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Earmolds Primer:
Custom Earmolds Essentials

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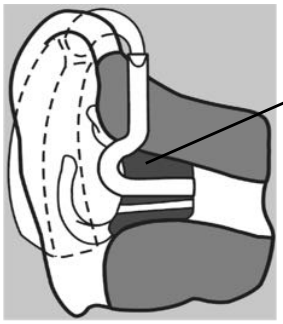
Learning Outcomes

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.



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Earmolds Primer: Custom Earmolds Essentials

- 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

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

Earmolds Primer: Custom Earmolds Essentials

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

Ear Impression Requirements

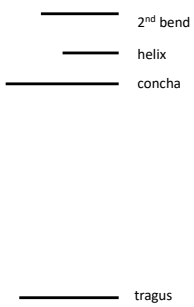
- Most earmold fitting issues can be eliminated by taking an accurate ear impression:
- Common issues caused by impression qualities are:
  - Seal
  - Comfort
  - Retention

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 chose appropriate material hardness:
  - Soft materials are recommended for hard pinna
    - Eg. Pediatrics
  - Hard materials are recommended for soft pinna
    - Eg. Seniors

Earmold Materials

Soft material----------→----------→----------→----------Hard material

SOFT	SEMI-SOFT	HARD PLIABLE	HARD
SILICONE	SILICONE	VINYL (hard)	ACRYLIC
VINYL (soft)	HEAT CURE SILICONE		HEAT CURE ACRYLIC
			POLYETHYLENE

Soft material---------→----------AGE GROUPS----------→----------Hard material

INFANTS

PEDIATRIC GROUP

ADULTS

SENIORS

Earmold Materials

- PEDIATRICS
  - 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.

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

Earmold Materials

- SILICONE
  - 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

Earmold Materials

- 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

Earmold Materials

- 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)

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 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.

Picture is courtesy of Microsonic

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

	STYLE NAME	SPECIAL NOTES
	CANAL	Occluding Available in all materials Fills only the canal portion of the ear Helix and concha areas are removed

Graphic is courtesy of Microsonic

Occluding Earmold Styles

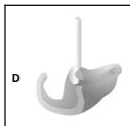
- SHELL
  - Addresses retention issues, and provides perfect seal
  - May not be preferred for cosmetic reasons

	STYLE NAME	SPECIAL NOTES
	SHELL	Occluding Available in all materials Deeply shelled out in the concha area Used when acoustic seal is an essential factor

Graphic is courtesy of Microsonic

Occluding Earmold Styles

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

	STYLE NAME	SPECIAL NOTES
	CANAL-LOK	Occluding Available in all materials Similar to canal style, easier to insert and remove
	CANAL-LONG LOK	Occluding Available in all materials Provides additional retention without sacrificing the cosmetic advantages of the Canal-Lok style

Graphic is courtesy of Microsonic

Occluding Earmold Styles

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

	STYLE NAME	SPECIAL NOTES
	SKELETON	Occluding Available in all materials Open space in concha for appearance
	¾ SKELETON ½ SKELETON	Occluding Available in all materials Helix is reduced (3/4) or removed (1/2) Recommended Skeleton styles for dexterity issues

Graphic is courtesy of Microsonic

Occluding Earmold Styles

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

	STYLE NAME	SPECIAL NOTES
	SEMI-SKELETON	Occluding Available in all materials Recommended for ears with flat concha rim to avoid earmold sticking out from ear Select appropriate style based on the location of flat region on concha rim.
	CANAL-LOK W/HELIX	

Graphic is courtesy of Microsonic

Occluding Earmold Styles

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

	STYLE NAME	SPECIAL NOTES	
	CANAL-SHELL (Half-Shell)	Concha bowl only. Helix area is completely removed	Occluding Available in all materials Performs as Shell style Ideal for dexterity issues (easy insertion & removal)
	¾ SHELL	Concha bowl and part of helix. Helix tip is significantly reduced	

Graphic is courtesy of Microsonic

Occluding Earmold Styles

- EXCESSIVE MANDIBULAR ACTION

	STYLE NAME	SPECIAL NOTES
	HOLLOW CANAL	Soft Materials only For severe hearing losses with excessive mandibular action

Graphic is courtesy of Microsonic

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

	STYLE NAME	SPECIAL NOTES
	SKELETON	Occluding Recommended for RIC hearing aids Available in SOFT materials only Friction fit Receiver or tube model has to be specified for a secure fit
	CANAL	
	CANAL-LOK	

Graphic is courtesy of Microsonic

Occluding Earmold Styles

- OTHER OCCLUDING STYLES
  - For use with other than BTE hearing aids

	STYLE NAME	SPECIAL NOTES
	REGULAR	Occluding Semi-soft and hard materials only Used with external receiver that snaps into earmold. Body Aids
	REGULAR W/TUBING	Occluding Available in all materials

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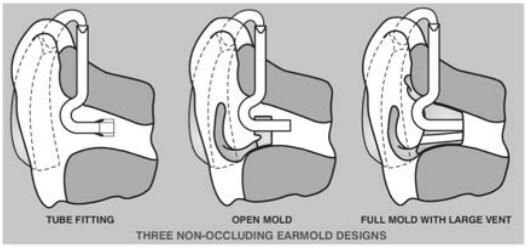
Non-Occluding Earmold Styles (Open)

- 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.



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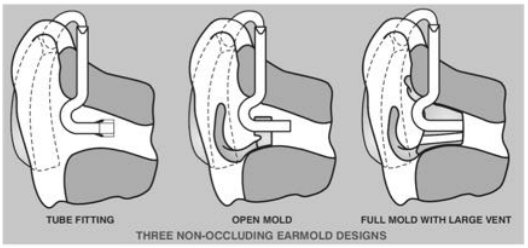
Non-Occluding Earmold Styles (Open)

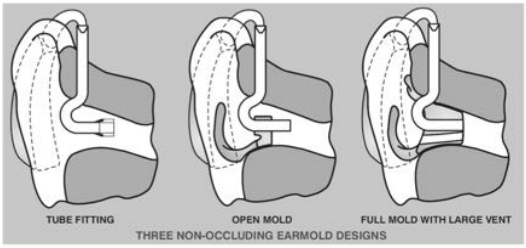
- They offer the patient a more pleasing sound by providing an "overlay" of amplification on the natural hearing.



Graphic is courtesy of Microsonic

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.



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

	STYLE NAME	SPECIAL NOTES
	CROS A (no vent)	Hard materials only Minimum outside diameter canal Long Canal Canal-Lok style with longer lok
	CROS B (no vent)	Hard and Soft materials Minimum outside diameter canal Shorter canal Skeleton Style

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

	STYLE NAME	SPECIAL NOTES
	CROS C (no vent)	Hard and Soft materials Minimum outside diameter canal Short Canal with extended tubing. Skeleton Style mold.

Graphic is courtesy of Microsonic

Non-Occluding Earmold Styles

- ADVANCED DESIGN FREE FIELD

	STYLE NAME	SPECIAL NOTES	
	ADVANCED DESIGN FREE FIELD	Minimum occlusion	Available in all materials Seals canal entrance while leaving the canal itself un-occluded Assembled with selective vent (SAV) plug Eliminates feedback
		Moderate occlusion	
			

Graphic is courtesy of Microsonic

Non-Occluding Earmold Styles

- OPEN-FIT STYLES

	STYLE NAME	SPECIAL NOTES	
	SKELETON	SAV is optional	Available in all materials. IROS (provides largest vent possible) For use with slim tubes or RIC For maximum comfort with own voice
	CANAL	SAV is optional	
	CANAL-LOK	SAV is optional	
	CANAL-SHELL	SAV is optional	
	ADV DESIGN FREE FIELD	Assembled with SAV	

Graphic is courtesy of Microsonic

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

- Microsonic Earmold Manual 8th Edition
- Age- and sex-related changes in the normal human ear. Chiarella Sforza *, Gaia Grandi, Miriam Binelli, Davide G. Tommasi, Riccardo Rosati, Virgilio F. Ferrario.
- American Academy of Audiology Clinical Practice Guidelines on Pediatric Amplification, June 2013.