Temporal Bone: Modern Imaging & Current Controversies

Suresh K. Mukherji, MD, FACR

Professor and Chief of Neuroradiology
Professor of Radiology, Otolaryngology Head Neck Surgery, Radiation Oncology, Periodontics & Oral Medicine
University of Michigan Health System

Outline

• Technique
Imaging Technique

**CT**

- Multidetector CT (4-64 rows)
- Axial CT: 0.625mm thick
- Direct axial (parallel to IOML)
- Coronal reformats
- Magnify both side to 9cm FOV prior to filming
**Calcified Ligaments**

**Lateral Malleolar Ligament**

**Calcified Tendons**

**Tensor Tympani Tendon**
Calcified Tendons

Tympanosclerosis

Imaging Technique

**MR**

- Full course of CN VIII
- Slice thickness \( \leq 3\)mm (3T: 2mm)
- Pre-contrast T1W
- Post-contrast axial and coronal
- Axial T2W
- Include T2W of brain (MS)
T2 DRIVE

.29/.29/.29 reconstructed @.59/.59/.58 (Isovoxel)

Parallel Imaging

Vestibular-Cochlear Nerve
Vestibular-Cochlear Nerve

Vestibular Schwannoma
Vestibular Schwannoma
vision of vestibular nerve and anterior and utrue)

n)

Utricle

Anterior meml

Lateral mem

Saccule

Post

vestibular nerve

vestibular ganglion
Vestibular nerves

Superior division

Macula of The utricle

Macula of The saccule

Inferior division

Otoliths on cupula

*Courtesy: Jan Casselman, M.D.*
### Utricular Macula Dimensions

<table>
<thead>
<tr>
<th>Plane</th>
<th>Axis</th>
<th>Ave (mm)</th>
<th>Std</th>
<th>Range</th>
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<tbody>
<tr>
<td>AP</td>
<td>AP</td>
<td>1.66</td>
<td>0.20</td>
<td>1.2-2.0</td>
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<tr>
<td></td>
<td>Trans</td>
<td>1.47</td>
<td>0.18</td>
<td>0.9-2.0</td>
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<tr>
<td>Sag</td>
<td>CC</td>
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<td>0.19</td>
<td>1.1-2.0</td>
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<tr>
<td></td>
<td>AP</td>
<td>1.63</td>
<td>0.21</td>
<td>1.1-2.1</td>
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<tr>
<td>Cor</td>
<td>Trans</td>
<td>1.50</td>
<td>0.19</td>
<td>1.1-1.9</td>
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<tr>
<td></td>
<td>CC</td>
<td>1.0</td>
<td>0.12</td>
<td>0.8-1.3</td>
</tr>
</tbody>
</table>

*72 Asymptomatic side (44 Right & 28 Left)*

*39 Female & 33 Male*

*Average Age 52.9 years (22-81)*
MR Microscopy

Outline

• Technique
• Labyrinthitis
Labyrinthitis

- Inflammation of the membranous labyrinth
- Acute phase: enhancement of the cochlea and vestibule
- Chronic Phase: labyrinthitis ossificans
Acute Labyrinthitis

Schulnecht HF. Pathology of the Ear, 2nd ed.
Obliterative Labyrinthitis
(*Labyrinthitis Ossificans*)

*Schulnecht HF. Pathology of the Ear, 2nd ed.*
Labyrinthitis Ossificans

Michel’s Anomaly

Obliterative Labyrinthitis
*(Labyrinthitis Ossificans)*
Obliterative Labyrinthitis

(Cochlear Implant)

Obliterative Labyrinthitis

(Labyrinthitis Ossificans)
Obliterative Labyrinthitis
(Labyrinthitis Ossificans)
Outline

• Technique
• Labyrinthitis
• Otosclerosis
Otosclerosis

- Unique disease of the otic capsule; Unknown etiology
- Primarily autosomal dominant with incomplete penetrance
- F > M (2:1); Bilateral < 60%
- Abnormal resorption and deposition of bone in the labyrinth and middle ear
- Maybe associated with endochondral ossification of the temporal bone

Otosclerosis

- Primarily a clinical diagnosis
- Characteristic audiologic findings
- “Schwartze sign”: increased vascularity of cochlear promontory
Fenestral Otosclerosis

• Primarily involves the cochlea
  – “pericochlear lucencies”
  – cochlear enhancement

• Usually occurs in the presence of fenestral otosclerosis

Retrofenestral Otosclerosis

Roland & Myeroff
Retrofenestral Otosclerosis

Outline

- Technique
- Labyrinthitis
- Cholesteatoma
Cholesteatoma

Pathology

• Keratinizing debris that arises from the desquamation of the squamous epithelial lining

• “Skin growing in the wrong place”!

Cholesteatoma

Classification

• Congenital

• Acquired
  – Primary acquired
  – Secondary acquired
Acquired Cholesteatoma

Pathogenesis

- Invagination:

- Epithelial Invasion

- Basal Cell hyperplasia

- Middle ear metaplasia

Retraction Pocket
## Acquired Cholesteatoma

### Bone Erosion
- Long process of incus is first ossicle eroded
- Erosion of the scutum is a late finding
- Bone erosion due to cellular and enzymatic degradation and not pressure erosion

### CT
- Focal soft tissue mass
- Ossicular erosion
- Bone erosion
Cholesteatoma

**MR**

- T1W: Intermediate signal
- T2W: Increased signal
- No internal enhancement
  - +/- internal enhancement
- Diffusion: Increased signal

Summary

• Technique
• Inner Ear Malformations
• Labyrinthitis
• Cholesteatoma