



Sudden Sensorineural Hearing Loss—A Medical Emergency

ABSTRACT

Sudden hearing loss—usually unilateral and rarely bilateral—can be associated with tinnitus and vertigo. In most cases it is idiopathic, although various explanations such as infective, vascular, and immune causes have been postulated. We have reviewed the literature and what follows is a survey of current research and suggested treatments for sudden hearing loss.

KEYWORDS: sudden sensorineural hearing loss (SSNHL), tinnitus, pure tone audiogram (PTA), acoustic brainstem response audiometry (ABRA), viral neuritis, vascular insufficiency, oral steroids, intratympanic steroids, antiviral treatment, hyperbaric oxygen therapy (HBOT), MRI brain, acoustic neuroma.



Introduction

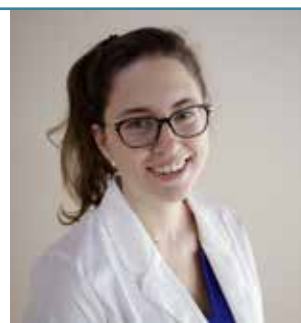
Sudden hearing loss is the loss of at least 30dB for three consecutive frequencies over the course of less than three days.^{1,2,4} The incidence of sudden hearing loss ranges from 5 to 20 per 100 000 individuals per year.^{1,2,3,4}

According to the literature, unilateral sudden hearing loss represents between 95%¹ and 98%³ of cases, and bilateral sudden hearing loss less than 5% of cases. Most cases are idiopathic and about 65% of them improve in the two weeks following initial loss.¹

Figure 1: Sudden hearing loss



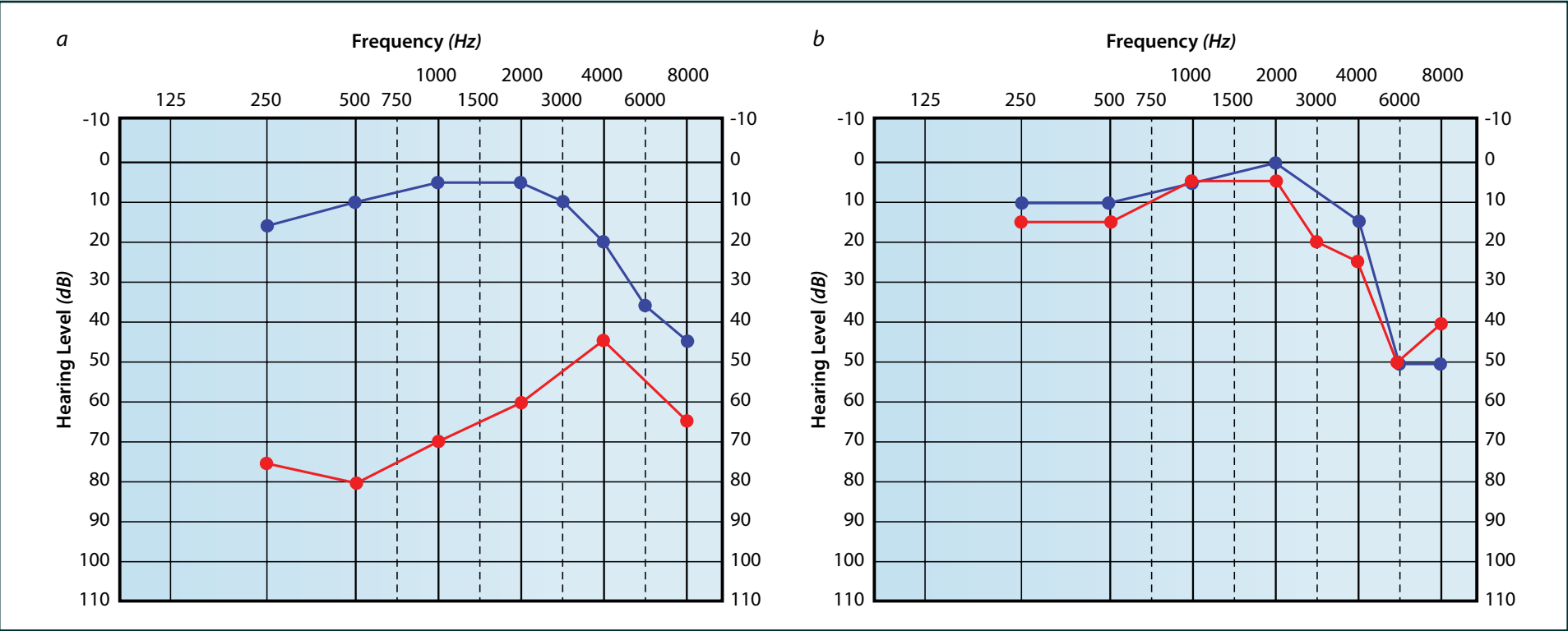
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Figure 2: Audiogram: Low- and Mid-Frequency Sudden Hearing Loss—The Right Side Became Normal After Receiving Corticosteroid Treatment



When a cause can be identified, it is most often viral.⁵ The remaining cases are linked to trauma, or otologic, vascular, hematologic, or neoplastic disease (see Table 1). Chances of improvement vary; according to Kuhn *et al.*,³ the following factors generally suggest good chances of improvement:

- Age under 60 years old
- Impairment lasts less than two weeks
- Low- or mid-frequency hearing loss

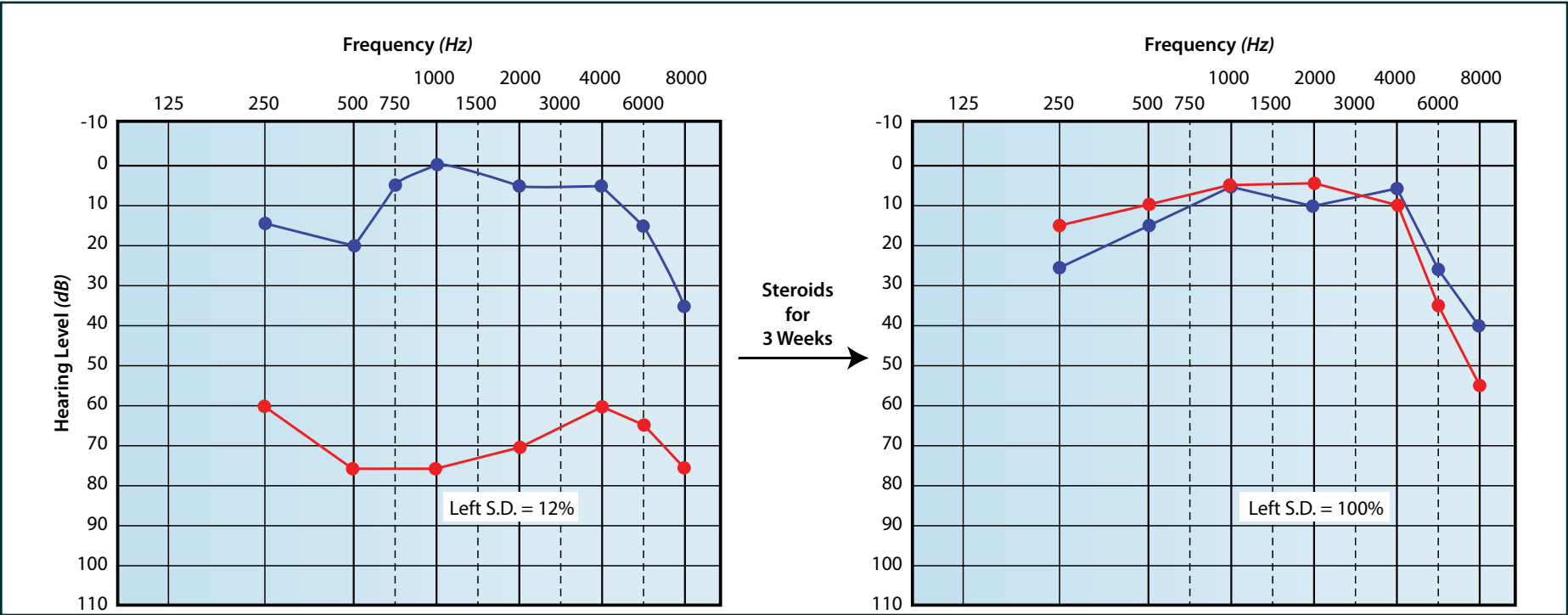
On the other hand, patients with a flat or high frequency hearing loss, those with the condition lasting more than three months, or patients who suffer balance issues associated with sudden hearing loss will have less chance of improvement. 87% of patients will recover within the first week, and this number is reduced to 52% within the first two weeks. After three months, only 10% of patients will recover some or all of their hearing. (See Table 2 and Figures 2, 3, and 4).

According to Chau *et al.*⁴ and Kuhn *et al.*,³ 44.7% to 91% of patients who experience sudden hearing loss complain of tinni-

Table 1: Sudden Hearing Loss: Causes (%)	
Causes	% of Cases ^{3,4}
Viral	12.8 to 13%
Otologic disease	4.7 to 5%
Trauma	4 to 4.2%
Vascular or hematologic	2.8 to 3%
Neoplastic	2 to 2.3%



Figure 3: Audiogram Showing Low-, Mid-, and High-Frequency Hearing Loss Return to Normal After Three Weeks of Steroid Treatment



tus, 29.1% to 56% also experience vertigo, and 6.8% report aural fullness.

Studies done by Lin *et al.*,² and Chau *et al.*⁴ have found that hypertension, smoking, and diabetes are all risk factors for SSNHL (Table 3).

According to Kuhn *et al.*³ individuals who experience sudden hearing loss need to be seen very rapidly by an audiologist and an

ENT. Ordering a series of audiograms to monitor recovery or relapse is essential. When hearing is stabilized, aural rehabilitation and use of a hearing aid is generally recommended.

Discussion

Sudden hearing loss is usually unilateral and can be associated with tinnitus and vertigo. In most cases,

Table 2: Chances of Improvement (%) According to Audiogram Type

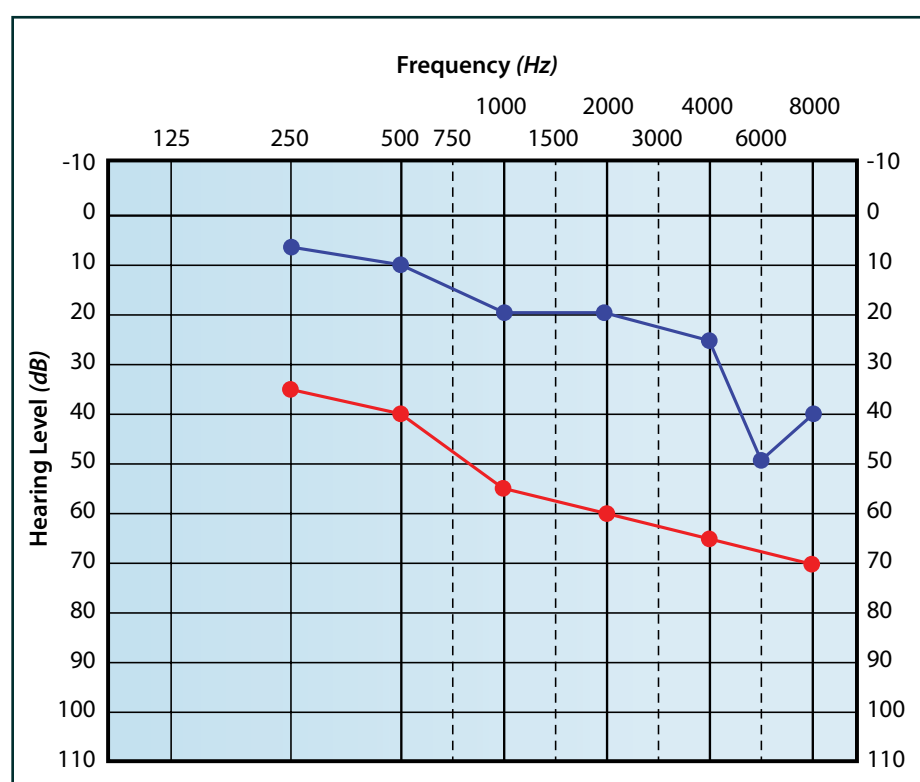
Hearing loss	Chances of improvement (%)
Low frequencies	63 to 88%
Mid frequencies	36 to 71%
High frequencies	19 to 38%
Flat audiogram	40 to 56%

Table 3: % of People With and Without SNHL According to Risk Factors

Risk factors	% in SNHL population	% in control group
Hypertension	13.6	0.5
Diabetes	6.5	0.15
Smoking	36	19.1
Alcohol	11.8	17.5



Figure 4: Audiogram Showing Low-, Mid-, and High-Frequency Sloping Downward to the Right Side did not Improve Hearing



the cause is idiopathic, although various infective, vascular, and immune responses have also been proposed. Patients who experience sudden hearing loss should be referred for further assessment. About half of patients recover completely in about two weeks. Many treatments are used, including corticosteroids, antiviral drugs, vasodilators, vasoactive drugs, and oxygen-based treatments. There is much to learn about the pathogenesis of sudden hearing loss and more trials to be carried out in order to establish evidence-based management.

Overview

Sudden sensorineural hearing loss is a complex disease influenced by interactions between multiple internal and external factors. Many

etiologies have been proposed for SSNHL, but most of them are not confirmed and most causes are ultimately not identified (ie: they are believed to be idiopathic).⁸

Viral infection of the inner ear remains a popular diagnosis since previous review 1996. Neurotrophic viruses like herpes simplex, the cytomegalovirus, and the rubella virus are well-documented causes of congenital deafness, but objective evidence of acute infections causing SSNHL in adults is still lacking.^{4,8,9}

Vascular Impairment

Interruption of blood flow to the inner ear due to diabetes, hypertension, cardiovascular disease, smoking, alcoholism, high cholesterol, elevated levels of fibrinogen or homocysteine, and autoimmune diseases are the most commonly hypothesized causes of SSNHL. Meniere's disease, perilymph fistula, and systemic disease affecting the inner ear are other causes of SSNHL. None of these studies is able to have inflammatory marker. Further research is required to establish the causes of inner ear and CNS pathologies. (See Figure 5).

Recommendations

Clinical History

It is ideal to take a thorough clinical history to help identify potential causes of SSNHL, such as trauma, a cerebrovascular accident, otosclerosis, or otological surgery.



Examination

A good clinical examination should include checking the ears, nose, throat, and neck, in addition to a complete neurological examination. Otological microscopy can be used to rule out any pathology in the external and middle ear.

Pure Tone and Speech Audiometry

Serial audiometry can be performed to confirm deafness of more than 30dB in three consecutive frequencies.

Tympanometry and Stapedial Reflex Test

Tympanometry and a stapedial reflex test can be used to rule out

middle ear pathology.

Otoacoustic Emissions

Otoacoustic emissions can help rule out cochlear pathology.

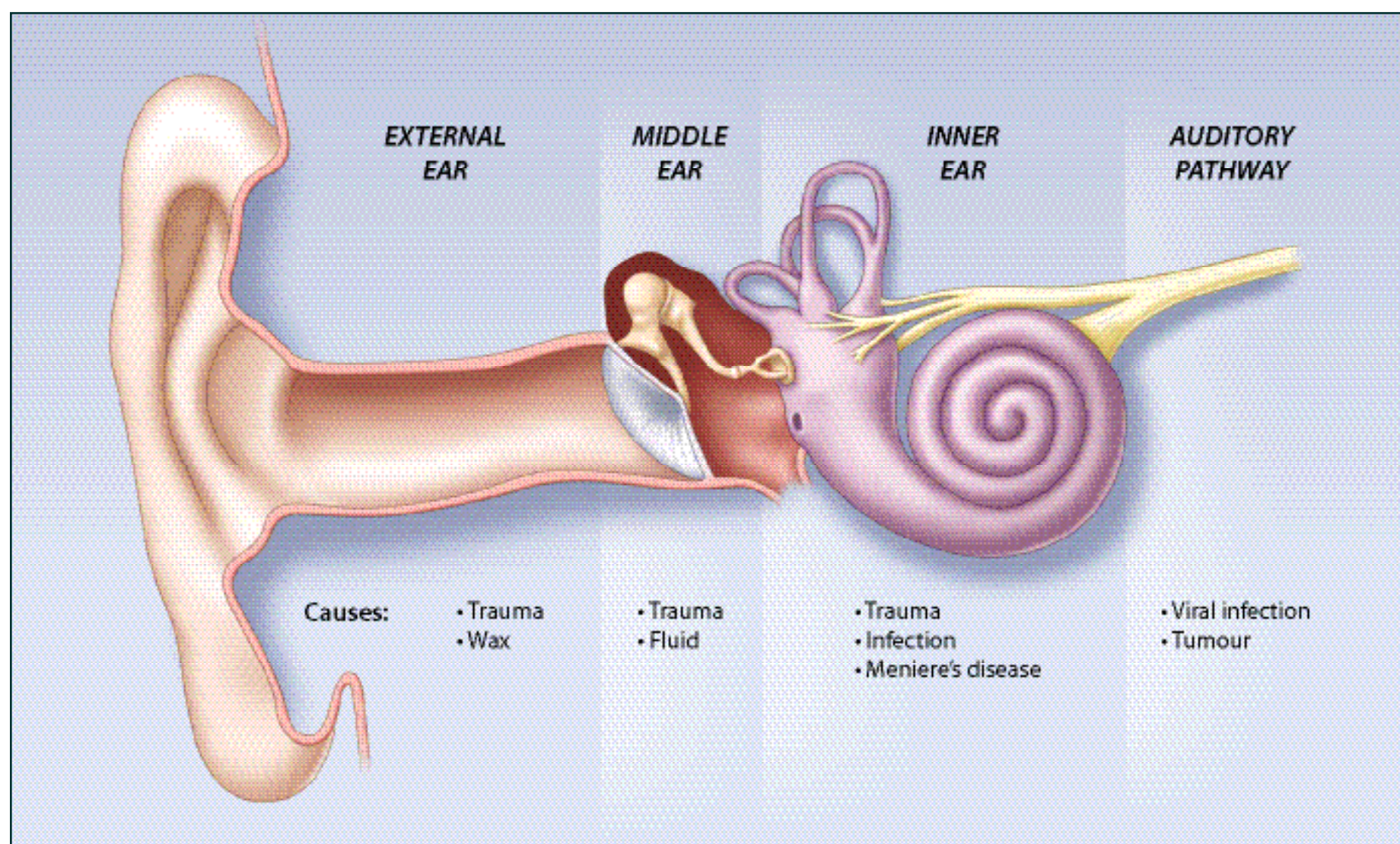
Brainstem-evoked Audiometry

Brainstem-evoked audiometry is recommended six weeks after the acute episode.

Routine Laboratory Tests

Routine laboratory tests should include screening for autoimmune disease, hematologic abnormalities, or lipid abnormalities. Screening for infective agents such as toxoplasmosis, syphilis, and viruses is also essential.

Figure 5: Causes of Sudden Sensorineural Hearing Loss



Radiological Studies

An MRI brain with contrast should be performed to rule out pathology in the CP angle or Internal Auditory Meatus. If the MRI is contraindicated, a CT scan of the brain is recommended.⁹

Treatment ***Oral Steroids***

The use of oral steroids is probably the most common therapy; the rationale behind its use is to decrease any associated pathogenic inflammation and edema. A commonly suggested regimen of oral prednisone is 1mg/kg/day up to a maximum of 60mg for 7 to 14 days. It is reasonable when steroids are contraindicated in patients with diabetes or hypertension. The risks associated with systemic steroid use by these types of patients is not justified; however the patient should be informed about the importance of a course of corticosteroids to improve sudden hearing loss, and

well as the possible risk of diabetes and hypertension worsening.^{6,7,8}

Intratympanic Injection of Steroids

Intratympanic injection of steroids could be considered because it will provide a lessened systemic effect and higher perilymph levels of the steroid.^{6,7,8} (See Figure 6)

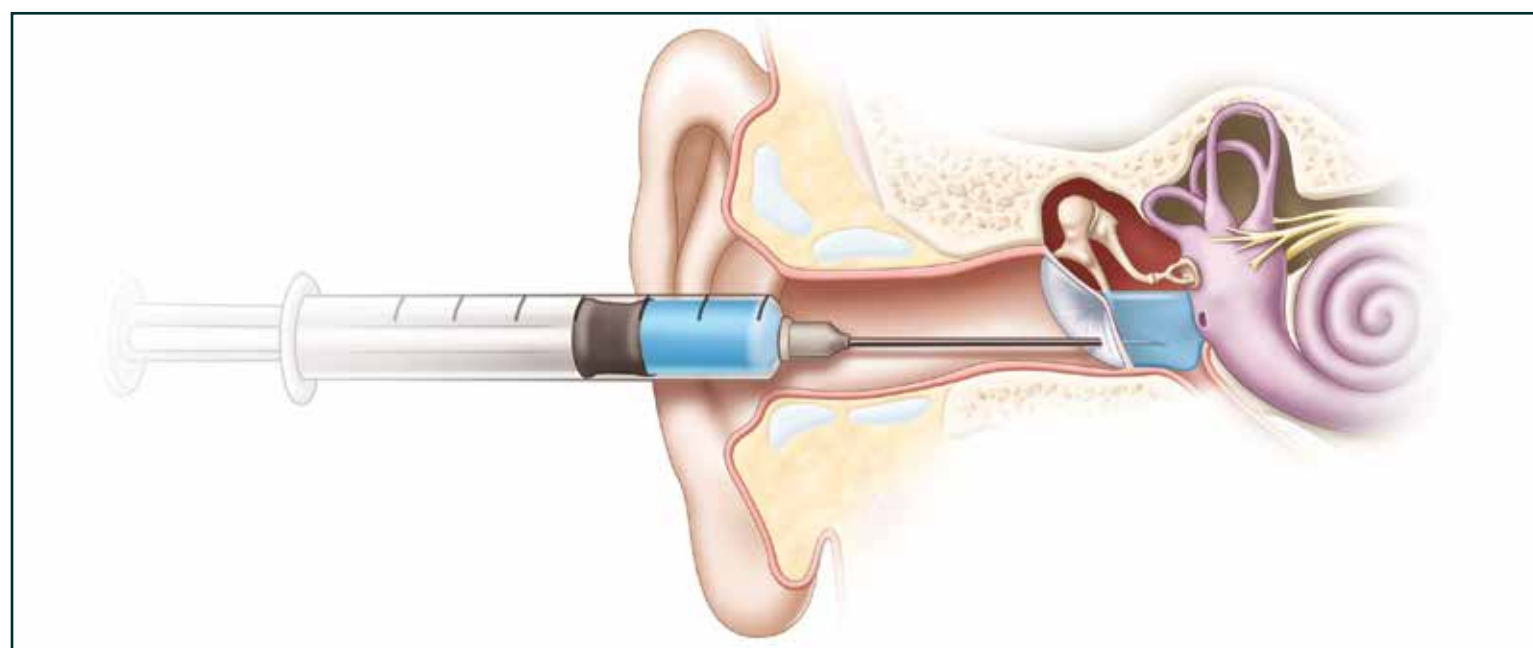
Antiviral Treatment

Antiviral treatment is given when there is evidence of a viral infection and the clinical history, the examination, or laboratory studies for viral titres and antibodies demonstrate that it is potentially caused by SSNHL.^{6,7}

Vasodilators and Vasoactive Substances

Vasodilators and vasoactive substances are given for SSNHL if there is evidence of any interruption of vascular flow to the cochlea (a hypothesized cause of SSNHL). Carboxygen (5% carbon dioxide and 95% oxygen) has demon-

Figure 6: Intratympanic Injection of Dexamethasone for SSNHL





SUMMARY OF KEY POINTS

All patients with SSNHL should be assessed by taking a thorough history and performing a complete examination to identify any specific disease.

PTA should be performed in all patients.

Targeted laboratory investigations should be performed after the initial assessment.

All patients should have an MRI of the brain if a CT SCAN of the brain is contraindicated; ABR testing should also be considered.

strated the ability to increase the mean perilymph oxygen tension. Prostaglandin E1 is a known vasodilator and Dextran is thought to improve microcirculation through an antithrombotic effect. This group of vasoactive and vasodilator agents are promising, but difficult to assess as more evidence is still needed.^{6,7}

Hyperbaric Oxygen Therapy (HBOT)

Hyperbaric oxygen delivers increased partial pressure to the inner ear structures. This may benefit patients where vascular ischemia is causing SSNHL.⁸

Patients should be managed on an individual basis. If the ability to communicate with the patient is affected, they may need temporary amplification. For more permanent deafness, patients should be treated with empathy; hearing aids, bone-anchored hearing aids, and cochlear implants can all provide more lasting solutions to an individual's hearing loss.¹

Conclusion

Sudden SSNHL is significant condition and can dramatically affect quality of life. Initial assessment focuses on establishing the cause of



CLINICAL PEARLS

If a specific cause for SSNHL is found, the patient should be managed accordingly.

If SSNHL is idiopathic in nature, patients may be offered a course of oral steroids.

If oral steroids are contraindicated, IT steroid therapy could be considered as a primary or salvage therapy.

Use of antivirals, HBOT, vasodilators, and vasoactive agents are not currently supported by the research.



the hearing loss which should subsequently be treated accordingly.

Unilateral and bilateral SSNHL represent different disease processes and should be investigated and managed differently. Bilateral SSNHL should be managed urgently as it is often a manifestation of a serious underlying condition associated with high degrees of morbidity and mortality.¹

Acknowledgement

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