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Intratympanic dexona therapy for Sudden sensorineural hearing loss: Our Clinical Experience

Gitanjali Manathara, Vaishali Gupta, Abhinav Krishnan, Anil Kumar Ramabhadraiah*

Department of Otorhinolaryngology, Bangalore Medical College and Research Institute, Fort, K R Road, Bengaluru 560002, India

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***Corresponding author:** Anil Kumar Ramabhadraiah, Department of Otorhinolaryngology, Bangalore Medical College and Research Institute, Fort, K R Road, Bengaluru 560002, India

Abstract

Introduction: Sudden sensorineural hearing loss (SSNHL) is an otological emergency defined as a hearing loss of 30dB or more, over at atleast three contiguous audiometric frequencies, that develops over 72 hours or less, with no identifiable cause in spite of thorough investigation. At the current scenario there still exists a lack of proper evidence regarding management of SSNHL but among them steroid therapy has been shown to be beneficial compared to placebo. While systemic steroid therapy is most widely considered as a main treatment for sudden sensorineural hearing loss (SSNHL), the disadvantages of its use are numerous side effects. Intratympanic steroid injection (ITS) delivers steroids through transtympanic route, hence avoids possible side effects with higher inner ear concentration.

Material and methods: This a prospective study conducted in the Department of Otorhinolaryngology, Bangalore Medical College and Research Institute during the study period of 2 years, from October 2020 to February 2023. The sample consisted of 50 patients who were diagnosed with idiopathic sudden sensorineural hearing loss. Intratympanic dexona injection was given in the postero- inferior quadrant of the tympanic membrane about 0.5ml (4mg/ml) under endoscopic guidance with a 22G spinal needle.

Results: Overall, 43 patients (86%) showed improvement in hearing, as PTA was done after one month of first dose of intratympanic dexona. Four patients (8%) had no change in hearing, and three patients (6%) hearing worsened, mean improvement in hearing was 12 dB. There was a significant statistical correlation between hearing recovery and age of the patient,time of presentation to treatment, severity of hearing loss and improvement in associated symptoms such as vertigo and tinnitus.

Conclusion: Intratympanic Dexona (ITS) is an effective and the safest therapy in sudden sensorineural hearing loss cases. Earlier the ITD given, more is the gain in hearing recovery.

Keywords: sudden sensorineural hearing loss; intratympanic dexona; steroid; hearing improvement

Introduction

Sudden sensorineural hearing loss (SSNHL) is a common otologic emergency, presenting mostly as an acute unilateral deafness in 99% of cases with an abrupt onset (generally within 3 days), of more than 30 dB hearing loss at three consecutive frequencies. Fifteen thousand new cases are reported annually world-wide accounting for approximately 1% of all cases of sensorineural hearing loss [1] Some causes of SSNHL have been hypothesized including viral infection of the labyrinth or cochlear nerve, vascular incident causing cochlear hypoxia, intracochlear membrane rupture and inflammatory and autoimmune disorders [2]. The etiology and pathogenesis of SSNHL are still unclear, and its treatment remains controversial due to this. Spontaneous recovery in untreated patients has been reported as ranging from 38% to 65% [3]. Many factors seem to influence recovery; the age of the patient, the degree of hearing loss, the audiogram pattern, the existence of vertigo, and the duration between the onset and treatment of SNHL are probably the most important factors. A delay in presentation, age of more than 60, profound and downward sloping audiogram and association with vertigo are considered poor prognostic factors. A variety of treatments has been described for this condition, including vasodilators, , hyperbaric oxygen, antivirals, vitamins, and even zinc, calcium antagonists. However, ever since the 1980s when two double-blind trials showed efficacy of corticosteroids in the treatment of this condition, they have become the most commonly used agents

in most centers worldwide, albeit with controversy [4-6] While systemic steroid therapy is most widely considered as a main treatment for sudden sensorineural hearing loss (SSNHL), the disadvantages of its use are numerous side effects. Intratympanic steroid injection (ITS) delivers steroids through transtympanic route, hence avoids possible side effects with higher perilymph concentration.

Objective

To evaluate the safety and efficacy of intratympanic dexamethasone injection in the treatment of idiopathic sudden sensorineural hearing loss.

Materials and Methods

This a prospective study conducted in the Department of Otorhinolaryngology, Bangalore Medical College and Research Institute during the study period of 2 years, from October 2022 to October 2024.The sample consisted of fifty patients who were diagnosed with idiopathic sudden sensorineural hearing loss.

Patients diagnosed with sudden unilateral sensorineural hearing loss of at least 30 dB across 3 contiguous frequencies occurring in less than 72 hours or progressively over several days, but with an onset within 30 days, with in the age group of 18 to 60 years were included in the study. Onset of hearing loss over 30 days, history of recent use of ototoxic medications or recent trauma, patients with Meniere's disease, diabetes, neurological disorders, severe liver or renal dysfunction and pregnancy were excluded from the study.

Technique: Informed consent was taken. The patients were placed in supine position with the head turned 45° away from the affected side. The ear canal was anesthetized using 2% lidocaine injection. 0.5ml of dexamethasone (4mg/ml)was injected into the middle ear through the postero-inferior quadrant with a 22 gauge spinal needle under endoscopic guidance. After the injection, the patients were instructed to avoid swallowing or sniffing and to remain in the position for 20 minutes. A total number of six injections were given over a period of two weeks and pure tone audiometry was repeated one month after the first injection to assess the improvement in hearing.

Results

As per inclusion criteria, 50 patients were included in the study. Among them, 33 were male and 17 females (Figure 1). Eight patients were in the age group of 20 to 30 years, 26 patients (31-40 years), 14 patients (41-50 years) and 2 patients aged > 50 years (Figure 2). Treatment outcome of 50 patients enrolled for the study showed that, 43 patients had improvement in hearing, 4 patients showed no improvement and in 3 patients hearing worsened (Figure 3). Among 43 patients, hearing improvement was more than 20 dB in 4 patients, ranged from 10-20 dB in 35 and in 4 patients it less than 10 dB. Overall hearing gain was 12.17 dB which was statistically significant (p value <0.05). In the age specific post treatment assessment of these patients, maximum gain in hearing loss was attained in the age group of 31- 40 years. Out of 50 patients enrolled in our study, 8 patients had associated symptoms of vertigo and tinnitus, 5 patients had vertigo only, 15 patients had tinnitus only and 12 patients had no associated symptoms (Figure 4).

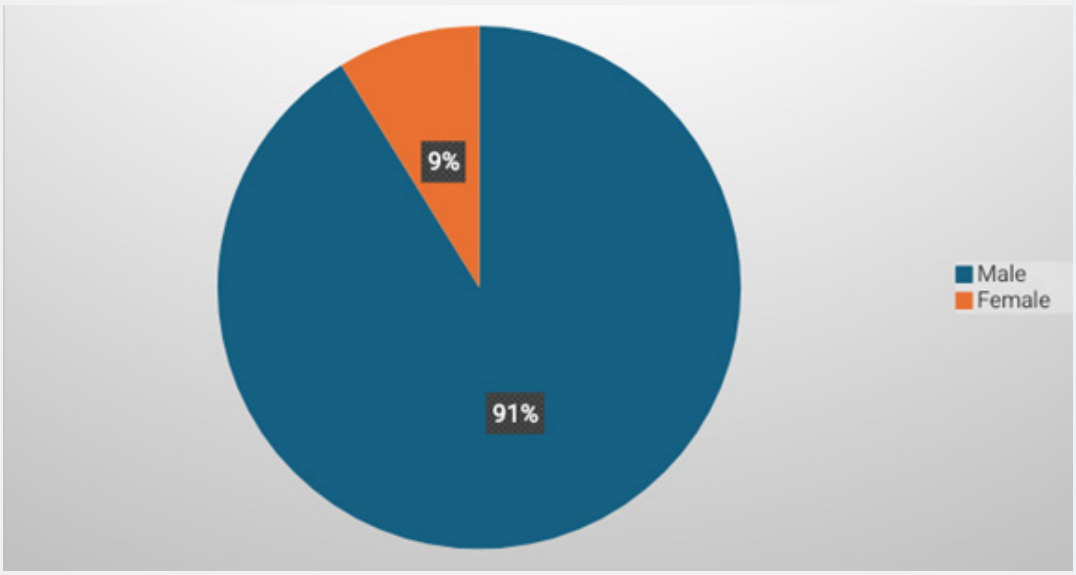

Figure 1: Gender distribution.

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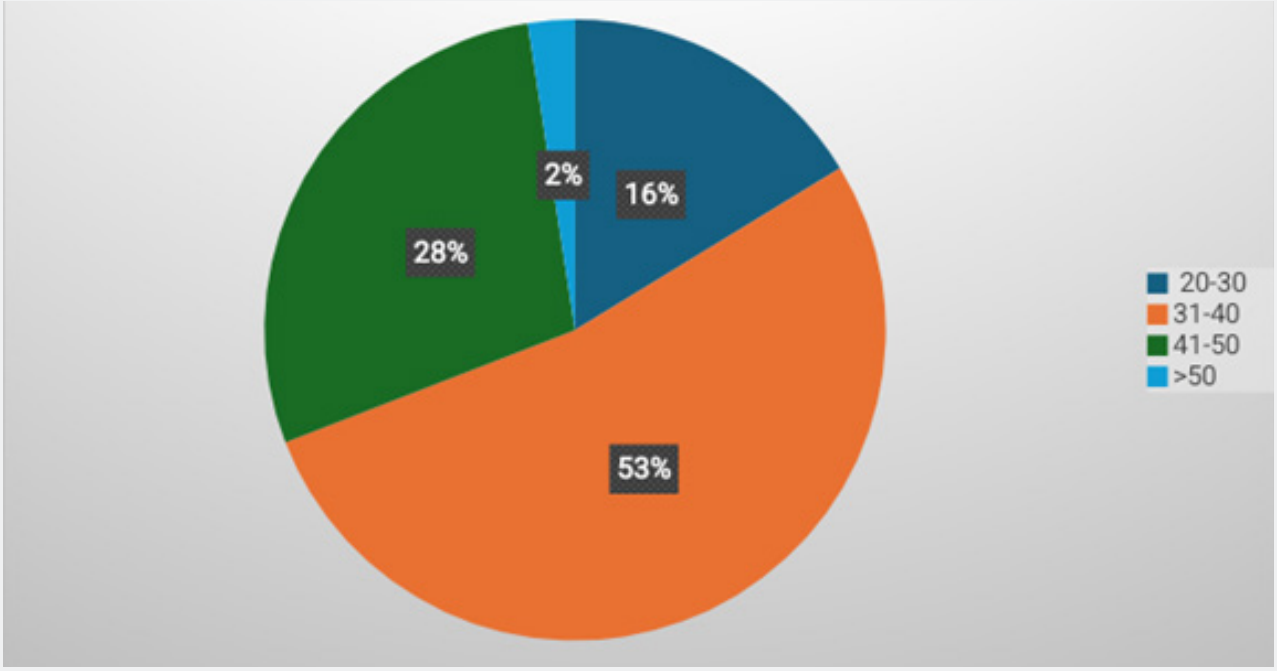

Figure 2: Age distribution.

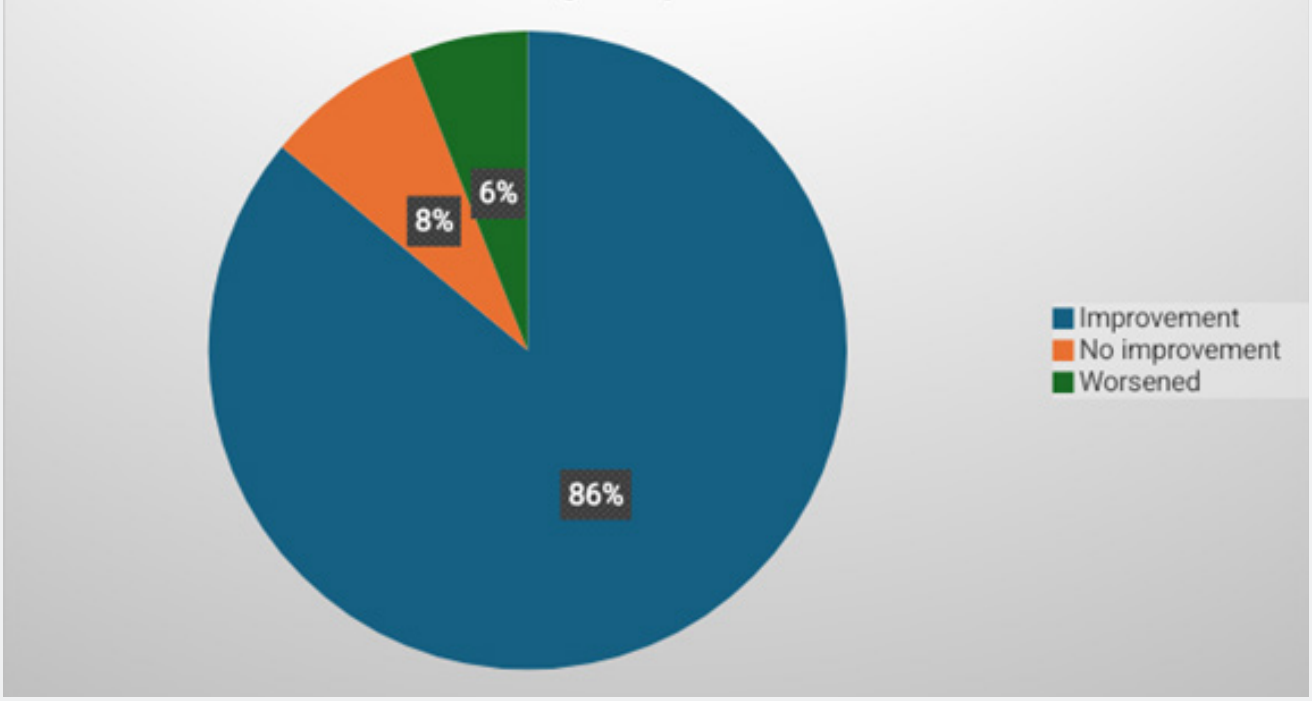

Figure 3: Hearing improvement post therapy.

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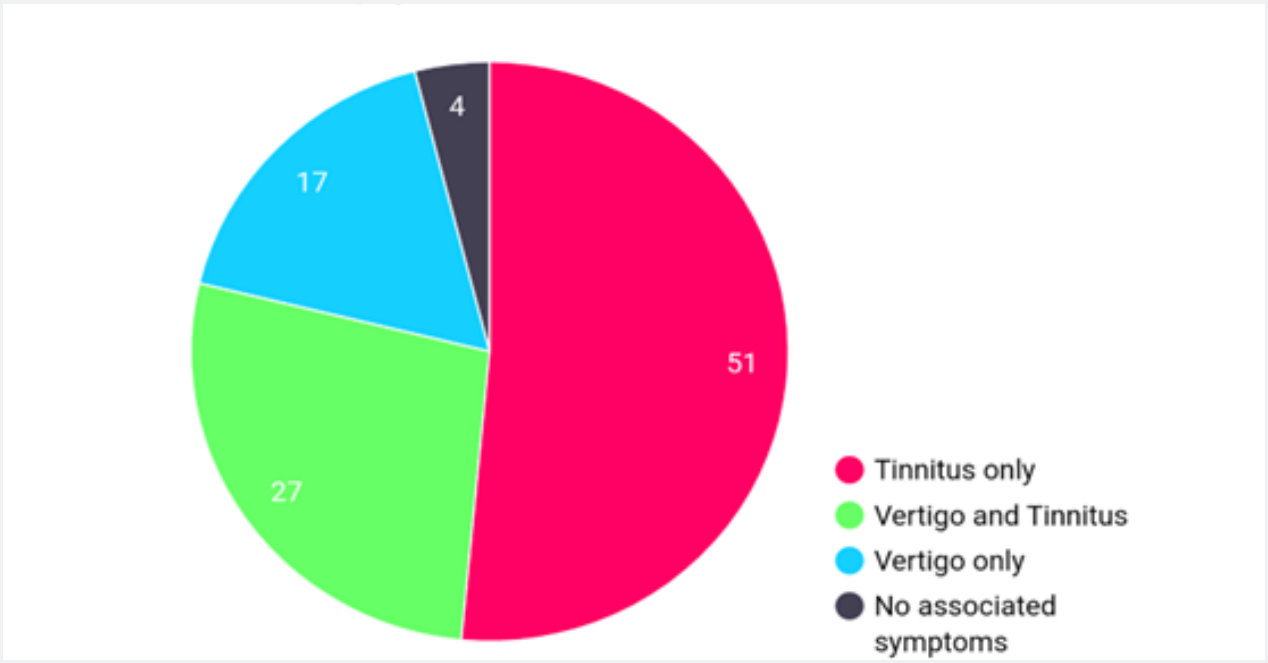
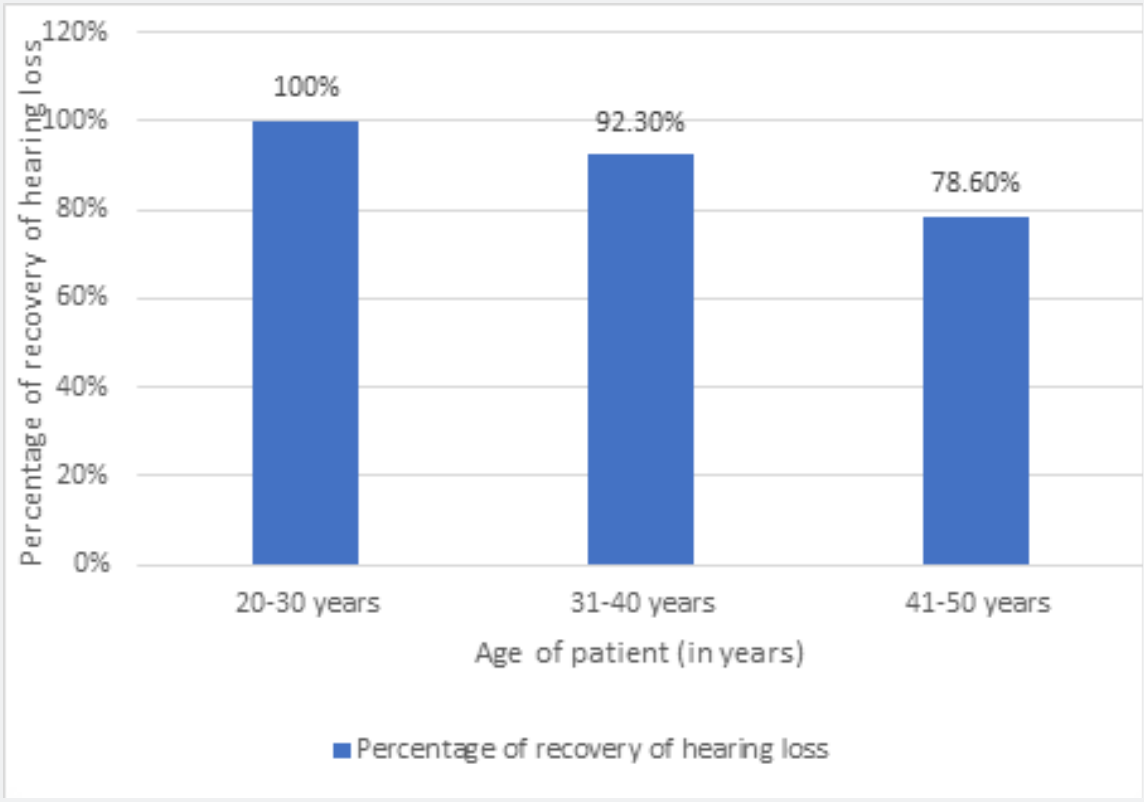


Figure 4: Associated symptoms with hearing loss.



Graph 1: Recovery related to age of patient.

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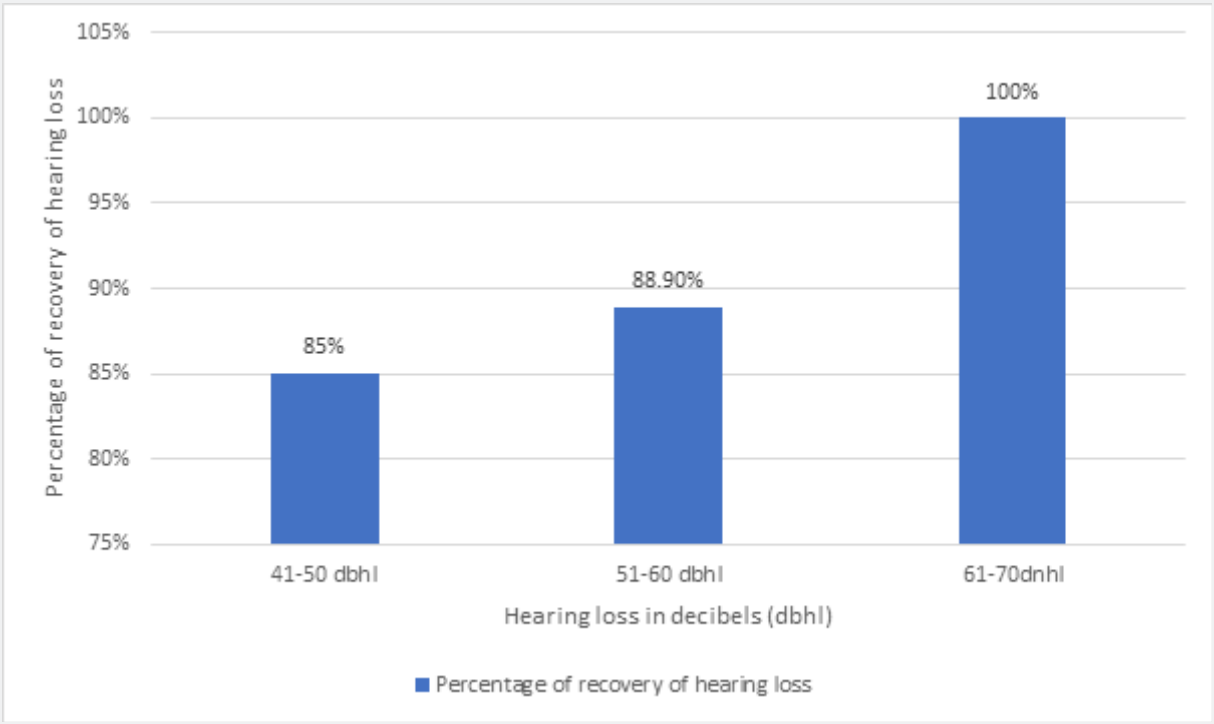
After one month of treatment, 21 patients with vertigo improved (91.3%) and 4 patients with tinnitus showed improvement (12.1%).Tinnitus did not have a significant effect on recovery. The presence of these symptoms did not correlate with the severity of the initial hearing loss. Recovery related to the age of the patient showed that, in the age group of 20-30 years there was 100% recovery, 92.3% recovery was seen in 31-40 age group and 78.6% in the age group of 41-50, no improvement was seen patients > 50 years of age (Figure 5). Although some previous reports have shown that older age is related to negative prognosis, younger patients were reported to have a better recovery by zadeh et al, similar to our study [7].

Recovery related to severity of hearing loss, showed that 40 patients (85%) with hearing loss in the range of 41-50 dB had recovery, as compared to 88.9% recovery in 51-60 dB range.100% recovery was seen in 61-70 dB range. Studies have shown that reduced efficacy was noted in patients who had profound hearing loss and primarily high frequency loss at presentation, and in our study, there was only one patient with hearing loss in the range of 61-70 dB, who recovered completely (Figure 6). Analysis of rate of recovery with time to onset of symptoms stated that, patients who presented less than 20 days of SSNHL for treatment showed improvement in 42 number of patients. Whereas patients who presented more than 20 days of onset of symptoms for treatment showed improvement in one patient and 5 patients showed no improvement/worsening, which was statistically significant (Chi square test $p<0.05$). The interval between onset of hearing loss and start of treatment is a known variable to affect recovery. This interval can range from days to months. Many studies reported better results when initial or salvage treatment was started within two weeks from the onset.

Mean hearing improvement of 12.17dB was seen post Intratympanic Dexamethasone therapy at the end of 1 month of first injection which was statistically significant (p value <0.05) (Figure 6). This is comparable with other studies.



Graph 2: Recovery related to severity of hearing loss.

Discussion

Sudden sensorineural hearing loss (SSNHL) is a common otologic emergency, presenting mostly as an acute unilateral deafness, with an abrupt onset. It has a high rate of spontaneous recovery and it is difficult to determine the efficacy of any therapeutic intervention. Natural recovery varies from 31-65%. [1,4,8,9] Hearing recovery results vary among the therapeutic interventions as it may be related to various factors like the severity of hearing loss, the duration from onset of symptoms to treatment, the type of steroid used etc. Silverstein in 1996 introduced intratympanic steroids in the treatment of sudden SNHL [10,11] Primary intratympanic Dexona (24 mg/mL) therapy for 25 patients with sudden SNHL by Battista in 2005 showed full recovery in 8% and partial recovery in 12% patients [11] in

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[12] study using intratympanic Methyl prednisolone (32 mg/mL)15.3% patients each achieved full and partial recovery. Studies by [13,14] reported that ITS in the treatment of SSHL patients are more effective at low frequencies. In our study the overall hearing gain was 12.17dB which was statistically significant (p value <0.05). 9.3% patients showed hearing gain of more than 20dB and 65% patients hearing gain was in the range of 10-20dB range. Majority of the patients who recovered were in the younger age group and patients who presented early for the treatment.

The precise mechanism through which steroids may improve hearing remains unknown. Steroids mainly act on the of inflammatory mediators, such as the tumor necrosis factor (TNF-α and NF-κB) and cytokines (interleukin 1 and 6), which is elevated in infection [15,16] thereby protecting the cochlea. It increases the cochlear blood flow [17] thereby avoiding cochlear ischemia [18], steroids regulate the protein synthesis in the inner ear [19] and the vascular stria which regulates the Na/K secretion in order to maintain endocochlear potential which is the most frequent site of injury in the SSNHL [20]. demonstrated the relation between the SSNHL pathogenesis and immunologically mediated vasculitis. The endothelial cells are thought to promote vasculitis by secreting cytokines. In Idiopathic SSNHL there is abnormal activation of endocochlear nuclear factor- κB which is a molecular transcription factor plays a key role in the normal cellular physiology and in mediating the cellular responses to a pathogenic stress like infectious, mechanical, or osmotic, with stimulation of synthesis of cytokines and alterations of homeostatic balance of the inner ear. Transient activation of this system is related to spontaneous recovery, whereas a prolonged stimulation would lead to an irreversible damage of cochlear cells leading to atrophy of "Organ of Corti" [21]. Due to a multiple treatment protocols, a variable rate of recovery, and a high rate of spontaneous recovery, well-controlled clinical trials and standard criteria of hearing recovery are required to document the real efficacy of ITS.

Conclusion

It is suggested that intratympanic steroids are equivalent to systemic steroid therapy as initial treatment for SSHL. In patients with contraindications against the use of systemic steroid, Intra tympanic dexona may be considered as valuable therapeutic option.

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