Outer Ear Examination
Cerumen Management

Bopanna B. Ballachanda, Ph.D.
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Cerumen Impaction and clinical protocol for management

- Introduction
- Position Statements from Professional organizations
- Cerumen impaction on health care burden
- A&P of cerumen glands
- Outer ear examination
- Primary and secondary interventions

AUDIOLOGY NOW INVOLVES A CLEAR AND CLEAN EAR CANAL

- IMMITANCE (IMPEDEANCE) AUDIOMETRY
- ELECTRONYSTAGMOGRAPHY
- REAL EAR MEASUREMENTS
- COCHLEAR EMISSIONS
- ELECTROCOCHLEOGRAPHY
- EAR IMPRESSIONS
- HEARING AIDS
- SOUND PLUGS
- OTHER

SCOPE AND PRACTICE OF AUDIOLOGY HAS EXPANDED SO WE SPEND A LOT OF TIME IN THE EAR CANAL

- MALPRACTICE INSURANCE
- PUBLIC EXPECTATION
- EAR HYGIENE IS OUR RESPONSIBILITY
- SCOPE AND PRACTICE OF OUR PROFESSION

PROFESSIONAL STATUS OF 1940’S

- AUDIOLOGY
  - WORKED FOR UNIVERSITIES AND CLINICS
  - PEOPLE REFERRED TO AUDIOLOGIST BY MEDICAL STAFF
  - PEOPLE HAD BEEN SCREENED MEDICALLY IF WAX PRESENT IT HAD BEEN REMOVED
  - REFERRED FOR AUDIOLOGICAL TESTING...TO LOCATE AIR BONE GAP
  - THE ENT OFFICE WAS THE POINT OF ENTRY FOR HEARING HEALTH CARE
A NEW AND GROWING PROFESSION

- AUDIOLOGY 1950’s
- AUDIOLOGY 1960’s
- AUDIOLOGY 1970’s
- AUDIOLOGY 1980’s
- AUDIOLOGY 1990’s
- AUDIOLOGY 2000’s
- AUDIOLOGY 2010’s

AUDIOLOGY NOW INVOLVES A CLEAR AND CLEAN EAR CANAL

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SCOPE AND PRACTICE OF AUDIOLOGY HAS EXPANDED SO WE SPEND A LOT OF TIME IN THE EAR CANAL

- MALPRACTICE INSURANCE...? EAR CANAL?
- PUBLIC EXPECTATION
- EAR HYGIENE IS OUR RESPONSIBILITY
- SCOPE AND PRACTICE OF OUR PROFESSION
- PROFESSIONS DISAGREE

AMERICAN SPEECH-LANGUAGE HEARING ASSOC.

- It is the position of the American Speech-Language Hearing Association that otoscopic inspection of the external auditory canal and tympanic membrane, as well as limited management of occluding cerumen, is well within the scope of practice of audiologist. This area of practice requires that audiologists possess sufficient knowledge and skills in the use of pneumatic otoscopy, recognition of the canal and tympanic membrane condition, and removal of cerumen when it can be performed comfortably and safely, not requiring direct contact with the TM.

ASHA POSITION CONTINUED

- Audiologist should have knowledge of the medical conditions of the pinna, external ear canal and tympanic membrane, and of how these potentially could have an impact on the examination and the audiological procedures. Practical, supervised experience along with efficiency (skill) in the inspection of the pinna and external auditory canal, tympanic membrane integrity and cerumen management are required. (Nov 1991)

AMERICAN ACADEMY OF AUDIOLOGY

- ...defined by the training and knowledge base of licensed and certified Audiologist. Areas of competency include assessment and rehabilitation of individuals with auditory disorders. Audiologists conduct otoscopic examinations, clean ear canals, take ear impressions...
...cerumen management is considered within the scope of practice of the dispensing audiologist.

Whereas: Cerumen removal requires mechanical or chemical manipulation of the external auditory canal, and
Whereas: Such manipulation may result in traumatic and/or inflammatory lesions to the external auditory canal, tympanic membrane, and/or middle ear conducting mechanism, be it therefore
Resolved:

Why audiologists don’t perform cerumen management

- Potential for patient injury
- Inadequacy of training
- Liability for injury
- Exposure to and transmission of pathogens
- Transmission of pathogens
- State laws – Texas law

Knowledge and skills required to perform cerumen management

- Knowledge of anatomy and physiology
- Knowledge of pathophysiology
- Skill in otoscopy
- Training
- Supervised experience

What is health care burden due to cerumen impaction?

Answer:
2 to 6% of the general population suffer from cerumen impaction in the UK.
Applying this to US population: 12 to 18 Million
CMS report: Cost of disimpaction is around 46.9 Million – Yang et al. 2016 JAMA
Cerumen

• Physiology
• Pathophysiology
• Prevalence of Cerumen Impaction

Exocrine Glands of the Ear Canal

<table>
<thead>
<tr>
<th>Gland</th>
<th>Type</th>
<th>Secretion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebaceous</td>
<td>Holocrine</td>
<td>Sebum</td>
</tr>
<tr>
<td>Apocrine</td>
<td>Mixed</td>
<td>&quot;Sweat&quot; (Ceruminous)</td>
</tr>
<tr>
<td></td>
<td>(Eccrine-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aprocrine-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Holocrine)</td>
<td></td>
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</tbody>
</table>

Secrections of the Sebaceous and Apocrine glands together form cerumen.
Which glands are responsible for the production of Cerumen?

Answer

- Sebaceous
- Apocrine

Freshly formed Cerumen

Changes due to time

Dry cerumen
Wet type of cerumen

Functions of Cerumen

- Lubricate
- Cleanse
- Protect*

*antibacterial/antifungal action

CLEANSING FUNCTION

Chemical composition of Cerumen

- **Cerumen Composition**
  - Cerotic Acid
  - Cholesterol
  - Hexos Bases
  - Neurostacic Acid a “Bitter Substance”
  - Acid C17H34NO2
  - Substances C8H14NO2
  - Argimon
  - Cystine
  - Histidine
  - Lysine

- **Protein**
- **Fyrosine**
- **Amino Acids**: Lucine, Essoleucine, Valine, Alanine, Theronine, Sreve, Guatamin Acid, Aspiratic Acid, Glycine, Amino Butyric Acid
- **Fatty Acids**: L-Elestearic, Arachidic, Behenic, Ligonoceric Stearic, Cerotic, Erinid, Myristic and Palmitic.
- **Copper/Iron**
Protective Function of Cerumen

- Perry (1955): cerumen has no significant antibacterial or antifungal properties.
- Chail and Chai (1980): cerumen has a bactericide activity against some stains of bacteria tested. Cerumen functions to kill certain foreign organisms that enter the ear canal.
- Stone and Fulghum (1984): bacteria were reduced 17-99% by treatment with a 3% suspension of human cerumen or the soft or “wet” type.

Innervation of External Ear Canal

<table>
<thead>
<tr>
<th>Nerve Area Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auriculotemporal Branch</td>
</tr>
<tr>
<td>Walls of Trigeminal (V)</td>
</tr>
<tr>
<td>Posterior Auricular Branch</td>
</tr>
<tr>
<td>Auricular Branch</td>
</tr>
</tbody>
</table>

Unusual Complications of Excessive/Impacted Cerumen

- Cardiac Depression (Prasad, 1984)
- Chronic Cough (Ramen, 1986)
- Pseudodementia (Myers & Pueschel, 1987)

Complications of Excessive/Impacted Cerumen

- Tinnitus
- Vertigo
- Itching
- Earache
- Otitis Externa
- Hearing Loss
Cerumen Fact

The amount of cerumen found in ear canals varies widely from individual to individual and among different populations.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Impaction Percentage</th>
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</thead>
<tbody>
<tr>
<td>26-44</td>
<td>5</td>
</tr>
<tr>
<td>45-54</td>
<td>15</td>
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<tr>
<td>55-64</td>
<td>25</td>
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<tr>
<td>65-75</td>
<td>34</td>
</tr>
<tr>
<td>75-84</td>
<td>22</td>
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</table>

Incidence of Excessive/Impacted Cerumen in Normal Populations

- Roche, et al (1978) 10% (n=224)
- Briscco (1985) 10% (n=349)
- Lebensohn (1943) 3% (n=794)
- Perry (1957) 17% (n=111)
- Hopkinson (1981) 4% (n=500)
- Foltner (1984) 9% (n=100)
- Cooper (1985) 5% (n=587)

Incidence of Excessive/Impacted Cerumen in Special Populations

- Mentally Retarded Adolescents
  - Nudo (1965) 36% (n=494)
  - Fulton & Griffen (1967) 28% (n=191)
  - Brister, et al (1986) 22% (n=88)
  - Crandall & Roeser (1993) 28% (n=121)
- Geriatric Population
  - Mahoney (in Press) 34% (n=104)
Cerumen Fact
• Certain drugs, increased emotional states, and mechanical “milking” increase the production of cerumen

Cerumen Fact
• There are marked racial tendencies in the consistency and color of cerumen

Dry cerumen

Wet type of cerumen

Cerumen Facts
• Cerumen topic of interest for anthropologists
• Cerumen topic of study for Breast cancer specialists
• Cerumen and Otitis externa

Asteatosis
• Diminished or arrested action of the sebaceous glands
• Etiological Factors
  • Eczema
  • Cleaning
  • Old Age
• Treatment
  • Skin lubricant (mineral oil)
Question

Cerumen impaction is more common in what type of patient population?

Answer

Higher propensity in:
1. Elderly
2. Patients with cognitive impairment
3. Hearing aid users
4. All of the above

Hearing Aids ???

Insert Hearing Protection ???

Outer Ear Examination

- Rationale for examination
  1. Identification of Pathologies
  2. Cerumen management
  3. Identify contraindications
  4. Precautions
  5. Impact on hearing aid fitting/habilitation
     a. Ear canal movement
     b. Fit, Comfort, and Feedback

Historical Overview

- Otoscopy Interest since 14th Century
- Illumination
  - Artificial Light
  - Candles-Shine through a Flask or Water Glass to Concentrate Light
  - Light Boxes
  - Water Glass
  - Concentrate Light with Concave Mirror
  - Mineral Oil Lamps in Late 19th Century
The Ear Canal
Introduction: Historical Overview

- Ear canal Examination
  - Northern Perspective
  - Not in Winter
  - Only on Sunny Days
  - 11 a.m. - 3 p.m.

- Thomas Edison - Electric Lights

Ear Canal
(External Auditory Meatus)

External Ear

Age related changes

Hairy Tragus

Pinna Examination
The Ear Canal
Anatomy & Pathology

• Aging
  • Stretching/elongation due to loss of elastic and reliance in the epithelial layer of the pinna (Fowler, 1944)
  • Scaliness, dryness, rough appearance and loss of rebound epithelium noted by (Johnson and Hadley, 1964)
  • Hair growth (Hall, 1978)
  • Collapsing Canals

Collapsing Canals: Aging
• Schow & Goldbaum: 41% of all nursing home patients (80+)
• Jerger & Jerger: 1/3 of patients over 65 years of age
• Schow & Randolf: 36% of those 60-79 years of age

Threshold Differences (Collapsed Canal)

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>N</th>
<th>250</th>
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<th>2000</th>
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<td>48</td>
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<td>10</td>
<td>21.3</td>
<td>22.5</td>
<td>28.1</td>
<td>32.6</td>
<td>28.2</td>
<td>25</td>
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<tr>
<td>Ross &amp; Tucker</td>
<td>1965</td>
<td>1</td>
<td>10</td>
<td>12.5</td>
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<td>22.5</td>
<td>30</td>
<td>20</td>
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<td>Gole</td>
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<tr>
<td>Ross</td>
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<td>12.5</td>
<td>35</td>
<td>27.5</td>
<td>20</td>
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<tr>
<td>Chaisin &amp; McClellan</td>
<td>1971</td>
<td>12</td>
<td>12.9</td>
<td>9.1</td>
<td>16.2</td>
<td>24.3</td>
<td>24.5</td>
<td>26.3</td>
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<tr>
<td>Overall Mean</td>
<td></td>
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<td>13.7</td>
<td>18.2</td>
<td>14.2</td>
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<td>7.2-32.5</td>
<td>11.4-35</td>
<td>5-35</td>
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Ear Canal Examination

Ear Canal Examination Instruments

- Head Mirror
- Head Lamp – Ear Loupe
- Otoscopes
- Microscopes
- Video Otoscopes

Ear Canal Examination

Hong Kong, China: A visitor peers into US artist John Baldessari’s “Beethoven’s Trumpet (With Ear) Opus # 133” at the Art Basel fair on March 15, 2015. Hong Kong’s biggest art fair, Art Basel, opened its doors with thousands of visitors expected for a city-wide canvas of creativity and commerce.
Innervation of External Ear Canal

Outer Ear Nerve Supply

The Ear Canal
Anatomy & Pathology
► Reflexes
  ► Cough Reflex
  ► Sneezing
  ► Gagging
  ► Coughing
  ► Vomiting
  ► Fainting/Unconsciousness/Cardiac Depression
  ► Dizziness
Etiology of Ear Canal Reflexes

• Reflexes
  • Posterior Auricular branch of Facial (VII)
  • Auriculotemporal Branch of the Mandibular Division of Trigeminal (V)
  • Auricular Branch of the Vagus Nerve (X)

Outer Ear Examination

• Pathologies of the Outer Ear

Foreign Bodies
Diagnosis of Cerumen Impaction

► Question

When should a clinician diagnose cerumen impaction?

► Answer

1. Presence of cerumen is associated with symptoms
2. Prevents needed assessment

What does this mean?

A Comprehensive Approach to Cerumen Management

Instruments and Procedures

Plugged Ear Canal

ONE APPROACH TO CERUMEN MANAGEMENT

Let me blow in your ear.
Outline

- Ear Canal Examination
- Case History
- Contraindications
- Precautions
- Techniques to Extract Cerumen
- Post Extraction Evaluation

Ear Canal Examination

- Identify Pathological Conditions
- Cerumen Management
- Contraindications
- Precautions
- Other Complications

Ear Canal Examination Instruments

- Head Mirror
- Head Lamp
- Otoscopes
- Microscopes
- Video Otoscope

Case History

- Ear Infections
- Perforation of Tympanic Membrane
- Cardiac Problems
- Dizziness
- Age
- Infectious Diseases

Contraindications

[A Decision Process]

[Conditions that might restrict, inhibit, or complicate extraction]

Modifying Factors for cerumen management

- Anticoagulant therapy
- Immunocompromised State
- Diabetic mellitus
- Prior radiation therapy of the head and neck
- Ear canal stenosis
- Exostoses
- Non intact tympanic membrane
Precautions

- Information to the Patient
- Use Clean Instruments
- Personal Protective Barriers
- No Forced Removal
- Documentation
- Medical Assistance
- Follow up Guidelines

Need for intervention if Impacted

- Clinician Should Treat
- Refer to another clinician who can treat.

Need for intervention if NOT Impacted

- Observation
- Patient education on ear hygiene

Cerumen Softening

Use Cerumenolytics

Two Approaches
15 - 45 Minutes
3 - 5 Days

Cerumen Extraction Procedures

Mechanical Removal
Aural Suctioning
Aural Irrigation

Cerumen Extraction Procedures
Mechanical Removal

- Instruments
  - Forceps
  - Loops
  - Curettes
  - Other
Cerumen Extraction Procedures

Mechanical Removal

➢ Procedures
  ➢ Instruction to the Patient
  ➢ Seat the Patient Comfortably
  ➢ Adequate Lighting
  ➢ Insert the instrument gently
  ➢ Dislodge the cerumen
  ➢ Gently Retract Using the Instrument

Advantages
➢ Injury is Extremely Low
➢ Direct Control of the Situation

Limitations
➢ Requires Skills
➢ Patience, Practice, & Time
➢ Cooperative Patient
Cerumen Extraction Procedures

**Suctioning**

- **Instruments**
  - Suction Unit
  - Suction Tip

**Procedures**
- Instruction
- Seat the Patient Comfortably
- Adequate Illumination
- Gently Insert the Suction tip
- Suction the cerumen

**Advantages**
- Easy to suction
- Suction can reduce damage
- Simple and easy

**Limitations**
- May damage the tympanic membrane

**Irrigation**

- **Instruments**
  - Syringe
  - Water PiK-Oral Irrigator
  - Special tip
  - Illumination
Cerumen Extraction Procedures

Irrigation

Procedure
- Instruction to the Patient
- Seat Patient Comfortably
- Place a towel and aural basin
- Place the tip at the entrance of the canal
- Introduce water gently

Advantages
- Easy to remove cerumen
- Requires minimal practice
- Complete removal without complications

Limitations
- Uncontrolled Pressure or Pulse
- Water Temperature
- TM Perforation - Ear Canal Infections
- Dizziness, Diabetes, Cardiac Problems

Post Extraction Evaluation
- Ear Canal Examination
- Documentation
- Medical Referral
Cerumen Management Protocol FlowChart

1. Start
2. Ear Canal Inspection
3. Impaction?
4. Otological & Medical history
5. Contra-indications?
6. Instruments
7. Suction
8. Irrigation
9. Precautions
10. Is softening Required?
11. Extraction
12. Evaluation
13. Complications?
14. Is Cerumen Removed?
15. Test
16. Medical Facility
17. Secondary Intervention

- Ear hygiene
- Counseling on cerumen impaction and hearing aids
- Cost analysis
- Health care burden
- Quality of life assessment
- Suggested intervention: Periodic evaluation by qualified clinician, cleaning hearing aids, over cleaning, use of external items for cleaning, self management
Research Needs

- Universal definition of impaction
- Assess the natural history of cerumen impaction
- Evaluate the efficacy of various methods in a randomized study
- Conduct to study to evaluate the financial analysis

Infection Control

- Sterilization
- Disinfection
- Protective Barriers
- Waste Management

Ceruminologists

Ceruminectomy