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Intratympanic Dexamethasone Treatment in Profound Idiopathic Sudden Sensorineural Hearing Loss: A Prospective Evaluation in the ENT Setting

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KEYWORDS

Sudden Sensorineural Hearing Loss (ISSNHL), Intratympanic Dexamethasone, Hearing, Recovery, Audiological Intervention, Treatment Efficacy

ABSTRACT:

This prospective study aimed to evaluate the efficacy of intratympanic dexamethasone in treating profound idiopathic sudden sensorineural hearing loss (ISSNHL) and to assess hearing recovery outcomes. 50 consecutive patients with profound ISSNHL were included, receiving four doses of intratympanic dexamethasone over a two-week period. Hearing recovery was defined as achieving a pure-tone average (PTA) within 10 dB of baseline, with PTAs showing over 50% improvement considered as partial recovery. Contralateral ear hearing served as the baseline. On average, patients received treatment 28 days after onset. 4 patients exhibited significant hearing recovery, with an additional patient achieving partial recovery. Notably, 4 patients experienced substantial hearing improvement within nine days of clinic visit post-hearing loss onset. The study suggests that intratympanic dexamethasone, following the provided protocol and hearing recovery definition, does not significantly enhance hearing in patients with confirmed ISSNHL. However, improved outcomes may be possible if treatment is initiated within 11 days of hearing loss onset.

Introduction

Idiopathic Sensorineural Hearing Loss (ISSNHL) is a sudden occurrence of hearing loss in otherwise normal-hearing individuals, with an estimated incidence of 5-20 cases per 100,000 people [1]. The true incidence remains uncertain due to cases that may go untreated, often experiencing spontaneous recovery. Commonly attributed to viral inflammation, vascular occlusion, or a ruptured intralabyrinthine membrane, ISSNHL poses challenges in understanding its etiology [2,3]. Clinical evidence suggests a viral origin for most cases. Steroids, particularly systemic corticosteroids, have been a primary treatment approach for ISSNHL. Randomized, double-blind, placebo-controlled trials have demonstrated the effectiveness of systemic steroids, especially in cases with severe or moderate hearing loss [4]. Unfortunately, profound ISSNHL cases, even with treatment, exhibit a poor prognosis. Intratympanic steroid therapy offers a promising alternative by achieving a significant increase in steroid concentration compared to systemic administration. This study explores the use of intratympanic dexamethasone as a treatment strategy for profound ISSNHL, aiming to enhance patient outcomes, particularly in cases with severe hearing impairment.

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Materials and Methods

Study Design

The threshold for profound SNHL was defined as 90 dB at 0.5, 1, 2, 3 kHz. Four intratympanic injections of dexamethasone were given after two days of methylprednisolone oral (64 mg a day). All patients received intratympanic injections of dexamethasone. Combined intratympanic and oral steroids were used.

TTA (Transtympanic Technique)

To perform transtympanic injections, the tympanic membrane was first anesthetized with phenol solution. Dexamethasone was injected into the round window region in a volume of 0.3 cc (24 mg/mL). using a 27-G needle. The steroid perfused, keeping the injected ear pointing upwards for 30 minutes. For the duration of perfusion, the patient should refrain from swallowing, Eustachian tubes are prevented from receiving solution. Four steroid administrations were assembled over a 14-day period.

Data Collected

In addition to age, gender, and time to transtym-panic treatment, we collected information on associated symptoms. Pretreatment and post-treatment audiometric data were collected, as well as word recognition scores and contralateral pure-tone averages. An audiometric assessment, before and after therapy, pure tone and speech were performed. Each patient underwent a contrast-enhanced MRI of the brain and an internal auditory canal is inspected to rule out any intracranial pathology.

Hearing Improvement and Hearing Recovery Criteria

In the affected ear, the premorbid hearing (baseline) was determined by using the PTA in the unaffected ear. Within 10 dB of baseline, PTA is considered complete hearing recovery. We defined partial recovery lastly, as a PTA that includes a hearing percentage of 50% health.8 Hearing health was calculated as follows:

Analyses of statistics

Treatment time and hearing recovery were correlated by Pearson's correlation coefficient. For two-tailed t tests, significance is defined as a P value of less than 0.01.

Results

Studies Groups: An overview of demographics and characteristics

This study included 50 patients. According to Table 1, the study group was demographically and racially diverse. Brain and internal auditory canal contrast-enhanced MRIs of all patients were negative.

Characteristics	Number (50)
Age in years (mean with range)	52 (30-70)
Ear affected	
Right side	24
Left side	26
Gender	
Male	30
Female	20
Associated symptoms (Tinnitus, Vertigo)	96%

Audio logical Results

107 dB was the average initial PTA of the affected ear 90 dB was the average final PTA. Contra laterally, the PTA averaged 11 dB.

Statistical Analyses

Hearing recovery and treatment time was correlated using Pearson's correlation coefficient. A P value less than 0.05 are considered significant for two-tailed t tests.

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Recovery of hearing

As many as eight percent of patients (4/50) were able to recover their hearing completely. Among the 4 patients who were able to completely recover their hearing, the final PTA/WRS for each patient was 16 dB/96% with a WRS of 26 dB/100%. There was another patient with par-status for all the patients and the results are summarized in Table 2. In the end, there was a patient recovered partially (PTA/WRS final: 62 dB/50%). Regarding the timing of therapy, the recovery status is summarized according to its relationship to the recovery process. There has been a significant hearing recovery in four patients, respectively, on days 2 and 9 after hearing loss at its onset, determined to be the days of the better hearing. After a partial recovery, the patient was given treatment on day 11 of his recovery journey. The results of intratympanic treatment, if given within 11 days of hearing loss onset, were generally better than those obtained with intratympanic treatment done later on. The results of the correlation analysis, pearson correlation, - 0.203; P = 0.331) showed no statistical significance.

Table: 2 Status of recovery

Variables	N (%)
Final measurement of PTA (within 10dB)	8 (4/50)
Ears with 50% recovery of hearing	12 (6/50)
Final WRS (at least 85%)	4 (2/50)

Table: 3 Time to treatment relating the recovery of hearing

Treatment in days	Status of recovery		
	Complete	Partial	None
Less than 7	2	0	6
7 to 14	2	2	8
15 to 30	0	0	22
More than 30	0	0	8

Side effects

During the first 3 months following the treatment, a persistent pinpoint perforation was experienced by two patients. Upon tympanic patch placement over the perforation, the perforation was completely resolved by 6 months post-treatment.

Discussions

As a result of the dismal prognosis associated with ISSNHL despite the use of oral steroids, there is a need for immediate intervention. [1-3,7,8] In addition, advanced a dismal prognosis often results from ISSNHL. Patients with profound ISSNHL were treated with intratympanic dexamethasone and oral steroids. There are at least two advantages of intratympanic delivery of steroids over oral administration of steroids when compared with oral administration of steroids. Oral steroids have more lymph and endolymph side effects than oral steroids. [9] A higher ear concentration may have a greater potential therapeutic effect.

The timing of therapy also affects hearing recovery in ISSNHL. According to Patients who are seen within 10 days of onset of ISSNHL have shown greater improvement. The finding may reflect either early treatment benefit or natural recovery. [1, 2, 10] There have been reports of spontaneous recovery from profound ISSNHL. The hearing loss in 20 patients (Table 3) started within 14 days of the onset of the hearing loss. 14 patients did not recover their hearing. After treatment of intratympanic dexamethasone with oral steroids for these 6 patients, they were either able to attain better hearing as a result of the treatment or as a result of spontaneous recovery. In spite ,Intratympanic benefits theoretically dexamethasone, Hearing recovery was not significant in the current study, when treated after 11 days of

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onset of hearing loss with intratympanic dexamethasone and oral steroids. Using intra-tympanic dexamethasone delivery for ISSNHL, hearing loss can be explained by several factors. The use of corticosteroids is based on the assumption that hearing loss is caused by inflammation, probably caused by viruses. It is possible that there are some cases of ISSNHL without inflammation, which may explain the non-recovery of hearing. Multiple factors contribute to ISSNHL. There is also the possibility that a different corticosteroid is needed to overcome failure. A variety of pharmacokinetic properties were shown for dexamethasone, methylprednisolone, and hydrocortisone in animal studies. Among these 3 types of corticosteroids, intratympanic methylprednisolone maintained the longest concentration in the inner ear. [9] Possibly Inner ear diffusion is poor resulted; the delivery method we used in our study was intratympanic. There have been reports that endoscopes have been used before intratympanic delivery, adhesions should be removed from the round window niche. In order to improve diffusion through a round window, facilitating agents like histamine have also been used. [12] For round window application, a device for sustained release may be helpful. [13]

Steroids can diffuse adequately using an intratympanic delivery system, but it is unknown what will happen in the inner world. A cochlea marker delivered intratympanic for 80 minutes remained substantially in the basal turn in 1 guinea pig study. It is possible that in patients with profound ISSNHL, the inner ear is so severely damaged that no existing treatments can restore hearing to normal despite intratympanic dexamethasone.

A control group of patients treated with oral steroids alone was not included in the study. However, our group's results can be compared with those of previous reports on similar patients treated with oral steroids. One-eighth of those receiving steroids and one-sixth of those receiving placebo recovered (defined as PTA within half that of premorbid hearing). A survey showed that 25% of patients with profound ISSNHL recovered their hearing (defined as >50% hearing return) [14]. In patients with profound ISSNHL, intratympanic dexamethasone does not improve hearing outcomes when compared with oral steroids alone have been used in previous studies.

Conclusion

This study has shown that when combined with oral steroids, intratympanic dexamethasone does not significantly improve hearing in patients with profound ISSNHL. When used with the protocol and definition of hearing recovery used in this study. There is a possibility that patients' hearing result may be improved if intratympanic treatment is applied within 11 days of the onset of hearing loss. The optimal treatment, dosage, and sensorineural hearing loss caused by an idiopathic, profound sudden event should be further investigated in order to determine the most effective therapy.

REFERENCES

[1] Byl FM Jr. Sudden hearing loss: eight years' experience and suggested prognostic table. Laryngoscope 1984;94:647-61.

[2] Mattox DE, Simmons FB. Natural history of sudden sensorineu- ral hearing loss. Ann Otol Rhinol Laryngol 1977;86:463-80.

[3] Mattox DE, Lyles CA. Idiopathic sudden sensorineural hearing loss. Am J Otol 1989;10:242-7.

[4] Wilson WR. The relationship of the herpesvirus family to sudden hearing loss: a prospective clinical study and literature review. Laryngoscope 1986;96:870-7.

[5] Schuknecht HF, Donovan ED. The pathology of idiopathic sud- den sensorineural hearing loss. Arch Otorhinolaryngol 1986;243: 1-15.

[6] Wilson WR, Veltri RW, Laird N, et al. Viral and epidemiologic studies of idiopathic sudden hearing loss. Otolaryngol Head Neck Surg 1983;91:653-8.

[7] Moskowitz D, Lee KJ, Smith HW. Steroid use in idiopathic sudden sensorineural hearing loss. Laryngoscope 1984;94:664-6.

[8] Wilson WR, Byl FM, Laird N. The efficacy of steroids in the treatment of idiopathic sudden hearing loss. A double-blind clinical study. Arch Otolaryngol 1980;106:772-6.

[9] Parnes LS, Sun A, Freeman DJ. Corticosteroid pharmacokinetics in the inner ear fluids: an animal

Journal of Chemical Health Risks

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study followed by clinical application. Laryngoscope 1999;109(Suppl):1-17.

[10] Shaia FT, Sheehy JL. Sudden sensori-neural hearing impairment: a report of 1,220 cases. Laryngoscope 1976;86:389-98.

[11] Silverstein H, Choo D, Rosenberg SI, et al. Intratympanic steroid treatment of inner ear disease and tinnitus (preliminary report). Ear Nose Throat J 1996;75:468-71,74,76 passim.

[12] Chandrasekhar SS. Intratympanic dexamethasone for sudden sensorineural hearing loss: clinical and laboratory evaluation. Otol Neurotol 2001;22:18-23.

[13] Kopke RD, Hoffer ME, Wester D, et al. Targeted topical steroid therapy in sudden sensorineural hearing loss. Otol Neurotol 2001;22:475-9.

[14] Salt AN, Ma Y. Quantification of solute entry into cochlear perilymph through the round window membrane. Hearing Res 2001;154:88-97.