

Role of Intratympanic Dexamethasone Injection as a Treatment Choice in Patients with Immune-mediated Sensory Neural Hearing Loss - A Clinical Study

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Abstract

Background: Sensorineural hearing loss (SNHL) is not an uncommon condition encountered in ENT practice. Once developed in patients, it causes severe handicap that affects their job, family life, and social life. Therefore, once diagnosed the otologists should treat the disorder effectively to improve and/or even stabilize hearing.

Aim: To evaluate the role of intratympanic corticosteroids for the treatment of different types of SNHL.

Materials and Methods: A total of 68 patients with immune-mediated SNHL were subjected to intratympanic steroid injections under local anesthesia. Pre- and post-injection Audiological evaluation; pure tone average (PTA) was done to know the results.

Observations and Results: Hearing improvement with improved PTA of 26.20 dB by pure tone audiometry observed in 49.42% of the patients. Improved speech discrimination scores of 37.60% in 58.4% of patients.

Conclusion: In SNHL of immune-mediated pathogenesis intratympanic steroid injection remains a safe and effective tool in the armamentarium of an ENT surgeon.

Key words: Immune mediated, Intra tympanic, Dexamethasone, Hearing loss and Sensorineural

INTRODUCTION

Development of sensorineural hearing loss (SNHL) in subjects who had normal hearing, either sudden or insidious or rapidly progressing is alarming and has a devastating effect on their family and social lives. If it is sudden in onset should be considered as a medical emergency situation. The treating physician should consider appropriate diagnostic approach and initiate immediate measures to control or recover the lost acuity of hearing. According to Harris *et al.* from the physician's point of view after diagnosis SNHL is potentially treatable.¹ Review

of literature shows that most of the acquired SNHL is immune-mediated which was established with laboratory and clinical evidence.² Among the immune-mediated diseases of SNHL, the common is idiopathic sudden SNHL (ISSNHL), idiopathic progressive bilateral SNHL (IPBSNHL), and Meniere's disease.³ McCabe quoted that systemic steroids are effective in controlling the SNHL in immune-mediated diseases.⁴ However, the systemic use of steroids is fraught with systemic complications such as diabetes, gastrointestinal tract bleeding, osteoporosis, hypertension, or avascular necrosis of the head of the femur especially if patients are predisposed or have a milder form of the disease; Shea.⁵ Receptors of glucocorticoid were identified by Pitovski *et al.*⁶ and Curtis⁷ in various animal models by the former and in human cadavers by the later. The receptors were identified in the cochlear as well as labyrinth tissues with the highest concentration in the spiral ligament. Dexamethasone passes through round window membrane after being left in contact with the round window membrane for 3 h, and its concentration was

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appreciable in both the basal and apical turns of cochlear and labyrinth.^{8,9} They also noted that the concentration of dexamethasone was higher in the inner ear fluids when administered intratympanic route than a systemic route.^{8,9}

MATERIALS AND METHODS

Aim of the Study

The aim of the study was to evaluate the role of intratympanic administration of dexamethasone for the treatment of patients with primary immune-mediated SNHL.

Study Period

The study was conducted from December 2016 –to July 2017.

Institute OS Study

Owaisi Hospital and Research centre attached to Deccan College of Medical Sciences, Hyderabad.

68 patients' attending the OPD of the Department of ENT and diagnosed as ISSNHL, IPBSNHL or Meniere's diseases were included in the study. Ethical Committee Clearance was obtained before the commencement of the study. An Ethical Committee approved consent form was used for obtaining the consent from all the participants of the study.

Inclusion Criteria

1. Patients aged above 25 years and below 55 years were included.
2. Patients with immune-related SNHL were included.
3. Patients with the diagnosis of ISSNHL, IPBSNHL, or Meniere's diseases were included.

Exclusion Criteria

1. Patients below 25 years and above 55 years were excluded.
2. Patients with diabetes, hypertension and thyroid and other endocrine disorders were excluded.
3. Patients with cervical spondylosis were excluded.
4. Patients on recent treatment with vestibular sedatives were excluded.
5. Patients in the acute phase of Meniere's disease were excluded.

All the patients were elicited of the history of onset, progression and actual status of hearing loss. A thorough clinical examination of ear, nose, and throat was performed to exclude associated ENT diseases. Audiological evaluation was done to record the pure tone average (PTA) on pure tone audiometry and speech discrimination score (SDS) on speech audiometry. A loss of more than 30 dB of hearing on pure tone audiometry on consecutive three audiograms

within consecutive 3 days was defined as sudden loss of hearing. Advanced evaluation of patients with magnetic resonance imaging to exclude retrocochlear lesions, tympanometry, otoacoustic emissions, and auditory brain stem response tests were done on tests for autoimmune ear diseases. Pre-treatment counseling of patients was done to alleviate the fear of complications and explain the possible side effects of intratympanic dexamethasone injections. Intra-tympanic 12 mg dexamethasone (0.5 ml of 24 mg/ml) was injected through the tympanic membrane of the patients lying in the supine position in the operation theater ambience. The patients are asked to remain without changing the position of the head for 30 min so as to allow dexamethasone to diffuse through the round window niche to the inner ear. Local anesthesia was obtained before injection by glycerin phenol 20%. A small opening in the anterior part of the drum was made to allow air to escape while injecting the drug. The procedure was repeated every 3rd day for 3 times. Post-treatment Audiological evaluation using PTA and SDS were done in all patients after 1 week after the completion of the three injections. All data were tabulated and statistically analyzed using SPSS software for windows.

OBSERVATIONS AND RESULTS

A total of 68 patients were included in this study with the definite diagnosis of immune related SNHL (ISSNHL, IPBSNHL, or Meniere's diseases). Among the 68 patients 23 were diagnosed with ISSNHL, 28 with IPBSNHL 37 were males, and 31 were females and the remaining 17 with Meniere's disease. Among the 68 patients, 37 were males, and 31 were females. The male to female ratio was 1.9:1 among the SNHL patients. In ISSNHL group (23) the males were 14 and females were 09. In the IPBSNHL group (28) males were 18 and females were 10. In the Meniere's disease group (17) males were 8 and females were 11. The mean age and standard deviations (SD) of patients of all the three groups in this study are shown in Table 1. Patient's age group among the total SNHL (68) patients ranged from 26 years to 57 years with a mean age of 36.42 ± 2.30 . Similarly, the mean age of sub groups is shown in Table 1. Mean values of age groups were compared among the sub groups using analysis of variance and found to be having no significant difference in the age or sex between the three groups (Table 1).

Comparison between pre-treatment and post-treatment Audiological evaluation in ISSNHL group showed improvement in PTA of 13 out of the 23 (56.52%) patients. The auditory gain among these patients was 39.64 dB. In IPBSNHL group showed improvement in PTA of 15 out of the 28 (53.57%) patients. The auditory gain among these

patients was 43.90 dB. In Meniere's disease 11/17 (64.70%) patients showed improvement. The auditory gain among these patients was 43.60 dB (Table 2).

The SDS results showed improvement in 14/23 (60.86%) of ISSNHL patients. The SDS gain in this group was 33.86%. 17/28 (60.71%) of IBPSNHL patients showed improvement. The SDS score improvement in IBPSNHL was 32.05%. In Meniere's group, 12/17 (70.58%) of patients showed improvement. The SDS gain was 26.89% (Table 3). The correlation between SDS and PTA results in the three patient groups as a whole and both IPBSNHL and Meniere's disease groups proved to be significant (Table 3).

DISCUSSION

Various treatment modalities are described in literature to treat patients with immune-related SNHL such as using vasodilators nicotine, papaverine, micro vasodilators betahistine hydrochloride, platelet adhesion inhibitors (dipyridamole), inhalation of carbogen, low molecular weight heparin, and systemic steroids. Intratympanic steroid injection was described and in vogue for the past one and half decades by various authors worldwide. It is an

easy and effective outpatient procedure for the treatment of Meniere's disease, ISSNHL, and IPBSNHL to avoid the side effects of systemic corticosteroids. In the present study was conducted to review the results by various authors and to establish a definite protocol in the Hospital for the management of SNHL. This study is in agreement with the protocol of Hamid.¹⁰ The author reported 90% recovery in auditory gain in his study followed up over a period of 4 years, especially in SDS scores. A new advancement in the drug delivery of dexamethasone at the round window membrane was shown by a study conducted by Li *et al.*¹¹ He demonstrated that intratympanic dexamethasone perfusion by an external electronic pump with gelatin sponge placement in a round window niche is an efficacious and safe method for the treatment of ISSNHL, showing superiority to simple injection through the drum. However, the study by Garavello *et al.*¹² reported intratympanic steroid therapy seems to confer only a certain degree of benefit as salvage but not as a primary treatment of sudden deafness. This report is actually in contradiction to results of this study that proved intratympanic dexamethasone injection was an effective primary therapy probably because of inclusion criteria used. The gain in PTA values in this study demonstrates a significant therapeutic action of the short-duration intratympanic dexamethasone therapy on moderate to severe immune-mediated SNHL. Filipo *et al.*¹³ concluded his study with similar results of auditory gain.

Table 1: The gender incidence, mean age and SD (n=68)

Observation	Males	Females	Mean age	SD
ISSNHL - 23	14	09	33.28	1.80
IPBSNHL - 28	18	10	35.64	2.34
Meniere's - 17	08	11	34.80	2.86
Total - 68	37	31	36.42	2.30

SD: Standard deviation

Table 2: The PTA results before and after treatment (n=68)

Observation	Mean PTA before treatment	Mean PTA after treatment	Mean auditory gain in dB
ISSNHL - 23	72.24±2.50	32.60±1.09	39.64
IPBSNHL - 28	74.40±1.20	30.50±1.08	43.90
Meniere's - 17	76.30±1.90	32.70±1.34	43.60
Total - 68	70.31±1.86	31.93±1.17	38.38

PTA: Pure tone average

Table 3: The SDS results before and after treatment (n=68)

Observation	Mean SDS score before treatment-%	Mean SDS score after treatment-%	Mean SDS gain %
ISSNHL - 23	42.44	76.30	33.86
IPBSNHL - 28	46.20	78.25	32.05
Meniere's - 17	48.50	72.60	26.89
Total - 68	45.71	75.71	30.60

SDS: Speech discrimination score

CONCLUSIONS

Intratympanic dexamethasone injection in the treatment of immune-mediated SNHL is an effective, easy office procedure performed under local anesthesia. It is cost effective with minimal or no side effects. If started at the earliest after the onset of symptoms could be proved as an optimal choice in the management of SNHL disorders.

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