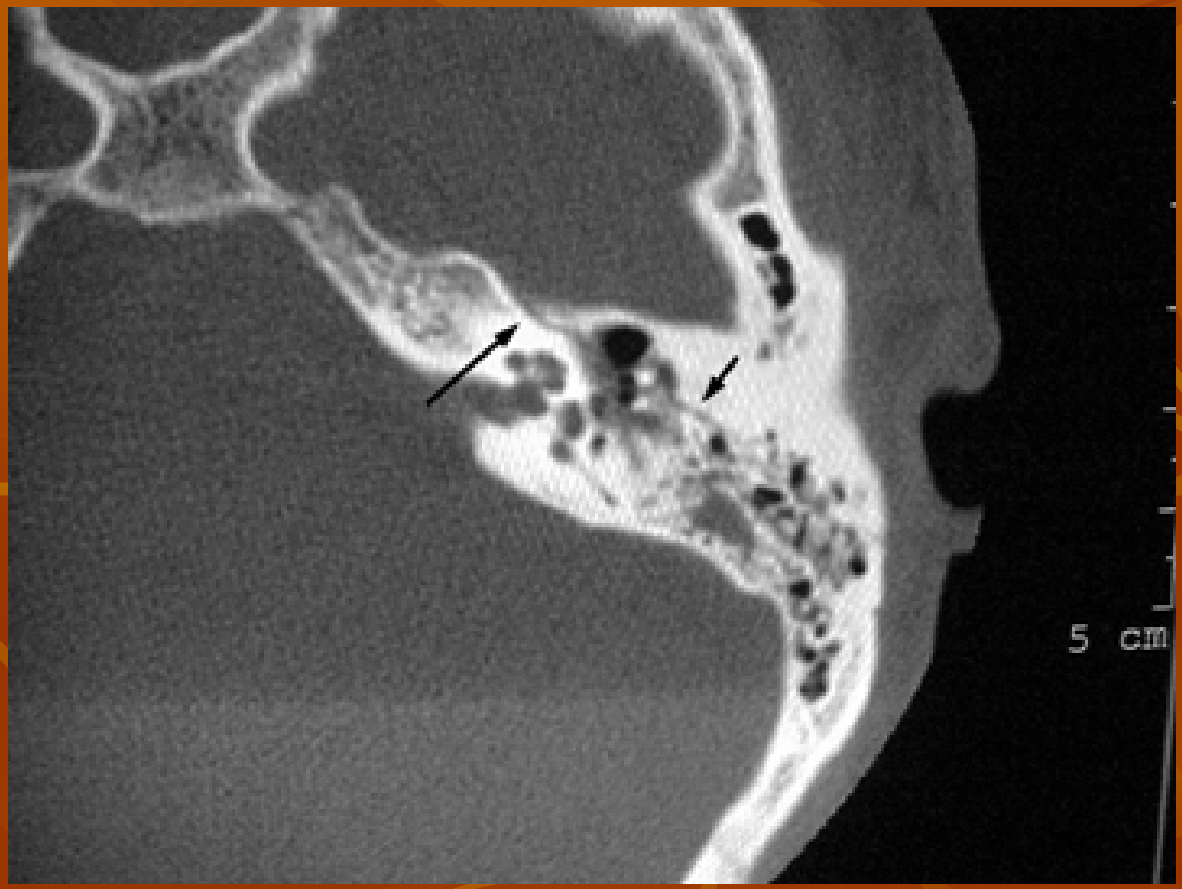
Fractures	Sutures
Greater than 3 mm in width	Less than 2 mm in width
Widest at the center and narrow at the ends	Same width throughout
Runs through both the outer and the inner lamina of bone, hence appears darker	Lighter on x-rays compared to fracture lines
Usually over temporoparietal area	At specific anatomic sites
Usually runs in a straight line	Does not run in a straight line
Angular turns	Curvaceous

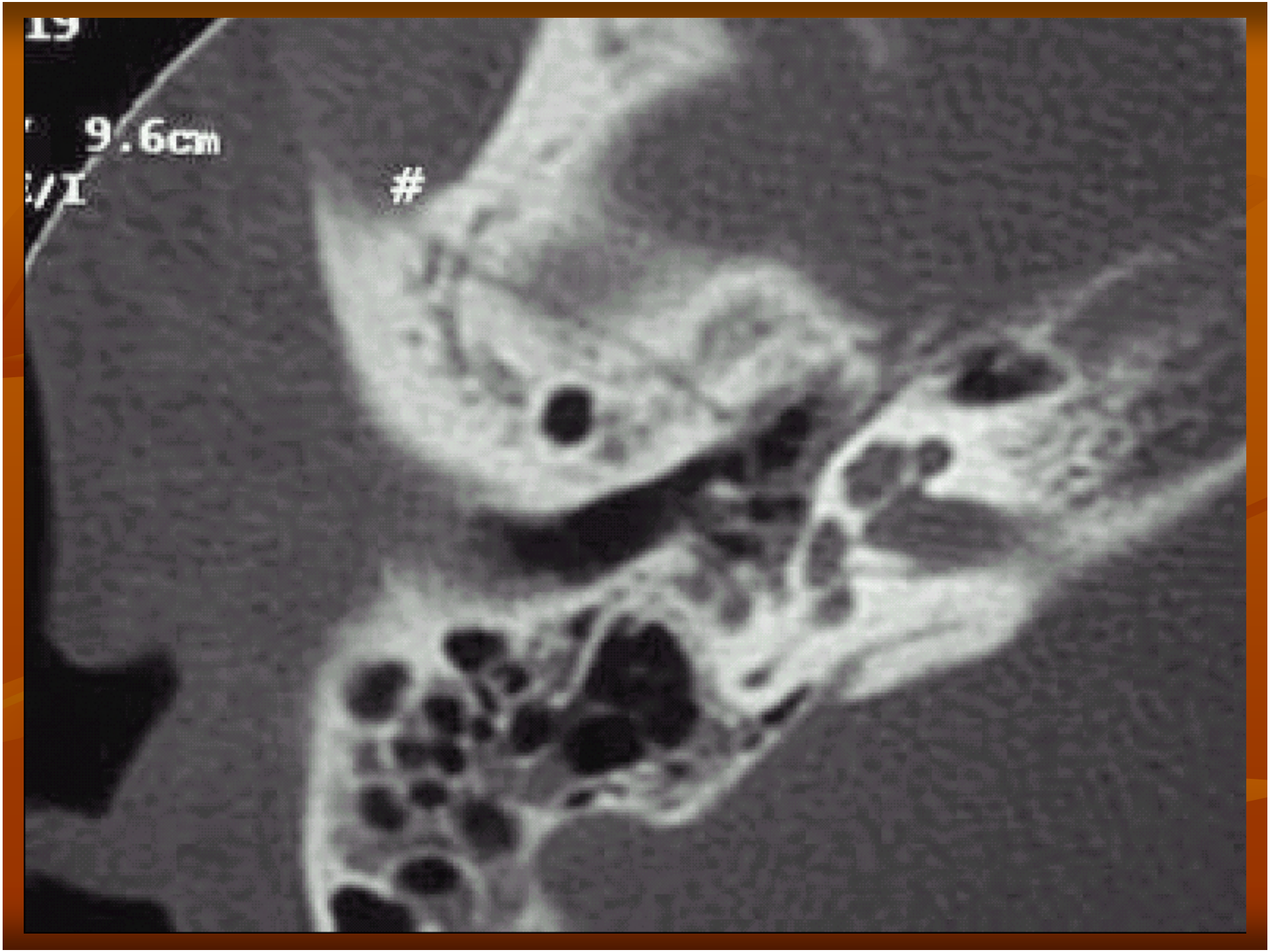


Longitudinal TB#

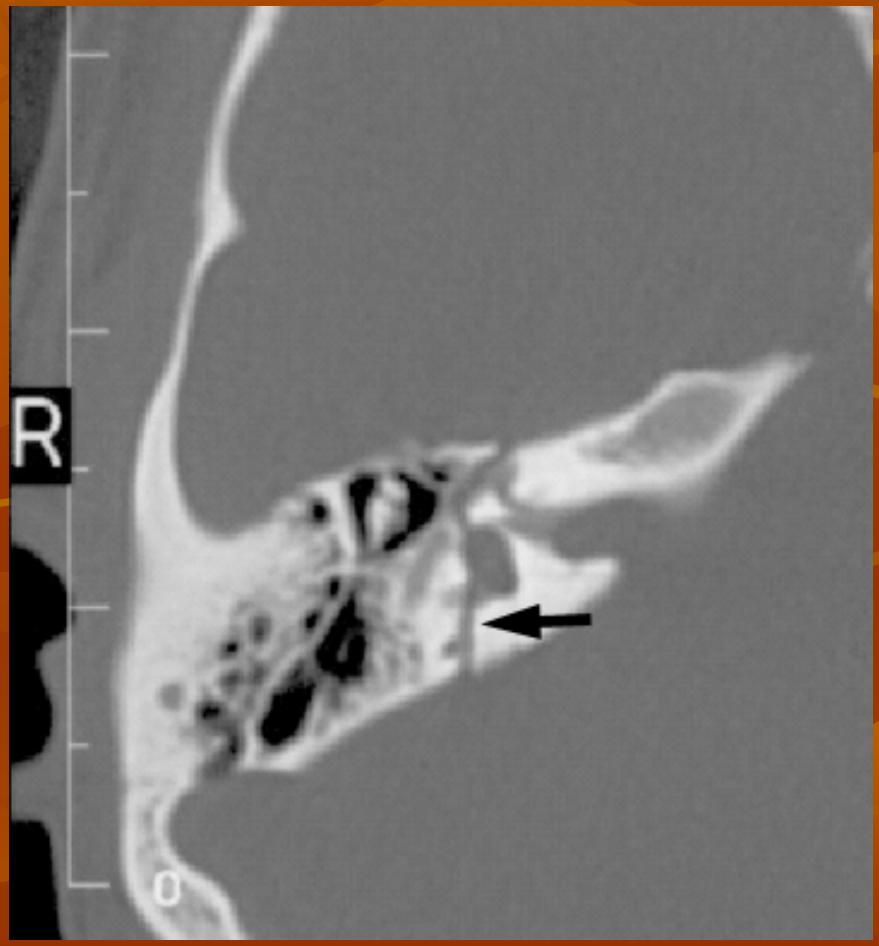


Longitudinal TB#

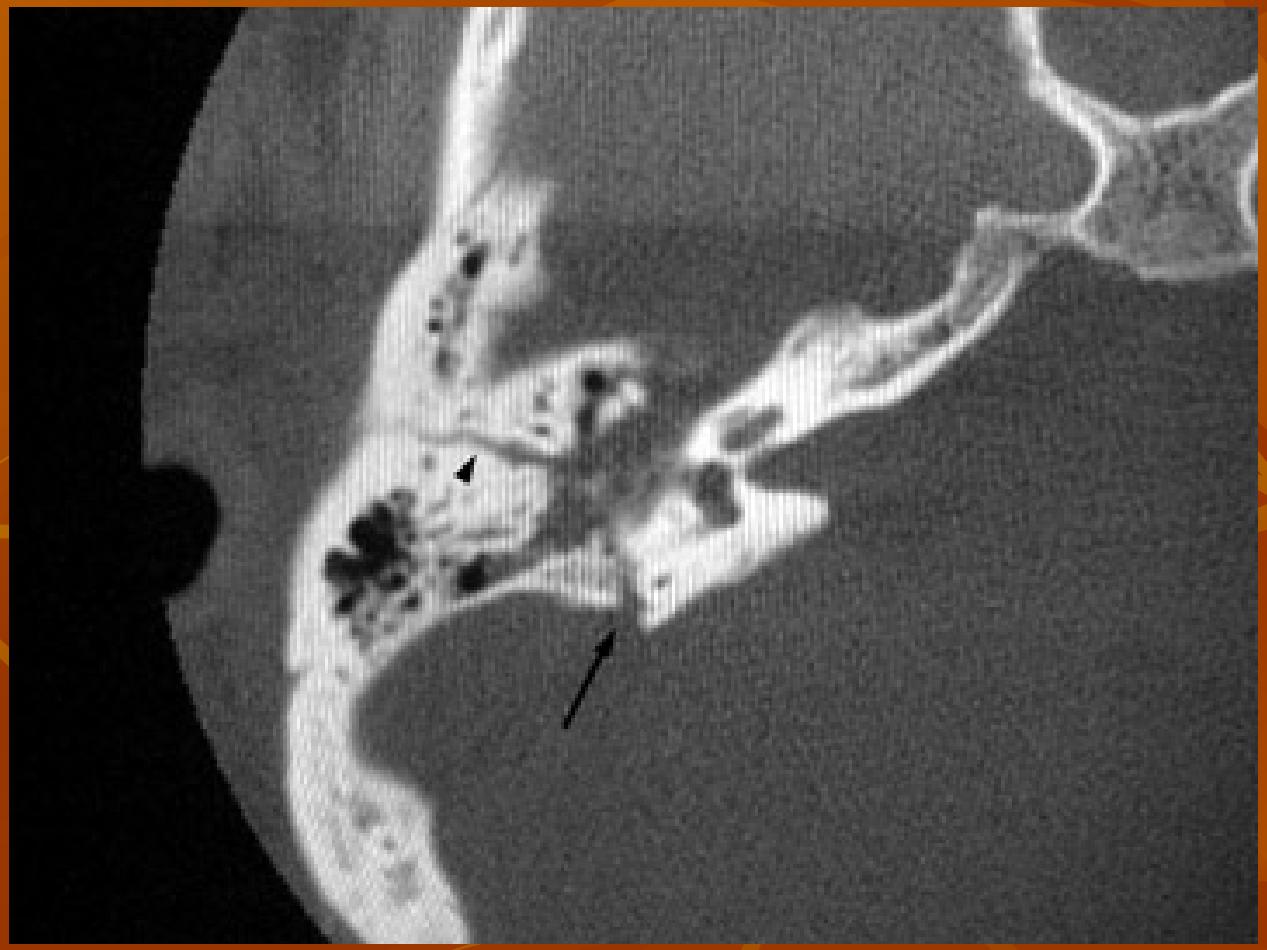



9.6cm
#

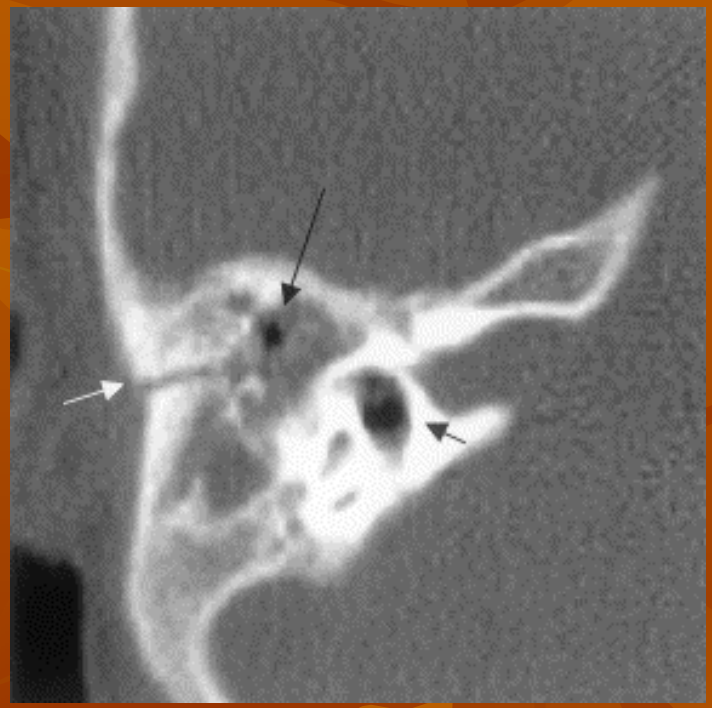
Transverse TB#



Oblique TB#



pneumolabyrinth



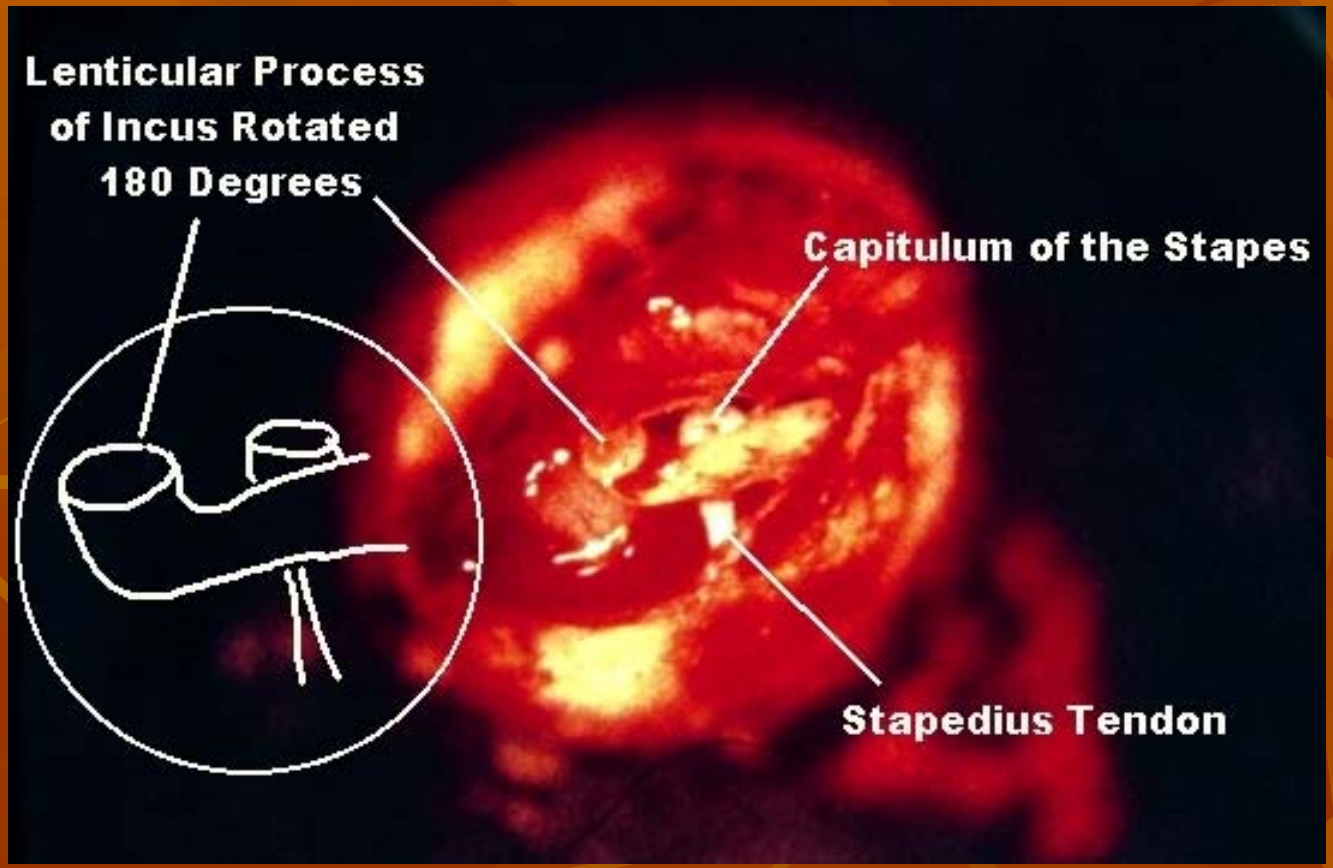
Complications of TB#

- Hearing loss
- Vertigo
- Tinnitus
- Facial paralysis
- CSF leak
- Carotid injury

Ossicular injuries RC

- Separation of the incudostapedial joints
- Dislocation of the incus
- Fracture of stapedial arches,
- Fracture of malleus handle
- Footplate fracture-dislocation

Incus inversion



Large Vestibular Aqueduct Syndrome

- Inner ear malformation
- Early onset and progressive hearing loss (mixed in 90%, pure neurosensory in the rest) in children
- 80% are bilateral
- Progression may be associated with mild head injury

1- ? Dx

CSF otorrhea (longitudinal)

- 25 Y male
- MVA
- ABC is OK
- Eye open to pain, Inappropriate words and decerebrate rigidity

2- ? GCS 2+3+2 =7

3-? Rx

Table 8-2 Glasgow Coma Scale

Eye Opening	
Spontaneous	4
To verbal command	3
To pain	2
No response	1
Verbal Response	
Oriented and converses	5
Disoriented and converses	4
Inappropriate words	3
Incomprehensible sounds	2
No response	1
Motor Response	
Obeys verbal commands	6
Localizes pain	5
Withdraws from pain (flexion)	4
Abnormal flexion in response to pain (decorticate rigidity)	3
Extension in response to pain (decerebrate rigidity)	2
No response	1

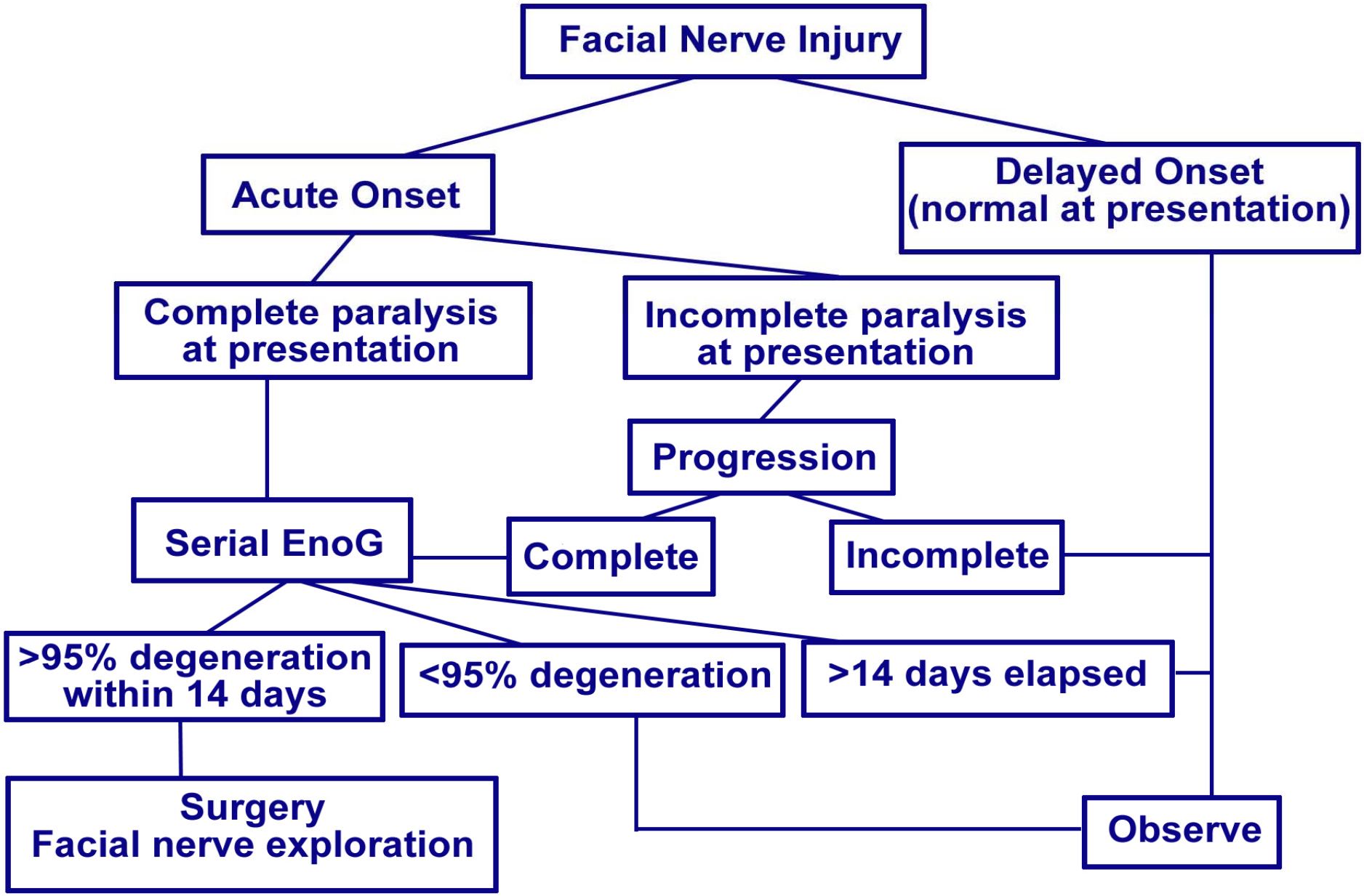
CSF leak

- CSF otorrhea or rhinorrhea
- All TB# should be assumed to have a CSF leak;
  - ear canal must not be syringed
  - ear canal cleaning must be done carefully (aseptically)
  - ?topical and systemic antibiotic prophylaxis Immunosuppressed, CSF soilage is obvious and with device
- usually subsides within 1 week.
- intervention including LP
- Leaks persisting beyond 1-2 weeks

  localization studies → surgical intervention.

Diagnosis, Laboratory

- Glucose (have false-positives and false-negatives)
- Beta-2-Transferrin
  - Gold Standard
  - Found in CSF, perilymph, vitreous humor
- Radiologic
  - CT Cisternography
  - Radionuclide cisternography
  - MRI adjunctive if encephalocele
  - Fluorescein and Dye


Facial Nerve Injury
Acute Onset
Delayed Onset
(normal at presentation)
Complete paralysis
at presentation
Incomplete paralysis
at presentation
Progression
Serial EnoG
Complete
Incomplete
>95% degeneration
within 14 days
<95% degeneration
>14 days elapsed
Surgery
Facial nerve exploration
Observe

Delayed complications of TB#

- Meningitis
- pneumocranium
- Cholesteatoma
- BPV-the most common
- Labyrinthine concussion
- Meniere’s syndrome
- Migraine-associated dizziness
- Central vestibular disorders
- Mixed peripheral/central
- Psychogenic and malingering
- Cervical vertigo

Pneumocranium

Rx RC

Tinnitus post head/neck injury

- May be caused by inner ear or CNS injury
- younger than average tinnitus patient
- More severe
- co-symptoms than average tinnitus

Laryngoscope 113: May 2003


Thank
You