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Audiology Grand Rounds:
A Week at Henry Ford Hospital
Day 4: Vestibular Assessment

Henry Ford Health System: The Institution

- Founded in 1915 by Henry Ford
- Over 18,000 employees
- 1,200 Medical Group Members
- 6 hospitals
- 25 outpatient centers
- Over 3.1 million outpatient visits annually
- Over 15,000 appointment slots per day
- 17 audiologists at 4 sites
Report of a Case

Case: A

- Age: 6 years
- Sex: Male
- History:
  - Right ear hearing loss, 1 month prior
  - Pediatrician otoscopy shows dull, opaque TM
  - Treated for right otitis media and allergic rhinitis
  - One month later, Dx of right OME, referral to Audiology and ENT

Audiology/ENT Exam

Case: A

- History:
  - Passed newborn and school hearing screening
  - Right ear hearing loss, 2 months prior
  - Dizziness and right tinnitus
  - Amateur boxer, but symptoms not perceived as sudden or associated with trauma
Case: A  Age: 6 years  Male

**Right Ear**

<table>
<thead>
<tr>
<th>Signal to RE</th>
<th>BBN</th>
<th>500</th>
<th>1K</th>
<th>2K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossed</td>
<td>Absent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncrossed</td>
<td>Absent</td>
<td></td>
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</tbody>
</table>

**Left Ear**

<table>
<thead>
<tr>
<th>Signal to LE</th>
<th>BBN</th>
<th>500</th>
<th>1K</th>
<th>2K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossed</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Uncrossed</td>
<td>90</td>
<td>90</td>
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</tbody>
</table>

**Admittance in ml**

- ECV=1.2

**Air Pressure in daPa**

*No response to air-conduction or bone-conduction at equipment limits*
Case: A  Age: 6 years  Male

<table>
<thead>
<tr>
<th></th>
<th>Right</th>
<th></th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR</td>
<td>%</td>
<td>SRT</td>
<td>5 %</td>
</tr>
<tr>
<td>0 %</td>
<td>WRS</td>
<td>100 %</td>
<td></td>
</tr>
</tbody>
</table>

Otoacoustic Emissions - LE  Case: A
Otoacoustic Emissions - RE  
Case: A

VNG – Ocular Motility  
Case: A

- Gaze: Normal
- Saccade: Normal
- Pursuit: Reduced gain leftward
- Optokinetic: Reduced gain leftward
VNG – Vestibular System  

**Case: A**

- **Spontaneous** nystagmus – vision denied
  - Left nystagmus 4 degrees

- **Positional** nystagmus – vision denied
  - Left nystagmus 7-9 degrees
  - Throughout all positions

VNG - Calorics  

**Case: A**

- **Calorics (Air)**
  - Cold only; patient could not tolerate warm

- **Precaloric Nystagmus**
  - Left nystagmus 6-7 degrees

- **Cold Left**
  - Initial left nystagmus was reduced to 0 degrees

- **Cold Right**
  - Initial left nystagmus remained unchanged
Case: A  Age: 7 years  Male

<table>
<thead>
<tr>
<th>Frequency in Hz</th>
<th>Hearing Level in dB (ANSI-2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>1K</td>
<td>*E</td>
</tr>
<tr>
<td>2K</td>
<td>*E</td>
</tr>
<tr>
<td>4K</td>
<td></td>
</tr>
<tr>
<td>8K</td>
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*most likely vibrotactile

Temporal Bone CT Scan  Case: A

CONTINUED
CT Report  Case: A

- **Findings:**
  The right cochlea, right vestibule, and right semicircular canals appear markedly sclerotic, hyperdense, and partially ossified

- **Impression:**
  Findings are compatible with labyrinthitis ossificans of right inner ear … with the given history of patient being an amateur boxer, trauma to the temporal bone is most likely cause
Report of a Case

Case: B

- Age: 84 years  
- Sex: Male

History:
- Episodic vertigo
- Described as room spinning for 3-4 minutes
- No ear symptoms accompanying dizziness
- History of stroke

Case: B  
Age: 84 years  
Male

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<tr>
<td>Crossed</td>
<td>CNT</td>
<td></td>
<td></td>
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</tr>
<tr>
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ECV = 1.3

ECV = 1.5
Case: B  Age: 84 years  Male

**Word-Recognition Scores**

<table>
<thead>
<tr>
<th></th>
<th>Right</th>
<th>Left</th>
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</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td>90 %</td>
<td>80 HL</td>
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<tr>
<td><strong>HL</strong></td>
<td></td>
<td>70</td>
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**Right Ear**

**Frequency in Hz**

- 250
- 500
- 1K
- 2K
- 4K
- 8K

**Hearing Level in dB (ANSI-2004)**

- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90
- 100
- 110

**Left Ear**

**Frequency in Hz**

- 250
- 500
- 1K
- 2K
- 4K
- 8K

**Hearing Level in dB (ANSI-2004)**

- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90
- 100
- 110
VNG – Ocular Motility  Case: B

- Gaze: Abnormal
- Saccade: Abnormal
- Pursuit: Abnormal
- Optokinetic: Patient unable to perform

VNG – Vestibular System  Case: B

- Spontaneous: Abnormal, mixed nystagmus
- Positional:
  - Head Left: Abnormal, ageotropic nystagmus
  - Head right: Consistent with spontaneous
  - Supine: Abnormal, vertical nystagmus
- Dix-Hallpike
  - Right: Consistent with spontaneous
  - Left: Persistent upbeat nystagmus
  - Repeat L: Upbeating persisted; not transient
- Head-shake: Consistent with spontaneous
VNG - Calorics  
Case: B

Stim = 45 s
Max. SPV
R warm = 105
L warm = 109
Posturography Case: B

Equilibrium Score

Sensory Analysis

Posturography Case: B
Report of a Case  

Case: C

- Age: 57 years  
  Sex: Female

History:
- 4-year Hx of nausea and dry heaves when sound presented to right ear
- Multiple auditory triggers
- 7-year Hx of imbalance and dizziness
- Right tinnitus described as “crickets”
Case: C  Age: 57 yrs  Female

Right Ear

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Case: C  Age: 57 yrs  Female

Right Ear

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Case: C  Age: 57 yrs  Female

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<tr>
<td>Right</td>
<td>20 dB</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td>52 %</td>
<td>SRT 20 dB</td>
</tr>
<tr>
<td></td>
<td>WRS 50%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>(MCL)</td>
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VNG – Ocular Motility  Case: C

- Gaze: Normal
- Saccade: Normal
- Pursuit: Normal
- Optokinetic: Normal
VNG – Vestibular System  Case: C

- Spontaneous: Normal
- Positional: Vision denied
  - Head Left: Low-level left nystagmus (1-2 degrees)
  - Head right: Low-level left nystagmus
  - Supine: Low-level left nystagmus

VNG – Calorics  Case: C

- Precaloric nystagmus: Absent
- Warm left: 26 degrees
- Warm right: 3 degrees (retching)
Fistula Test

Case: C

- Right ear: positive
  (right beating nystagmus)
- Left ear: negative
Posturography Case: C

Equilibrium Score

FALL | Conditions | Composite
1    | N          | 39
2    | N          | 50
3    | N          | 25
4    | N          | 75
5    | FF         | 75
6    | AAN        | 50
   | AAA        | 25
   | LLL        | 75
   | LLL        | 50
   | LLL        | 25
   | Composite  | 39

Sensory Analysis

SOM | VIS | VEST | PREF
--- | --- | --- | ---
75  | 75  | 50  | 100
75  | 75  | 50  | 100
50  | 50  | 50  | 50
25  | 25  | 25  | 25
0   | 0   | 0   | 0
Surgical Report  Case: C

- **Operation:**
  - Exploratory middle-ear surgery for fistula

- **Findings:**
  - No evidence of a fistula
  - Unusual peri-otic channel at the ante fenestra, with an adhesion from membrane to stapes
  - Lysed several adhesions and patched OW and RW
Case: C  Age: 57 yrs  Post-op

Right Ear

- *WRS = 96% at 75 dB
- *WRS = 100% at 65 dB
- *monitored live voice

Left Ear

- *WRS = 100% at 65 dB

Hearing Level in dB (ANSI-2004)

Frequency in Hz

250 500 1K 2K 4K 8K