Role of intratympanic dexamethasone in patients presenting with sensorineural hearing loss and tinnitus not responding to oral medications

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INTRODUCTION

Since the past few decades, steroids in various routes have been used for various diseases and disorders and many studies have a proven role for the treatment of cases of sudden sensorineural hearing loss (SNHL), it has also been tried in cases of Menière’s disease and a number of other inner ear disorders. A very well-known fact which is always in mind of clinician before using higher dose of steroid or for longer duration is the adverse effect of it and direct steroid delivery to the inner ear using intratympanic injection would not only achieve higher concentration of steroid in inner ear but also at the same time, it limits systemic side effects at a relatively much lesser dose. The study has been done to evaluate the role of intratympanic dexamethasone for the treatment of tinnitus in SNHL not responding to oral medications. Materials and Methods: This prospective interventional study has been done in the Department of Otorhinolaryngology, Government Medical College and Susheela Tiwari Government Hospital, Haldwani, Nainital, Uttarakhand. The study included 50 patients SNHL with tinnitus not responded to oral medication for at least 6 weeks. All patients were divided into two groups. The first group received intratympanic dexamethasone and the second group did not receive it. Results: There was a significant improvement seen in 52% of patients after treatment with intratympanic dexamethasone, whereas only 12% improvement was seen in the other group. Conclusion: Intratympanic dexamethasone treatment is a simple office-based procedure with satisfying results in cases of sudden sensorineural hearing loss with tinnitus.

KEY WORDS: Dexamethasone, intratympanic injection, sudden sensorineural hearing loss, tinnitus

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The study found no difference between the groups, one who received intratympanic injection of dexamethasone and the other receiving intratympanic saline. Overall, there is no consensus on the definite role of intratympanic dexamethasone as different studies word over has different and varying results. The study has been undertaken with the objective of treating patients presenting with recent onset of SNHL with severe tinnitus not responding to 6 weeks of oral medications.

**MATERIALS AND METHODS**

The study was performed in the Department of ENT, Government Medical College and Dr. Susheela Tiwari Govt. Hospital, Haldwani, Uttarakhand. A total of 50 patients of tinnitus with sudden SNHL were included in the study. Selection of the patients was on the basis of continued presence of tinnitus even after 6 weeks of above said regimen of oral medication, absence of diabetes mellitus, hypertension, or any other chronic systemic illness or any contraindication for steroid therapy. These cases were randomly divided into two groups of 25 each. One group was treated with intratympanic dexamethasone and other groups were continued on medical management consisted of capsule of Vitamin B12 along with folic acid. An average hearing loss was calculated by taking mean of the obtained hearing levels at these following frequencies 250, 500, 1000, 2000, and 4000 Hz. Improvement of hearing was assessed and ranked as no change where average improvement of hearing was of 10 dB or less; slight improvement as average improvement in hearing of more than 10 dB but <30 dB; remarkable improvement as average improvement in hearing of more than 30 dB and complete recovery was assigned to those having improvement of hearing to the same degree of hearing as in the contra lateral ear.

Assessment of the tinnitus was done on the basis of questionnaire, proposed by tinnitus research conference in Japan, which included questions covering various details related to hearing loss and tinnitus such as duration, affected ear, subjective hearing loss, description of type of the sound heard (like rain, whistle, click, or any other), and details of any previous treatment obtained. The patients were also assess severity of tinnitus on the basis of visual analog scale graded from 0 to 10, 0 was assigned as no tinnitus, score of 10 to an intolerable level of severity, and rest graded as increasing severity of tinnitus in between. Tinnitus of severe degree is defined as when the patients had to stop daily activity because of the symptom. The selected patients gave their informed consent for participation in the study.

The procedures of intratympanic steroid injection were done on an outpatient basis in minor procedure room under strict aseptic precautions. The procedure has been performed in supine position with head turned to 30° away from the surgeon. Now, warmed 0.4–0.6 ml of dexamethasone (4 mg/mL) to body temperature was injected with the help of 1 ml syringe with a 23-gauge needle into the anteroinferior quadrant of the tympanic membrane. The procedure was performed under direct visualization through a 0° endoscope. To ensure proper absorption through the round window, each patient was asked to maintain the position for about 30 min. The patients were asked to come once a week for 3 consecutive weeks for the procedure. The above described questionnaire was filled once before commencing treatment and other 3 weeks after finishing treatment. Appropriate statistics was applied with level of significance set at P < 0.05.

**RESULTS**

In the present study, 31 years were found to be the average age of the patients with male-to-female ratio that was found to be 1.5:1 and 31 patients presented with bilateral involvement.

A total of 13 (52%) patients of group receiving intratympanic dexamethasone injection showed improvement in their tinnitus score. None of the patients had worsened tinnitus score. Only 3 (12%) patients of other groups managed with oral medication only showed improvement in their tinnitus score.

The only precaution one has to take while giving intratympanic injection that one need to be very precise under endoscopic visualization and immobilize the head for 20–30 min to avoid possibility of transient vertigo and better absorption of steroid through round window. However, none of the cases developed otitis media or tympanic membrane perforation.

**DISCUSSION**

Immunologic injury of different organ of the body is a well-known fact and the same has been implicated in a number of inner ear pathologies, sudden SNHL is one of the condition in which immunologic insult is one of the theories proposed. Meniere’s disease is also caused by some form of immune dysfunction as per some studies and one of the proposed theories of causation.

The study conducted by Tomoda et al. showed the presence of antibody elevation to Type 2 collagen and endolymph and also hypergammaglobulinemia in 30 patients who presented with classic Meniere’s disease and out these 30, five of them were treated with oral prednisolone (60 mg/day). A good response to oral steroid was also noted by studies done by Houghes et al. in 20% of Meniere’s patients.

Shea also found improvement to oral dexamethasone on hearing loss in patients of Meniere’s disease who presented with acute rapidly progressive hearing.

Many studies have suggested beneficial effect of steroid due to its anti-inflammatory effect in the labyrinth, suggesting immune dysfunction as the probable etiology also various in vitro studies have also suggested that steroid can affect perfusion of labyrinthine tissues, thereby affecting transport of sodium and maintains water balance. This has led to the use of steroids in the treatment of Meniere’s disease and it has been even included in the treatment protocol of it.

In this study, we got a marked improvement in the tinnitus score which is about 52% in Group A as compare to 12 % in control Group B even after 6 weeks of oral medication. Hearing gain was same in both groups. Transient dizziness was the only...
side effect noticed in some patients with none of the patients presented with otitis media or tympanic membrane perforation.

Itoh and Sakata were the first to propose intra tympanic steroid in the protocol in 1987. They have studied on 61 patients of unilateral Meniere’s disease and have given weekly intratympanic injection of dexamethasone in a dose of 2 mg for 4–5 weeks. They have found 80% relief in vertigo and 74% comparable reduction of tinnitus.[8] Varying results were obtained from the initial studies done by Shea and Ge, where they have used corticosteroids by both route, i.e., intratympanic and intravenous routes. They have found improvement of 67.9% and 96.4% in hearing and vertigo, respectively, among 28 Meniere’s disease patients.[9]

Shea further reported 2 years outcome among 48 Meniere’s disease patients and it showed improvement of 35% and 63% in hearing and control of vertigo, respectively.[9]

Silverstein et al. did a double-blind randomized crossover study and found no improvement in hearing.[10] Hamid performed a 2-year study on 60 patients of Meniere’s disease using 24 mg/ml dexamethasone, their results showing showed improvement in both vertigo and hearing 90% of patients and none of them reported any significant side effects.[11]

In 2003, Todd et al. found improvement in hearing in 40%, in 4%, it worsened and in remaining 56%, no change in hearing was observed in 50 Meniere’s disease patients who underwent intratympanic dexamethasone therapy.[12]

In 2004, Selivanova et al. in 2004 performed intratympanic injection of combined dexamethasone and hyaluronic acid in Meniere’s disease patient who has failed results with intravenous steroid treatment alone and found relatively better results thus obtained a reliable therapeutic option in certain situations.[12]

There is lot of variations among different reported studies in terms of treatment schedules, mode and methods, as well as frequency and dosage of medications and all these have caused the analysis difficult and complicated in regard to the efficacy of intratympanic steroids for the treatment of Meniere’s disease. Further analysis becomes more difficult in view of multifactorial association of the disease with lots of reason still unknown. The treatment is mainly empirical as there is no definite and permanent therapy with a clear endpoint of therapeutic success.

Intratympanic therapy further adds to another type of therapeutic intervention with variable but promising results. Despite these mixed outcomes, use of intratympanic steroid therapy is increasingly used in day-to-day clinical practice because it is office based, convenient, and ease of repeating and with minimal side effects reported with it.

CONCLUSION

Intratympanic dexamethasone injection is one of the simple, effective, and office-based treatment option for the control tinnitus with hearing loss in patients presenting with sudden SNHL with tinnitus even after 6 weeks of onset and not responding to oral medications. However, further randomized controlled studies with larger sample size are required and are the need for future research.

REFERENCES