

Intratympanic steroid injection in cases of idiopathic sudden sensorineural hearing loss

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Abstract:

Idiopathic Sudden Sensorineural Hearing Loss (ISSNHL) is an irritating problem that continues to pose a diagnostic and therapeutic enigma for the otologist. It is most commonly defined as sensorineural hearing loss of 30dB or greater over at least three contiguous audiometric frequencies occurring within a 72-hr period. It is not one of the more common causes of HL, disproportionate interest in ISSNHL exists most likely because it is one of the few reversible (sensorineural) hearing losses encountered by clinicians. Intratympanic steroid injection is increasingly used in the management of ISSNHL as it offers the potential for directed therapy of a high concentration to the inner ear with avoidance of systemic side effects. It also can improve hearing function in patients with ISSNHL after the failure of systemic steroid treatment.

Key Words Idiopathic Sudden Sensorineural Hearing Loss ,Intratympanic steroid injection.

Introduction:

Idiopathic Sudden Sensorineural Hearing Loss (ISSNHL) is defined as decline in hearing over 3 days or less affecting 3 or more frequencies by 30 dB or more with no identifiable etiology (Cheong et al., 2015). The actual number of patients recovering spontaneously from ISSNHL without having sought medical attention is not known (Kuhn et al., 2011). The high rate of spontaneous recovery, up to 65% , also confounds reviews as to the therapeutic

efficacy of any single agent or therapeutic intervention. Any proposed therapeutic intervention must improve on the 65% recovery rate that would be seen if no intervention was offered (Bae et al., 2013). Multiple treatment protocols and agents have been proposed to treat ISSNHL. Steroids, antiviral agents, anticoagulants, vasodilators, anti-inflammatory agents, and others have been proposed as therapeutic agents to treat ISSNHL, most of which propose

some benefit in the treatment of ISSNHL. The most accepted current treatment of sudden SNHL is steroids (Weber et al.,2002).

ISSNHL:

ISSNHL affects 5 to 20 persons per 100,000 annually. The average age of onset is reported to be 40-60years, with increasing incidence with age. ISSNHL occurs with equal incidence in men and women. The most common etiologies of ISSHL are vascular disorders, membrane breaks and viral infections (Belal,1979). The stress response theory is a relatively new concept about the cause of idiopathic sudden sensorineural hearing loss (Blackley et al.,1967). Diagnosis of ISSNHL is dependant on exclusion of the identifiable causes of SSNHL so, patients should undergo a workup to establish their diagnosis, obtain appropriate therapy, predict their prognosis for hearing recovery, and most importantly, to rule out an identifiable underlying cause of hearing loss (Vijayendra et al.,2012). The current version of the German S1 guideline on ISSHL recommends the following elements as necessary diagnostics (Hoth,2016):

- 1-Intensive general and specific history taking
- 2-ENT-specific physical examination
- 3-Blood pressure measurement
- 4-Ear microscopy

5-Hearing tests (tuning fork, pure tone audiogram)

6-Tympanometry

7-preliminary vestibular testing

In the last version of the German S1 guideline on ISSNHL, the following procedures are recommended as useful in individual cases. It seems to be required or suitable to determine a more detailed indication and evidence assessment of single diagnostic measures in a revised version of the guideline.

- Otoacoustic emissions (OAE)
- Auditory evoked brainstem potentials (ABR)
- Speech audiometry
- Stapedius reflex measurement
- Functional examination of the cervical spine
- Laboratory tests: blood glucose, CRP, procalcitonin, small blood count, differential blood count, creatinine, fibrinogen level
- Serologic testing: borreliosis, syphilis, herpes simplex virus type 1, varicella zoster virus, CMV, HIV
- MRI: exclusion of a tumor of the cerebellopontine angle (hearing protection is recommended)
- CT scan: skull, temporal bone, cervical spine
- Glycerol test according to Klockhoff
- Electrocochleography: cochlear damage, exclusion of hydrops
- CERA: exclusion of psychogenic deafness

- Auditory steady state responses (ASSR)
- Electronystagmography or video-oculography
- Duplex sonography
- Tympanoscopy
- Interdisciplinary examinations (e.g. neurology, internal medicine, orthopedics, human genetics) (Ballesteros et al.,2012).

The American Academy of Otolaryngology Foundation Updates Sudden Hearing Loss Guideline .The Key Action Statements (KASs) or significant points made in the guideline are:

KAS1: Exclusion of Conductive Hearing Loss (CHL) – Strong recommendation. Clinicians should distinguish sensorineural hearing loss (SNHL) from CHL when a patient first presents with SHL.

KAS2: Modifying Factors – Recommendation .Clinicians should assess patients with presumptive SSNHL through history and physical examination for bilateral SHL, recurrent episodes of SHL, and/or focal neurologic findings.

KAS3: Computed Tomography – Strong recommendation against Clinicians should not order routine computed tomography (CT) of the head in the initial evaluation of a patient with presumptive SSNHL.

KAS4: Audiometric Confirmation of SSNHL – Recommend In patients with SHL, clinicians should obtain, or refer to a clinician who can obtain, audiometry as soon as possible (within 14 days of

symptom onset) to confirm the diagnosis of SSNHL.

KAS5: Laboratory Testing – Strong recommendation against Clinicians should not obtain routine laboratory tests in patients with SSNHL.

KAS6: Retrocochlear Pathology – Recommendation

Clinicians should evaluate patients with SSNHL for retrocochlear pathology by obtaining an MRI or Auditory Brainstem Response (ABR).

KAS7: Patient Education – Strong recommendation. Clinicians should educate patients with SSNHL about the natural history of the condition, the benefits and risks of medical interventions, and the limitations of existing evidence regarding efficacy.

KAS8: Initial Corticosteroids – Option Clinicians may offer corticosteroids as initial therapy to patients with SSNHL within two weeks of symptom onset.

KAS9a: Initial Therapy with Hyperbaric Oxygen Therapy – Option

Clinicians may offer, or refer to a clinician who can offer, hyperbaric oxygen therapy (HBOT) combined with steroid therapy within two weeks of onset of SSNHL.

KAS9b: Salvage Therapy with Hyperbaric Oxygen Therapy – Option

Clinicians may offer, or refer to a clinician who can offer, hyperbaric oxygen therapy (HBOT) combined with steroid therapy as salvage within one month of onset of SSNHL.

KAS10: Intratympanic (IT) Steroids for Salvage Therapy – Recommendation.

Clinicians should offer, or refer to a clinician who can offer, IT steroid therapy when patients have incomplete recovery from SSNHL two to six weeks after onset of symptoms.

KAS11: Other Pharmacologic Therapy – Strong recommendation against Clinicians should not routinely prescribe antivirals, thrombolytics, vasodilators, or vasoactive substances to patients with SSNHL.

KAS12: Outcomes Assessment – Recommendation. Clinicians should obtain follow-up audiometric evaluation for patients with SSNHL at the conclusion of treatment and within six months of completion of treatment.

KAS13: Rehabilitation – Strong recommendation. Clinicians should counsel patients with SSNHL who have residual hearing loss and/or tinnitus about the possible benefits of audiological rehabilitation (**Chandrasekhar et al.,2019**).

Intratympanic steroid injection:

The use of intratympanic steroids has evolved into 3 main protocols for treatment of ISSNHL :

1-As an initial or primary treatment for sudden SNHL without systemic steroids

2-As adjunctive treatment given concomitantly with systemic steroids for sudden SNHL;

3-As “salvage therapy” after failure of systemic steroids for sudden SNHL (**Filipo et al., 2014**).

The primary reason for the use of intratympanic steroids without systemic

steroids is that: it offers the potential for directed therapy of a high concentration to the inner ear, avoidance of side effects of systemic steroid ,bypassing the blood-brain barrier,avoiding “first pass” effects and lower quantities of the drugs needed (**Kikuchi et al.,1995**).Dexamethasone is the most common steroid used for intratympanic use followed by methylprednisolone. There are differences in the strength of the solution (2–4 mg/mL¹⁴, 20 to 25 mg/mL dexamethasone¹⁵; 32 mg/mL²³ to 62.5 mg/mL methylprednisolone). it was confirmed that absorption, allowing for sampling effects, of Dexamethasone into the stria and surrounding tissues was more rapid, in contrast to methylprednisolone, which remained in the endolymph longer than Dexamethasone by a factor of 4 to 6 hours(**Suzuki et al., 2012**).Techniques also differ in method of delivery: transtympanic needle injection, delivery through a myringotomy, delivery through a myringotomy with a tube, delivery with a wick placed in a myringotomy, and delivery through an implantable pump to deliver the steroid as a constant infusion (**Topf et al.,2017**).The number of injections in which patients are treated with intratympanic steroids also differs ranging from a single day to weekly transtympanic injections to multiple weeks with self-administered steroid drops to transtympanic injections given several times per week or to an implantable pump (**Spear et al.,2011**).

Conclusion:

In the diagnosis and treatment of ISSNHL, results suggest that earlier treatment with steroids is better than later treatment, which follows accepted practice guidelines for ISSNHL.

Intratympanic (IT) steroids gave better hearing results than systemic steroids with no side effects. Some of the patients that were applied IT steroid achieved additional benefit after 10 days from injections.

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