

TINNITUS IN CHILDREN AND TEENS

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Format for today

- 1) An overview of tinnitus
- 2) Considerations in assessment
- 3) Considerations in management/audiologic treatment

Tying the opening session of AAAConf19 into tinnitus assessment and management

- Dr. Catherine Palmer. President elect of AAA's perspective of what we do as a profession
 - We don't treat tinnitus, we change people's lives
 - Telling a patient that there is nothing that can be done is not so life changing
- James Kane's, keynote speaker, information about loyalty and trust
 - We need to know the patient
 - Patients with tinnitus want you to know them; loyalty and trust are key

Tinnitus

- “Ringing or buzzing in the ear(s)” Dictionary definition
 - Broader than that: hissing, crickets or cicadas, whooshing, etc.
- Perception of sound in the ears or the head without an external source (Smith et al, 2019)
- Phantom perception
- A symptom rather than a condition
- Conceptualized from a “biosocial” perspective: biological, psychological, and social variables (Andersson, Hesser, & McKenna, 2016)

Possible etiologies (Levi et al, 2019)

- Noise exposure
- Concussion/Traumatic brain injury
- Seizure disorder
- Chiari malformations
- Hearing loss
- Otitis media

The “language” of tinnitus

- The term “suffer”: has, experiences, etc.
- “How weird”
- “Everyone has it”
- “There’s nothing you can do about it
- For audiologists, my friend Jacob Johnson, an otologist, says that we need to “own the ear”
 - Multidisciplinary but we need to address this (maybe not all audiologists but at least some of us)
 - Awareness of tinnitus/hyperacusis/misophonia along with vestibular issues in children changes the playing field and provides best care for children



Children/adolescents and tinnitus: What we know?

- Not very much: Conference at Colorado Children's in September, 2019
- More questions than answers
 - Historically, it is estimated that up to 50% of children with hearing loss have tinnitus
 - We have no idea as we don't ask during case history; and if we ask, do we get accurate results?
 - Important information due to issues with attention, anxiety, and distress for children and teens: Quality of life questions

Children/adolescents and tinnitus: What we know?

- Difficult due to variability in definitions and criteria
- Henry et al, 2019 noted that there needs to be a calibration for audiologists providing tinnitus services; audiologists working with this population (e.g. no coursework in AuD programs)
- Tinnitus not sufficiently studied in children
- No strong evidence base
- Tinnitus may be on the rise in children/teens
 - Increase noise exposure/hearing loss (British Society of Audiology, 2014)
 - Increase in concussion/mTBI (upcoming issue of *Tinnitus Today*, publication of the American Tinnitus Association)

Tinnitus in children

- Thought to be a “common experience” in childhood, particularly in children with hearing loss
- Baguley and McFerran (2016) report it’s more common in children with hearing loss than in children with normal hearing
 - Recent study suggested that 6% of children report tinnitus that is not transient (Plotrowska, Raj-Koziak, Lorens, & Skarzynski, 2015)
 - 12-36% in children with normal hearing acuity (Sheyte, 2010)

Tinnitus in children

- Tinnitus is not an uncommon **symptom** in the pediatric population
- In children with normal hearing, thought to range from 6-34% that report tinnitus (Savastano, Marioni, & de Fillippi, 2009)

Do children report tinnitus?

- Children don't tend to report tinnitus unless it's "new"; for kids with hearing loss, often present their whole life and don't see it as unusual
 - Noise in the ear is "normal" for them if this is a long-term issue
 - Another explanation of why it's not bothersome is that they don't correlate a significance between the sound and a "medical" issue

Do Children report tinnitus?

- Just as in adults, it is likely that many children with tinnitus find it “non-bothersome”
- How to separate those that have “learned to live with it” from those that are bothered/annoyed by it?

Do children report tinnitus?

- Children have difficulty identifying tinnitus and generally do not report it to parents (Kedzierawska et al,2017)
- This study concluded that the majority of children in their study (n=30 10-16 year olds) reported little annoyance from their tinnitus, it did not interfere with their daily activities, and no intervention was needed



Is tinnitus a clinical concern in children?

- Debate based on current research
- Baguley and colleagues (2013) suggest referrals for tinnitus in children is a low number, inferring that children “do not express their distress of tinnitus or require intervention in the same way as adults.”

How bothersome is this for children?

- About 25% of children with hearing loss report bothersome tinnitus (Savastano, Marioni, & de Fillippi, 2009)
- 3-10% are bothered (Sheyte and Kennedy, 2010)

How bothersome is this for children?

- For children with tinnitus that is distressing, it can have a significant impact on physical and psychological well being and educational progress
 - Can have lifelong consequences (British Society of Audiology, 2015)
- Tinnitus distress: Negative emotions that children and parents may feel as a consequence of their tinnitus, such as annoyance, anger, fear, worry, anxiety (British Society of Audiology, 2015).

How bothersome is this for children?

- Many children are not disturbed by their tinnitus, or at least adjust to it
 - My current patient, G., with sudden onset unilateral hearing loss and tinnitus
- For others, it affects sleep, concentration, attention, and psychological well being (Kentish, 2016) and “unusual” auditory behaviors (fear of not hearing the teacher without other explanation) (British Society of Audiology, 2015)
 - Case that I will present on the panel

How bothersome is this for children?

- Can impact general cognitive function (Hallum, McKenna, Sherlock, 2004)
- May be psychologically distressing
 - Explain tinnitus to child and family
 - Address sleep issues: Must be with team
- Educational impact: “Can’t hear” over the tinnitus
- Children with tinnitus report “listening difficulties” and having problems with concentration

How bothersome is this for children?

- Scoping review of pediatric health records (18 years and younger) with tinnitus
- Results demonstrated detrimental affect of tinnitus on quality of life and on emotional wellbeing
- Recommended developing a standard and dedicated measure of tinnitus in children, across a range of domains

(Smith et al, 2019)

Janet

- 59 year old female seeking help for tinnitus management
- When asked when she first noticed her tinnitus, she reported “at 4”.
 - She meant 4 years; father and 2 brothers also reported tinnitus; father also from childhood
- She reported her tinnitus first became bothersome at age 9; sleep over and “her little friend”

Janet

- Hearing loss was diagnosed in her mid-20s; believes she had a hearing loss earlier but recalls her parents being told it wasn't "bad enough" to treat
- Reported struggling in school; thought it was hearing and her "little friend", but teachers told her she had "terrible attention"

Janet

- Fit with hearing aids in her 40s, primarily for relief from tinnitus that didn't happen
- When she arrived at our clinic, it was determined that her hearing aids under fit ("well fit hearing aids help with reducing tinnitus perception")
 - When aids fit to provide appropriate gain, tinnitus perception was reduced significantly
- A lot to consider: Brain still plastic after many years ?/!
 - Addressing the issue of "well fit" hearing aids (those real ear measures do provide useful information 😊)

Asking child about tinnitus

- According to research, may increase the chance that a child will respond that they experience tinnitus if specifically asked (Savastano, 2009); however this is also true in adults
- Audiologists who work with children with tinnitus find that asking the child about their experience provides the opportunity to normalize the experience for the child (going back to my patient, G.) (British Society of Audiology, 2015)

Asking child about tinnitus

- It should be routine part of case history to ask all children seen for an audiologic assessment if they hear noise in their ears/head
- Many children may not have been aware that this is “a thing”

Asking child about tinnitus

- Ask for it to be described:
 - Do you remember when this started?
 - Bees buzzing, drums, humming
 - Can sing it?
 - Draw a picture of the sound (G drew crickets for his mom; brought picture to me and told me he wasn't "a good drawer" but described his crickets in detail)
 - Gauge how bothersome

Description of tinnitus

- Baguley (personal communication): Have child express their “feelings” about tinnitus
 - Draw pictures, tell a story, etc.
 - Describe “your sound”
 - Address annoyance/bothersome aspects
 - Sleep
- Sweetow paraphrase: Drawing attention to the tinnitus draws attention to the tinnitus

Some Case history questions

- Family history of tinnitus
- Otitis media
- Rhinitis/hay fever
- Noise exposure
- Sound intolerance
- Concussion/mild traumatic brain injury (mTBI)
- Medication
- Drug and alcohol use/abuse

“Red flag” responses

- Depression and anxiety, particularly if untreated
- Self-harm or suicidal thoughts
- Reluctance or refusal to attend school
- Emotional issues with family
 - Referral to mental health support rather than proceed with audiology/otology, etc.

Description of tinnitus

- Tinnitus questionnaires
 - None are normed for children; being worked on by physician at Children's Hospital of Colorado
 - In older children and teens, same as used with adults (Tinnitus Reaction Questionnaire—TRQ)
 - Tinnitus Functional Index, with modifications, for teens (Fligor, 2017)
 - Younger children: My World tool from Ida Institute (https://idainstitute.com/tools/my_world/)
 - Ida Institute: Free resources for anyone (professionals, patients, families): <https://idainstitute.com/>

Description of tinnitus

- What time are you aware of the tinnitus and what percentage of time is it bothersome (over past week?)

Evaluating and diagnosing tinnitus/hearing loss

- Comprehensive audiologic: the foundation
 - Pure tone for 250-12,500 Hz with interoctave frequencies
- OAEs
- Tympanometry and AR
 - If hyperacusis is reported/suspected, may choose to not perform acoustic reflexes
- Speech-in-noise testing

Evaluating and diagnosing: A tinnitus evaluation?

- To do or not to do—this is the question!
- British Audiology Society (2015) suggests no clinical or management value of these tests in children
- Use Neuromonics suggested assessment as a guide
 - Pitch match
 - Loudness match
 - NBN masking
 - BBN masking
 - Loudness discomfort level (commodity with hyperacusis)

Team assessment needed

- Medical referral
- Educating physicians about tinnitus in children
 - Great opportunity for Interprofessional Education/Interprofessional practice (Psychologists, physicians, audiologists and more)
 - Patients with concussions: Up to 70% of children with concussion/mTBI report tinnitus
 - Conductive hearing loss

Team assessment needed

- Medical referral
- Parents should be aware of what might happen:
 - Imaging for
 - Unilateral hearing loss/tinnitus (preparing child with tinnitus, assess if it's reactive?)
 - Asymmetric hearing loss
 - Pulsatile tinnitus

Important points

- Explain tinnitus in basic terms
 - Sound that it seems like our ears make and our brains hear
- Involve child in discussion
- Normalize the tinnitus
 - “My little friend” vs. something sinister (what adults think they have a brain tumor)

Important points

- Our opportunity to educate about noise and its deleterious effects on the auditory system
- Hearing conservation
- Young musicians/all music listeners
 - High school music teacher : “Tinnitus is worse than hearing loss”

Questions and opportunities

- Hearing conservation program
 - Many out there
 - Dangerous Decibels: Great opportunity to educate and also to talk about tinnitus (<http://dangerousdecibels.org/>)
- Apps: Many out there and appeal to teens
 - <https://www.resound.com/en-us/hearing-aids/apps/relief>
- Preventive: Searching for answers
- Address listening issues: How are audiologists essential?



Considerations for the program: Interprofessional education/interprofessional practice

Resources: Who is part of your team?

- Otology
- Mental health
- Dentistry / oral surgery
- Physical therapy
- Alternative medicine providers

Specialty clinic set up

- Traumatic brain injury/concussion clinic
- Hearing loss
- Oncology clinic: Survivorship and quality of life
- Questions that lead to referrals



HEARING AIDS AND HABITUATION DEVICES

Sound based therapies


- Sound generators like Neuromonics or Levo
- Wearable sound generator: General Hearing Instruments Tranquil
- Hearing aids with tinnitus device:
 - Widex Evoke with Zen
 - Oticon Opn
 - Signia with Notched Noise (hearing loss only— not for children with normal hearing)

Use of hearing aids with children with tinnitus

- Del Bo and Ambrosetti (2007)
- Hearing aids in patients with tinnitus have two specific benefits: 1) the hearing aid makes the patient less aware of their tinnitus and 2) provides improved communication by reducing the sensation of annoyance perceived and the perception that the tinnitus masks voices

Use of hearing aids with children with tinnitus

- Del Bo and Ambrosetti (2007)
 - Amplification appears to provide sufficient activation of the auditory nervous system to reduce the tinnitus perception and it MAY elicit expression of neural plasticity that can reprogram the auditory nervous system and have a long term benefit on tinnitus by restoring neural function


- 
- No specific research in children related to sound generators or hearing aids

Use of hearing aids with children with tinnitus

- Recent research finds that using hearing aids with sound generators (e.g. Widex Evoke) or hearing aids alone were associated with a clinically significant reduction in tinnitus symptom severity
- Cochrane corner
- Brennan-Jones, et al. (2019)

Use of hearing aids with children with tinnitus

- Care in fitting children with normal hearing acuity with a hearing aid that has a tinnitus habituation option
 - Medical clearance
 - Real ear measures
 - Careful discussion about expectations
 - Considerations for extended bandwidth
 - Follow-up
 - Feedback: Spontaneously told that “ear sounds were quiet”; we talked about it



Hearing aids/amplification/habituatation programs

- Current research indicates that 60-80% of patients that experience hearing loss and tinnitus receive benefit from the fitting of well fit hearing aids.
 - Giving the brain sound that it needs?
 - A couple of “rules”:
 - The hearing aids must be “well fit”: My bucket list request to our profession: Use real ear measures
 - Consistent hearing aid use

Maskers: A classic

- Some patients may benefit from a traditional masker
 - Our clinic experience is that most patients prefer hearing aids, even with a normal audiogram
 - For some patients with “simple” tinnitus, trial of a masker is a cost effective approach and clinically effective
 - Demo stock to borrow

Maskers: A classic

- No research on sound generators as a stand alone treatment in children
- Study on Tinnitus Retraining Therapy (TRT) in children, which was successful (Bartnik et al, 2012)

Michael

- 16 year old teen; “incredible student”, loves music, percussionist
- Mom is a psychologist and we have worked with her with some of our patients
- Brought her son as he complained about concentration, increase in tinnitus perception, etc.

Michael

- Audiologic: Very normal hearing
- Otologic: Unremarkable
- Reported consistent use of hearing protection and monitors levels of listening
- Consistent tinnitus reports
 - Tinnitus questionnaire: Aware 80% of the time, bothered 100% of that time

Michael


- Counseling provided by psychologist
- Tried amplification with habituation tool
 - Emailed me to let me know he wanted to move ahead and wanted to pick the color of the hearing aids
 - Describes his ability to listen and concentrate improved significantly
 - Reduced awareness and annoyance significantly
 - “So much better”



COUNSELING

Educational counseling

- Information about tinnitus; children are surprised that others experience tinnitus, too
- The word “suffer”: We don’t use this in our clinic
- Address questions (parents report thinking “sinister” causes for tinnitus)
- Consider issues like sodium and caffeine
- Hearing conservation
- Outline treatment plan and plan for follow-up (e.g. annual audiologic evaluation)



The value of positive and supportive audiology counseling

- Monitoring progress
 - Last week one of our teen patients went from in the 60s on the TRQ to single digits over about a 3 month period (questionnaire tool used despite no normative data on this population; hoping to use as a pre-post)
 - Opted not to get hearing aids/habituations but noted that the information and support provided by the audiology team (preceptor and AuD student) changed his perception/perspective

Counseling

- Best combination for treatment: Device use and cognitive behavioral therapist (CBT)
- Children with disturbing tinnitus and normal hearing: 93% have improvement with CBT
- Children with disturbing tinnitus and moderate hearing loss:
 - 83% have improvement with CBT (Lee, Lee, and Kim, 2018)

CBT referral/Team

- Not all counselors are created equally
- Adult CBT provider has grown with our clinic (Rehabilitation Psychologist with a background in pain management, she will see some of our older teens—16 and up)
- Pediatric providers of CBT much wider set of skills
 - Work to educate them about needs of children with tinnitus
- May have to build your own provider


Considerations for the program

- **Resources: Who is part of your team?**
 - **Make sure these people know you might refer to them, and that they have enough of an understanding of tinnitus, hyperacusis, and misophonia and the special considerations that go with this population that you are comfortable referring your patients to them.**
 - **Make sure they are prepared for more referrals: Able to accommodate this unique population**



Cognitive Behavioral Therapy (CBT)

- Teach the patient to better control thoughts, feelings, sensations, memories, and other events they consider private
- Traditional approach to working with tinnitus patients
 - Used with early combination of Neuromonics and therapy to address tinnitus perception



Acceptance and Commitment Therapy (ACT)

- Teaches patient to “just notice”, accept, and embrace their private events, especially unwanted ones
- A: Accept your reaction and be present
- C: Choose a valued direction
- T: Take action

Bibliotherapy

- Effective tool
- Build your library
 - Books that are useful for older children and teens and parents

Bibliotherapy: Building your library

- Living With Tinnitus: A Practical Guide to Understanding, Treating, and Coping with Tinnitus 1st Edition (Laura Cole)
- Living with Tinnitus and Hyperacusis (David Baguley and Don McFerran)
- American Tinnitus Association (ATA.org): Great magazine and tell patients to ONLY look at ATA as a resource



SCHOOL BASED SUPPORT

Support at school

- In-service education for teachers and school personnel
- Add to Individualized Education Plan (IEP) or create an IEP (Other Health Impaired—OHI) in the US
- Develop an accommodation plan
- Generally short term

Information provided to teachers


- Information booklet: Tinnitus in the classroom
- Appendix 8 of British Society of Audiology (2015)
 - Avoiding quiet
 - Preferential placement in the classroom
 - Find a way to alert teacher is tinnitus is triggered



SLEEP

Sleep hygiene

- Sleep is a foundation for tinnitus treatment
- Vicious cycle: Child can't sleep due to tinnitus perception; tired the next day and don't have the ability to concentrate or the resources to address tinnitus
 - Sound pillow
 - Melatonin: Consult with otologist as OTC amount often doesn't provide relief
 - Sound generators
 - Referral/partnership with sleep clinic
 - Apps
 - ReSound Relief



Some additional resources to
build tinnitus foundation

Certificate Holder-Tinnitus Management (CH-TM)

- American Board of Audiology (ABA) created a certificate in tinnitus management based on demand from the profession

<http://www.boardofaudiology.org/certificate-programs.shtml>

Two parts: Foundations of tinnitus management and Tinnitus Management Principles in Practice

Honing your skills

- The Ida Institute
 - FREE
 - Initially based on a standard case model—historically taught physicians with this model
 - Materials that can augment the CH-TM
 - Learning Hall course on Tinnitus
 - Ethnographic films (3) on the topic of tinnitus: Great place for practice and discussion: Focus on emotional aspects of tinnitus

Honing your skills

- The Ida Institute
 - **Materials that can augment the CH-TM**
 - **The tinnitus thermometer: How tinnitus impacts the person; video demonstrating it's use**
 - **Tinnitus thermometer—how the tinnitus impacts the patient; video who demonstrates it**
 - **Tinnitus communication guide—helps to give structure thru open ended questions**
 - **Tinnitus “first aid kit” goal is to help provide **hope** and **reassurance** to the patient—again, gives a structure for this**

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Great pediatric resource

- UK GUIDELINES FOR MANAGEMENT OF TINNITUS IN CHILDREN
- <http://www.thebsa.org.uk/wp-content/uploads/2014/06/Paed-Tin-Guide-Pub-Consul-Compressed.pdf>