Otologic Emergencies

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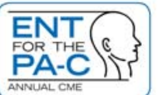
Disclosures

- This speaker has no commercial relationships to disclose.



Learning Objectives

- Provide a detailed and systematic work-up for common otologic emergencies including hallmark physical examination findings and interpretation of pertinent laboratory and imaging studies.
- Review evidence-based treatment protocols and guidelines for determining when surgical intervention is warranted.
- Determine the appropriate frequency of observation and assessment of treatment response.

Medical Emergencies

- Airway
- Bleeding
- Circulation

Otologic Emergencies

- Trauma
- Infection
- Facial paralysis
- Acute vertigo
- Sudden hearing loss

Otologic Emergencies
Evaluation

- History
- Physical Exam
  - Eye movement (nystagmus)
  - Facial nerve function
  - Tympanic membrane
  - Tuning forks
- Audiometric testing
- Imaging

Otologic Emergencies

Trauma

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Otologic Emergencies
Trauma to the Pinna

- Auricular hematoma / seroma
- Laceration

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Otologic Emergencies
Auricular Hematoma/Seroma

- Blunt trauma – assault, wrestling
- Anterior surface
- Acute pain with tenderness
- Swelling and fluctuance

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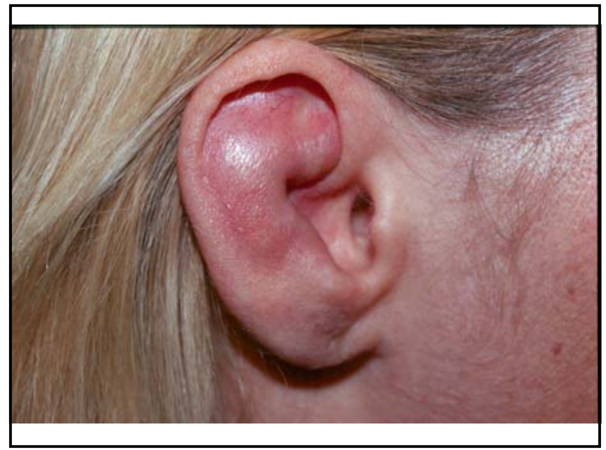
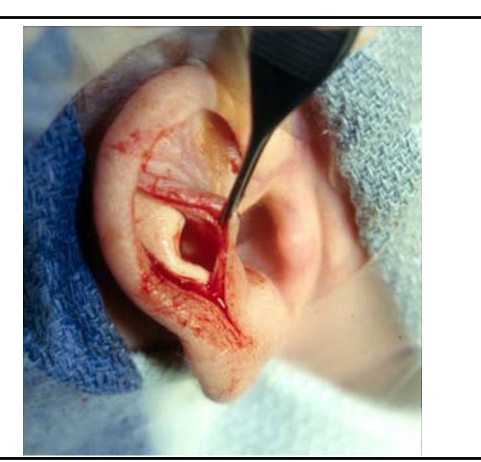
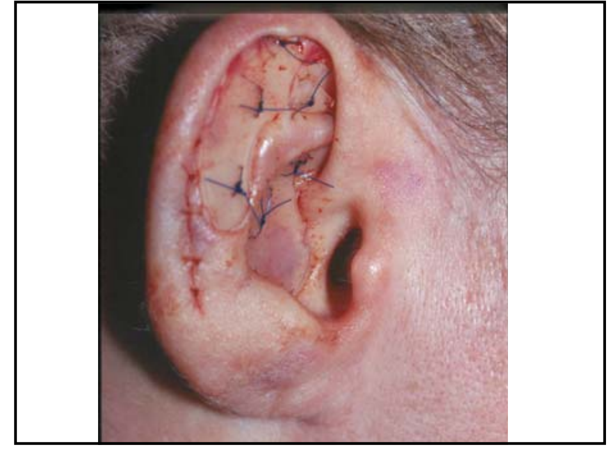
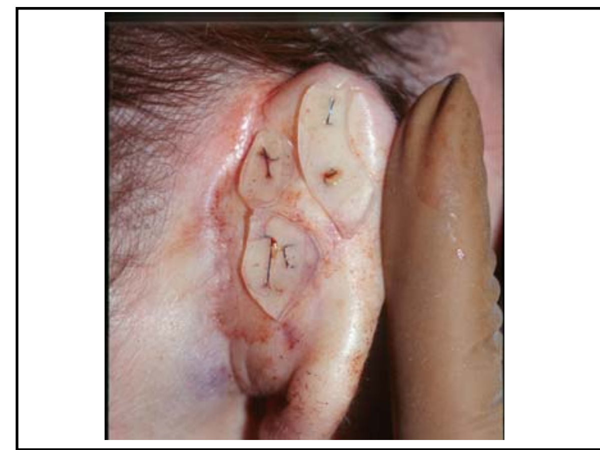


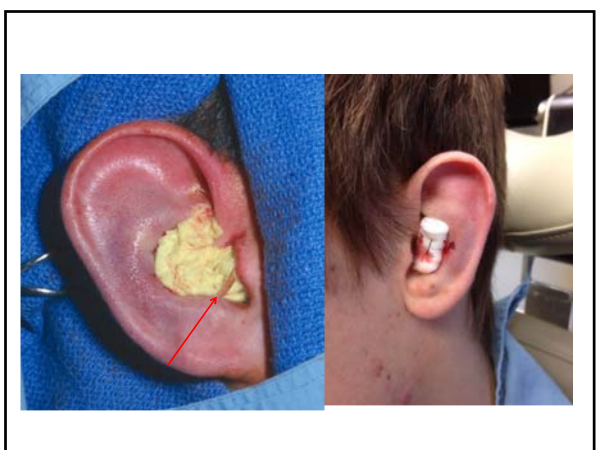
Auricular Hematoma / Seroma
Treatment

- Drainage
  - Needle aspiration (18Ga)
  - Incision
    - Rubber band, Penrose
- Compression dressing
  - Mattress sutures with bolsters
  - Xeroform, cotton/mineral oil
  - Dental roll
  - Silastic sheeting





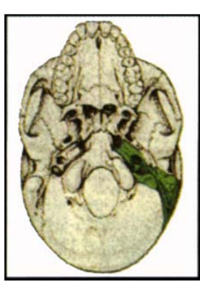
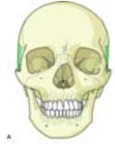


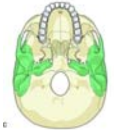


Auricular Laceration

- Sharp clean edges
  - Two layer closure
- Skin avulsion
  - Anterior - 2° healing
  - Posterior – local flaps
- Human bites
  - Leave open

Temporal Bone Trauma



Patel, A: Management of Temporal Bone Trauma CraniomaxillofacTrauma Reconstr. Jun 2010

INCIDENCE

- 75% of MVA result in head trauma
- 14-22% of skull fractures involve TB
- 31% TB fractures result from MVA
  - Assaults, falls, motorcycle, pedestrian, GSW

March, A: Temporal Bone Fractures Medscape

MECHANISM OF INJURY

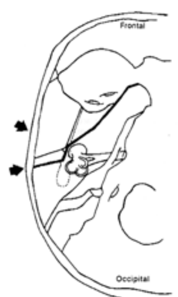
- 90% blunt trauma
- Significant force of 1875 lbs
- Associated intracranial injuries - 90%

CLASSIFICATION

- Relation of fracture to long axis of petrous pyramid:
  - Longitudinal
  - Transverse
  - Mixed
  - Olbique
- Otic capsule sparing / disrupting

LONGITUDINAL FRACTURES

- 80% of TB FXs
- Lateral blow
- 8-29% bilateral
  - TM disruption
  - Bloody otorrhea
  - CHL
  - 10-25% VII injury



LONGITUDINAL FRACTURES

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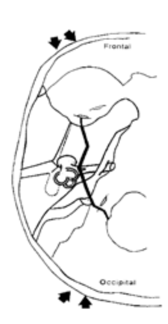
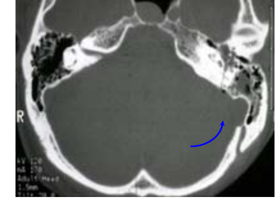
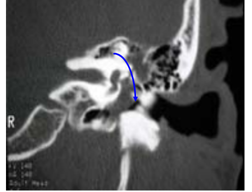
TRANSVERSE FRACTURES

- 20% of TB FXs
- Occipitofrontal blow
  - Profound SNHL
  - Vertigo
  - 30-50% VII injury
  - CSF fistula



TRANSVERSE FRACTURES





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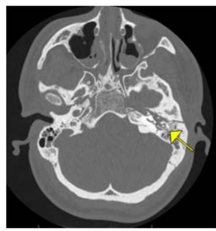
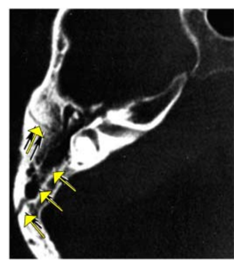
MIXED FRACTURES

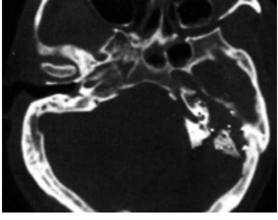
- Mixed anatomical & clinical findings





PENETRATING TRAUMA

- Gunshot wounds
- More destructive
  - 36% CNS injury
  - 32% vascular injury
  - 50% VII injury
  - 86% IE/ME injury



CLINICAL EVALUATION

PRIORITIES

- Airway
- Hemodynamics
- Central neurological deficits
- Cervical spine stability

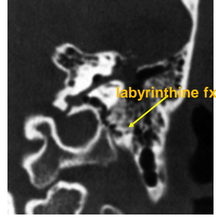
CLINICAL EVALUATION

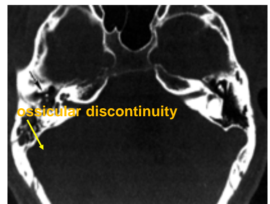
- Eyes: spontaneous nystagmus, racoon eyes
- Ears: Battle's sign, EAC bleed/otorrhea, TM integrity, hemotympanum
- Nose: rhinorrhea (halo sign)
- Neuro: CN VII & VIII (tuning forks/audio)

RADIOLOGIC EVALUATION

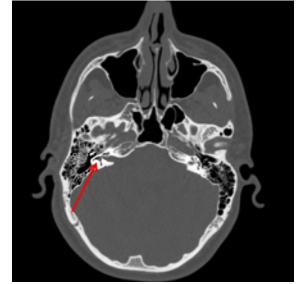
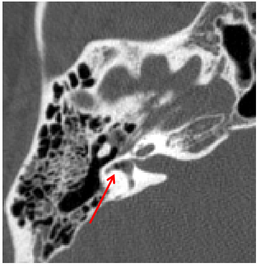
- CT scan: -1.0-1.5mm axial/coronal planes, bone window algorithm
  - 100% sensitive
- MRI scan: - Diagnosis of concomitant CNS injury

RADIOLOGIC EVALUATION





RADIOLOGIC EVALUATION
Pneumolabyrinth

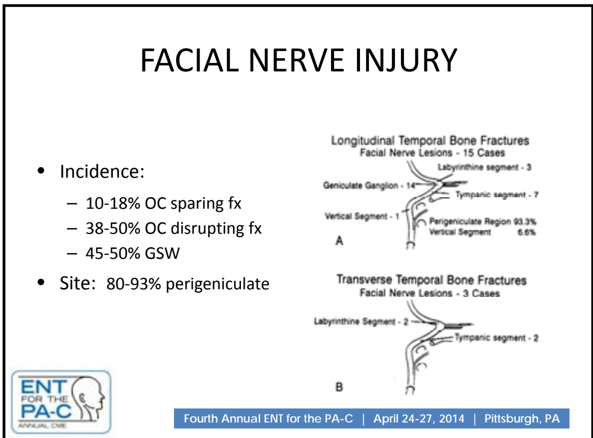



COMPLICATIONS

- Facial nerve injury
- CSF leakage & meningitis
- Hearing loss
- Vertigo
- Cholesteatoma

FACIAL NERVE INJURY

- Majority resolve spontaneously
- Determinants for surgical intervention:
  - Time of onset of paralysis- immediate/delayed
  - Severity of paresis
  - Mechanism of injury



FACIAL NERVE INJURY

Immediate vs Delayed Paralysis

- Immediate paralysis = severe nerve trauma/transection = worse prognosis

Natural History of Traumatic Facial Nerve Paralysis (Turner)

Paralysis	N	"Good" recovery	Partial recovery with synkinesis	No recovery in 1 year
Immediate	19	10 (53%)	6 (32%)	3 (16%)
Delayed	11	9 (82%)	1 (9%)	1 (9%)

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FACIAL NERVE INJURY

Severity of Paresis

- Incomplete paresis usually resolves spontaneously
- Intervene surgically if:
  - 90% or more degeneration by ENoG
  - No EMG response

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FACIAL NERVE INJURY

Facial Nerve Pathology Discovered During Exploration of Longitudinal Fractures (Fisch/Coker/Lambert & Brackmann)

Facial Nerve Pathology	Frequency(%)
Intraneural edema and/or hematoma	45-93
Impingement by bony spicule	17-45
Total nerve transection	0-26
No pathology found	0-7

FACIAL NERVE INJURY

Surgical Management

- Approach:
  - No hearing: translabyrinthine
  - Hearing: transmastoid & MCF
    transmastoid & supralabyrinthine
- Timing: early repair / grafting
- Bony vs epineural decompression

FACIAL NERVE INJURY

Surgical Management

- Bony decompression for neural edema
- Epineural decompression for large intraneural hematoma
- Remove bony spicules
- Primary anastomosis preferred to cable grafting
- Epineural neurorrhaphy

FACIAL NERVE INJURY

Does Sx Intervention Alter Outcome ?

Results from Facial Nerve Exploration Following Temporal Bone Trauma

	Decompression only		Nerve Anastomosis	
		"Good" results		"Good" results
Study	N	HB I-II	N	HB I-II
Lambert /Brackmann	15	10 (66.6%)	Not reported	
Kamerer	42	18 (42.8%)	20	0
Coker et al.	9	5 (55.5%)	4	0
Totals	*66*	*33 (50.0%)*	*24*	0

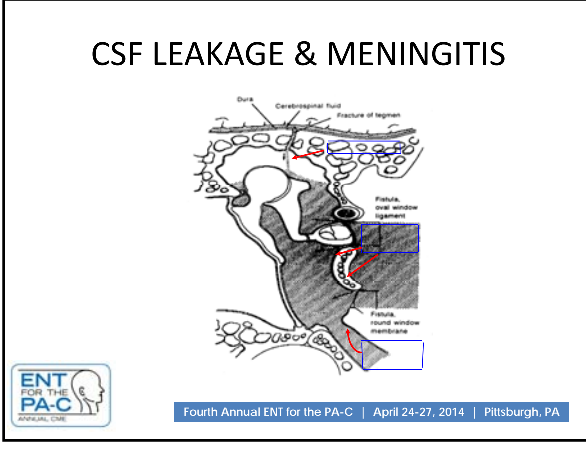
FACIAL NERVE INJURY

In Summary

1. Goal of surgical intervention is to provide most favorable environment for axonal regeneration
2. Explore OC disrupting fractures/GSW when electrical tests indicate poor prognosis
3. Explore OC sparing fractures when CT demonstrates anatomical barrier to nerve regeneration
4. Delayed onset facial paresis usually has good recovery

CSF LEAKAGE & MENINGITIS

- Incidence of CSF leak 11-27%
  - acute
  - delayed
- Risk of meningitis 12%
- Increased risk if:
  - leak > 7dys (23% vs 3%)
  - concurrent infection (20% vs 3%)



CSF LEAKAGE & MENINGITIS

Acute CSF Fistula

- Pneumococcus, Staph, Strep, H. influenza
- Otorrhea – longitudinal fractures
  Rhinorrhea – transverse fractures
- Role of prophylactic antibiotics controversial
  - ? Decreased incidence of meningitis
  - Masking of early infection & antibiotic resistance

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CSF LEAKAGE & MENINGITIS

Acute CSF Fistula

- Majority resolve spontaneously in 3-5 days
  - Bed rest, head elevation x 5 days
  - Lumbar drainage if leakage persists after 5 days
- Surgical closure of fistulas persisting after 7-10 days of conservative management

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CSF LEAKAGE & MENINGITIS

Surgical Closure

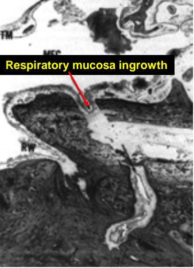
- Approach influenced by:
  - site of leak
  - hearing status
- OC sparing fractures: MCF, extradural repair

  OC disrupting fractures: Labyrinthectomy & mastoid obliteration

CSF LEAKAGE & MENINGITIS

Late Meningitis

- May occur years after trauma
- Incidence unknown
- Incomplete healing of labyrinthine fracture
- Labyrinthectomy & obliteration of pneumatized spaces & ET



HEARING LOSS

- Audiogram as soon as patient is stable
  - Pure tone thresholds
  - Tympanogram
  - Stapedial reflex
- Types of hearing loss:
  - Sensorineural
  - Conductive
  - Mixed

HEARING LOSS
Sensorineural Hearing Loss

- Mechanisms:
  - Labyrinthine fracture
  - Labyrinthine concussion or bleed
  - Noise-induced HL
  - PLF
  - Auditory CNS injury
- Majority will not improve significantly with time

HEARING LOSS
Conductive Hearing Loss

80% resolve with no intervention (6 Weeks)

- Hemotympanum: 30-45 dB CHL
- TM perforation : 20 dB CHL
- Ossicular dislocation > fracture
  - Incudostapedial separation most common
- (max CHL of 60 dB if ossicular discontinuity)

HEARING LOSS
Conductive Hearing Loss

Middle Ear Surgical Pathology Found in 31 Patients Following Temporal Bone Trauma (Hough & Stuart)

Injury	Incidence (%)
Incudostapedial joint separation	82.3
Massive dislocation of incus	57.1
Fracture of stapedial arch	30.0
Epitympanic fixation of ossicles	25.0
Fracture of malleus	11.0

HEARING LOSS

Conductive HL Management

- IS Separation :
  - Anatomic realignment
  - Prosthetic reconstruction
- Incus Dislocation:
  - Repositioned autograft
  - Incus replacement prosthesis

HEARING LOSS

Conductive HL Management

- Stapes Fracture (superstructure):
  - Footplate fixed: stapedectomy
  - Footplate mobile: TORP
- Malleus Fracture:
  - Ossicular reconstruction
- Epitympanic Fixation
  - Bony / fibrous: removal
  - IRP

VERTIGO

- Postconcussion syndrome
- Labyrinthine concussion
- Cupulolithiasis
- Labyrinthine fracture
- PLF
- Delayed endolymphatic hydrops

VERTIGO

Labyrinthine Concussion

- Most common cause of posttraumatic vertigo
- Vertigo with rapid head movement
- Normal ENG
- Intact labyrinthine capsule on CT
- Self-limited, no treatment

VERTIGO

Cupulolithiasis

- Utricular degeneration releases otoconia into PSC ampulla
- Symptoms of BPPV mos / yrs after trauma
- Positive Dix-Hallpike test
- Particle repositioning maneuver

VERTIGO

Labyrinthine Fx

- Sudden complete vestibular deficit
- Debilitating vertigo, nausea & emesis
- Horizontal nystagmus away from affected ear
- Absent calorics in affected ear
- CT positive
- Vestibular suppressants & physical therapy

VERTIGO

Perilymphatic Fistula

- Explosive / implosive
- Fluctuating / progressive SNHL & vertigo, worsened with straining
- 58% positive fistula test
- Bedrest; exploratory tympanotomy if symptoms persist

VERTIGO

Dealyed endolymphatic hydrops

- Symptoms mos / yrs after trauma
- Vertigo, fluctuating HL, tinnitus & aural fullness
- Salt restriction, diuretics & vestibular suppressants

VERTIGO

- Most posttraumatic vertigo is self-limited in nature
- Litigation may prolong recovery
- Surgical intervention for persistent disabling vertigo:
  - No hearing: labyrinthectomy
  - Hearing: vestibular nerve section

Otologic Emergencies

Infection

Otologic Emergencies
Infections

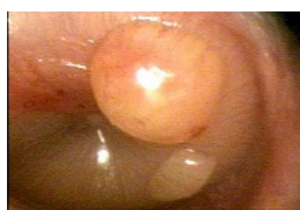
- Perichondritis
- Otitis externa
- Otitis media

Perichondritis

- Trauma (piercing) often involved
- Involvement over the cartilagenous pinna
- Ear lobule often spared
- Pseudomonas most common > Staph
- Systemic quinolones-
- Culture specific
- Drainage for abscess formation

Otitis Media

- Bullous myringitis
- Acute suppurative O.M.



UTMB.edu website

Bullous Myringitis

- Acute severe otalgia
- Single or multiple fluid filled blisters on the T.M.
- Aspirate with 3 or 5 Fr suction
- Mycoplasma pneumoniae etiology?
  - Bacteriology is similar to AOM
- If residual inflammation - topical ofloxacin

Sudden Hearing Loss
Otitis Media

- Pain
- Erythematous T.M.
- Conductive hearing loss by tuning forks
- Antibiotic treatment
- Myringotomy

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Acute Otitis Media

Microbiology	Frequency
Streptococcus pneumonia	(3x)
Hemophilius influenze	(2x
Moraxella catarrhalis	(x)
Streptococcus Group A	
Staphylococcus aureus	

Otitis Media
Antibiotics

- Ampicillin/Amoxocillin
  - Clavulonic acid
- Cephalosporins
  - Cefaclor
  - Cefuroxime
  - Cefixime
- Trimethoprin – sulfamethoxazole
- Erythromycin - sulfisoxazole

Otologic Emergencies

Facial Paralysis

Otologic Emergencies
Facial Paralysis

- Otitis media
- Bell's palsy
- Herpes Zoster oticus- Ramsey Hunt syndrome
- Temporal bone trauma

Facial Paralysis
Acute Otitis Media

- More frequent in children
- More likely in adults with AOM
- Wide myringotomy is needed
- Antibiotics and steroids
- Mastoidectomy not necessary unless coalescence
- Surgical decompression not indicated

Facial Paralysis
Bell's Palsy

- Prodrome of post-auricular pain
- Rapid onset of paresis/paralysis
- May see small vesicles palate/mouth
- Presumed of viral origin (Herpes simplex)
- No associated hearing loss or dizziness
- Auricular vesicles are absent

Bell's Palsy
Treatment

- Eye Care
  - Tear replacement, ointment at night
  - Moisture chamber or patch
- Prednisone
  - 60 mg tapered
- Electrical testing ENoG
- Close follow-up

Debra Munsell, PA-C

Bell's Palsy Clinical Guidelines
Today
5-6 pm

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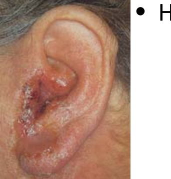
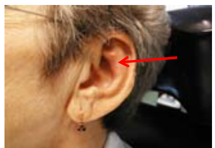
Facial Paralysis
Herpes Zoster Oticus

- Prodrome of pain
- Auricular vesicles
- Rapid onset facial paralysis
- Hearing loss and/or vertigo often





Herpes Zoster Oticus
Treatment

- Eye Care
  - Tear replacement, ointment at night
  - Moisture chamber or patch
- Prednisone
  - 60 mg tapered
- Anti-virals
  - Acyclovir, famciclovir, valacyclovir
- Electrical testing ENoG
- Poor prognosis compare to Bell's

Facial Paralysis
Temporal Bone Trauma

- More common in transverse fractures
- Often there is associated hearing loss
- Document onset (immediate/delayed) and degree of paresis/paralysis
- CT scan, temporal bone; bone window

Otologic Emergencies

Acute Vertigo

Vestibular Disorders
Anatomic Locations

- Labyrinth
- Vestibular nerve
- Central nervous system

Acute Vertigo
Temporal Bone Trauma

- Nystagmus, nausea, vomiting
- Sudden hearing loss
- Facial paralysis often present
- CT head, temporal bone, bone window
- Supportive care

Acute Vertigo
Meniere's Disease

- Sudden onset of vertigo
  - Lasts 15 minutes to 24 hours
- Unilateral hearing loss
  - Sound distortion/sensitivity
- Unilateral tinnitus
- Aural fullness or pressure

Meniere's Disease
Treatment

- Stabilize nausea and vertigo
  - Droperidol, compazine, diazepam
- Hydration if needed
- Follow-up for long term treatment

Acute Vertigo
Vestibular Neuronitis

- Occasionally following URI
- No hearing loss
- Nystagmus often present
- Vertigo lasts days to weeks
- Can be recurrent history

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Acute Vertigo
Treatment

- Quick acting
- droperidol - Inapsine
- diazepam - Valium
- odansetron - Zofran
- promethazine – Phenergan
- prochlorperazine – Compazine
- meclizine - Antivert

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Acute Vertigo
Wallenberg (lateral medullary) Syndrome

- Vertigo, nausea, vomiting, nystagmus
- Ataxia, falling to side of lesion, unable to stand
- Ipsilateral Horner's syndrome
- Dysphagia – ipsilateral palate, vocal cord paralysis
- Loss of pain and temperature sensation ipsilateral face, contralateral body

Posterior Inferior Cerebellar Artery

Otologic Emergencies

Sudden Hearing Loss

Otologic Emergencies
Sudden Hearing Loss

- Cerumen impaction
- Otitis media
- Trauma
- Meniere's
- Idiopathic

Sudden Hearing Loss
Cerumen Impaction

- T.M. is not visible
- Tuning forks
  - Weber – lateralizes
  - Rinne – B > A
- Dry removal- curette, hooks, suction
- Wet removal – irrigation rarely

Sudden Hearing Loss
Trauma

- Unilateral or bilateral
- Vertigo with otic capsule involvement
- Bloody otorrhea, canal lacerations
- Hemotympanum
- Tuning forks – conductive/sensorineural
- Facial paralysis occasionally

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Sudden Hearing Loss
Meniere's Disease

- Sensorineural hearing loss
  - Low frequency upsloping curve
- Aural fullness
- Tinnitus
- Vertigo – 15 minutes to 24 hours

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Sudden Sensorineural Hearing Loss
Idiopathic

- Viral infection
- Vascular occlusion
- Inner ear membrane rupture
- Autoimmune

Sudden Sensorineural Hearing Loss
Idiopathic

- Incidence 5–20 per 100,000
- Loss of at least 30 dB in 3 contiguous frequencies < 3 days
- Diagnosis of exclusion

Idiopathic Sensorineural Hearing Loss
Evaluation

- Ear exam is normal
- Audiogram
- Metabolic blood tests – rarely obtained unless bilateral
- Imaging – MRI (CT if contraindicated)

Clinical Course of ISSNHL

- Spontaneous recovery 32% - 65%
- Prognostic variables:
  - Severity of loss
  - Audiometric configuration of loss
  - Vertigo
  - Age
  - Time from onset to diagnosis and treatment

Idiopathic Sensorineural Hearing Loss
Treatment

- Corticosteroids
- Antivirals
- Vasodilators
- Diuretics
- Histamine
- Plasma expanders
- Hyperbaric oxygen

Antiviral Therapy

Generally no additional benefit compared to steroid alone treatment

Corticosteroid Therapy

- Beneficial effect on hearing recovery compared to placebo
  - Administered within 10 days of onset
  - Moderate hearing losses

Wilson et al. *Arch Otolaryngol 1980*

Mechanism of Action

- Increased cochlear blood flow
- Anti-inflammatory effect
- Regulation of cochlear fluid and electrolyte balance

Protocol for Oral Steroids

- Prednisone:
  - 1mg/kg body weight/day x 10-14 days
  - 60-80mg daily x 5-10 days
  - 10mg/day taper
- Medrol Dosepak

Intratympanic Steroid Therapy (ITS)

- Higher inner ear drug level more efficacious
- Avoid systemic side effects
- Useful when systemic steroids contraindicated

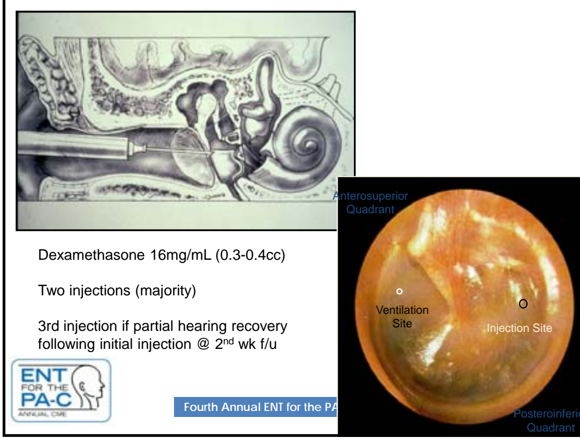
ITS Therapy

- Dexamethasone (4, 10, 16, 24mg/mL)
- Methylprednisolone (32-62.5mg/mL)

- 0.3-0.5 mL injected
- Addition of 0.1cc 1-2% lidocaine

ITS Delivery Techniques

- Intratympanic injection(s)
- Myringotomy +/- ventilation tube
- Round window application
- Silverstein MicroWick



Protocols for ITS in ISSNHL

- Initial or primary treatment
- Adjunctive treatment administered concomitantly with systemic steroids
- Salvage therapy after failure of systemic steroids

ITS Salvage Therapy for ISSNHL

- Some measurable benefit in hearing recovery
  - Gianoli GJ, Li JC. 2001
  - Lefebvre PP, Staecker H. 2002
  - Ho GM, Lin HC, Shu MT, et al. 2004
  - Herr BD, Marzo SJ. 2005
  - Roebuck J, Chang JCY. 2006
  - Haynes DS, O'Malley M, Cohen S, et al. 2007

ITS Salvage Therapy for ISSNHL

- Hearing improvement 30-50%
- No benefit after 36 days
- Poorer recovery with severe to profound losses

Concommitant ITS Therapy

- Lauterman J, Sudhoff H, Junker R. 2005
- Battista RA. 2005

ITS administered as primary therapy adjunctively with systemic steroids showed no benefit in recovery of profound SSNHL

Risks of ITS Therapy

- TM perforation
- Acute otitis media
- Transient vertigo (15-20 seconds)
- Worsening hearing

Management of Sudden SNHL

- Document hearing with audiogram
- Systemic steroids +/- intratympanic steroids
- Follow-up audiogram in 1 week
- Elective MRI with gadolinium

Clinical Practice Guideline: Sudden Hearing Loss

Otolaryngology-Head and Neck Surgery
March 1, 2012