Management of Acute Acoustic Trauma (AAT) and Idiopathic Sudden Sensorineural Hearing Loss (SSNHL)

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AAA 2023 + HearTECH EXPO

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Objectives

- Define Noise-Induced Hearing Loss (NIHL), Acute Acoustic Trauma (AAT) and Idiopathic Sudden Sensorineural Hearing Loss (SSNHL).
- Health care burden
- Case presentations
- Discuss physiology
- Discuss management and controversies

Definitions

- NIHL: SNHL caused by exposure to hazardous levels of noise over an undefined period.
- AAT: Immediate hearing loss after impulse or blast wave noise.
- SSNHL: *idiopathic sudden* SNHL loss with symptoms occurring over 72 hours, with ≥ 30 dB loss in 3 consecutive frequencies



Chandrasekhar SS, Tsai Do BS, Schwartz SR, et al. Clinical Practice Guideline: Sudden Hearing Loss (Update) Executive Summary. *Otolaryngol Head Neck Surg*. Aug 2019;161(2):195-210. doi:10.1177/0194599819859883
National Institute on Deafness and Other Communication Disorders. *NIDCD Fact Sheet: Sudden Deafness*. Washington, DC: US Department of Health and Human Services; 2018

Health care burden of NIHL

- The most common occupational disability impacting roughly 16% of US population.
- The most prevalent DOD (Department of Defense) disability.
- The second most common form of SNHL (after presbycusis).
- Tinnitus and cognitive impairment are secondary effects of NIHL.

Occupational noise-induced hearing loss. ACOM Noise and Hearing Conservation Committee. *J Occup Med.* 1989;31:996.

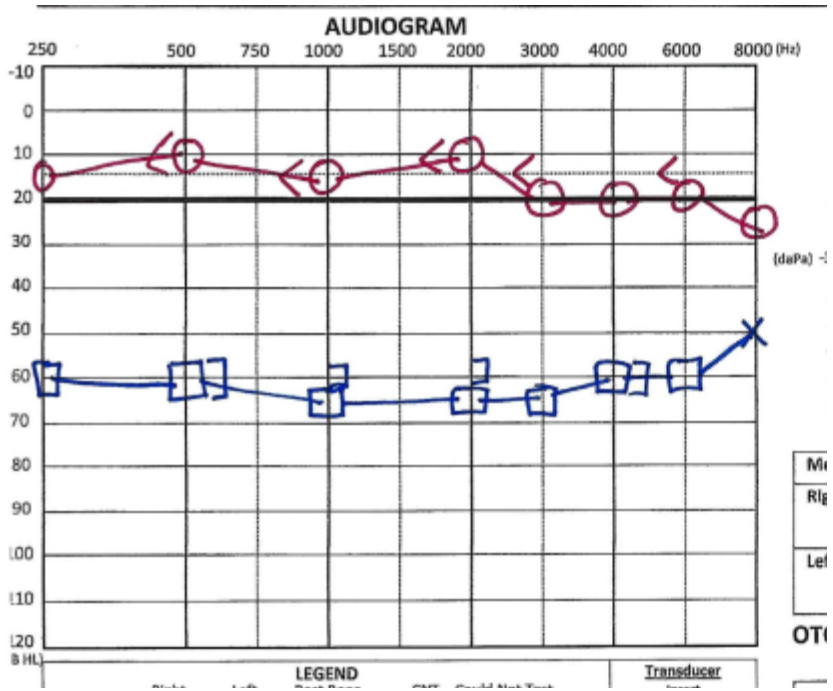
Health care burden of SSNHL

- United States: 5 to 27 per 100,000 people seen in ED, urgent care, PCM office for sudden hearing loss annually
- "Dizziness" present in 30-60% of patients
- Tinnitus nearly universal
- ED/PCM often focus on dizziness and tinnitus, and fail to recognize urgency of treatment for SSNHL

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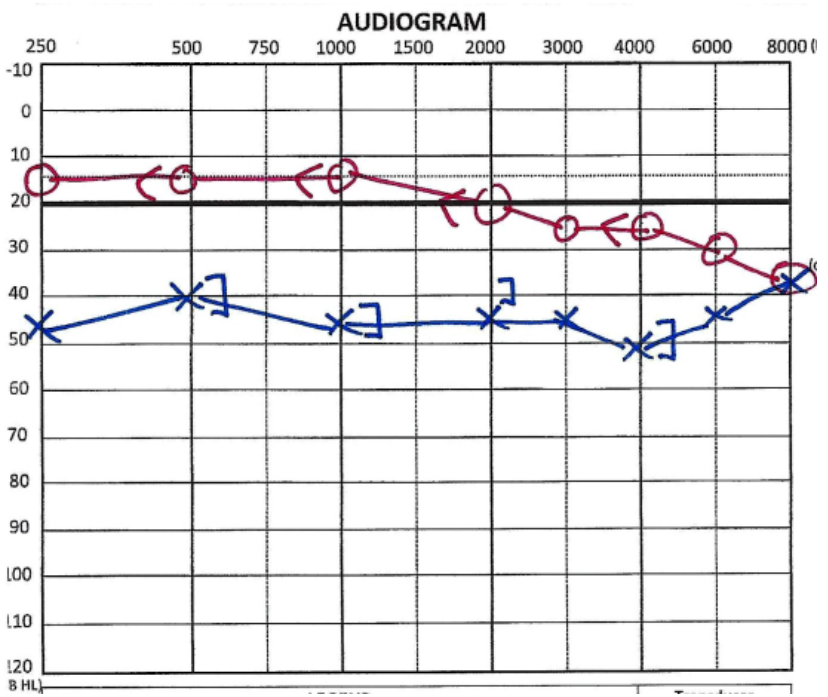
Case Presentations

Patient 1



WRS AD: 100%
WRS AS: 60%

Patient 2

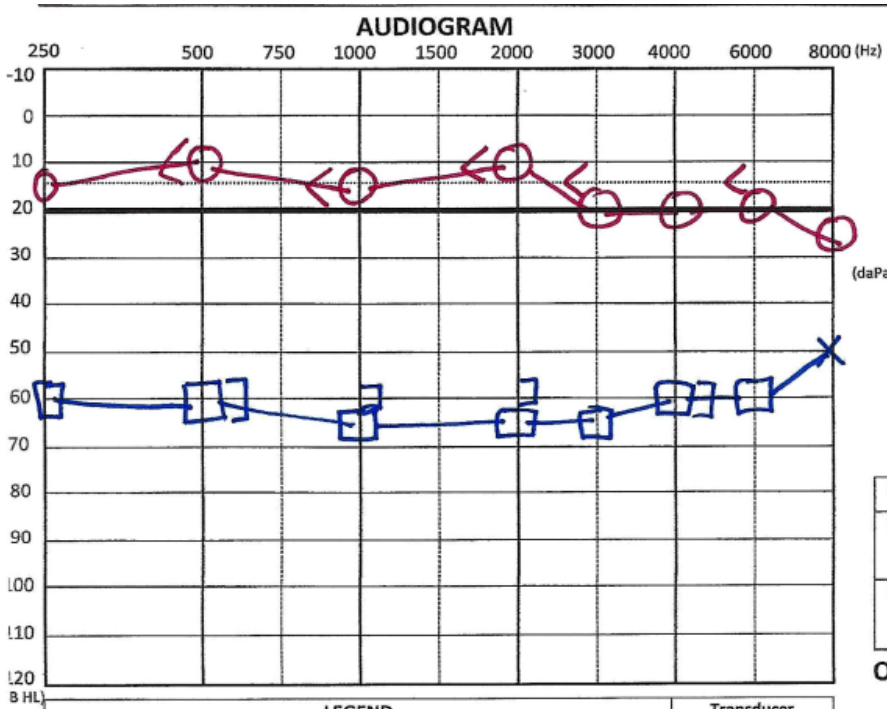


WRS AD: 100%
WRS AS: 72%

Case # 1 Clinical Presentation

20 year-old male presenting 5 days after weapon misfire at the range with LEFT-sided symptoms of:

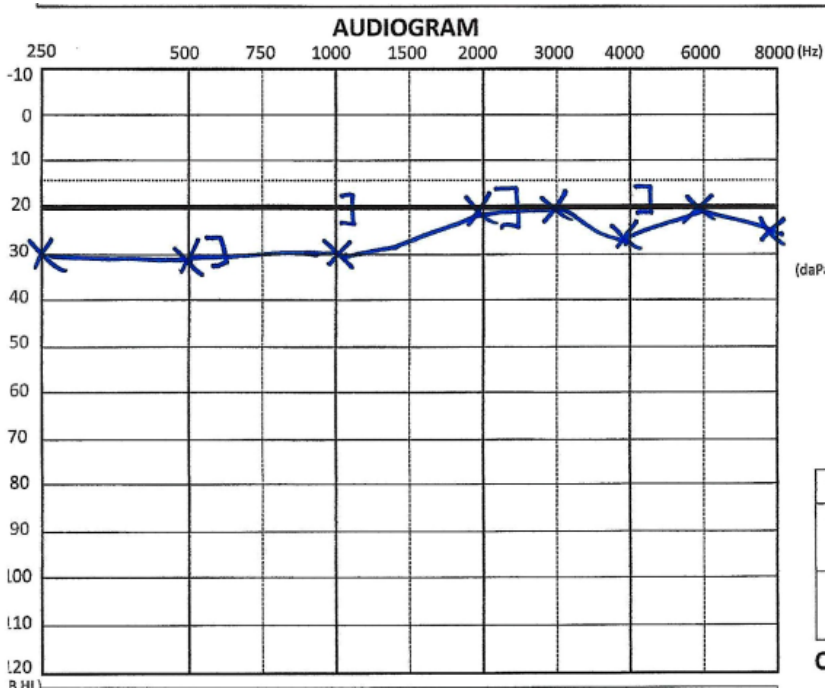
1. **Sudden hearing loss**
2. **Constant nonpulsatile tinnitus**
3. **Aural fullness**



WRS AS: 60%

Case # 1 Treatment – 6 Week Audiogram

- Medical Treatment: 60mg oral prednisone for 7 days
- Gradual but significant improvement in symptoms
- Tinnitus is still bothersome
- Counseling: hearing protection, tinnitus and hearing loss management

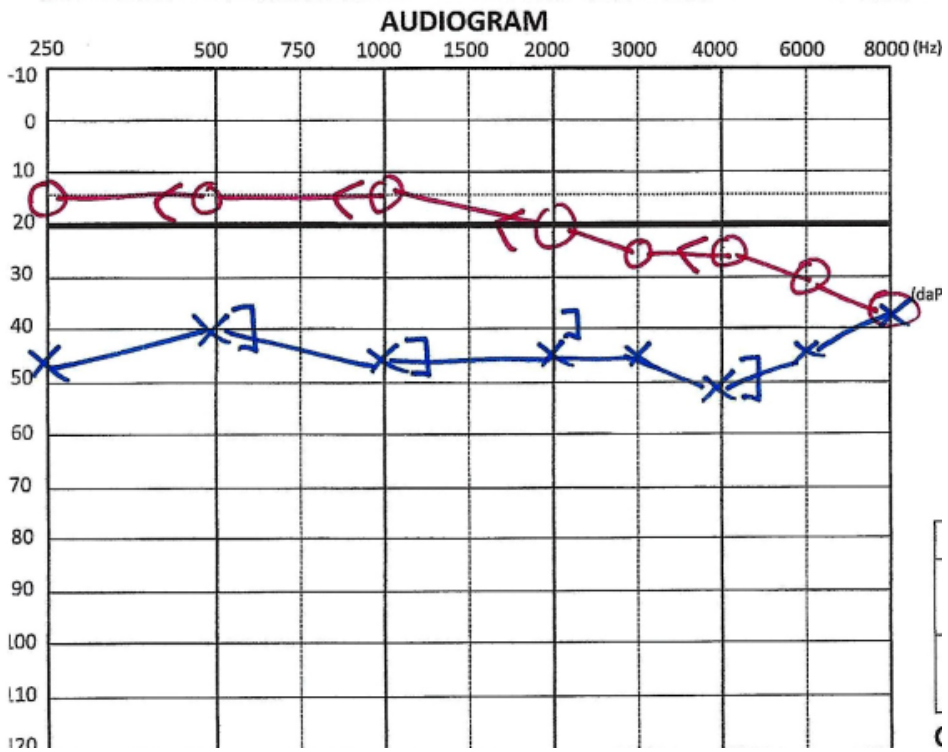


WRS AS: 88%

Case # 2 Clinical Presentation

28 year-old male presenting 7 days after sudden idiopathic symptoms after waking up with LEFT sided:

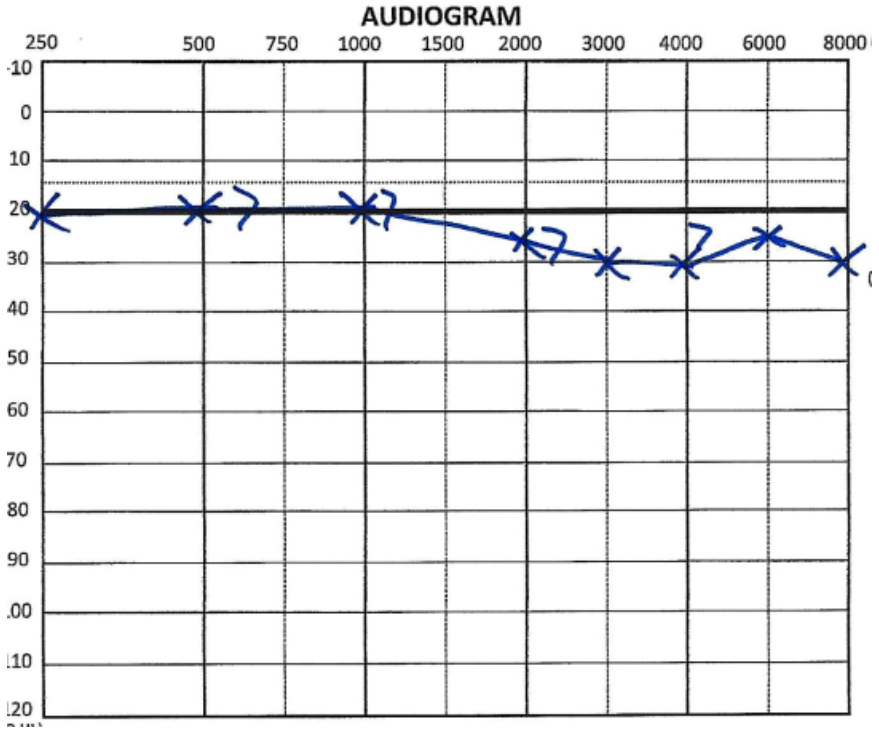
1. **Sudden hearing loss**
2. **Constant nonpulsatile tinnitus**
3. **Aural fullness**
4. **Previously experienced long standing subtle bilateral constant tinnitus.**



WRS AS: 72%

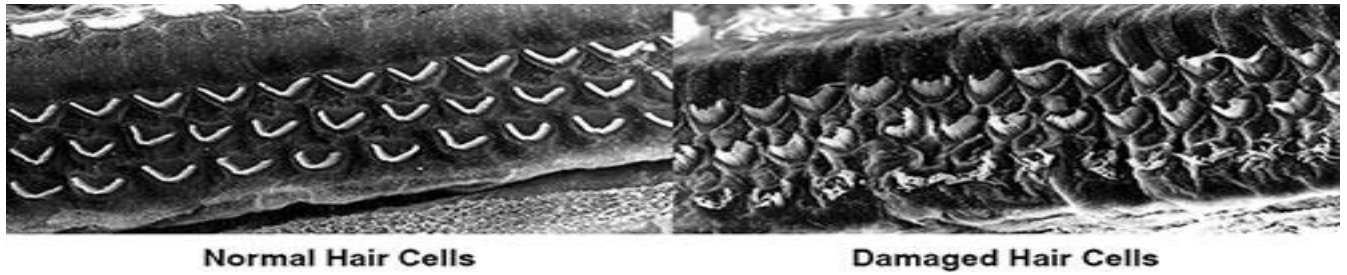
Case # 2 Treatment – 6 Week Audiogram

- Medical Treatment:
  - Oral prednisone 60mg daily x 7 days
  - Transtympanic steroid treatment (dexamethasone 10mg/mL) x 2
- Persistent bothersome bilateral nonpulsatile tinnitus
- Counseling: hearing protection, tinnitus and hearing loss management



WRS AS: 92%

Physiology

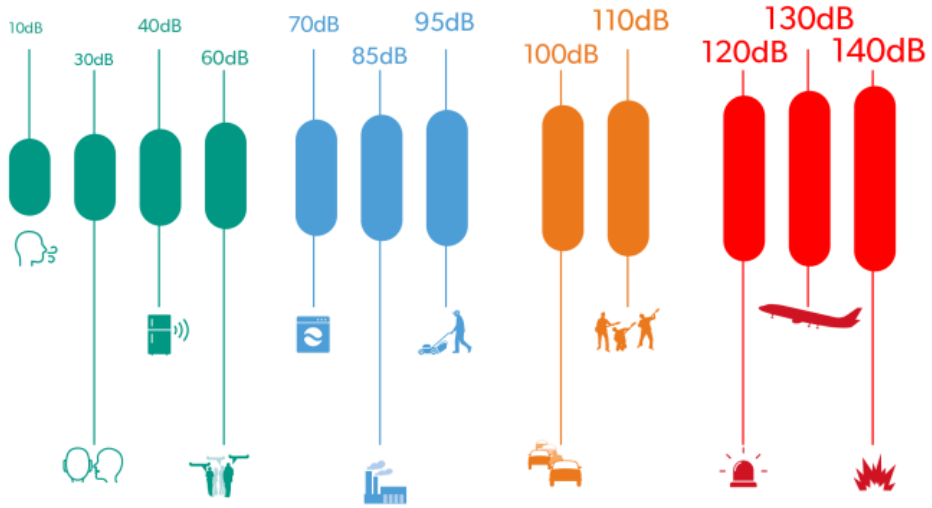


- Intense noise exposure induces a robust inflammatory response with production of inflammatory cytokines and mobilization of immune cells.

- Idiopathic loss is usually related to activation of stress mediating pathways of the inner ear than can then lead to potential mechanical damage.

Bayoumy AB, Weenink RP, van der Veen EL, Besseling-Hansen FS, Hoedemaeker ADM, de Jong FJM, et al. It's all about timing, early treatment with hyperbaric oxygen therapy and corticosteroids is essential in acute acoustic trauma. J Otol. 2021 Oct;16((4)):237–41.

Management of AAT & SSNHL



True ear emergency?

Spontaneous Recovery



- Literature indicates that 32% to 65% of cases of SSNHL and/or NIHL may recover spontaneously.
- Clinical experience shows that these numbers may be an overestimation.
- Tinnitus often persists and becomes the patient's primary concern.

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Supplement

Clinical Practice Guideline: Sudden Hearing Loss (Update)

Sujana S. Chandrasekhar, MD[1,2,3], Betty S. Tsai Do, MD[4], Seth R. Schwartz, MD, MPH[5], Laura J. Bontempo, MD, MEd[6], Erynne A. Faucett, MD[7], Sandra A. Finestone, PsyD[8], Deena B. Hollingsworth, MSN, FNP-BC[9], David M. Kelley, MD[10], Steven T. Kmucha, MD, JD[11], Gul Moonis, MD[12], Gayla L. Poling, PhD, CCC-A[13], J. Kirk Roberts, MD[12], Robert J. Stachler, MD[14], Daniel M. Zeitler, MD[5], Maureen D. Corrigan[15], Lorraine C. Nnacheta, MPH, DrPH[15], and Lisa Satterfield, MS, MPH[15]

SSNHL

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AAO SSNHL Treatment Guidelines

The STRONG recommendations include:

1. Distinguish CHL vs. SNHL
2. Do NOT order CT of the head, lab tests or prescribe antivirals
3. Educate patients on natural history of the condition and possible medical interventions.
4. Counsel patients with residual hearing and/or tinnitus about benefits of audiologic rehabilitation or other supportive measures.

STEROIDS ARE NOT INCLUDED UNDER STRONG RECOMMENDATIONS

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Corticosteroids - optional recommendation for SSNHL?

"Considering the devastation of SSNHL and the profound impact on QOL (quality of life) that a hearing improvement may offer, the [AAO] concludes that even a small possibility of hearing improvement makes this a reasonable treatment to offer to patients."

Chandrasekhar SS, Tsai Do BS, Schwartz SR, et al. Clinical Practice Guideline: Sudden Hearing Loss (Update) Executive Summary. *Otolaryngol Head Neck Surg*. Aug 2019;161(2):195-210. doi:10.1177/0194599819859883

Corticosteroid Side Effects

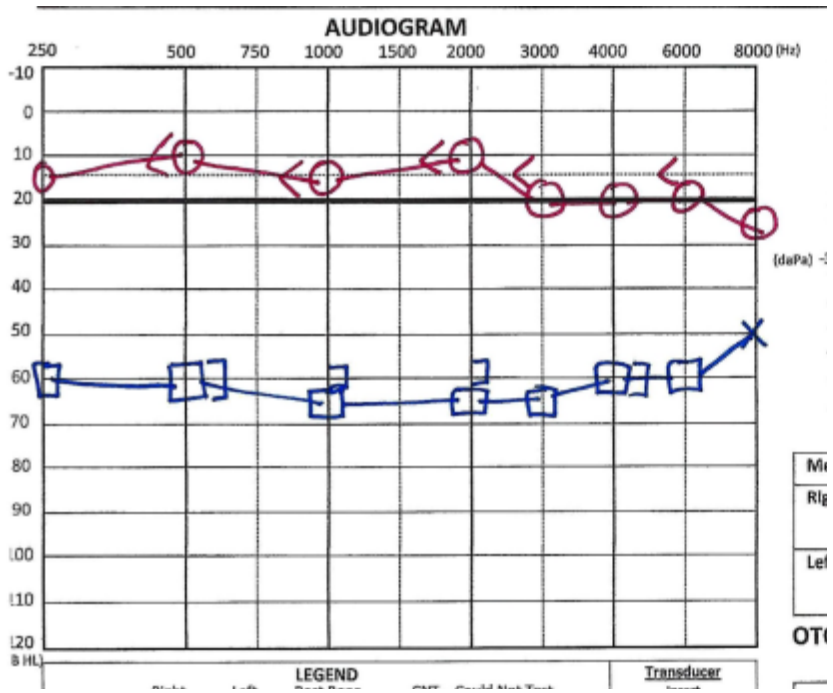
- Increased appetite
- Acne
- Sleep problems
- Indigestion
- Rapid mood swings and mood changes
- Thin skin that bruises easily
- Muscle weakness
- Delayed wound healing

Corticosteroids and AAT

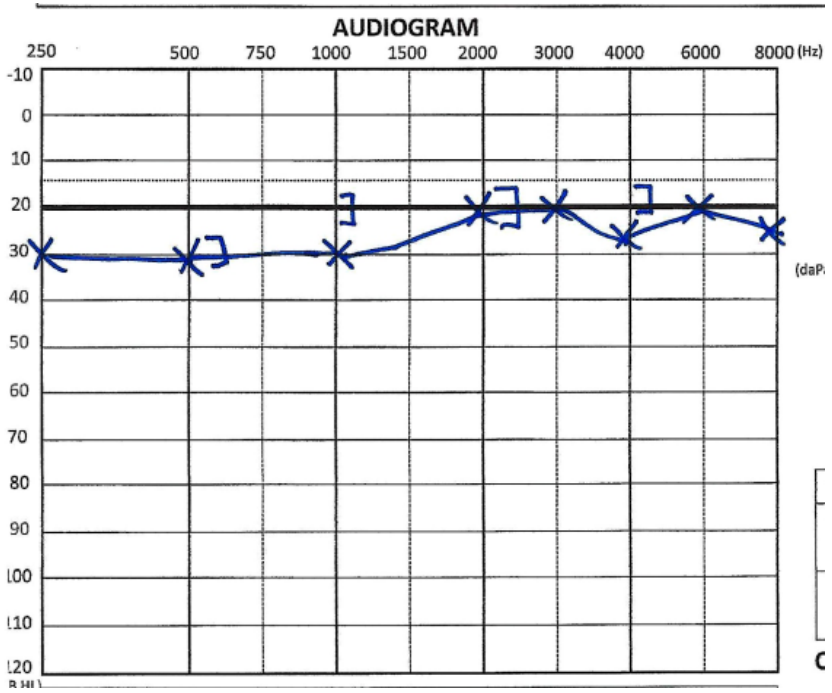
- "Efficacy of Oral Steroids for Acute Acoustic Trauma" , case-controlled non-randomized study
- Design: 263 subjects, 137 (52%) received medical therapy vs 126 (48%) no medical therapy
- Medical therapy: prednisone (1mg/kg/d, 60mg max) for ≥7 days
- Results:
  - Treatment group had 13-14dB improvement in BC at 3-4kHz compared to control (p = 0.001)
  - No difference between AC/BC PTA between both groups
- Conclusions: early (<24 h) treatment with high-dose steroids for ≥7 days demonstrated significantly better hearing outcomes in some frequencies compared with the nontreatment group.

Zloczower E, Tsur N, Hershkovich S, Fink N, Marom T. Efficacy of Oral Steroids for Acute Acoustic Trauma. Audiol Neurootol. 2022;27(4):312-320. doi: 10.1159/000522051. Epub 2022 Mar 1. PMID: 35231916; PMCID: PMC9501729.

Case # 1 AAT with Corticosteroid Treatment



WRS AS: 60%



WRS AS: 88%

Why should a provider use a tuning fork during initial presentation?

A. To avoid needing audiology referral
B. To determine possible middle ear effusion
C. To consider possible SNHL in symptomatic ear
D. To support starting prophylactic systemic steroids before audiology evaluation
E. B-D



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The presentation of NIHL and SSNHL can look very similar on an audiogram. Which of the following IS CRUCIAL for us to do in order to differentiate one from the other?

A. Acoustic Reflexes
B. Word recognition scores
C. Quick-SIN
D. Case History



NIHL is the most common occupational disability impacting roughly _____ of the population.

A. 40%

B. 16%

C. 5%

D. 25%

Corticosteroids are thought to:

A. Reduce inflammation in the inner ear
B. Regenerate outer hair cells
C. Regenerate the auditory nerve
D. Prevent further loss of hearing

Conclusions

- Although still a controversial topic, studies suggest that the benefit of **TIMELY** corticosteroids may outweigh the side effects when managing SSNHL and AAT.
- More **RESEARCH** is needed in order to establish official AAT guidelines.
- It is important to understand the **LIMITATIONS** of available treatments for counseling patients.



Poll the audience!

IF YOU HAD SSNHL OR AAT, WOULD YOU WANT CORTICOSTEROIDS?





Thank you for your time!

Questions?

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