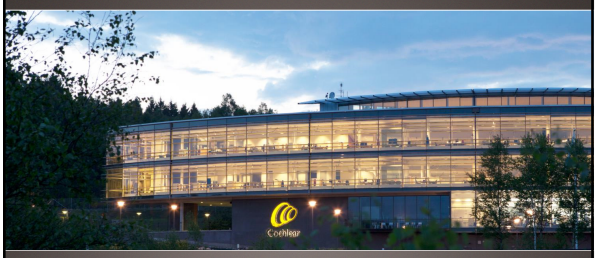


Closing the Gap: Mixed and Conductive Hearing Loss in Adults

Amy Isaacs Donaldson, AuD, CCC/A
Professional Education Manager

Hear now. And always

Agenda

- Introduction to conductive and mixed hearing loss (CMHL) in adults
- Treating conductive and mixed hearing loss with Baha® technology
- Exploring Baha solutions for adults

Conductive and Mixed Hearing Loss (CMHL) in Adults

- Just under half of all hearing impairments can be classified as conductive or mixed[1]
- Conductive hearing loss may be more common in conjunction with certain diseases - 17% of patients with rheumatoid arthritis exhibited clinically significant conductive or mixed hearing loss in one study[2]
- Cholesteatoma has an incidence of 6.8 per 100,000 patients per year and re-occurs in 44% of patients[3]
- The prevalence of Otosclerosis is 0.3-0.4% in people of European descent but may be rarer in people of African or Asian descent[4]
- Chronic suppurative otitis media (CSOM) prevalence is highly dependent on geography and ethnicity with prevalence ranging from 0.4% in North America and Europe to 4% in Africa and China and as high as 7% in India[5]

1 - Margolis RH, Saly GL. (2008) Distribution of hearing loss characteristics in a clinical population. Ear Hear. 29(4):524-32.
2 - Raut W, Cullen J, Cathers G. (2001) Hearing loss in rheumatoid arthritis. J Otolaryngol. 30(5):289-94.
3 - Britze A, Møller ML, Qvesen T. (2017) Incidence, 10-year recidivism rate and prognostic factors for cholesteatoma. J Laryngol Otol. 131(4):319-328.
4 – Thys M, Van Camp G (2008) Genetics of Otosclerosis. Otology & Neurotology. 30:1021-1032.
5 – World Health Organization (2004) Chronic suppurative otitis media: Burden of illness and management options. ISBN 92-4-159158 7

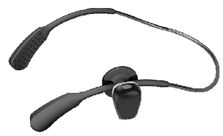
Treatment Options for CMHL in Adults

Surgical Treatment Options

- Middle Ear Surgery
  - Stapedectomy
  - Tympanoplasty
  - Cholesteatoma removal
- Pressure equalization (PE) tubes
- Implantable hearing devices such as Baha® Connect or Baha® Attract

Non-surgical Treatment Options

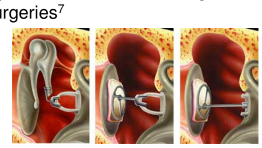
- Air conduction hearing aids
- Bone conduction hearing aids
- Non-surgical Baha solutions, such as SoundArc or Softband



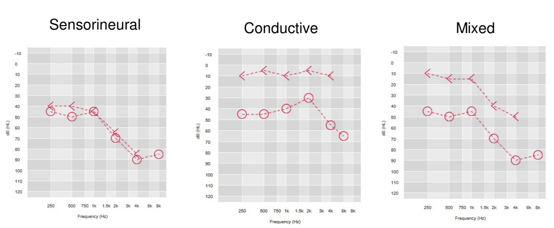
Middle Ear Surgery

- Common middle ear surgeries include tympanoplasty, ossiculoplasty and stapedectomy
- Over 300,000 ear surgeries are performed each year in the US (excluding myringotomy and tubes)[1]
- For tympanoplasty and ossiculoplasty, 60-70% of patients will have "successful" hearing restoration (air-bone gap of 20 dB or less)[2-5]
- Stapedectomy is more successful with over 90% of patients achieving closure of the air-bone gap to within 10 dB[6], although that number drops to 64% for revision surgeries[7]

1 – Hall MJ, Schwartzman A, Zhang J, Liu X, Division of Health Care Statistics. National Health Statistics Reports: Ambulatory surgery data from hospitals and ambulatory surgery centers: United States, 2010, Number 102 (February 28, 2017)
2 - Iniguez-Cuadra R, Alobid I, Bores-Domenech A, Menendez-Colino L-M, Cballero-Borrego M, Bernal-Sprekelsen M. (2010) Type III tympanoplasty with titanium total ossicular replacement prosthesis: Anatomic and functional results. Otology & Neurotology, 31(3): 409-414.
3 - Cox MD, Trinidade A, Russell JS, Dornhoffer JL. (2017) Long-term hearing results after ossiculoplasty. Otol Neurotol, 38(4):510-515.
4 - Stankovic MD (2008) Audiologic results of surgery for cholesteatoma: Short- and Long-term follow-up of influential factors. Otology & Neurotology, 29(7):933-940.
5 - O'Reilly RC, Cass SP, Hirsch BE, Kamerer DB, Bernat RA, Poznanovic SP. (2005) Ossiculoplasty using incus interposition: Hearing results and analysis of the middle ear risk index. Otology & Neurotology, 26(5):853-858.
6 - Vincent R, Sperling NM, Oates J, Jindal M. (2006) Surgical findings and long-term hearing results in 3,050 stapedotomies for primary otosclerosis: a prospective study with the otology-neurotology database. Otl Neurotol, 27(8 Suppl 2):S25-47.
7 - Vincent R, Srovers M, Zingade N, Oates J, Sperling N, Deveze A, Grolman W. (2010) Revision Stapedotomy: operative findings and hearing results. A prospective study of 652 cases from the otology-neurotology database. Otol Neurotol, 31(6):875-82.



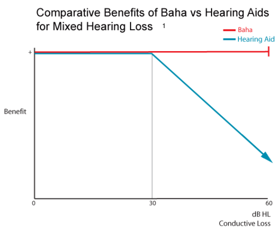
Hearing Aid Fitting[1]: CMHL



1/3 Gain Rule	75% ABG + BC	75% ABG + BC
Average Gain ~ 21 dB	Average Gain ~ 34 dB	Average Gain ~ 55 dB

1 - **Simplified for illustration purposes**, formulas are based on:
- Lybarger S. (1963) Simplified fitting system for hearing aids. Catonsburg, PA: Radioear Co; McCandless G .
- Lyregaard P. Prescription of gain and output (POGO) for hearing aids . Hear Instr 1983 ;34
- Byrne D, Dillion H. The National Acoustic Laboratories (NAL) new procedure for selecting the gain and frequency response of a hearing aid . Ear Hear 1986 ;7 :257-65
- Seewald RC, Ramji KV, Sinclair ST, Moodie KS, Jamieson DG. User's manual : computer assisted implementation of the desired sensation level method for electroacoustic selection and firing in children . Version 3 .1, London : University of Western Ontario; 1993

Hearing Aids vs Direct Bone Conduction



- The greater the air-bone gap, the more a Baha system will outperform hearing aids[2]
- Hearing aid prescriptions for conductive and mixed hearing loss require more gain and receive less clinical research than for sensorineural hearing loss[3]
- Hearing aid fitting can be difficult if there is drainage from the ear, ear pain or a mastoid cavity present after mastoidectomy[4]

1 - Snik AF et al. (2005) Consensus Statements on the BAHA System: Where Do We Stand at Present? Annals of ORL 114(12S). 195:1-12
2 – Mylanus EAM, van der Pouq K, Snik M (1998) Intraindividual comparison of the bone-anchored hearing aid and air-conduction hearing aids. Arch Otolaryngol Head Neck Surg, 124(3):271-276
3 - Johnson EE. (2013) Prescriptive amplification recommendations for hearing losses with a conductive component and their impact on the required maximum power output: An update with accompanying clinical explanation. J Am Acad Audiol, 24(6):452-60.
4 - Gluth MB, Friedman AB, Atcherson SR, Dornhoffer JL. (2013) Hearing aid tolerance after revision and obliteration of canal wall down mastoidectomy cavities. Otology & Neurotology, 34(4):711-4.

Baha Systems for CMHL

- ✓ Nothing worn in the ear canal, which is helpful in cases where ear drainage is present[1]
- ✓ Baha processors do not need to be re-adjusted if the air conduction thresholds fluctuate because gain is only required for the bone conduction thresholds
- ✓ Pre-operative testing can be used to predict post-operative benefit[2]
- ✓ Use of the Baha system is associated with high user satisfaction and good long-term benefit[3,4]

1 - Bouhabel S, Arcand P, Saliba I. (2012) Congenital aural atresia: bone-anchored hearing aid vs. external auditory canal reconstruction. Int J Pediat Otorhinolaryngol. 76(2):272-7.
2 - Monini S, Filippi C, Atturo F, Biagini M, Lazzarino AI, Barbara M. (2015) Individualised headband simulation test for predicting outcome after percutaneous bone conduction implantation. Acta Otorhinolaryngol Ital. 35(4):258-64
3 - Gardell ISK, Andresen K, Faber CE, Wanscher JH. (2015) Bone-anchored hearing aids are effective and associated with a high degree of satisfaction. Danish Medical Journal, 62(7):A5108
4 - Rasmussen J, Olsen S, Nielsen LH. (2012) Evaluation of long-term patient satisfaction and experience with the Baha bone conduction implant. Int J Audiol. 51(3):194-9.

Baha Indications

Conductive & Mixed Hearing Loss

Candidacy is based on bone conduction thresholds

Bone Conduction PTA equal to or better than 65 dB at 0.5, 1, 2 & 3 kHz

Bilateral fitting requires symmetric bone conduction thresholds

Less than 10 dB on average (0.5, 1, 2 & 3) or less than 15 dB at individual frequencies

Single-Sided Deafness

Normal hearing in the good ear

Defined as Air Conduction PTA equal to or better than 20 dB at 0.5, 1, 2 & 3 kHz

Surgery can be considered for children 5 years of age or older

Baha® Surgical Solutions

Baha Attract Baha Connect

- The Baha Attract System provides clinically proven performance with nothing through the skin[1]
- The Baha Connect System's direct connection with the implant provides the maximum possible gain[2]
- Two systems with one strong foundation[3]

1 – Briggs R, Van Hasselt A, Luntz M, Goycoolea M, Wigren S, Weber P, Smeds H, Flynn M, Cowan R. Clinical performance of a new magnetic bone conduction hearing implant system: results from a prospective, multicenter, clinical investigation. Otol Neurotol. 2015;36(5):834-41.
2 - Clinicaltrials.gov ID NCT01796236. Clinical and Health Economic Evaluation With a New Baha® Abutment Combined With a Minimally Invasive Surgical Technique
3 - Nelissen RC, Stalfors J, de Wolf MJ, Flynn MC, Wigren S, Eeg-Olofsson M, Green K, Rothera MP, Mylanus EA, & Hol MK. Long-term stability, survival, and tolerability of a novel osseointegrated implant for bone conduction hearing: 5-year data from a multicenter, randomized, controlled, clinical investigation. Otol Neurotol. 2014; 35(8): 1486-91.

Baha Evaluations

- Establish benefit before surgery[1,2]
- Can provide the patient with realistic expectations of surgery
- Can help identify the best surgical candidates through pre-operative testing
- Can assist in choice of processor

1 – Monini S, Filippi C, Atturo F, Biagini M, Lazzarino AI, Barbara M. (2015) Individualised headband simulation test for predicting outcome after percutaneous bone conduction implantation. Acta Otorhinolaryngol Ital. 35(4):258-64.
2 – Snapp HA, Fabry DA, Telischi FF, Arheart KL, Angeli SI. (2010) A clinical protocol for predicting outcomes with an implantable prosthetic device (Baha) in patients with single-sided deafness. J Am Acad Audiol. 21(10):654-62.

Baha 5 Sound Processors: Small. Smart. Powerful.

Baha 5 sound processors share the same unique technology building blocks to deliver a smart and seamless hearing experience to all patients.

- The industry's smallest sound processors.[1]
- The only smart processors with direct-to-device wireless streaming and control.
- Two power sound processors including the industry's most powerful solution.[2]

1. Flynn MC. Smart and Small – innovative technologies behind the Cochlear Baha 5 Sound Processor. Cochlear Bone Anchored Solutions AB, 629761, 2015.
2. Norman, J. Review of fitting ranges. Cochlear Bone Anchored Solutions AB, D773528, 2015.

Bluetooth | Made for iPhone | iPad | iPod

Choosing Baha 5 Sound Processors

- Made for iPhone compatibility to allow direct connection to iOS devices
- Baha 5 Smart App for iOS and Android™ allows patients to control and monitor their device
- Ture wireless™ accessories provide access to sounds in challenging listening environments
- Various retention options and colors allow recipients to personalize their device for their needs

Support and Resources

- Request free information packs for yourself or your candidates at our website

www.cochlear.com/us

- Candidates may contact our innovative Concierge group for answers to their questions and to connect with a local volunteer if desired

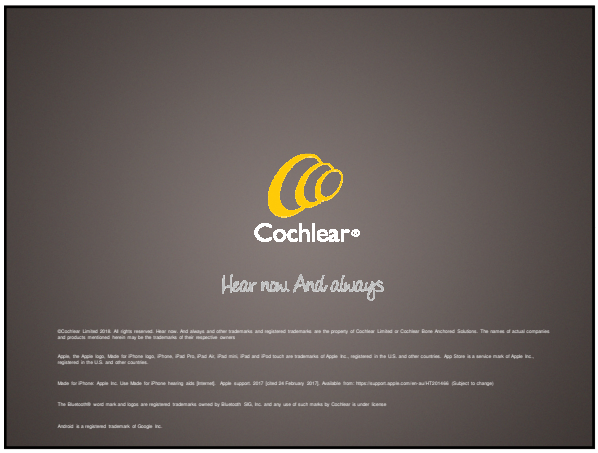
1-877-897-4474 or concierge@cochlear.com

- Recipients can connect directly with Cochlear for all their self-service needs through our Cochlear Family program

www.cochlear.com/us/family

Summary

- ✓ Conductive and mixed hearing loss can be caused by many different diseases and can be more prevalent in certain populations
- ✓ Baha technology provides a unique treatment option for conductive and mixed hearing loss
- ✓ Baha 5 Sound Processors offer True Wireless and Made for iPhone technology to help recipients connect to the world around them
- ✓ Cochlear offers unparalleled support for both candidates and recipients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