Pediatric Cholesteatoma

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Objectives

1. Describe the pathogenesis of cholesteatoma formation
2. Identify the impact cholesteatoma can have on a child and their family
3. Define key points in the history, physical examination and diagnostic techniques used in diagnosis confirmation
4. Discuss surgical options and medical therapies for patients with cholesteatoma(s)
5. Examine the post-operative expectations for the patient with a cholesteatoma
6. Participate in a case study discussion of a pediatric patient diagnosed with a cholesteatoma

What is a Cholesteatoma?

• Cyst-like expansile lesion(s) of the temporal bone lined by stratified squamous epithelium that contain desquamated keratin
• Most frequently involve the middle ear (ME) and mastoid but may develop anywhere in the pneumatized portions of the temporal bone

Physiology of Cholesteatoma

• The matrix contains fully differentiated squamous epithelium resting on connective tissue
• Deeper layers of the epithelium of a cholesteatoma matrix show activity in the form of downgrowths into the underlying connective tissue
• There is always a layer of granulation tissue in contact with bone
• The layer of granulation tissue elaborates various enzymes such as collagenase resulting in bone destruction
Histology

History
- 1st description of cholesteatoma like mass by DuVerney in 1683
- Misnomer originated by Johannes Mueller in 1838
  - Described it as a "layered pearly tumor of fat, which was distinguished from other fat tumors by the biliary fat or cholesterin that is interspersed among the sheets of polyhedral cells"
  - Cholesteatomas do not contain fat and not usually cholesterin
  - More appropriate term suggested by Schuknecht was "keratoma"
- In 1889, Habermann known for 1st temporal bone report describing the pathology of cholesteatoma

Anatomy Review

Anatomy - Middle Ear Regions
- Name based on position relative to superior and inferior aspect of external auditory canal (EAC)
  - Epitympanum
  - Mesotympanum
  - Hypotympanum
Anatomy – Middle Ear Regions

• Epitympanum
  – Lies above short process of malleus; includes the head of the malleus, body of incus and associated ligaments and mucosal folds

• Mesotympanum
  – Includes the stapes, long process of incus, handle of malleus and oval and round windows
  – Eustachian tube exits from anterior aspect
  – 2 recesses extend posteriorly that are often not visible
    • Facial recess
    • Sinus tympani

• Hypotympanum
  – Lies inferior & medial to floor of bony canal; irregular bony groove that is seldom involved by cholesteatoma

Cholesteatoma Classification

<table>
<thead>
<tr>
<th>Congenital</th>
<th>Acquired</th>
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<tr>
<td><img src="image1.png" alt="Congenital Cholesteatoma" /></td>
<td><img src="image2.png" alt="Acquired Cholesteatoma" /></td>
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Incidence

• The true incidence is not known

• Mean annual incidence of 9.2 cases per 100,000 persons of all ages (range 3.7 to 13.9) (Kemppainen, Puhakka, Laippala, Sipilä & Karma, 1999)

• Approximately 5 to 15 per 100,000 in children alone (Bluestone & Klein, 2003)

• Congenital cholesteatomas account for 1 to 5 percent in most published series (Bennett, Warren, Jackson & Kaylie, 2006)

• Spilsbury, Miller, Semmens & Lannigan, 2010:
  – 0.9% percent was seen in a retrospective series of 45,980 children who had undergone 1 set of ventilation tubes
  – Two or more ventilation tube placements increased rate of cholesteatoma to 21%

In 172 cases of congenital cholesteatoma between 1981 and 2000, the following observations were made:

- 72 percent of cases occurred in boys
- The average age was 5 yrs
- Nearly one-half of cases involved ≥2 quadrants; 81 percent of cases confined to one quadrant were in the anterosuperior quadrant
- The ossicular chain and mastoid were involved in 43 percent and 23 percent of cases, respectively
- Cholesteatomas are bilateral in approximately 4 percent of cases
- Bilateral congenital cholesteatomas are more common in boys, whereas bilateral acquired cholesteatomas are more common in girls

(derived from, Kornan, Samart & Wimmer, 2002; Lut, Delair, Janossy & Freidberg, 2004)

Congenital Cholesteatoma

• Definition(s):
  – Congenital rest of epithelial tissue in the ear without tympanic membrane perforation and without history of otitis media (Haltiner & Chien, 1985)
  – Includes a normal pars flaccida and pars tensa with no history of otomastoiditis and no history of otologic procedure (Bennett et al., 1997)

  – Not excluded if there is a history of otitis media

(Cholesteatoma Classification)
Congenital Cholesteatoma
- White, cyst-like structure in the middle ear (ME) space or temporal bone
- Can occur anywhere in temporal bone
  - Most common in the anterosuperior quadrant (AS) in the ME above the eustachian tube (ET) opening in the mesotympanum

Pathogenesis not completely understood
- Most popular theory
  - Presence of an epidermoid residue in the AS quadrant of the ME in the human fetus, on the lateral wall of the ET, near the annulus
  - Failure to reabsorb the epidermoid residue normally found in embryos between the 10th and 33rd week of gestation has been observed (Michaels, 1986), (Teed, 1936)

Acquired Cholesteatoma
- 2 types
  - Primary acquired
  - Secondary acquired
- Occur after birth
- Most common type typically as result of chronic middle ear (ME) disease

Primary acquired
- Most common
- Forms as retraction pockets of the TM
- Occurs mostly in pars flaccida although pars tensa retraction can occur
- Bacteria can affect the keratin matrix, forming biofilms leading to chronic infection and epithelial proliferation

Secondary acquired
- Form as result of either squamous epithelial migration from the TM or implantation of squamous epithelium into the ME during surgery (ie: Ventilation tube placement or tympanoplasty)
- Perforations from infection or trauma

Acquired Cholesteatoma Staging
- Stage 1
  - Confined to ME (hypo- & mesotympanum) without erosion of ossicular chain
- Stage 2
  - Same as 1, but in addition, there is erosion of one or more ossicles
- Stage 3
  - Involvement of middle ear and mastoid gas-cell system without erosion of ossicles
- Stage 4
  - Same as 3, but with erosion of one or more ossicles
- Stage 5
  - Extensive cholesteatoma of the middle ear, mastoid, & other portions of the temporal bone, including one or more ossicles
  - Not able to complete surgical removal (ie: medial to labyrinth)
  - A fistula of the labyrinth may or may not be present
- Stage 6
  - Same as 5 but now cholesteatoma extends beyond the temporal bone (Bluestone & Klein, 2003)
Predisposing Factors

- History of recurrent acute otitis media and/or chronic middle ear effusions
- Older age at first placement of tympanostomy tubes, and increasing number of, and longer interval between, insertions
- Cleft palate
- Craniofacial anomalies
- Turner syndrome
- Down syndrome
- Family history of chronic middle ear disease and/or cholesteatoma

Signs and Symptoms

- Acquired
  - Typically present with recurrent or persistent purulent otorrhea and hearing loss
  - Also can present with tinnitus, vertigo or dysequilibrium
  - Facial nerve twitching, palsy or paralysis
    - Can result from inflammatory process or mechanical compression of the nerve
- Congenital
  - Conductive hearing loss

Impact of Cholesteatoma

- Hearing loss (HL)
  - Late recognition of cholesteatoma formation still a problem
- Speech delay
- Psychosocial effects

Cholesteatoma in Children vs. Adults

- More aggressive disease in children than adults
  - Very extensive disease is found in children at the time of surgery vs. adults
  - Rates of persistent and recurrent cholesteatoma are higher in children
    - Persistent eustachian tube dysfunction
    - Well pneumatized mastoid complex
  
- Children frequently unaware of signs and symptoms
  - Rarely complain about HL, especially if unilateral
  - Frequently no otorrhea
  - Otalgia may be absent
  - Unable to determine fullness of the ear, tinnitus, mild vertigo
- Most adults have history of HL that is progressive and recurrent otorrhea
Complications

- Accumulation of keratin may cause:
  - Infection
  - Otorrhea
  - Bone destruction
  - Hearing loss
    - Conductive &/or SNHL
    - Vertigo
    - Facial nerve paralysis
    - Labyrinthine fistula
    - Intratemporal infection

- Intracranial complications
  - Epidural and subdural abscesses
  - Parenchymal brain abscesses
  - Meningitis
  - Thrombophlebitis of the dural venous sinuses
  - Brain herniation

Complications: Epidural Abscess

Complications: Sigmoid Sinus Thrombosis

Patient History

- Recurrent acute otitis media
- Chronic otitis media with effusion
- Cleft palate
- Craniofacial abnormalities
- Turner or Down syndromes
- Family history of chronic ME including cholesteatoma
- New onset HL in previously operated ear
- Persistent otorrhea >2 weeks
- Foul smelling otorrhea
- Concern about intratemporal or intracranial complication with otalgia symptomology
- Fullness of the ear
- Tinnitus
- Mild vertigo
- Facial muscle weakness

Physical Exam

- White mass behind intact TM
- Deep retraction pocket with or without granulation and skin debris
- Focal granulation on surface of TM
- Otorrhea >2 weeks despite treatment
- Hearing loss

Differential Diagnoses

- Tympanosclerosis
- White foreign body
- Exostoses
- Prosthetic and graft material
- Inclusion cysts of the tympanic membrane
- Bulging acute otitis media

(Sie, 1996)
Differential Diagnoses

Diagnosis

- May go undetected for many years as s/s may be lacking
  - Otoscopy/Oto-microscopy
  - Detailed otologic history
  - Audiogram
  - CT scan of the temporal bones
  - Diffusion weighted MRI

CT Scan

- CT of the temporal bones without contrast in the coronal and axial views often of value
- Identifies:
  - Extent of disease
  - Possibility of ossicular involvement
  - Complications such as labyrinthine fistula
- Used to aide in decisions regarding surgical approach and extent of surgery

Treatment

- Surgical intervention
  - Tympanoplasty
  - Canal Wall-Up mastoidectomy (CWU)
  - Canal Wall-Down mastoidectomy (CWD)
  - Partial Ossicular Replacement Prosthesis (PORP)
  - Total Ossicular Replacement Prosthesis (TORP)
  - Second-Look Procedure
Cholesteatoma Surgery in Children -
Goals

1. Eradicate disease
2. Preserve or reconstruct the anatomic structure
3. Preserve or restore hearing
4. Prevent residual and recurrent disease

(Bluestone, 2002)

Tympanoplasty

• Tympanoplasty
  - Surgical reconstruction of the TM/ossicle transformer mechanism
  - i.e.: If a perforation is present, it will be repaired with a connective tissue graft; but unlike with a myringoplasty, the middle ear is explored
  - Ossicles can be repositioned (ossiculoplasty) to restore ossicular chain continuity
  - Trans-canal or post-auricular

Tympanoplasty (Trans-Canal & Post-Auricular) Pros

• Trans-canal
  - Shorter surgery
  - Less discomfort
  - Patient perception

• Post-Auricular
  - Better exposure
  - Better graft harvest
  - Anterior exposure
  - Better handedness
  - Limited disruption of canal skin vasculature
  - Faster healing

Tympanoplasty (Trans-Canal & Post-Auricular) Cons

• Trans-canal
  - Limited exposure
  - Difficult handedness
  - Smaller grafts
  - Disruption of vascular supply to canal skin
  - Canal needs to heal

• Post-Auricular
  - Longer surgery
  - More discomfort
  - Patient perception

Mastoidectomy

• Mastoidectomy
  - Removal of mastoid bone
  - Involves the surgical exposure and removal of mastoid air cells

http://www.ghorayeb.com/mastoidectomy.html
Tympanomastoidectomy with Tympanoplasty

- Tympanomastoidectomy with tympanoplasty
  - Tympanoplasty performed in combination with mastoidectomy
    - Canal Wall-Up procedure (aka: Closed cavity procedure)
    - Canal Wall-Down procedure (aka: Open cavity procedure)

Canal Wall-Up Mastoidectomy

- Posterior canal wall remains intact
- Preserves middle ear structures
  - Hope that ME function may improve with age
- Higher rate of reoccurrence and need for second surgery
- Hearing aids fit better
- Maintenance free
- Fewer activity restrictions
- More natural appearance
- Better hearing results

Canal Wall-Down Mastoidectomy

- Every effort made to avoid CWD procedure
- Hearing may be worse (typically worse)
- Open mastoid cavity
- Enlarged canal visible to the naked eye
  - About 2x the size
- More difficult to clean in children
  - Would require general anesthesia for cleaning and debridement
- Swimming
  - Common activity for children; More susceptible to infection with water exposure

Canal Wall Down Mastoidectomy

- Pros
  - Greatly reduces the risk of recurrence
  - Good option for those with co-morbidities that are at high risk undergoing anesthesia
  - Good option for those who have poor-follow-up
Canal Wall Down Mastoidectomy

Osborn, Papsin and James, 2012
- Retrospective review 1996-2010
- 420 patients (435 total ears)
- Extent of cholesteatoma graded according to Mills Classification
- Pre & post air conduction hearing thresholds assessed
- CWU preferred
  - Preserved canal in 89.5% of cases
  - Financial and emotional costs of 2nd look offset by avoiding open cavity management
  - Better hearing results
- CWD
  - Lower rates of recurrence and revision

Canal Wall-Up vs. Canal Wall-Down Literature

Wilson, Hoggan & Shelton, 2013
- Case series with chart review
- All cases treated with Intact Canal Wall (ICW) mastoidectomy over 9 years with at least 2 years of follow-up data
- 145 patients with 156 affected ears (median age 5.3 years; range 2.1-14.8 years)
- 35% had residual cholesteatoma at 2nd stage
- 13 patients (8%) had recurrence with 6 needing CWD mastoidectomy
- ICW mastoidectomy w/ tympanoplasty continues to be successful treatment
- Substantial recurrence rate at 2nd stage justifying need for staging
- Recurrence rate using ICW is low; excellent disease control and functional results for majority of patients

Ossicular Reconstruction

Partial Ossicular Replacement Prosthesis (PORP)
- Used when the stapes superstructure is intact
- Stapes superstructure is bridged with a synthetic biocompatible prosthesis to the tympanic membrane, graft or malleus
- PORP is positioned on the stapes head

Total Ossicular Replacement Prosthesis (TORP)
- Used only when the stapes footplate is available
- Used when an intact stapes footplate is bridged with a synthetic biocompatible prosthesis to the tympanic membrane, graft or malleus
- TORP is placed on the stapes footplate

PORP & TORP
Prosthesis

Middle Ear Prosthesis

Second-Look Procedure

- Detects residual cholesteatoma or recurrent disease as the middle ear and mastoid are not directly visible
  - Recommended at 6 months post-op in children
  - 12 months post-op in adults
  - Difference secondary to children experiencing more aggressive disease
- If disease is found at second-look, it is removed and the child is recommended to go to the OR again in 6 months
  - Repeated until residual disease is not present

Alternative To Second-Look Procedure

- Diffusion Weighted MRI Imaging (DWI)
  - More recently introduced in cholesteatoma diagnosis
  - Non-invasive
  - Prevents unnecessary second-look surgery in patients without cholesteatoma

Alternative To Second-Look Procedure

- How it works:
  - Provides information about diffusion of water molecules in biological tissue
  - Greater diffusion of water molecules, the less signal enhancement appears in the image; lower the diffusion of water molecules, the greater signal enhancement appears
  - Not exactly known why cholesteatoma shows a high level of signal enhancement on DWI
  - DWI shows a cholesteatoma as high signal intensity, granulation and other tissue visualized at a low signal intensity
  - Resultant image is bright at cholesteatoma and darker at surrounding tissues
**Diffusion Weighted MRI Study**

- Turkish Study (Evlice, Tarkan, Kiroglu, Bicakci, Ozdemir, Tuncer & Cekic, 2012)
  - 58 chronic otitis media patients with suspected cholesteatoma evaluated 2 weeks pre-operatively (41 with no previous surgery & 17 with previous surgery scheduled for “second-look”)
  - Mean age 22 y/o (Range 9-67 y/o)
  - All underwent Echo-planar diffusion-weighted MRI pre-operatively
  - Operative findings and pathology results compared with MRI results

**Results**

- Cholesteatoma found in 63% of patients with no history of surgical intervention and 58% found in second-look group
- Diffusion-weighted MRI accurate in 90% of group 1 and 76% of group 2 patients

**Conclusion**

- Echo-planar diffusion-weighted MRI is a valuable imaging technique for detection of primary or recurrent acquired cholesteatoma
- Can be considered instead of second-look procedure

**Surgical Risks & Complications**

**Tympanoplasty with or without Mastoidectomy**

- Infection
- Hearing loss
- Tinnitus
- Dizziness
- Taste disturbance and mouth dryness
- General anesthetic complications

**Mastoidectomy**

- Facial paralysis
- Hematoma
- Spinal fluid leak
- Dural injury
- Intracranial complications
- General anesthetic complications

**Post-Operative Course**

- Bulky dressing covering the ear for 24 hours
- Numbness of the ear
  - Resolves over weeks to several months
- Sharp, sudden stabbing pains are common
  - May take weeks to resolve
- Protrusion of the ear
- Pain with eating/chewing
- Taste disturbance (metallic taste)
  - May take up to 6 months to resolve
- Blood tinged otorrhea

http://www.youtube.com/watch?v=xCQBSNF3DY

**Post-operative Course**

- Packing/sponge plug/wick may extrude
  - Inform family not to not replace
- Hearing noises such as “swishing, gurgling, your heartbeat” is normal and slowly subsides
- Decreased hearing
  - Swelling
  - Hemotympanum
  - Packing
  - All normal, takes several weeks to resolve
- Dysequilibrium with quick movements
  - Common for several days to 1 week post-op
**Care & Cleaning of the Ear**
- Strict water precautions until 1st post-op appointment
- If post-auricular incision present, may clean gently with soap and water after 1st post-op visit
- No water in canal up to 2-3 months
  - Place cotton ball with Vaseline in outer part of canal
  - No commercial ear plugs recommended
  - May put pressure on packing
- Sleep with head elevated 30 degrees for 1 week; try not to lie on ear that was surgically repaired
  - Decreases swelling
- Pad eyeglasses if you wear them
- Consider use of ice pack for 15-20 minutes at a time

**Care & Cleaning**
- Clean post-auricular incision with H2O2 on a cotton swab morning and night
- Do not clean external auditory canal
- May use antibiotic ointment until 1st post-op visit
- Place dry cotton ball in outer canal to absorb drainage; change at least 2x daily and as needed
- Cover ear in frigid weather if post-auricular incision
  - Post-op numbness
  - Sensitivity

**Activity Restrictions**
- No work or school for 1 week
- Light activity during the 1st week
- No strenuous activity, exertion, sports or lifting over 20 lbs for 1 month
- No playing musical wind instruments for 6 weeks
- No vigorous nose blowing or popping of the ears for 6 weeks
- Keep mouth open with sneezing
  - Helps avoid transmission of pressure to the ear
- Use stool softener if constipated
  - Avoids straining
- No airline flights for 1 month

**Medications**
- Prescription pain medication
  - Shouldn’t be necessary after 7-10 days
- No aspirin, aspirin containing products or anti-inflammatory agents until 1st post-op visit
- Blood thinners may be started 1 week after
- Oral antibiotics prescribed for 1 week
- Otic drops
  - Typically not started until 1st post-op visit
  - Typically will need for multiple weeks

**Post-Operative Follow-Up**
- Post-op visit #1 scheduled for 7-10 days following surgery
- Recommended to call for:
  - Increased pain, post-auricular erythema or swelling
  - Incision drainage
  - Opening of incision
  - Malodorous, discolored post-auricular drainage
  - Fever over 100.5
  - Developed weakness of facial muscles on surgical side
  - Developing/increasing vertigo
  - Severe nausea or vomiting

**Future Follow-Up**
- Every 3 months for the 1st year post-op
- Every 6 months for the 2nd & 3rd years post-op
- After the 3rd year; annually for 5-7 more years

(Bluestone & Rosenfeld, 2002)
Future Follow-up

- Pediatric 29 year study
  - Retrospective study 1982-2011
  - 81 ears; 73 studied
  - Acquired only; congenital excluded; 18 years or younger
  - Follow-up every 6 months for the first 5 years then annually
  - Recurrence of cholesteatoma occurred in 7 ears
  - Mean detection time was 10.4 years (range 1.9-17.2 years)
  - 2 were residual disease and 5 were recurrent
  - Recommend: Follow-up as long as possible or at least until adulthood

Prevention

- No methods currently for congenital
- Primary acquired
  - Pathogenesis not clearly understood; assumed that ETO is required for formation
  - No way to correct ET function directly
  - Provide secondary ventilation to the ME with ventilation tube placement
- Secondary acquired are often iatrogenic
  - Surgeon takes all steps to prevent implantation of squamous epithelium into ME

Case Study

- History
  - 2 y/o little boy with history of recurrent acute otitis media
  - Underwent bilateral myringotomy & ventilation tube (BM&T) placement just prior to new patient appointment w/us at outside facility
  - At time of surgery, right-sided middle ear abnormality noted; ventilation tubes were placed
  - CT scan of the temporal bones obtained and he was referred to CHW

- What are we concerned about based on this information? Congenital cholesteatoma
- What are your next steps?
  - Physical exam
  - Audiogram
  - Review CT scan of the temporal bones

- Physical exam
  - Otoscopy & Micro-otoscopy
  - Ears well formed externally with normal canals
  - Right TM showed whitish discoloration anteriorly but no obvious cholesteatoma formation; Ventilation tube was in place and patent
  - Left tympanic membrane was clear with a tube that was in place and patent

- Audiogram 6/22/2011
Case Study

Right middle ear exploration with ventilation tube removal, atticotomy and cholesteatoma removal, tympanoplasty with fascia

Findings:
- Extensive congenital cholesteatoma throughout the ME space extending into the eustachian tube into the attic
- Did not extend posteriorly into the mastoid
- Involved the malleus, incus, hypotympanum, eustachian tube; attic and part of the stapes; incus and malleolus were removed along with substantial portion of the TM
- Middle ear mucosa diseased at grade 2
- D/C’d on Ciprodex, Lortab

Case Study Post-Op Visit (2 weeks later)

Subjective:
- No concerns 1st week post-op
- Right otalgia – was playing outside without head coverage
- No otorrhea
- Using Ciprodex as prescribed
- Now only using Tylenol at bedtime for pain

Objective/Physical Exam:
- Right post-auricular incision well approximated, C/D/I
- Canal with small amount of gel foam which was removed under microscopy
- TM with small amount of gelfoam left alone; could not completely visualize
- TM out healing

Plan:
- Continue Ciprodex BID
- Strict water precautions
- X-2 weeks

Case Study Post-Op Visit #2

Subjective:
- Patient without complaint

Objective/Physical Exam:
- Right post-auricular incision healing well
- External auditory canal clear without gelfoam
- TM healing well

Plan:
- Follow-up 2 months
- Plan for second-look procedure in 9-12 months

Case Study Post-Op Visit #3

Subjective:
- No parental concerns

Objective/Physical Exam:
- Micro-otoscopy
- Right post-auricular site healed
- Right TM with post-surgical changes; no visible cholesteatoma
- Audiogram obtained

Case Study Post-Op Visit #3

Pre-Op Audiogram 6/22/2011
- Post-Op Audiogram 3/14/2012
Case Study
Post-Op Visit #3
• Plan:
  – See at second-look procedure scheduled in 4 months

Case Study
Second-Look Procedure
– Right middle ear exploration with tympanoplasty and PORP ossicular reconstruction
– Discharged with Ciprodex, Cefdinir & Lortab
– Follow-up in 1 week

Case Study
Post-Op Visit #1 for Second-Look Procedure
• Subjective:
  – Doing well, no otorrhea, no otalgia, afebrile, good oral intake, sleeping well
• Objective:
  – Post-auricular incision well approximated; C/D/I
  – Few superior sutures removed
  – Some gelfoam in canal; left alone
  – TM healing well
• Plan:
  – Ciprodex BID for 14 days
  – Strict water precautions
  – F/u 2 weeks

Case Study
Post-Op Visit #2 for Second-Look Procedure
• Subjective:
  – No concerns, no otorrhea, no otalgia, afebrile, good oral intake, sleeping well
  – Using Ciprodex as recommended
• Objective:
  – Post-auricular incision well healed
  – Significant gelfoam; partial removal as it was adhered to TM
• Plan:
  – Continue Ciprodex BID for 1 month with return at that time

Case Study
Post-Op Visit #3 for Second-Look Procedure
• Subjective:
  – No concerns, no otorrhea, no otalgia, afebrile, good oral intake, sleeping well
  – Stopped using drops early
• Objective:
  – Post-auricular incision well healed
  – Cerumen and dry gelfoam removed
  – TM clear with post-surgical changes
  – Audiogram obtained

Case Study
Pre-op Audiogram 6/22/2011
Post-op 2nd Look Procedure 9/18/2012
Case Study
Post-Op Visit #3 for Second-Look Procedure

• Plan
  – D/C water precautions
  – Follow-up in 6 months

Case Study
Post-Op Visit #4 for Second-Look Procedure

• Subjective:
  – No parental concerns

• Objective:
  – Small less than 5% TM perforation on the right; cartilage healing well
  – Audiogram – Normal bilaterally!!!

• Plan:
  – Follow-up in 4 months

Questions???

Thank You!

• Dr. David Friedland
• Dr. Steven Harvey
• Dr. Joseph Kerschner
• Roxanne Link, APNP
• Kristina Keppel, APNP

References


References


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