VOLUME - 9, ISSUE - 8, August - 2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

ENT

ROLE OF INTRATYMPANIC STEROID IN IDIOPATHIC SUDDEN SENSORINEURAL HEARING LOSS

Prof. Dr. Sridhara Narayanan*	Professor,Department Of Ent , Sree Balaji Medical College And Hospital. *Corresponding Author
Dr.Nithya Balasubramanian	Junior Resident,Department Of Ent , Sree Balaji Medical College And Hospital
Dr. Karthika Manimaran	Junior Resident,Department Of Ent , Sree Balaji Medical College And Hospital

ABSTRACT The aim of this study is the investigation of the effectiveness of intratympanic steroids therapy (IST) in patients with idiopathic sudden sensorineural hearing loss (ISSHL), evaluating the overall hearing recovery. Our study consisted of 30 patients with refractory ISSHL, who had a puretone 4-frequency average (PTA) of worse than 30dB . 10 patients presented with tinnitus along with sudden SNHL. The patients received 0.5 mL of dexamethasone by direct intratympanic injection. The procedure was carried out every alternate day for 7 days.

KEYWORDS :

INTRODUCTION

Idiopathic sudden sensorineural hearing loss (ISSHL) is a clinical diagnosis characterised by a sudden deafness of cochlear or retrocochlear origin, in the absence of a clear precipitating cause.

The diagnosis of idiopathic sudden sensorineural hearing loss remains obscure. Different theories attempt to explain this problem, including disturbance of cochlear blood flow, viral infections, autoimmune disease and Reissner's membrane rupture . Various treatments have been tried to treat sudden sensorineural hearing loss.

Sudden sensorineural hearing loss (SSHL) is defined as a hearing loss of 30 dB or more, affecting at least 3 consecutive frequencies, occurring within 3 days without any identifiable cause. It is relatively common disease, affecting 5 to 20 per 100,000 persons per year. The cause, pathophysiology, and management of SSHL are still not known. Spontaneous recovery in untreated patients has been reported as ranging from 38% to 65%.\

Tinnitus is a complex disorder and is presented as a hearing senasation, not associated with an external sound stimulus. It probably arises initially in the cochlea and later reaches higher structures of the auditory system where it becomes sometimes very annoying.

A more recent method of treatment is the intratympanic (IT) route.

Intratympanic (IT) steroid injection has been used increasingly in treating sudden sensorineural hearing loss along with tinnitus. Administration of IT steroid within 72 hours of onset of SNHL has shown to be more beneficial. Early intervention, asymmetric sensorineural hearing loss and unilateral tinnitus seem to be favorable factors for outcome of IT steroid injection. Because of the higher concentration of the drug into the target organ and the lower risk of the systemic side effect.

CASE HISTORY

This study was conducted on patients who presented to the OPD of Department of ENT, Sree Balaji Medical College and Hospital.

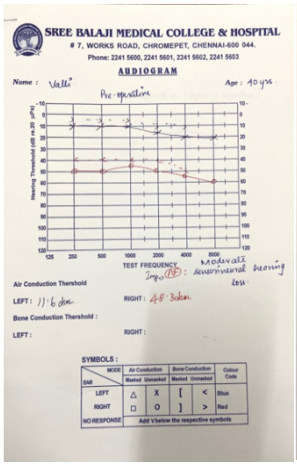
Thirty patients having sensorineural hearing loss and tinnitus, refractory to medical line of management were included in the study. The study was conducted between June 2019-June 2020. The patients were subjected to detailed history taking and otologic examination.

Auditory function was determined by pure-tone audiometry; the mean hearing levels were expressed as the average of hearing thresholds at 0.5, 1, 2, and 3 kHz (4-tone average) (PTA). Auditory measurements were performed before, during, and 3-month after treatment. "Complete recovery" was defined as more than 30dB hearing gain and as final hearing better than 25dB, "partial recovery" as more than 15dB hearing gain and as final hearing between 25 and 45dB, "slight improvement" as more than 15dB hearing gain but with a final hearing poorer than 45dB, and "no improvement" as less than 15dB hearing gain and final hearing poorer than 75dB.

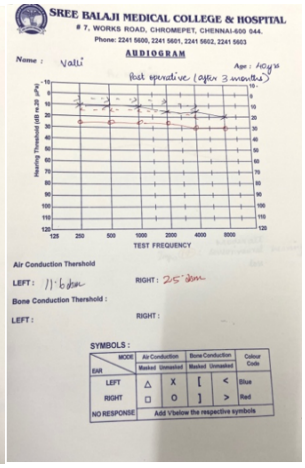
OBSERVATIONS AND RESULTS

Observations

The study sample consisted of 30 patients in the age group of 30-45 years. 20 patients presented with only sudden sensorineural hearing loss and the rest presented with sudden sensorineural hearing loss along with tinnitus Audiogram of a patient with 48.3dB hearing loss. A gain of 23dB is seen 3 months after administration of IT steroid indicative of partial improvement.



PRE-OPERATIVE PTA



POST OPERATIVE PTA AFTER 3 MONTHS

Within-Subjects Factors	
Measure: MEASURE_1	
factor1	Dependent Variable
1	PREOPPTA
2	POSTOPPTA

Mauchly's Test of Sphericity[a]					
Measure: MEASURE_1					
Within Subjects Effect	Mauchly'sW	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
factor1	1.000	.000	0	.	1.000

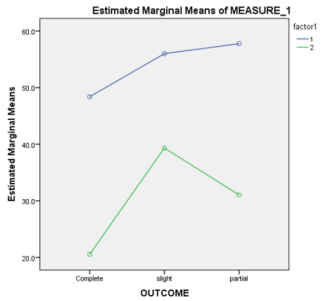
Mauchly's Test of Sphericity[a]		
Measure: MEASURE_1		
Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
factor1	1.000	1.000

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
factor1	Sphericity Assumed	5212.950	1	5212.950	272.426
	Greenhouse-Geisser	5212.950	1.000	5212.950	272.426
	Huynh-Feldt	5212.950	1.000	5212.950	272.426
	Lower-bound	5212.950	1.000	5212.950	272.426
factor1 * OUTCOME	Sphericity Assumed	153.350	2	76.675	4.007
	Greenhouse-Geisser	153.350	2.000	76.675	4.007
	Huynh-Feldt	153.350	2.000	76.675	4.007
	Lower-bound	153.350	2.000	76.675	4.007
Error (factor1)	Sphericity Assumed	516.652	27	19.135	
	Greenhouse-Geisser	516.652	27.000	19.135	
	Huynh-Feldt	516.652	27.000	19.135	
	Lower-bound	516.652	27.000	19.135	

Tests of Within-Subjects Effects		
Measure: MEASURE_1		
Source		Sig.
factor1	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.000
factor1 * OUTCOME	Sphericity Assumed	.030
	Greenhouse-Geisser	.030
	Huynh-Feldt	.030
	Lower-bound	.030
Error(factor1)	Sphericity Assumed	
	Greenhouse-Geisser	
	Huynh-Feldt	
	Lower-bound	



FACTOR 1 - PRE-OP PTA; FACTOR 2 - POST-OP PTA

Outcome showing the decibel gain after the procedure.

Statistics					
		AGE	PRE-OP PTA	POST OP PTA	GAIN
N	Valid	30	30	30	30
	Missing	0	0	0	0
Mean		40.40	54.153	28.023	26.53
Std. Deviation		3.125	7.9552	7.3735	7.347
Range		10	30.0	29.0	33
Minimum		35	38.0	17.0	15
Maximum		45	68.0	46.0	48

OUTCOME					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Complete	11	36.7	36.7	36.7
	slight	3	10.0	10.0	46.7
	partial	16	53.3	53.3	100.0
	Total	30	100.0	100.0	

RESULTS

While analysing pre-op PTA and post-op PTA status, it was observed that 36.7% of the patients (n=11) showed complete recovery and 53.3% of the patients (n=16) showed partial recovery after administration of intratympanic steroid ($p<0.001$). 10% of the patients (n=3) showed only slight recovery.

Mauchly's test results show the assumption of equal time interval, which is significant with p value<0.001. Hence the study is checked with the Greenhouse-Geisser effect when the value is significant with p value<0.001. Therefore there is a significant difference between the groups. When a comparison of the study is made between subject effects, it is noted that there is a significant difference with p value<0.001, f value being 272.426 and df being 1.000.

DISCUSSION

One ear of each of the 30 patients was treated with IT dexamethasone injection under local anesthesia. The patients were placed in the supine position on the table with their heads turned about 30° away from the surgeon. A local anesthetic , 2.5% lidocaine, applied for topical anesthesia in the outer ear canal and the tympanic membrane, and left for 30-45 min. The dexamethasone solution of 8 mg/ml was checked and warmed to body temperature before injection, and about 0.5 ml of dexamethasone was injected into the posteroinferior quadrant of the tympanic membrane under direct visualization through an operating microscope. The patient remained in the described position for 30 min . Four injections were administered every alternate day for 7 days.

Injection intratympanic dexamethasone has been tried in patients with idiopathic sudden sensorineural hearing loss because it provides a high concentration of steroids in the labyrinth. In addition, there are several advantages to intratympanic treatment. It helps in improvement of tinnitus as

well. The procedure is well tolerated, relatively easy to perform as outpatient. Most patients understand the concept of intratympanic treatment and easily accept this therapy.

A study by Shikowitz et al shows that patients who had profound SNHL, when injected with intratympanic dexamethasone(4mg/mL) in the anteroinferior portion of the tympanic membrane, achieved maximum benefit.

A study by Parnes, et al showed that injection of intratympanic steroid(2mg/mL), showed a 50% recovery rate overall.

In the study by Batista et al, four injections of intratymapnic steroid were given over a period of 14 days. 8% of the patients returned to normal hearing and 12% showed partial recovery.

CONCLUSION

Sudden sensorineural hearing loss is a treatable condition provided patient presents within 72 hours of onset of symptoms.

In this study, after administration of intratympanic steroid, 90% of the patients showed improvement (complete and partial) and hence the treatment was considered to be successful. 10% of the patients showed only slight recovery, hence the administration of intratympanic steroid was considered to be a failure in them.

REFERENCES

1.Hughes GB, Freedman MA, Haberkamp TJ, Guay ME. Sudden sensorineural hearing loss. Otolaryngol Clin North Am 1996;29:393-405.
2.Byl FM Jr. Sudden hearing loss: eight years' experience and suggested prognostic table. Laryngoscope 1984;94:647-61.
3.Mattox DE, Simmons FB. Natural history of sudden sensorineural hearing loss. Ann Otol Rhinol Laryngol 1977;86:463-80.
4.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.
5.Moskowitz D, Lee KJ, Smith HW. Steroid use in idiopathic sudden sensorineural hearing loss. Laryngoscope 1984;94:664-6.
6.Cinnamon U, Bendet E, Kronenberg J. Steroids, carbogen or placebo for sudden hearing loss: a prospective double-blind study. Eur Arch Otorhinolaryngol 2001;258:477-80.
7.Silverstein H, Choo D, Rosenberg SI, Kuhn J, Seidman M, Stein I. Intratympanic steroid treatment of inner ear disease and tinnitus (preliminary report). Ear Nose Throat J 1996;75:468-71, 474, 476 passim.
8.Parnes LS, Sun AH, Freeman DJ. Corticosteroid pharmacokinetics in the inner ear fluids: an animal study followed by clinical application. Laryngoscope 1999;109:1-17.
9.Chandrasekhar SS, Rubinstein RY, Kwartler JA, Gatz M, Connelly PE, Huang E, et al. Dexamethasone pharmacokinetics in the inner ear: comparison of route of administration and use of facilitating agents. Otolaryngol Head Neck Surg 2000;122:521-8.
10. Cureoglu S, Schachern PA, Rinaldo A, Tsuprun V, Ferlito A, Paparella MM. Round window membrane and labyrinthine pathological changes: an overview. Acta Otolaryngol 2005;125:9-15.
11. Hargunani CA, Kempton JB, DeGagne JM, Trune DR. Intratympanic injection of dexamethasone: time course of inner ear distribution and conversion to its active form. Otol Neurotol 2006;27:564-9.
12. Plontke SK, Biegner T, Kammerer B, Delabar U, Salt AN. Dexamethasone concentration gradients along scala tympani after application to the round window membrane. Otol Neurotol 2008;29:401-6.
13. Banerjee A, Parnes LS. The biology of intratympanic drug administration and pharmacodynamics of round window drug absorption. Otolaryngol Clin North Am 2004;37:1035-51.
14. Bailey BJ, Johnson JT, Newlands SD. Head and Neck Surgery--Otolaryngology. Chapter 150 Lippincott Williams and Wilkins; 2006.
15. Alexander TH, Harris JP. Incidence of sudden sensorineural hearing loss. Otology and Neurotology. 2013;34:1586–89.
16. Merchant SN, Adams LC, Nadol JB., Jr Pathology and Pathophysiology of idiopathic sudden sensorineural hearing loss. Otology and Neurotology. 2005;26(2):151–60.
17. Lin RJ, Krall R, Chau JK. Systematic Review and Meta-Analysis of the Risk Factors for Sudden Sensorineural Hearing Loss in Adults. Laryngoscope. 2012;122:624–635.
18. Agarwal L, Pothier DD. Vasodilators and vasoactive substances for idiopathic sudden sensorineural hearing loss. The Cochrane Collaboration. 2012]
19. Awad Z, Huins C, Pothier DD. Antivirals for sudden sensorineural hearing loss. The Cochrane Collaboration. 2012
20. Bennett MH, Kertesz T, Lehm JP. Hyperbaric oxygen for idiopathic sudden sensorineural hearing loss and tinnitus. The Cochrane Collaboration. 2012
21. Wei BP, Stathopoulos D, O'Leary S. Steroids for idiopathic sudden sensorineural hearing loss. The Cochrane Collaboration. 2013
22. 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.
23. Nosrati-Zarenoe R, Hultcrantz E. Corticosteroid treatment of idiopathic sudden sensorineural hearing loss: randomized triple-blind placebo-controlled trial. Otology & Neurotology. 2012;33:523–531