Sudden Sensorineural hearing loss

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Sudden SNHL (SSNHL)

First described in 1944

Sudden complete or partial loss of function of the octavus-system in apparently normal persons.[1]

By A. DE KLEYN.

For this title we intentionally chose the name octavus-system, as for the present it will be left undecided whether the elimination is caused by a loss of function of the peripheral labyrinth of the N. octavus or of the acoustic nucleus region.

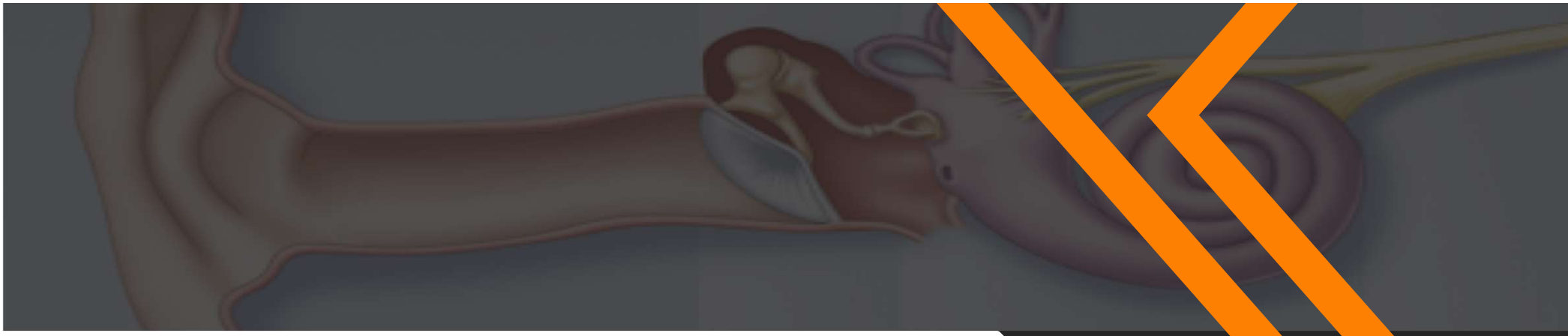
A sudden elimination can be total or partial. In the first case both disorders of the hearing and of the equilibrium will develop, due to the fact that both the acoustic and the vestibular system are involved in the process. In partial elimination on the contrary it is possible that either the acoustic or the vestibular system looses its function more or less isolatedly.

Such sudden eliminations are not seldom seen in the otological clinic. Each physician knows the famous patient of Ménière who complained of sudden violent tinnitus, deafness and dizziness; after death haemorrhages were found in the semicircular canals. However, such extensive labyrinthine haemorrhages are by no means the most frequent form under which these eliminations occur. In case of such haemorrhages the cause is mostly a blood disease, frequently leucaemia.

Far more often the sudden eliminations occur in the course of acute and chronic inflammations of the ear, which are caused either by a toxic serous labyrinthitis, or by a purulent inflammation of the inner ear.

Fractures of the cranial base and other traumatic lesions of the inner ear not seldom give rise to total or partial eliminations of the octavus-system.

Since Ulrich[2] we distinguish otologically longitudinal and transversal fractures of the petrous bone. As a rule the longitudinal fractures leave the labyrinthine block intact. The auditory disorders which are present in these cases are of non-labyrinthine



Introduction

1

According to the WHO, about 360 million people suffer from hearing impairment worldwide.

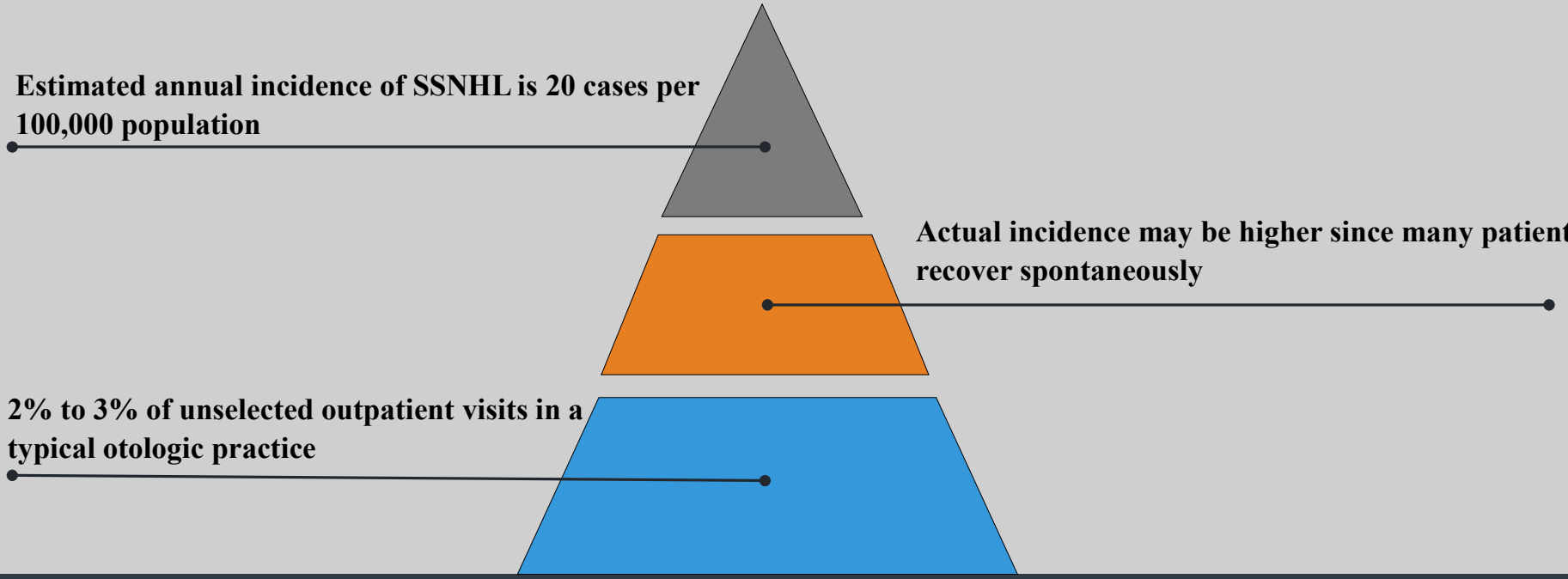
2

In the WHO list entitled “Global Burden of Disease”, hearing impairment ranks 15th

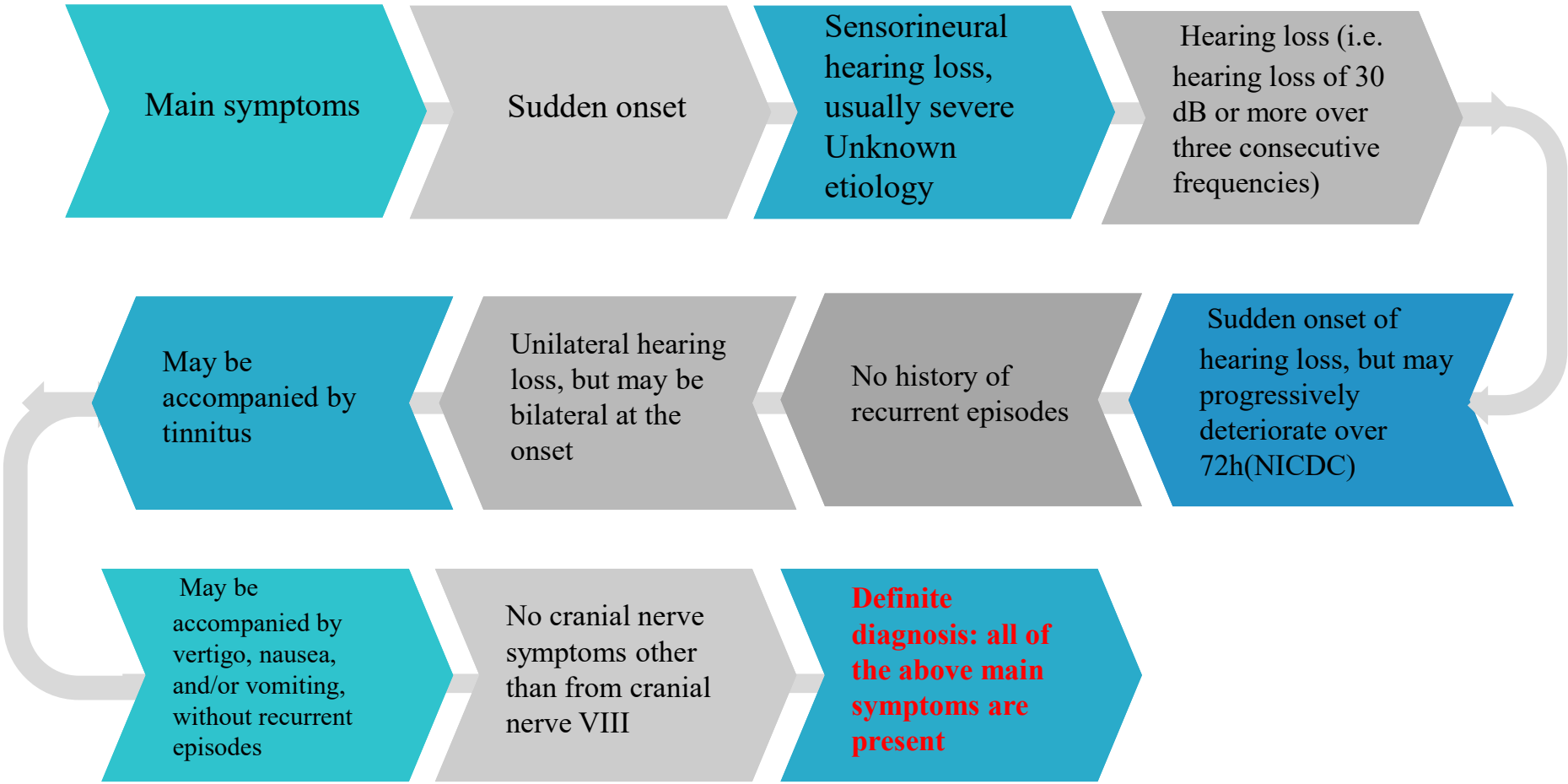
3

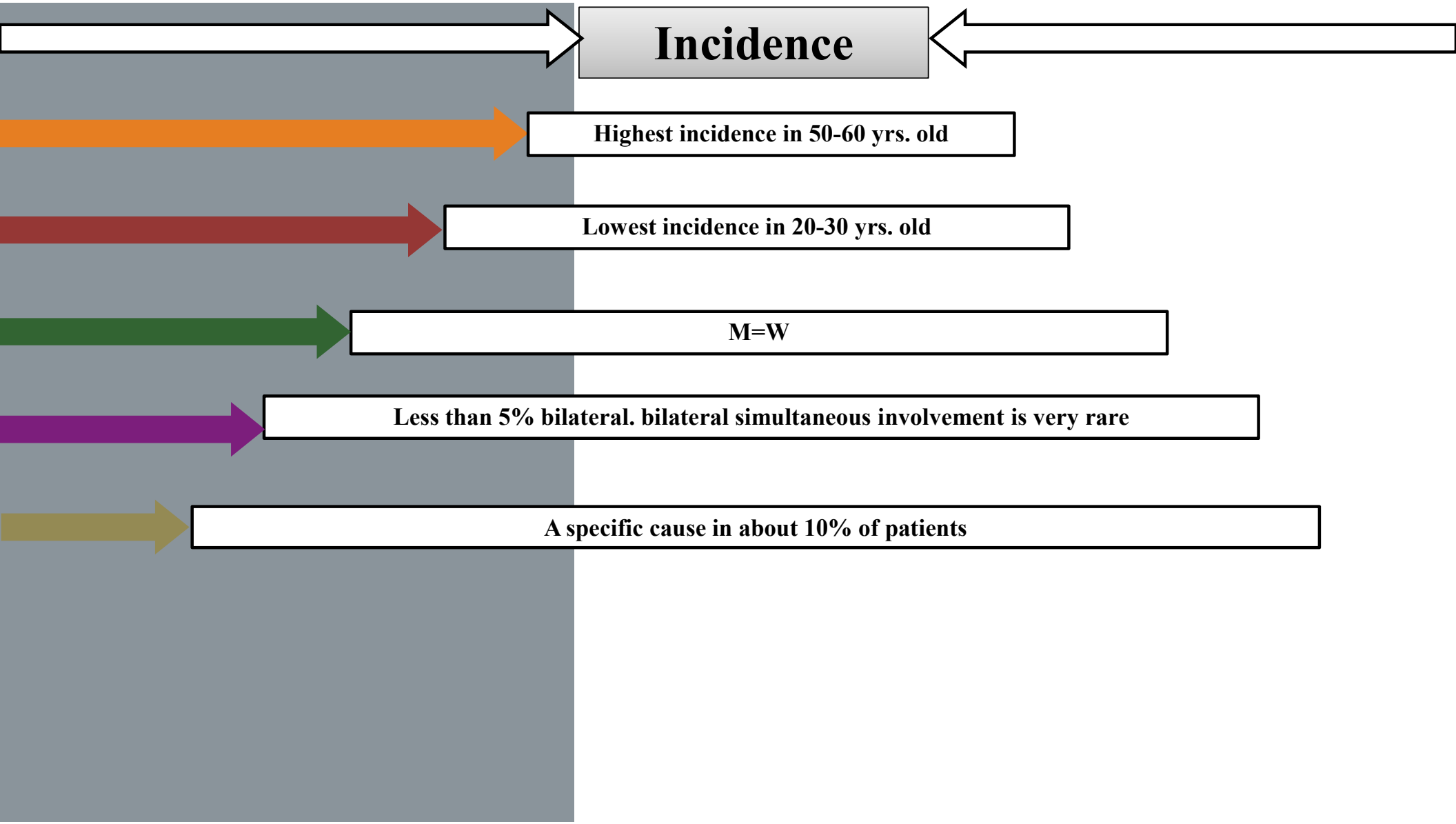
The majority of patients affected by hearing loss(>80%) suffer from sensorineural hearing loss.Apart from age-associated, drug-induced as well as noise-induced hearing loss, sudden idiopathic sensorineural hearing loss is the most frequent cause.

Incidence


Estimated annual incidence of SSNHL is 20 cases per 100,000 population
Actual incidence may be higher since many patients recover spontaneously
2% to 3% of unselected outpatient visits in a typical otologic practice

Definition


Main symptoms
Sudden onset
Sensorineural hearing loss, usually severe Unknown etiology
Hearing loss (i.e. hearing loss of 30 dB or more over three consecutive frequencies)
Sudden onset of hearing loss, but may progressively deteriorate over 72h(NICDC)
No history of recurrent episodes
Unilateral hearing loss, but may be bilateral at the onset
May be accompanied by tinnitus
May be accompanied by vertigo, nausea, and/or vomiting, without recurrent episodes
No cranial nerve symptoms other than from cranial nerve VIII
Definite diagnosis: all of the above main symptoms are present


Incidence
Highest incidence in 50-60 yrs. old
Lowest incidence in 20-30 yrs. old
M=W
Less than 5% bilateral. bilateral simultaneous involvement is very rare
A specific cause in about 10% of patients

Statistics

A

Tinnitus occurs in about 80% of patients

B

Vertigo, indicating an associated peripheral vestibular dysfunction, in about 40%.

C

Up to 80% of patients report a feeling of ear fullness and frequently is the only complaint.

D

Onset occurs in < 72 hours

E

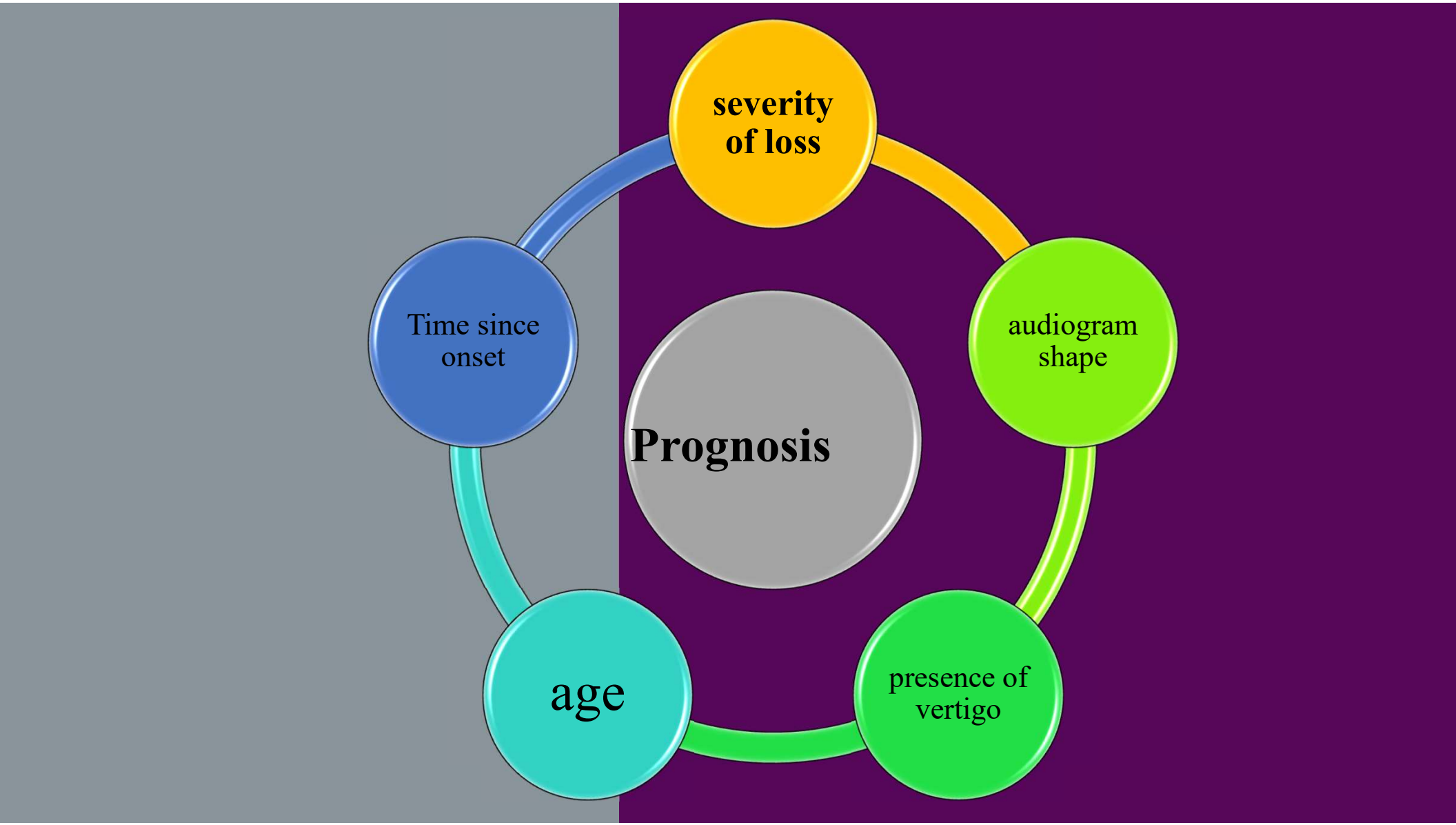
Recovery rate without treatment 30% to 65% other symptoms may remain

F

Usually within two weeks of onset

G

Only 36% patients have complete recovery


severity of loss
audiogram shape
presence of vertigo
age
Time since onset
Prognosis

Risk factors

1. Diet (those low in fresh vegetables) & low folate levels
2. Metabolic syndrome

are associated with an increased risk of SSNHL

3. Chronic otitis media
   DM

may be at higher risk of developing SSNHL

Association between Serum Vitamin D Levels and Risk of Sudden Sensorineural Hearing Loss: A cross-sectional Study

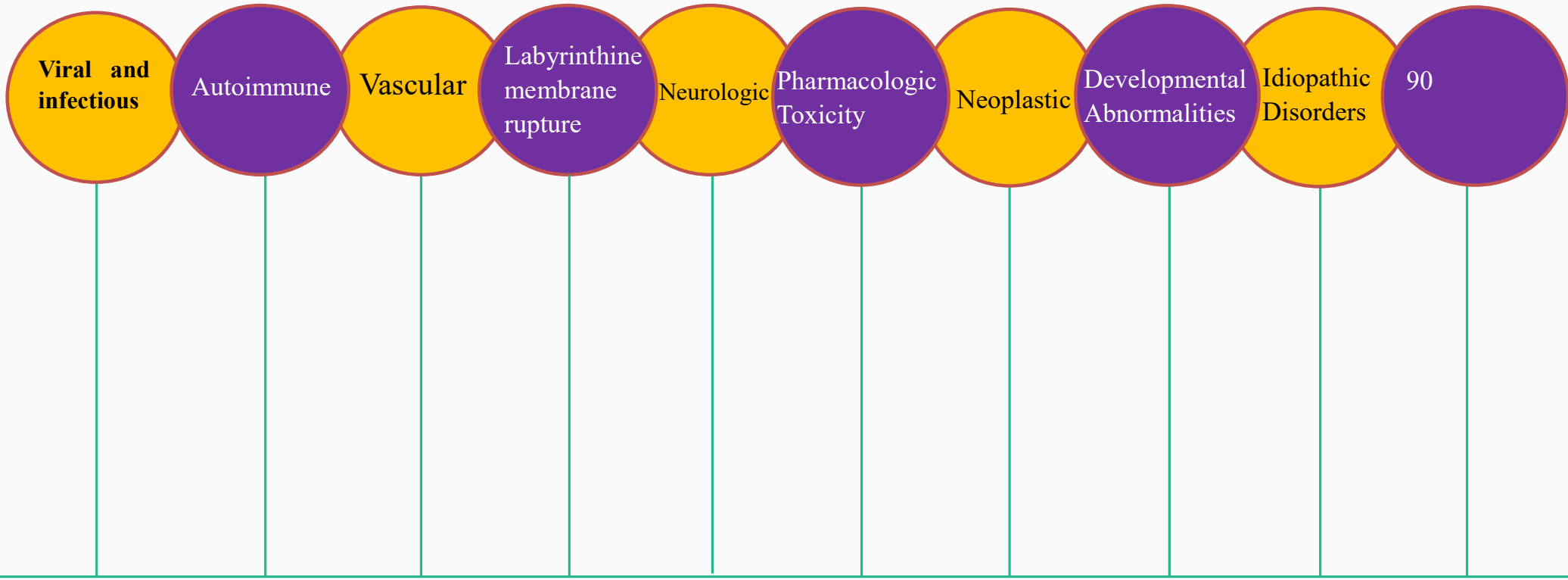
Afshin Zandi [# 1 2], Hassan Mehrad-Majd [# 3], Mohamad Reza Afzalzadeh [1 2]

Affiliations + expand

PMID: 37974694 PMCID: PMC10646042 (available on 2024-12-01)

DOI: 10.1007/s12070-023-03917-9

ETIOLOGY


Viral and infectious
Autoimmune
Vascular
Labyrinthine membrane rupture
Neurologic
Pharmacologic Toxicity
Neoplastic
Developmental Abnormalities
Idiopathic Disorders
90

Neoplastic

A

Acoustic neuroma 10%-%20- present with SSNHL

B

0.8% to3 % of SSNHL patient have acoustic neuroma
Tinnitus
Midfrequency and highfrequency
Electronystagmography abnormalities
Responsiveness of the hearing loss to treatment with steroids is not a reliable indicator that a retrocochlear lesion can be ruled out

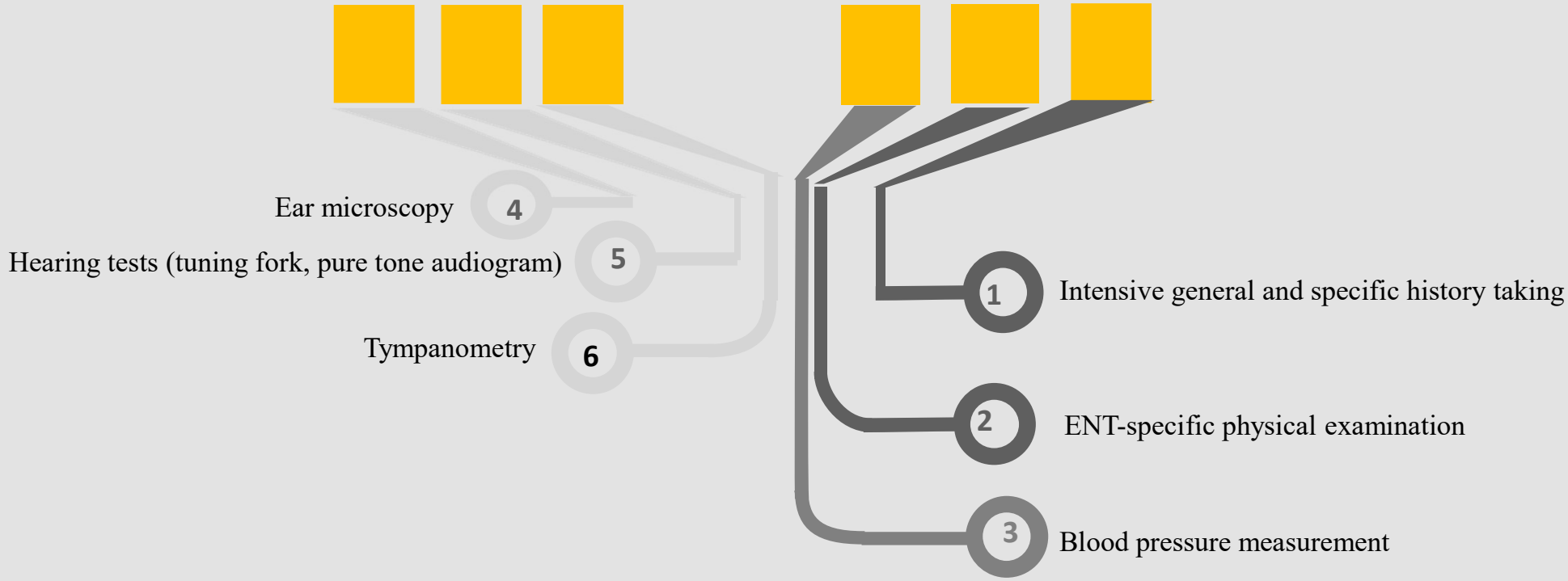
C

MRI
Pacemaker?

D

Neoplasms of the CPA or internal auditory canal other than acoustic neuromas

Diagnostics



History and physical examination

Bilateral SHL

Recurrent episodes of SHL

Focal neurologic finding

Some Symptoms and Signs Suggestive of Nonidiopathic Sudden Sensorineural Hearing Los

- Sudden onset of bilateral hearing loss
- Antecedent fluctuating hearing loss on one or both sides
- Concurrent severe bilateral vestibular loss with oscillopsia
- Gaze evoked or downbeat nystagmus
- Concurrent eye pain, redness, lacrimation, and photophobia
- Focal neurologic symptoms or signs, such as headache, confusion, diplopia, dysarthria, focal weakness, focal numbness, ataxia, facial weakness
- Recent head trauma
- Recent acoustic trauma
- Recent barotrauma

Laboratory examinations

- Specific laboratory examinations (clinical chemistry, serologic testing) may support the differential diagnostics of acute hearing loss

- The existing evidence regarding the usefulness of laboratory examinations is based only on case series and small case control studies without sufficiently demonstrating their benefit

- **Routine examinations, however, are not recommended**

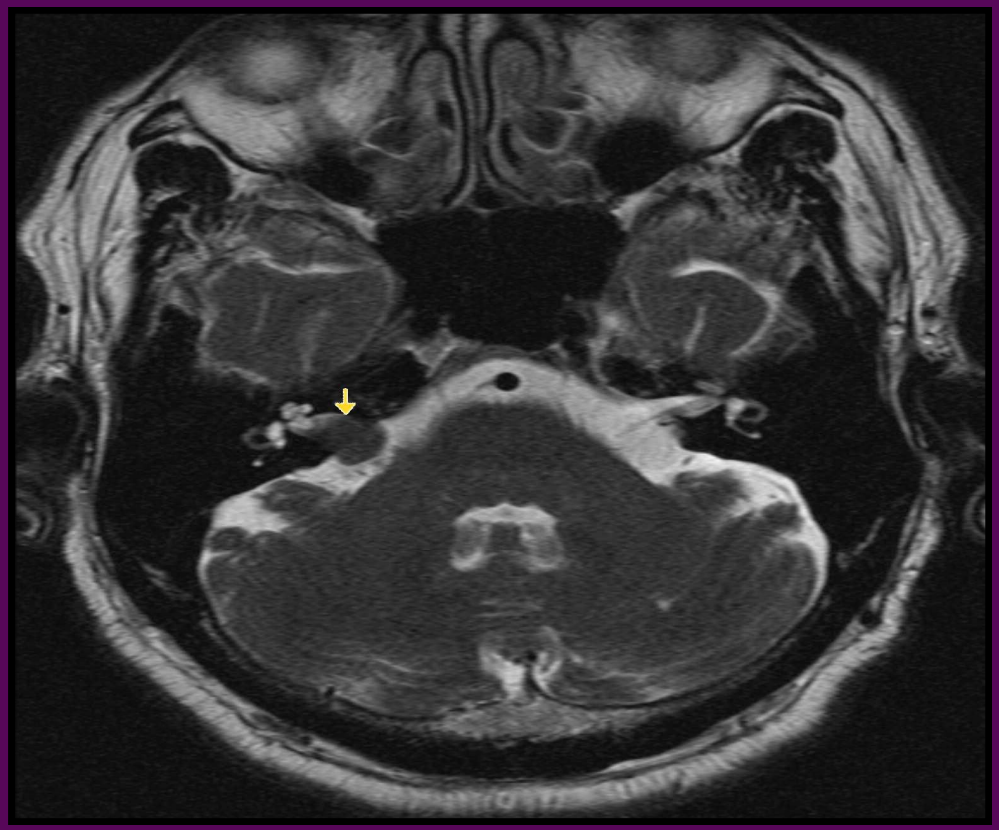
✓ **Magnetic resonance imaging**

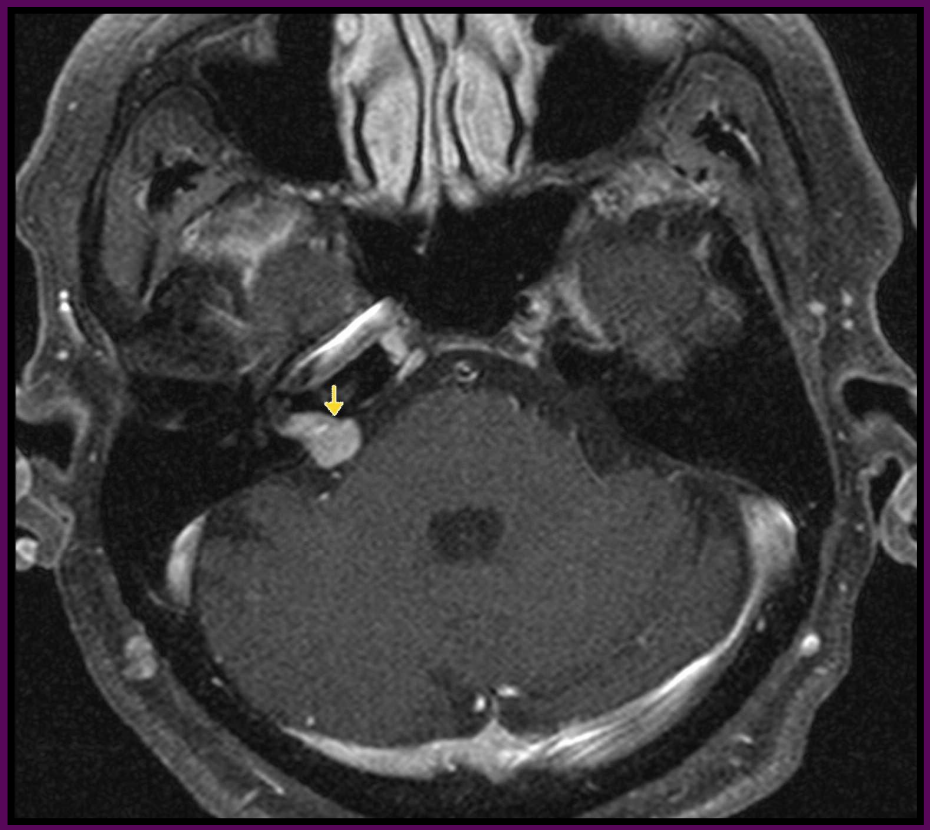
with special attention to the inner ear is generally indicated in all patients showing neuro-otological symptoms, in particular if unilateral and in every patient with acute idiopathic, sensorineural hearing loss

An immediate diagnostic is rarely indicated and should be performed only when a neurological emergency situation is expected. Even complete recovery of the hearing threshold after ISSHL does not exclude the cause of a pathology.

	Cases, n (%)
MRI normal	23 of 54 (43)
MRI abnormal	31 of 54 (57)
MRI abnormality directly related to SSNHL	6 of 54 (11)
Labyrinthine hemorrhage	2
Cochlear inflammation	1
Vestibular schwannoma of IAC and CPA	1
Arachnoid cyst of the CPA	1
White matter lesions	1
Incidental MRI finding unrelated to SSNHL	8 of 54 (15)
Chiari anomaly type I	1
Empty sella	1
Perinatal hypoxic-ischemic insult	1
Variant of temporal lobe venous drainage	1
Parietal meningioma	1
Circle of Willis aneurysm or focal arterial ectasia	3
MRI findings not directly related to SSNHL but possibly expressions of disease	17 of 54 (31)
Microvasculopathic chronic leukoencephalopathy	12
Demyelinating disease	1
Anterior inferior cerebellar artery loop in IAC	4
Artifactual findings on MRI: Artifactual semicircular canal abnormalities	3 of 54 (5.5)

Abbreviations: CPA, cerebellopontine angle; IAC, internal auditory canal; MRI, magnetic resonance imaging; SSNHL, sudden sensorineural hearing loss.





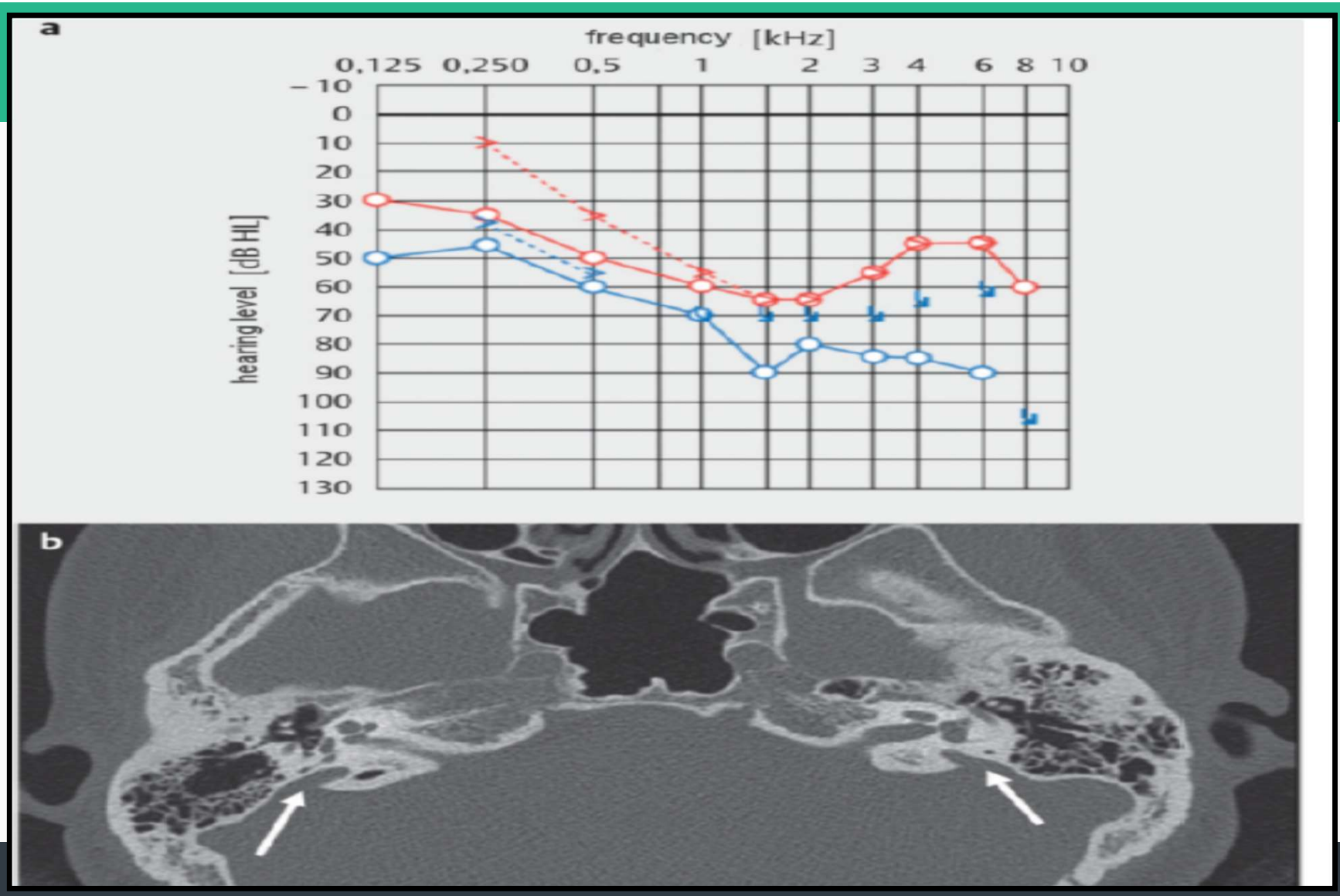
Vestibular Schwannoma in studies on MRI diagnostics in the context of sudden hearing loss

First outhor(year)	Incidence(%)	Number	Hearing loss(dB HL)
Carrire (1997) [131]	1.4	7 of 485	*
Wu et al.(1995) [128]	6	30of 495	*
Schick(2001) [131]	2.3	5of 354	*
Aarnisalo (2004) [132]	5	4of 82	**>25**
Newton (2010) [133]	1.5	2of 132	**>15**
Sheppard(1996) [134]	4.2	38of 892	**>15**
Dawes (1998) [135]	3.7	12of 334	**>20**
Ramos(2005) [136]	6.1	3of 49	**>30**
Fitzgerald (1998) [137]	3.8	3of 78	**>30**
Daniel (2000) [129]	5.2	56of 1070	*
Stokroos (1998) [138]	3.5	1of 28	**>30**
Average	3.9		
Scherb (2013) [30] (total)	4.0	8of 198	**>70**
Scherb (2013) [30] (only Patients Without previous disease)	5.9	3of 51	**>70**

Hearing loss: minimum severity of sudden hearing loss required to be included in the study cohort;
***: severity of hearing loss is not reported (table taken from [30])**

Computed tomography

Patients with sudden hearing loss, i.e. without any hint for a possible cause of the acute sensorineural hearing loss after history taking and examination, are not recommended to undergo immediate computed tomography for differential diagnosis because of the low significance, the costs, and radiation exposure If a malformation of inner ear is suspected (for example **large vestibular aqueduct LVAS)**, computed tomography is **suitable**

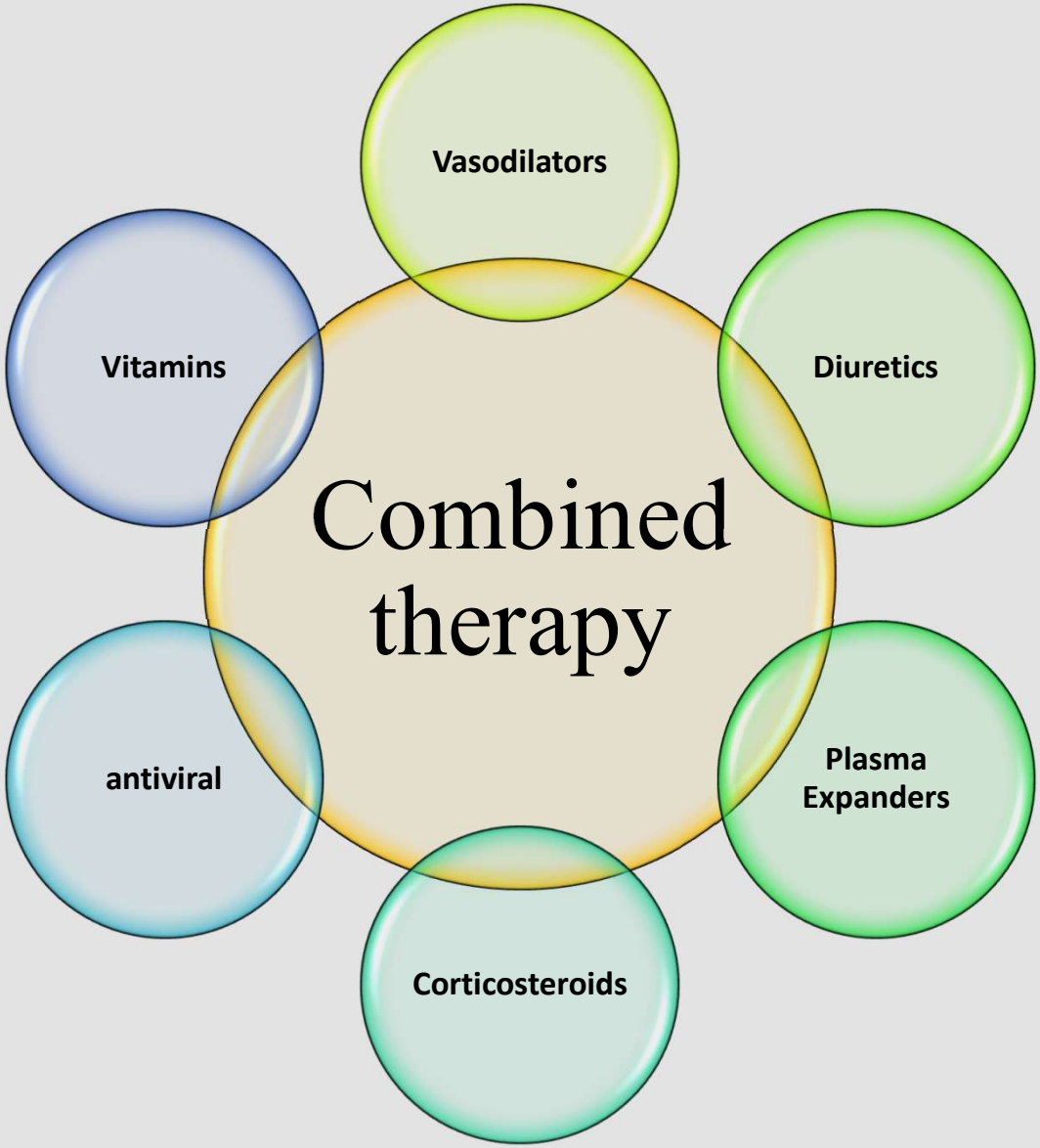

a
frequency [kHz]
0,125 0,250 0,5 1 2 3 4 6 8 10
hearing level [dB HL]
– 10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
b

ABR

- ABR may miss an average of 20% (range, 8%-42%) of intracanalicular vestibular schwannoma tumors.
- ABR is highly sensitive for a vestibular schwannoma >1 cm in size and those in the cerebellopontine angle.
- A normal ABR does NOT rule out retrocochlear pathology.

Criteria used to define audiological improvement

Hearing outcome	**Siegel's criteria**
Complete recovery[1]	PTA<<25 dB or identical to the contralateral, nonaffected ear
Marked/ partial improvement[1]	**.15-dB gain and final PTA of 25-45 dB**
Slight improvement	**.15-dB gain and final PTA worse than 45 dB**
No recovery	>15
[1]Successful treatment: Complate recovery + marked recovery.	


Vasodilators
Vitamins
Diuretics
Combined therapy
antiviral
Plasma Expanders
Corticosteroids

Why steroids?

› Otolaryngol Head Neck Surg. 1996 Jul;115(1):38-41. doi: 10.1016/S0194-5998(96)70133-X.

Receptors for glucocorticoids in the human inner ear

K E Rarey [1], L M Curtis

Affiliations + expand

PMID: 8758627 DOI: 10.1016/S0194-5998(96)70133-X

Abstract

Glucocorticoid receptors were detected in the human inner ear. The highest concentration of glucocorticoid receptor protein was measured by enzyme-linked immunosorbent assay in the spiral ligament tissues; the lowest concentration of glucocorticoid receptors was measured in the macula of the saccule. The demonstration of the presence of glucocorticoid receptors in human Inner ear tissues provides a basis to consider the direct effects of glucocorticoid action on select inner ear cells, rather than assuming a systemic antiinflammatory or immunosuppressive effect during the therapeutic treatment of patients with given inner ear disorders.

Clinical Trial > Arch Otolaryngol. 1980 Dec;106(12):772-6.
doi: 10.1001/archotol.1980.00790360050013.

The efficacy of steroids in the treatment of idiopathic sudden hearing loss. A double-blind clinical study

W R Wilson, F M Byl, N Laird

PMID: 7002129 DOI: 10.1001/archotol.1980.00790360050013

Abstract

Double-blind studies were conducted for the treatment of idiopathic sudden hearing loss (ISHL) with oral steroids. The condition was defined as not less than a 30-dB loss over three contiguous frequencies in three days or less. Follow-up audiograms were obtained four weeks and three months later. Specific audiologic guidelines for the assessment of hearing recovery were used to ensure objectivity. Steroids had a statistically significant effect on the recovery of hearing in patients with moderate hearing losses. The nature of the hearing loss and its susceptibility to improvement with steroid therapy lend support to the hypothesis that viral cochlitis is the primary cause of ISHL.

PubMed Disclaimer

Dose matter ?

› Otolaryngol Head Neck Surg. 2005 Jan;132(1):5-10. doi: 10.1016/j.otohns.2004.09.072.

Oral steroid regimens for idiopathic sudden sensorineural hearing loss

William H Slattery [1], Laurel M Fisher, Zarina Iqbal, Nancy Liu

Affiliations + expand

PMID: 15632902 DOI: 10.1016/j.otohns.2004.09.072

Abstract

Objective: To determine hearing recovery in patients with idiopathic sudden hearing loss treated with varying amounts of oral steroids.

Study design and setting: A retrospective chart review (n = 75) in a tertiary care clinic examined sudden hearing loss patients treated with 1 60-mg prednisone taper, 1 course of steroid less than a 60-mg taper, or any 2 courses of oral steroid.

Results: Overall, 35% of the patients recovered a clinically significant amount of hearing. Recovery was associated with immediate treatment (within 2 weeks from onset), better hearing at the onset of treatment, and treatment with the higher dose of prednisone in patients with just 1 additional symptom (dizziness or tinnitus). Patients tended to continue to experience some recovery in hearing up to 4 months after treatment.

Conclusion: Immediate treatment of patients with unilateral idiopathic sudden hearing loss and additional symptoms (dizziness or tinnitus) with a 14-day course of 60 mg prednisone (with taper) is recommended.

Systemic Steroid

- Benefits:
  - More studied in the literature
  - Can obtain treatment from PCP/ED right away so less delay to see a subspecialist.
  - One visit to doctor to get prescription and get started on treatment
  - Cost of prescription $10

Risks:

- Change in appetite, mood, or sleep pattern, weight gain, gastritis, HTN, hyperglycemia, cataract formation and avascular necrosis of the hip.
- Medically dangerous to use in patients with medical comorbidities such as diabetes.

Systemic steroid versus IT steroid

Corticosteroid pharmacokinetics in the inner ear fluids: an animal study followed by clinical application

L S Parnes [1], A H Sun, D J Freeman

Affiliations + expand

PMID: 10399889 DOI: 10.1097/00005537-199907001-00001

Abstract

Objective: Autoimmune disease (e.g., Cogan syndrome) and other inflammatory inner ear diseases may ravage the labyrinth if not treated aggressively with antiinflammatory medication. Corticosteroids are the mainstay of treatment, yet, partly because of the existence of the blood-labyrinthine barrier, the ideal drug, dose, and route of administration are currently unknown.

Study design: In the present study, we established cochlear fluid pharmacokinetic profiles of hydrocortisone, methylprednisolone, and dexamethasone in the guinea pig following oral, intravenous, and topical (intratympanic) administration. High-performance liquid chromatography was used to determine the drug concentrations, and comparisons were made with simultaneous pharmacokinetic profiles from blood and cerebrospinal fluid.

Results: Our findings demonstrated a much higher penetration of all three drugs into the cochlear fluids following topical application as compared with systemic administration, with methylprednisolone showing the best profile.

Discussion: The results suggested that intratympanic administration of corticosteroids might be more efficacious while avoiding high blood levels and therefore the deleterious side effects of systemic use.

Clinical application: Thirty-seven patients with various inner ear disorders causing sensorineural hearing loss were subsequently treated using intratympanic corticosteroids, 20 with dexamethasone, and 17 with methlyprednisolone. Patients with immune-mediated hearing losses showed the best

Original Contribution

FREE

May 25, 2011

Oral vs Intratympanic Corticosteroid Therapy for Idiopathic Sudden Sensorineural Hearing Loss

A Randomized Trial

Steven D. Rauch, MD; Christopher F. Halpin, PhD; Patrick J. Antonelli, MD; et al

» Author Affiliations | Article Information

JAMA. 2011;305(20):2071-2079. doi:10.1001/jama.2011.679

Intratympanic Steroid

Benefits:

- Can us in patients with certain systemic medical conditions:
  - Insulin-dependent or poorly controlled diabetes
  - Labile hypertension
  - Glaucoma
  - Tuberculosis
  - Peptic ulcer disease
  - Prior psychiatric reactions to corticosteroids

Risks:

- Pain, transient caloric vertigo, TM perforation, infection
- More visits, have to lie down for 30 min after each injection.
- More time consuming and inconvenient
- Cost of IT dex: reimbursed at $172 pe injection (4x = $688) not including cost of 4 doctor visits, lost time at work, parking, childcare costs, etc.

Combined steroid

Article

A Prospective, Multi-Centered Study of the Treatment of Idiopathic Sudden Sensorineural Hearing Loss With Combination Therapy Versus High-Dose Prednisone Alone: A 139 Patient Follow-up

June 2014 · Otology & neurotology: official publi... 35(6)
DOI: 10.1097/MAO.0000000000000450
Source · PubMed

Alex Battaglia · Annette Lualhati · Harrison W Lin · Show all 5 authors · Roberto A Cueva

TABLE 2. *Mean overall hearing change from baseline, final 4-tone PTA, and final SDS as a function of type of therapy*

Overall comparison between treatment groups			
Categories	Pred only (n = 59)	Combo Rx (n = 80)	*p*
Treatment delay	9.2 ± 8.7	7.2 ± 7.6	0.09
Pre-SDS%	26.2 ± 30	12.5 ± 19.9	0.004
Post-SDS%	44.7 ± 40.8	62.4 ± 40.4	0.01
Change SDS%	19.2 ± 36.3	49.9 ± 38.2	<0.0001
Pre-PTA dB	77.5 ± 20.5	84.8 ± 18.0	0.03
Post-PTA dB	65.5 ± 29.4	50.6 ± 27.8	0.005
Change-PTA dB	−12.0 ± 21.2	−34.1 ± 26.6	<0.0001

Despite beginning from a significantly lower baseline than the HDPT group, the improvements in 4-tone PTA and SDS along with the final scores are significantly greater for the combination therapy group. The combination therapy results are very similar to our previously reported results of 40-dB improvement in PTA and 44% improvement in SDS (20).

Combined steroid

Meta-Analysis > Otol Neurotol. 2017 Apr;38(4):487-495. doi: 10.1097/MAO.0000000000001361.

Combined Intratympanic and Systemic Use of Steroids as a First-Line Treatment for Sudden Sensorineural Hearing Loss: A Meta-Analysis of Randomized, Controlled Trials

Xue Han [1], Xiao Yin, Xiaodong Du, Changling Sun

Affiliations + expand

PMID: 28207624 DOI: 10.1097/MAO.0000000000001361

Abstract

Objective: To compare the efficacy of combination therapy (combined intratympanic and systemic use of steroids, CT) with systemic steroid therapy (SST) as a primary treatment for sudden sensorineural hearing loss (SSNHL).

Methods: An electronic database search (PubMed, Embase, Cochrane Library, and CNKI databases) was performed. Review Manger 5.3 was used for data synthesis. Data were collected on the following outcomes of interest: the proportion of patients with hearing improvement, changes in pure tone averages (PTA), and speech discrimination score (SDS).

Results: A total of 14 RCTs including 756 subjects allocated to CT and 638 to SST were selected. The proportion of patients with hearing improvement as outcome measure was observed in 13 studies, which resulted in an odds ratio (OR) of 2.50 (95% confidence interval [CI]: 1.95-2.1). The PTA changes (in dB) as outcome measure was observed in 12 studies, which resulted in mean difference (MD) 13 (95% CI: 9.24-16.77). SDS changes (in %) as outcome measure were reported in five studies, which resulted in MD 15.72 (95% CI: 5.11-26.33).

- 2017 Meta-Analysis of 14 RCTs involving 756 subjects allocated to combined therapy and 638 to systemic therapy alone
- Combination therapy may offer improved hearing, with an odds ratio of 2.5 (95% CI, 1.95-2.1) with a mean difference of 13 dB (95% CI, 9.24-16.77) in PTA and 15% improvement in SDS.

Table 10. General Guidelines for Corticosteroid Therapy for SSNHL.[a]

	Systemic Corticosteroids	Intratympanic Corticosteroids
Timing of treatment	Immediate, ideally within first 14 days. Benefit has been reported up to 6 weeks postonset of SSNHL.	1. Immediate 2. Salvage (rescue) after initial treatment fails or after 2 weeks of symptom onset
Dose	Prednisone, 1 mg/kg/d (usual maximal dose is 60 mg/d) or Methylprednisolone, 48 mg/d or Dexamethasone 10, mg/d	Dexamethasone 24 mg/mL (compounded) or 10 mg/mL (stock) if compounded concentration unavailable Methylprednisolone 40 mg/mL or 30 mg/mL
Duration/frequency	Full dose for 7 to 14 days, then taper over similar time period	Inject 0.4 to 0.8 mL into middle ear space up to 4 injections over a 2-week period
Technique	Do not divide doses	1. Fill the middle ear with steroid solution 2. Keep head in otologic position (one side down, affected ear up) for 15-30 minutes
Monitoring	Audiogram at completion of treatment course and at delayed intervals	Audiogram at completion of treatment course and at delayed intervals. Interval audiograms between injections may help direct early termination of therapy if hearing loss resolves. Inspect tympanic membrane to ensure healing at completion of treatment course and at a delayed interval.
Modifications	Medically treat significant adverse drug reactions, such as insomnia Monitor for hyperglycemia, hypertension in susceptible patients	May insert pressure-equalizing tube if planning multiple injections, but this increases risk of tympanic membrane perforation.

IT STEROIDS FOR SALVAGE THERAPY:

- Clinicians should offer IT steroid therapy when patients have incomplete recovery from SSNHL 2 to 6 weeks after onset of symptoms
- concentration of IT steroid (4 mg/mL, 10 mg/mL, 24 mg/mL for dexamethasone and 30 mg/mL to 40 mg/mL or more of methylprednisolone

Table 11. Summary of the Randomized Controlled Trials Evaluating IT Steroids Therapy as Salvage for SSNHL.

Study (Subjects)	Initiation of IT Salvage Therapy	Dose/Method of Injection	Definition of Improvement	% Improvement
Lee et al 2011 (n = 46)[199]	Within 2 days after systemic treatment	5 mg/mL of dexamethasone; 4 injections over 2 weeks	≥10-dB improvement in PTA	47.6% IT group vs 16% control group
Li et al 2011 (n = 65)[200]	Timing after systemic treatment not defined	40 mg of methylprednisolone in 1 mL of sodium bicarbonate; injection every 3 days for 4 injections	≥10-dB improvement in PTA	37.5% IT group vs 0% control group
Park et al 2011 (n = 88)[149]	Within 7 days after systemic treatment	5 mg/mL of dexamethasone; 6 injections over 2 weeks	Siegel's criteria (complete, partial, slight, no recovery)[a]	No significant differences between simultaneous and salvage groups for any measure
Wu et al 2011 (n = 60)[201]	Within 7 days after systemic treatment	4 mg/mL of dexamethasone; 4 injections over 2 weeks	≥10-dB improvement in PTA	44.4% IT group vs 10.7% control group
Zhou et al 2011 (n = 76)[202]	Within 7 days after systemic treatment	40 mg of methylprednisolone in 1 mL of sodium bicarbonate; injection every other day for 4 injections	≥15-dB improvement in PTA and/or ≥15% improvement in WRS	45.9% ≥15-dB PTA improvement (20.5% control); 43.2% ≥15% WRS improvement (17.9% control)

Abbreviations: IT, intratympanic; PTA, pure tone average; WRS, word recognition score.

[a]Siegel's criteria: complete recovery (PTA <25 dB), partial recovery (>15-dB PTA improvement and PTA between 25 and 45 dB), slight recovery (>15-dB PTA improvement and PTA <45 dB), no recovery (<15-dB PTA improvement and PTA >75 dB).

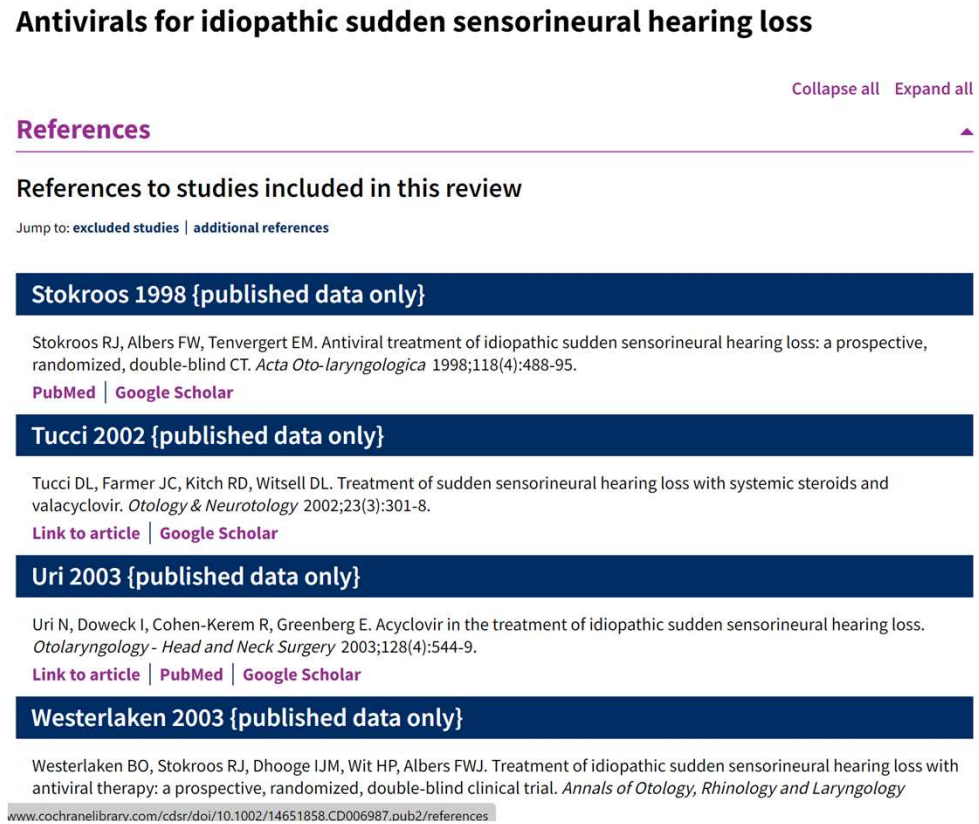
Evaluation of Sudden Sensory-Neural Hearing Loss Patients Treated with Systemic Steroids with Additional Intratympanic Dexamethasone Injection in Different Intervals; a Clinical Trial Study

Navid Nourizadeh [1], Naeeme Rezaiee [1], Mohsen Rajati [1], Sasan Dabiri [2], Mohamad Reza Afzalzadeh [1], Kimia Hasanabadi [3]

Affiliations + expand

PMID: 37206837 PMCID: PMC10188730 DOI: 10.1007/s12070-023-03641-4

Why antiviral not?



Antivirals for idiopathic sudden sensorineural hearing loss

Collapse all Expand all

References

References to studies included in this review

Jump to: **excluded studies** | **additional references**

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Stokroos RJ, Albers FW, Tenvergert EM. Antiviral treatment of idiopathic sudden sensorineural hearing loss: a prospective, randomized, double-blind CT. *Acta Oto-laryngologica* 1998;118(4):488-95.

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Link to article | PubMed | Google Scholar

Westerlaken 2003 {published data only}

Westerlaken BO, Stokroos RJ, Dhooge IJM, Wit HP, Albers FWJ. Treatment of idiopathic sudden sensorineural hearing loss with antiviral therapy: a prospective, randomized, double-blind clinical trial. *Annals of Otology, Rhinology and Laryngology*

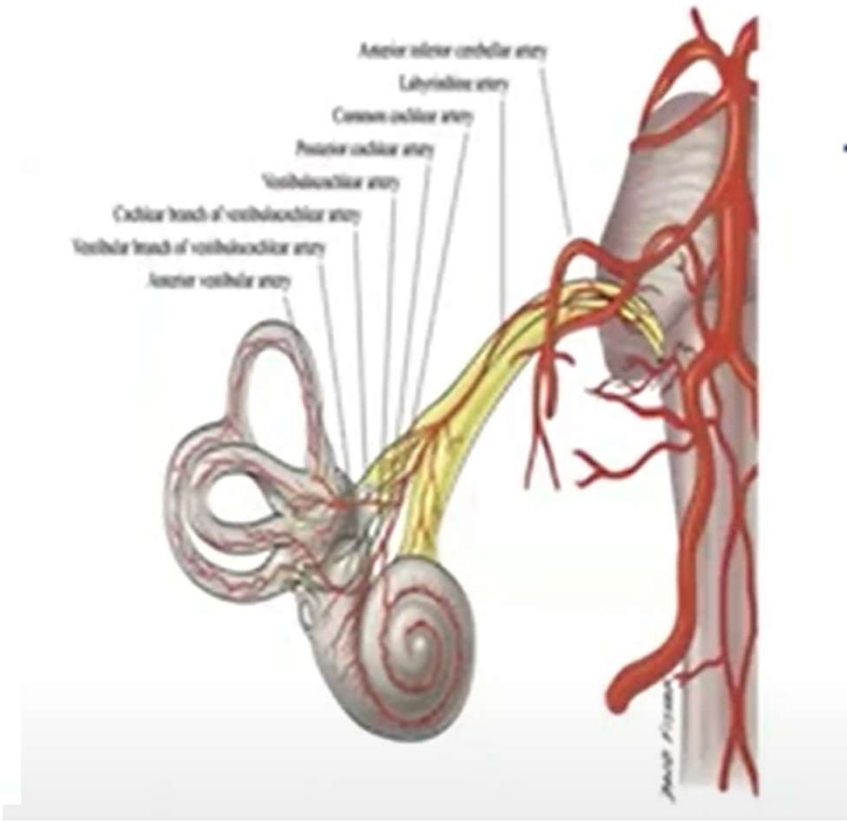
www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD006987.pub2/references

Vasodilators

- Clinicians should not routinely prescribe antivirals, thrombolytics, vasodilators, or vasoactive substances to patients with SSNHL. Strong

HYPERBARIC OXYGEN THERAPY

- HBOT was first described for SSNHL in the late 1960s in France and Germany.
- Vascular compromise, and associated cochlear ischemia, is a potential etiology of SSNHL.
- Blood is supplied to cochlea mainly through a single terminal vessel – the labyrinthine artery.
- Cochlear hair cells have a high oxygen consumption and poor tolerance of hypoxia.



- Proposed Mechanism
  - Increases the oxidative capacity of blood
  - Increases the elasticity of erythrocytes and reduces viscosity → improved microcirculation.
  - Decreases inflammatory response by Toll-like receptors.

JAMA Otolaryngol Head Neck Surg. 2022 Jan; 148(1): 5–11.
Published online 2021 Oct 28. doi: 10.1001/jamaoto.2021.2685

PMCID: PMC8554691
PMID: 34709348

Hyperbaric Oxygen Therapy for Patients With Sudden Sensorineural Hearing Loss

A Systematic Review and Meta-analysis

Temitope G. Joshua, MD, MSc, [1] Aysha Ayub, BSc, [1] Printha Wijesinghe, PhD, [1] and Desmond A. Nunez, MD, MBA [1, 2]

▸ Author information ▸ Article notes ▸ Copyright and License information PMC Disclaimer

- Initial: within 2 weeks of sx onset
- Salvage Therapy: within 1 month of symptom onset

HBOT salvage

Meta-Analysis > Otol Neurotol. 2021 Sep 1;42(8):e980-e986.
doi: 10.1097/MAO.0000000000003198.

Hyperbaric Oxygen Therapy Versus Intratympanic Steroid for Salvage Treatment of Sudden Sensorineural Hearing Loss: A Systematic Review and Meta-analysis

Xia Lei [1], Yanyan Feng [1], Ling Xia [1], Changling Sun [2]

Affiliations + expand

PMID: 34172651 DOI: 10.1097/MAO.0000000000003198

- Risks:
  - Barotraumatic lesions related to pressure equalization problems
    - ME, Sinuses, Lungs
  - Oxygen toxicity (hyperoxia)
  - Claustrophobia
  - Ocular effects: myopia and cataracts
- Costs:
  - 10-20 1-2 hour sessions. $600-700 each, often without insurance coverage

HYPERBARIC OXYGEN THERAPY

- Clinicians may offer, or refer to a clinician who can offer, hyperbaric oxygen therapy (HBOT) combined with steroid therapy within 2 weeks of onset of SSNHL.
- Clinicians may offer, or refer to a clinician who can offer, hyperbaric oxygen therapy (HBOT) combined with steroid therapy as salvage within 1 month of onset of SSNHL
- not currently FDA approved for this indication
- Therapy typically involves 10 to 20 one- to 2-hour sessions over days to weeks

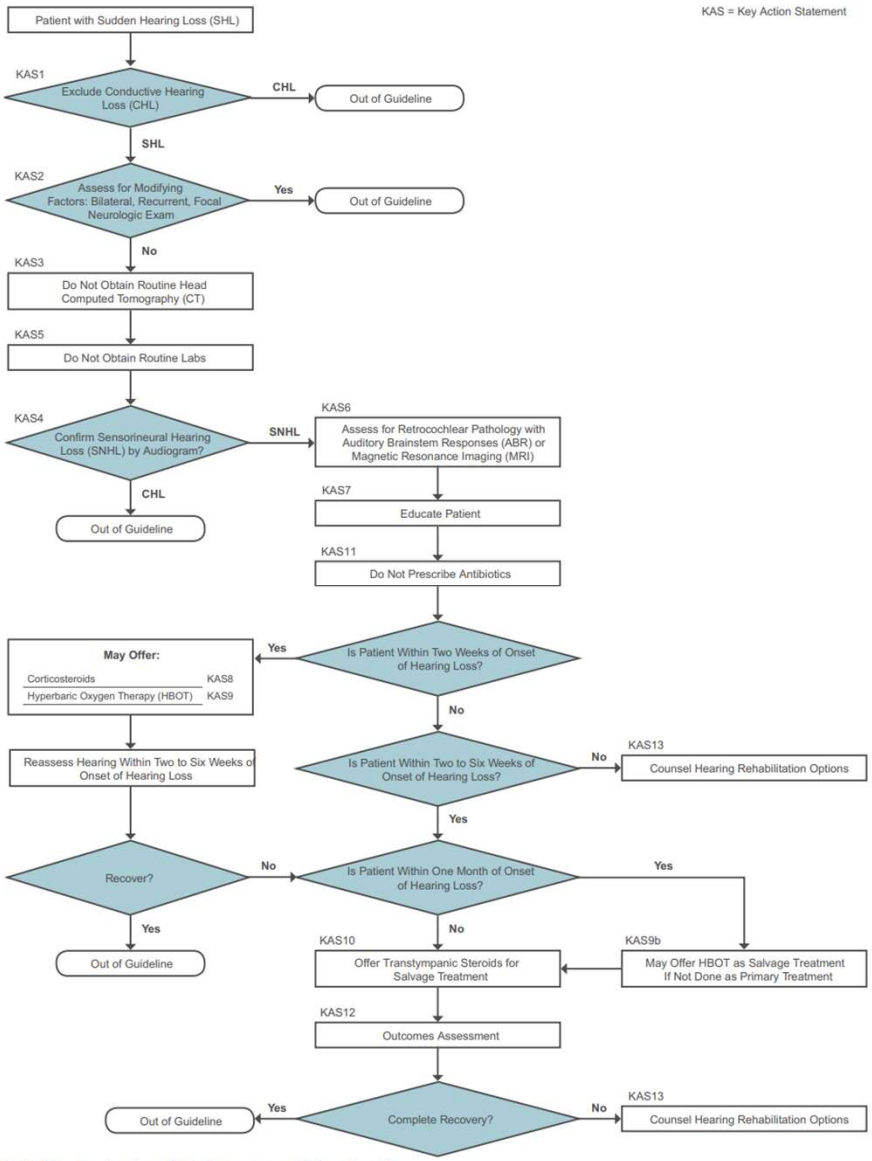


Figure 1. Sudden hearing loss clinical practice guideline algorithm.

Pediatric SSNHL

- Approximately 3-10% of all sudden SNHL cases occur in patients under 18yo.
- Pediatric patients are more likely to have delayed presentation.
- SSNHL can lead to speech and learning developmental issues.

Meta-Analysis > Laryngoscope. 2021 Feb;131(2):425-434. doi: 10.1002/lary.28829.
Epub 2020 Jul 16.

Sudden Sensorineural Hearing Loss in Children-Management and Outcomes: A Meta-analysis

Joshua W Wood [1] [2], Amber D Shaffer [1], Dennis Kitsko [1], David H Chi [1]

- The 13 studies yielded a total of 605 patients and 670 ears.
- <6 years-old (7.6%)
  - More likely to have congenital causes previously undetected
  - Investigate perinatal risk factors, consider genetic testing, and imaging
- 7-12 years-old (33.2%):
  - Less likely to have a congenital etiology but still investigate
- 13-19 years-old (58.6%):
  - More likely to present and respond to treatment like adults

The Laryngoscope
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Sudden Sensorineural Hearing Loss in Children—Management and Outcomes: A Meta-analysis

Joshua W. Wood, MD; Amber D. Shaffer, PhD; Dennis Kitsko, DO; David H. Chi, MD

TABLE IV.
Abnormal Computed Tomography and/or Magnetic Resonance Imaging Findings.

Study	Year	Abnormality	N	Total Imaged	Unit
Tarshish[16]	2013	Evidence of CMV	2	20	Ears
Dedhia[8]	2016	Bilateral EVA	3	18	Patients
		Left EVA, subarachnoid cyst	1		
		Right LSCC partially obliterated	1		
		Absent/hypoplastic cochlear nerve	1		
		Dehiscence of right tegmen	1		
		Left cochlear ossification/fibrosis	1		
Chen[7]	2018	Bilateral inner ear malformation (e.g., EVA)	22	129	Ears
		Unilateral inner ear hemorrhage	4		
		Bilateral inner ear hemorrhage	2		
		Bilateral demyelination	2		
		Unilateral inner ear malformation (e.g., EVA)	1		

CMV = cytomegalovirus; EVA = enlarged vestibular aqueduct; LSCC = lateral semicircular canal.

Serologic testing

CMV

HSV

Rubella

Comparative Study > Otol Neurotol. 2016 Jul;37(6):742-7. doi: 10.1097/MAO.0000000000001077.

Sudden Pediatric Hearing Loss: Comparing the Results of Combined Treatment (Intratympanic Dexamethasone and Systemic Steroids) With Systemic Steroid Treatment Alone

Gültekin Övet [1], Necat Alataş, Fatih Güzelkara

Affiliations + expand

PMID: 27223677 DOI: 10.1097/MAO.0000000000001077

TABLE 2. *Hearing improvements in combination and systemic steroid groups*

Recovery	Combination Therapy *n*, %	Systemic Steroid *n*, %	Total *n*, %	*p* Value
Complete	16 (62%)	8 (35%)	24 (49%)	0.142[a]
Partial	6 (23%)	7 (30%)	13 (27%)	
Unchanged	4 (15%)	8 (35%)	12 (24%)	
Total	26 (100%)	23 (100%)	49 (100%)	

[a]Pearson chi-square test.

How to Treat

- Partial improvement or complete resolution was reported in 53.3% of ears.
  - 46.7% of patients had no improvement.
- Most patients in the meta-analysis received systemic steroids.
- When reporting treatment regimens, none held statistical power. No RCT in pediatric patients to definitively support steroid use or dosages.

Kids vs Adults

- Bilateral SSNHL is more common (25.4% vs <2%)
- More children tended to present with profound levels of SSNHL – 36.7% with PTA >80dB in kids vs <25% in adults.

Pregnancy

Hypercoaguable state

Hormonal flactuation

Hear Res. 2002 Apr;166(1-2):1-8. doi: 10.1016/s0378-5955(02)00310-6.

Estrogen receptors alpha and beta in the inner ear of the 'Turner mouse' and an estrogen receptor beta knockout mouse

A E Stenberg [1], H Wang, L Sahlin, P Stierna, E Enmark, M Hultcrantz

Affiliations + expand

PMID: 12062753 DOI: 10.1016/s0378-5955(02)00310-6

- PO steroids:
  - Prednisone, Dexamethasone, and Methylprednisolone are US FDA Category C drug
- IT steroids:
  - Benefit is limited systemic absorption and tends to be most common mode of steroid administration
- HBOT:
  - Controversial given concerns of hyperoxic fetal exposure leading to possible teratogenic effects
- Dextran 40 (US FDA category B) as safer treatment alternative

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