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- Email customerservice@AudiologyOnline.com
Earmolds Primer: Custom Earmolds Essentials

Presenter:
Ozden Uslu, MS
Technical Director, Microsonic Earmold Laboratory

Learning Outcomes
After this course, participants will be able to:
- Judge impression quality for earmold
- Select appropriate earmold material
- Select appropriate earmold style
Earmolds Primer: Custom Earmolds Essentials

- An earmold is a custom fabricated device that channels the sound reproduced by a hearing aid through the ear canal.

Quality of an earmold
- is assessed based on the success for delivering its objectives

Key factors to achieve its objectives:
1. Impression quality
2. Earmold material selection
3. Earmold style selection
4. Earmold acoustics
   - Canal length, tubing, bore size, horn effects, venting, filters

We will focus on the first three factors in this course
Earmolds Primer: Custom Earmolds Essentials

<table>
<thead>
<tr>
<th>Objective</th>
<th>Custom Earmold</th>
<th>Universal Dome</th>
</tr>
</thead>
<tbody>
<tr>
<td>to provide a satisfactory acoustic seal</td>
<td>Very good</td>
<td>Poor</td>
</tr>
<tr>
<td>to retain the hearing aid on the pinna</td>
<td>Excellent</td>
<td>Poor</td>
</tr>
<tr>
<td>to acoustically modify the signal produced by the hearing aid</td>
<td>Very good</td>
<td>Poor</td>
</tr>
<tr>
<td>be comfortable to wear for an extended period of time</td>
<td>Very good</td>
<td>Good</td>
</tr>
<tr>
<td>be aesthetically acceptable to the patient</td>
<td>Varies</td>
<td>Fair</td>
</tr>
</tbody>
</table>

Why Custom over Universal Domes?
- Custom earmolds have several advantages over universal domes:
  - Seal
  - Retention of hearing aid
  - Acoustics
  - Comfort
  - Aesthetics
Ear Impression Requirements

- Most earmold fitting issues can be eliminated by taking an accurate ear impression:
- Common issues caused by impression qualities are:
  - Seal
  - Comfort
  - Retention

Key Factor 1: Impression taking process

- Take your time, never rush the process
  - Dispensing the material may take up to 30 seconds per ear
- Keep nozzle tip in the material throughout the process
- Follow this order to fill:
  1. Canal
  2. Tragus
  3. Concha
  4. Helix
Ear Impression Requirements

- The following features have to be present on the impression:
  - Canal length
    - Canal up to the 2nd bend is required
  - Concha
    - Bowl (cavum), crus of helix, and cymba
  - Helix
    - Up until the tip of helix
  - Tragus
    - Minimum ¾ of tragal cartilage

Key Factor 2: Earmold Material Selection

- Our ears grow during lifetime
- The pinna becomes softer with age
- Consider if the patient needs retention
- An easy way to choose appropriate material hardness:
  - Soft materials are recommended for hard pinna
    - Eg. Pediatrics
  - Hard materials are recommended for soft pinna
    - Eg. Seniors
Earmold Materials

<table>
<thead>
<tr>
<th>Soft material</th>
<th>Semi-Soft</th>
<th>Hard Pliable</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILICONE</td>
<td>SILICONE</td>
<td>VINYL (hard)</td>
<td>ACRYLIC</td>
</tr>
<tr>
<td>VINYL (soft)</td>
<td>HEAT CURE SILICONE</td>
<td>HEAT CURE ACRYLIC</td>
<td>POLYETHYLENE</td>
</tr>
</tbody>
</table>

Age groups

<table>
<thead>
<tr>
<th>INFANTS</th>
<th>PEDIATRIC GROUP</th>
<th>ADULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SENIORS</td>
</tr>
</tbody>
</table>

Factors to consider:

- **Hygiene:**
  - The material has to be easy to clean
  - Antibacterial materials may be considered

- **Activities**
  - Duration of hearing aid use
  - Safety

- **Insertion**
  - Do the child need assistance for insertion?
  - Ear canals with sharp bends may require somewhat harder material and matte/silky surface to ease insertion

- **Growth**
Earmold Materials

- **PEDIATRICS**
  - Soft materials are recommended for the following reasons:
    - **Safety**: soft materials may prevent injury for active children
    - **Comfort for extended use**: most children need to wear hearing aid all day long during school months
    - **Tolerance for growth**: frequent visits to audiology offices may not be desired for new earmolds
  - Although polyethylene (PE) is a hard material, it is recommended when none of the soft materials can be used for known allergic reactions. PE is typically chosen as a last resort for its superior hypoallergenic properties.

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Earmold Materials

- **SOFT VINYL**
  - Soft vinyl is recommended for infants
    - Soft and easy to insert
    - Comfortable
    - Can be modified by dispenser
    - Tubing can be cemented
  - Common pediatric material
  - Disadvantages:
    - Prone to shrink
      - Not recommended more for more than 12 month use
Earmold Materials

- **SILICONE**
  - Most popular material type because of its versatile use and desirable qualities:
    - Comfortable
    - Durable
    - Does not shrink
    - Hypoallergenic
      - Both platinum and heat cure types
    - Hygienic
      - Silicone surface is not an ideal environment for germs to grow
  - Tube lock assembly only

- **Platinum cure is the most popular silicone type**
- Variety of hardness options:
  - Shore A 25 - 60
  - Multi-color options
  - Glossy or matte finish
  - Longevity
Earmold Materials

- SILICONE
  - Heat cure silicone is a better choice than platinum cure when:
    - Higher precision is needed for intricate details
    - In-office modification is expected
  - Typically semi-soft, harder than other silicone types
  - Superior seal makes it ideal for power BTE

- HARD VINYL
  - Hard material
  - Becomes pliable with body heat
  - Hypoallergenic
  - Cemented tubing
  - Discreet
Earmold Materials

- ACRYLIC
  - Hard material
  - Hypoallergenic
  - Cemented tubing
  - Discreet
  - Standard acrylic (commonly known as Lucite) is default custom earmold material through hearing aid manufacturers for receiver-in-canal (RIC) devices
  - Heat-cure acrylic is recommended for allergic reactions

- POLYETHYLENE (PE)
  - Hard material
  - Hypoallergenic
  - Cemented tubing
  - Opaque beige only
  - Not popular due to its appearance
  - Typically used as the last option for most severe allergic cases
Earmold Materials

- **COMBO MATERIALS**
  - Two different materials are combined to form the earmold
    - Hard material is used in concha region for retention
    - Soft material is used for the canal to provide stronger seal
  - Recommended for
    - Some surgical ears
      - Retention and seal features cannot be achieved with conventional materials
    - Power BTE + soft canal texture + need extra retention
      - (e.g. 85 year old, profound loss, straight canal)

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Earmold Materials

- **COMBO MATERIALS**
  - Varieties:
    - Acrylic concha with soft vinyl canal
    - Acrylic concha with hard vinyl canal
    - Acrylic concha with semi-hard (heat cure) silicone
    - Semi-soft (heat cure) silicone concha with soft heat cure silicone
Key Factor 3: Earmold Style Selection

- Earmolds are available in a wide range of styles to address different physical challenges and acoustic requirements.
- Recommended for pediatrics, severe to profound hearing loss, and retention on open fittings.

Occluding Earmold Styles

- Occluding earmolds are designed to completely seal the ear canal.
- Recommended for pediatrics and most severe to profound hearing loss and for all power BTE hearing aids.

Picture is courtesy of Microsonic
Occluding Earmold Styles

- CANAL
  - The basic occluding style
  - The least visible style
  - However, it lacks retention feature.
  - Suitable when retention is not an issue
    - e.g. patient’s ear canal has sharp 1st and 2nd bends

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANAL</td>
<td>Occluding</td>
</tr>
<tr>
<td></td>
<td>Available in all materials</td>
</tr>
<tr>
<td></td>
<td>Fills only the canal portion of the ear</td>
</tr>
<tr>
<td></td>
<td>Helix and concha areas are removed</td>
</tr>
</tbody>
</table>

Occluding Earmold Styles

- SHELL
  - Addresses retention issues, and provides perfect seal
  - May not be preferred for cosmetic reasons

<table>
<thead>
<tr>
<th>STYLE NAME</th>
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</tr>
</thead>
<tbody>
<tr>
<td>SHELL</td>
<td>Occluding</td>
</tr>
<tr>
<td></td>
<td>Available in all materials</td>
</tr>
<tr>
<td></td>
<td>Deeply shelled out in the concha area</td>
</tr>
<tr>
<td></td>
<td>Used when acoustic seal is an essential factor</td>
</tr>
</tbody>
</table>
Occluding Earmold Styles

- **CANAL-LOK**
  - Preferred style for appearance
  - Both versions provide good retention

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANAL-LOK</td>
<td>Occluding&lt;br&gt;Available in all materials&lt;br&gt;Similar to canal style, easier to insert and remove</td>
</tr>
<tr>
<td>CANAL-LONG LOK</td>
<td>Occluding&lt;br&gt;Available in all materials&lt;br&gt;Provides additional retention without sacrificing the cosmetic advantages of the Canal-Lok style</td>
</tr>
</tbody>
</table>

Occluding Earmold Styles

- **SKELETON**
  - Provides very strong retention
  - Comparable to Shell style

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKELETON</td>
<td>Occluding&lt;br&gt;Available in all materials&lt;br&gt;Open space in concha for appearance</td>
</tr>
<tr>
<td>¾ SKELETON ½ SKELETON</td>
<td>Occluding&lt;br&gt;Available in all materials&lt;br&gt;Helix is reduced (3/4) or removed (1/2)&lt;br&gt;Recommended Skeleton styles for dexterity issues</td>
</tr>
</tbody>
</table>

Graphic is courtesy of Microsonic.
Occluding Earmold Styles

**DEFORMED PINNA: FLAT CONCHA RIM**
- Both styles provide very strong retention
- Comparable to Shell style

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMI-SKELETON</td>
<td>Occluding&lt;br&gt;Available in all materials&lt;br&gt;Recommended for ears with flat concha rim to avoid earmold sticking out from ear</td>
</tr>
<tr>
<td>CANAL-LOK W/HELIX</td>
<td>Select appropriate style based on the location of flat region on concha rim.</td>
</tr>
</tbody>
</table>

**DEXTERITY issues**
- Difficulty to insert and remove, particularly helix area
- Should be considered for seniors

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANAL-SHELL (Half-Shell)</td>
<td>Concha bowl only. Helix area is completely removed&lt;br&gt;Occluding&lt;br&gt;Available in all materials&lt;br&gt;Performs as Shell style</td>
</tr>
<tr>
<td>¾ SHELL</td>
<td>Concha bowl and part of helix. Helix tip is significantly reduced</td>
</tr>
</tbody>
</table>

Graphic is courtesy of Microsonic
Occluding Earmold Styles

- EXCESSIVE MANDIBULAR ACTION

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOLLOW CANAL</td>
<td>Soft Materials only For severe hearing losses with excessive mandibular action</td>
</tr>
</tbody>
</table>

Graphic is courtesy of Microsonic

CONTINUED

Occluding Earmold Styles

- STYLES FOR RECEIVER-IN-CANAL (RIC) & SLIM TUBE HEARING AIDS
  - Custom earmolds are recommended for RIC and slim tube BTE hearing aids for:
    - Secure fit
      - Significantly better retention than universal domes
    - Comfort
    - Acoustic performance
      - Good seal
      - Options to improve acoustics
        - Canal length, venting
Occluding Earmold Styles

**STYLES FOR RECEIVER-IN CANAL (RIC) & SLIM TUBE HEARING AIDS**

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKELETON</td>
<td>Occluding for RIC hearing aids. Available in SOFT materials only. Friction fit. Receiver or tube model has to be specified for a secure fit.</td>
</tr>
<tr>
<td>CANAL</td>
<td></td>
</tr>
<tr>
<td>CANAL-LOK</td>
<td></td>
</tr>
</tbody>
</table>

*Graphic is courtesy of Microsonic*

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**OTHER OCCLUDING STYLES**

- For use with other than BTE hearing aids

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGULAR</td>
<td>Occluding. Semi-soft and hard materials only. Used with external receiver that snaps into earmold. Body Aids.</td>
</tr>
<tr>
<td>REGULAR W/TUBING</td>
<td>Occluding. Available in all materials.</td>
</tr>
</tbody>
</table>

*Graphic is courtesy of Microsonic*
Non-Occluding Earmold Styles (Open)

- Non-occluding earmolds feature a small outside diameter canal portion to allow amplified sound to pass around the earmold as well as go through the tubing.

They offer the patient a more pleasing sound by providing an “overlay” of amplification on the natural hearing.
Non-Occluding Earmold Styles (Open)

- Non-occluded earmolds are also recommended for patients who have a chronic drainage problem, since aeration of the ear canal is allowed.

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CROS A (no vent)</td>
<td>Hard materials only</td>
</tr>
<tr>
<td></td>
<td>Minimum outside diameter canal</td>
</tr>
<tr>
<td></td>
<td>Long Canal</td>
</tr>
<tr>
<td></td>
<td>Canal-Lok style with longer lok</td>
</tr>
<tr>
<td>CROS B (no vent)</td>
<td>Hard and Soft materials</td>
</tr>
<tr>
<td></td>
<td>Minimum outside diameter canal</td>
</tr>
<tr>
<td></td>
<td>Shorter canal</td>
</tr>
<tr>
<td></td>
<td>Skeleton Style</td>
</tr>
</tbody>
</table>

Graphic is courtesy of Microsonic
Non-Occluding Earmold Styles

- **CROS STYLES**
  - Designed for CROS and many IROS fittings
  - Significant reduction in frequencies below 1000 Hz

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CROS C (no vent)</td>
<td>Hard and Soft materials</td>
</tr>
<tr>
<td></td>
<td>Minimum outside diameter canal</td>
</tr>
<tr>
<td></td>
<td>Short Canal with extended tubing.</td>
</tr>
<tr>
<td></td>
<td>Skeleton Style mold.</td>
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</tbody>
</table>

Graphic is courtesy of Microsonic

Non-Occluding Earmold Styles

- **ADVANCED DESIGN FREE FIELD**

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADVANCED DESIGN FREE</td>
<td>Minimum occlusion</td>
</tr>
<tr>
<td>FIELD</td>
<td>Available in all materials</td>
</tr>
<tr>
<td></td>
<td>Seals canal entrance while leaving the canal itself un-occluded</td>
</tr>
<tr>
<td></td>
<td>Assembled with selective vent (SAV) plug</td>
</tr>
<tr>
<td></td>
<td>Eliminates feedback</td>
</tr>
<tr>
<td></td>
<td>Moderate occlusion</td>
</tr>
</tbody>
</table>

Graphic is courtesy of Microsonic
Non-Occluding Earmold Styles

- **OPEN-FIT STYLES**

<table>
<thead>
<tr>
<th>STYLE NAME</th>
<th>SPECIAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKELETON</td>
<td>SAV is optional</td>
</tr>
<tr>
<td>CANAL</td>
<td>SAV is optional</td>
</tr>
<tr>
<td>CANAL-LOK</td>
<td>SAV is optional</td>
</tr>
<tr>
<td>CANAL-SHELL</td>
<td>SAV is optional</td>
</tr>
<tr>
<td>ADV DESIGN</td>
<td>Assembled with SAV</td>
</tr>
<tr>
<td>FREE FIELD</td>
<td></td>
</tr>
</tbody>
</table>

Aesthetical considerations

- Some individuals may prefer to hide their hearing impairment in their social life
  - Discreet hearing aid models and earmolds may be preferred
  - Dispenser should consider suitable discreet options for the patient
- What makes an earmold discreet?
  - Earmold and tubing color and finish
    - Matching skin tones
    - Surface: matte/dull finish
  - Earmold style
Aesthetical considerations

- In contrast with discreet earmolds, many colorful options are available for those who are comfortable with showing off their hearing aids
  - Multi-color options
  - Various color patterns
  - Glitter
  - Custom engraving of icons and special shapes
  - Addition of stones, gems
  - Glow-in-dark
- Such options are available in:
  - Silicone, vinyl, and acrylic earmolds

References