



INTRA TYMPANIC STEROID INJECTIONS FOR THE MANAGEMENT OF SUDDEN SENSORINEURAL HEARING LOSS

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ABSTRACT **Introduction:** Sudden sensorineural hearing loss (SSNHL) is a therapeutic challenge. There are several controversies regarding the management protocol of SSNHL. This study aimed to present the results of a novel treatment algorithm, which is a combination of systemic steroids and a tapering intratympanic (IT) dexamethasone regimen. **Materials and Methods:** This study was done in Department of Otorhinolaryngology and head and neck surgery, Government Medical College, Sawai Madhopur from May 2025 to April 2026. The total of 50 patients were studied who came to ENT OPD with SSNHL. Patients were assessed using standardized methods for pure-tone threshold audiometry. The management method of SSNHL treatment included oral steroids combined with IT administration of dexamethasone. Patients' recovery was assessed using Siegel's criteria. **Results:** In this study, a total of 50 cases of sudden sensorineural hearing loss were treated with IT administration of dexamethasone. 19 (38%) cases were within the age range of 40-60 years. Moreover, 22 (44%) and 28 (56%) cases were female and male, respectively. The most common associated symptoms were tinnitus (86%, n=43), followed by vertigo (52%, n=26). The final hearing outcome of patients showed that 8 (16%), 8 (16%), 17 (34%), and 17 (34%) patients underwent a complete recovery, partial recovery, slight recovery, and no recovery, based on Siegel's criteria. **Conclusions:** Currently, the IT steroid injection is a generally accepted method for the management of sudden sensorineural hearing loss. Nevertheless, the dose, interval, and duration of the treatment are not universally approved.

KEYWORDS : Intratympanic, Steroid, Sudden Sensorineural Hearing Loss

INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is defined as an rapid-onset hearing loss of 30 dB or more over three or more contiguous frequencies within 72 h or less with no identifiable etiology (1). The annual incidence is estimated at about 10-20 cases per 100,000 individuals (2). Although the etiology is mostly unknown, a number of cases can be attributed to vascular disorders, viral infections, metabolic, auto immune causes, or even cardiovascular conditions (3, 4).

Proposed treatment options for SSNHL may include observation and close follow-up (5), steroid therapy (6), acupuncture (7), hyperbaric oxygen therapy (8). However, the efficacy of early medical treatment is still controversial due to the delay in start of medical interventions in most patients, and many other confounding factors (9).

Intratympanic (IT) steroid injections are recommended by the American Academy of Otolaryngology-Head and Neck Surgery when patients have incomplete recovery or after the failure of initial systemic steroid therapy (10). The IT steroid injection has been shown to result in higher inner ear steroid concentrations than systemic steroids (5). The efficacy of IT steroid injections has already been demonstrated in a retrospective longitudinal study, especially if performed within 14 days from the onset of hearing loss (9, 11). Simultaneous or sequential administration of IT steroid is reported to be more effective in treatment of SSNHL than administration of systemic steroids alone (12). No standard protocol is available regarding the type of steroid to be injected, interval between the subsequent injections, and duration of treatment (9). The present study reports the result of IT dexamethasone administration, combined with systemic steroid therapy.

MATERIAL AND METHODS

This study was done in Department of Otorhinolaryngology and head and neck surgery, Government Medical College, Sawai Madhopur from April 2025 to March 2026. The total of 50 patients were studied who came to ENT OPD with SSNHL. The patients with comorbidities and who lack to follow up were excluded from this study.

All patients had unilateral SSNHL and were treated with both systemic (oral) and IT steroid therapy as first-line management. Informed written consent was obtained from all patients. The present study was approved by the Ethical Committee of Government Medical College, Sawai Madhopur.

The recorded data included name, gender, age, date of onset of hearing loss, associated symptoms, past medical history, pure-tone audiogram,

and prescribed treatment. Hearing thresholds were measured at octave intervals between 250 Hz and 8 kHz. Audiograms were obtained before the start of treatment as well as two weeks and one month after treatment.

Audiometric Data

Patients were assessed using standardized methods for pure tone audiometry. Pure tone average (PTA) was calculated as the mean of hearing thresholds at six frequencies (250, 500, 1000, 2000, 4000, and 8000 Hz), and Siegel's criteria was used to assess the hearing recovery (13, 14).

Complete recovery is defined as a final hearing better than 25 dB

Partial recovery is defined as a hearing gain of more than 15 dB and a final hearing between 25 dB and 45 dB.

Slight improvement is defined as a hearing gain of more than 15 dB and a final hearing poorer than 45 dB. Moreover, a hearing gain of less than 15 dB and a final hearing poorer than 75 dB was considered no improvement.

Management Protocol

SSNHL patients are treated with combined therapy of oral and intratympanic steroids. Oral prednisolone 1mg/kg/day (maximum 60mg daily) for 7-10 days followed by 7day tapering dose is given.

IT administration of dexamethasone (4 mg/ml) is given once every 3-4 days. The injections would be stopped in case patients show either complete recovery or no improvement within the first week of treatment. However, in case of either partial recovery or slight improvement, the IT injections will continue and the audiogram will be repeated after one week.

Afterward, in case no improvement is observed, the IT injections will discontinue; however, the injections will continue on a weekly basis for two more weeks in case of any hearing improvement.

The IT steroid injection procedure started with the evaluation of the integrity of the tympanic membrane with the aid of a microscope. Patients were placed in a supine position with their heads tilted 40-45° to the healthy side, and a 26-gauge, 1.5inch needle was introduced into the antero-inferior part of the tympanic membrane. The middle ear was gently perfused with dexamethasone (4 mg/ml) and the patient was asked to avoid swallowing for five min. The patients were kept in this position for 20mins.

Statistical Analysis

Statistical analyses were performed in SPSS software (Version 16). The absolute numbers and percentages were computed to describe the data. Moreover, the χ^2 test and the independent t-test results were used to compare qualitative and quantitative variables, respectively. A p-value less than 0.05 was considered statistically significant.

RESULTS

In this study, a total of 50 cases of sudden sensorineural hearing loss were treated with IT administration of dexamethasone. 19 (38%) cases were within the age range of 40-60 years. Moreover, 22 (44%) and 28 (56%) cases were female and male, respectively. The most common associated symptoms were tinnitus (86%, n=43), followed by vertigo (52%, n=26). The hearing loss in patients was categorized as mild (26-40 dB), moderate (41-55 dB), moderately severe (56-70 dB), severe (71-90 dB), and profound (>90 dB), according to the mean pure tone threshold at 500, 1000, 2000, and 4000 Hz.

Table 1- tabulates the frequency of pre-and post-treatment hearing levels.

Table 1. Hearing Loss Classification at Pre- And Post-treatment

Level	Pre-treatment	Post-treatment
Mild (26-40dB)	Excluded	15 (30%)
Moderate (41-55 dB)	7 (14%)	8 (16%)
Moderately Severe (56-70 dB)	7 (14%)	8 (16%)
Severe (71-90 dB)	15 (30%)	12 (24%)
Profound (Above 90 dB)	21 (42%)	7 (14%)
Total	50(100%)	50(100%)

Table 2 tabulates the overall recovery outcomes during one month, according to Siegel's criteria (13,14).

Table 2. Overall Recovery Outcome

Level	N	%
CR	8	16
PR	8	16
SI	17	34
NI	17	34
Total	50	100

DISCUSSION

Idiopathic SSNHL is a sudden onset hearing loss without a known cause and is considered a medical emergency. Although the patients may occasionally recover spontaneously (15, 16), early treatment is recommended (12,17). The IT steroid therapy has gained popularity due to the advantage of an increased medication concentration at the target organ (inner ear) and the reduced systemic corticosteroid distribution and side effects (18,19).

This study aimed to report the results of simultaneous first-line systemic steroids in combination with IT dexamethasone administered. This method included injections every 3-4days followed by gradual tapering, based on the audiological status. Ermutlu et al. reported separate safe and effective steroid administration routes as the primary treatment for SSNHL (15). Kang et al. studied 494 patients and reported that IT steroid therapy is a safe alternative for systemic steroid therapy in the initial treatment of sudden hearing loss (12). According to Gianoli et al., IT steroids can be administered through a ventilation tube on four separate occasions over 10-14 days to patients who failed to respond to systemic treatment (20).

The IT steroid administration method is still under debate. Several studies have used IT steroid injections to salvage the failure of systemic treatment. There are few studies on the simultaneous administration of IT and systemic steroids. Khorsandi Ashtiani reported that simultaneous administration of IT-Dex and oral prednisolone had no additional benefit (21). The IT administration intervals can be quite different. Kosyakov followed a 10-day protocol using a ventilation tube in a tapering approach (22), while Battaglia recommended the weekly usage for three weeks (23). Rauch also suggested four injections over two weeks (24), and Hong recommended daily injections for eight days (25). The degree of improvement cannot be easily compared in different studies regarding

the application of various criteria. Siegle criteria were used in the present study, while in most studies PTA changes as little as 10 dB were regarded as hearing improvement (26). The PTA improved more than 15 dB in most cases (66%) in the present study. Another important factor to be considered is that 42% of the included cases had profound HL, which was a poor prognostic factor. According to the collected data, the factors significantly related to hearing recovery in SSNHL included initial hearing threshold, vertigo, and the time of treatment initiation (being less than 15 days since the onset of hearing loss). Spontaneous hearing recovery, which tends to happen within two weeks from the onset, and the restoration of hearing during the early period of the disease can indicate the highest efficacy of IT steroid injection within 10 days after the onset (19). Tinnitus is the most frequent secondary symptom of SSNHL with a prevalence rate as high as 73-84% (24,27,28). Tinnitus is also known to disturb the patients more than hearing loss (29).

Mühlmeier et al. reported that the high rate of tinnitus was associated with SSNHL at the onset and that there was a significant correlation between tinnitus and hearing loss in terms of recovery patterns and severity (30). According to the previous studies, around 76.2% and 61.9% of patients with SSNHL have such complications as tinnitus and vertigo, respectively (31,32).

It has also been suggested that IT steroid is a good modality choice for the treatment of SSNHL patients who suffer from vertigo and tinnitus (33,34). In addition, it has been found that the IT steroid procedure resulted in a significant improvement of the symptom of tinnitus and vertigo (33, 35, 36).

CONCLUSION

Currently, the IT steroid injection is a generally accepted method for the management of sudden sensorineural hearing loss. Nevertheless, the dose, interval, and duration of the treatment are not universally approved.

REFERENCES

1. Vanwijck F, Rogister F, Pierre Barriat S, Camby S, Lefebvre P. Intratympanic steroid therapy for refractory sudden sensory hearing loss: a 12-year experience with the Silverstein catheter. *Acta Otolaryngol.* 2019;139(2):111–6. doi: 10.1080/00016489.2018.1532107. [DOI] [PubMed] [Google Scholar]
2. Weiss D, Böcker AJ, Koopmann M, Savvas E, Borowski M, Rudack C. Predictors of hearing recovery in patients with severe sudden sensorineural hearing loss. *Journal of Otolaryngology-Head & Neck Surgery.* 2017;46(1):27. doi: 10.1186/s40463-017-0207-1. [DOI] [PMC free article] [PubMed] [Google Scholar]
3. Chau JK, Lin JR, Atashband S, Irvine RA, Westerberg BD. Systematic review of the evidence for the etiology of adult sudden sensorineural hearing loss. *The Laryngoscope.* 2010;120(5):1011–21. doi: 10.1002/lary.20873. [DOI] [PubMed] [Google Scholar]
4. Pitaro J, Bechor-Fellner A, Gavriel H, Marom T, Eviatar E. Sudden sensorineural hearing loss in children: Etiology, management, and outcome. *International journal of pediatric otorhinolaryngology.* 2016;82:34–7. doi: 10.1016/j.ijporl.2015.12.022. [DOI] [PubMed] [Google Scholar]
5. Hobson CE, Alexander TH, Harris JP. Primary treatment of idiopathic sudden sensorineural hearing loss with intratympanic dexamethasone. Current opinion in otolaryngology & head and neck surgery. 2016;24(5):407–12. doi: 10.1097/MO0.0000000000000288. [DOI] [PubMed] [Google Scholar]
6. Berjís N, Soheilipour S, Musavi A, Hashemi SM. Intratympanic dexamethasone injection vs methylprednisolone for the treatment of refractory sudden sensorineural hearing loss. *Advanced biomedical research.* 2016;5. doi: 10.4103/2277-9175.184277. [DOI] [PMC free article] [PubMed] [Google Scholar]
7. Chen S, Zhao M, Qiu J. Acupuncture for the treatment of sudden sensorineural hearing loss: A systematic review and meta-analysis: Acupuncture for SSNHL. *Complementary therapies in medicine.* 2019;42:381–8. doi: 10.1016/j.ctim.2018.12.009. [DOI] [PubMed] [Google Scholar]
8. Dinç ASK, Çayönü M, Boynueğri S, Tuna EÜ, Eryılmaz A. Is Salvage Hyperbaric Oxygen Therapy Effective for Sudden Sensorineural Hearing Loss in Patients with Non-response to Corticosteroid Treatment? *Cureus.* 2020;12:1. doi: 10.7759/cureus.6560. [DOI] [PMC free article] [PubMed] [Google Scholar]
9. Attanasio G, Russo F, Di Porto E, Cagnoni L, Masci E, Ralli M, et al. Prediction of hearing recovery in sudden deafness treated with intratympanic steroids. *Acta Otorhinolaryngologica Italica.* 2018;38(5):453. doi: 10.14639/0392-100X-1614. [DOI] [PMC free article] [PubMed] [Google Scholar]
10. Schwartz SR, Zeitzer D. Clinical Practice Guideline: Sudden Hearing Loss (Update) for Audiology. *The Hearing Journal.* 2019;72(12):34–5. [Google Scholar]
11. Banerjee A, Parnes LS. Intratympanic corticosteroids for sudden idiopathic sensorineural hearing loss. *Otology & Neurology.* 2005;26(5):878–81. doi: 10.1097/01.mao.0000185052.07513.5a. [DOI] [PubMed] [Google Scholar]
12. Kang WS, Yang CJ, Shim M, Song CI, Kim TS, Lim HW, et al. Prognostic factors for recovery from sudden sensorineural hearing loss: a retrospective study. *Journal of audiology & otology.* 2017;21(1) doi: 10.7874/jao.2017.21.1.9. [DOI] [PMC free article] [PubMed] [Google Scholar]
13. Cheng Y-F, Chu Y-C, Tu T-Y, Shiao A-S, Wu S-L, Liao W-H. Modified Siegel's criteria for sudden sensorineural hearing loss: Reporting recovery outcomes with matched pretreatment hearing grades. *Journal of the Chinese Medical Association.* 2018;81(11):1008–12. doi: 10.1016/j.jcma.2018.03.012. [DOI] [PubMed] [Google Scholar]
14. Olusanya BO, Davis AC, Hoffman HJ. Hearing loss grades and the International classification of functioning, disability and health. *Bulletin of the World Health Organization.* 2019;97(10) doi: 10.2471/BLT.19.230367. [DOI] [PMC free article] [PubMed] [Google Scholar]
15. Ermutlu G, Süslü N, Yılmaz T, Saraç S. Sudden hearing loss: an effectiveness comparison of intratympanic and systemic steroid treatments. *European Archives of Oto-Rhino-Laryngology.* 2017;274(10):3585–91. doi: 10.1007/s00405-017-4691-8. [DOI]

- [PubMed] [Google Scholar]
16. Cassandro C, De Luca P, Ralli M, Gioacchini F, Di Bernardino F, Albera A, et al. Recurrence of Non-Hydropic Sudden Sensorineural Hearing Loss (SSNHL): A Literature Review. *Translational Medicine@ UniSa*. 2019;20:22. [PMC free article] [PubMed] [Google Scholar]
 17. Khamvongsa P, Patel N, Ali AA, Bodoukhin N, Carreno O. Using corticosteroids to treat sudden sensorineural hearing loss in pregnancy: A case report and literature review. *Case Reports in Women's Health*. 2020:e00201. doi: 10.1016/j.crwh.2020.e00201. [DOI] [PMC free article] [PubMed] [Google Scholar]
 18. Mirian C, Ovesen T. Intratympanic vs Systemic Corticosteroids in First-line Treatment of Idiopathic Sudden Sensorineural Hearing Loss: A Systematic Review and Meta-analysis. *JAMA Otolaryngology–Head & Neck Surgery*. 2020 doi: 10.1001/jamaoto.2020.0047. [DOI] [PMC free article] [PubMed] [Google Scholar]
 19. Kosyakov S, Atanesyan A, Gunenkov A, Ashkhatunyan E, Kurlova A. Intratympanic steroids for sudden sensorineural hearing loss. *Int Adv Otol*. 2011;7:323–32. [Google Scholar]
 20. Gianoli GJ, Li JC. Transtympanic steroids for treatment of sudden hearing loss. *Otolaryngology—Head and Neck Surgery*. 2001;125(3):142–6. doi: 10.1067/mhn.2001.117162. [DOI] [PubMed] [Google Scholar]
 21. Ashtiani MK, Firouzi F, Bastaninejad S, Dabiri S, Nasirimohtaram S, Saeedi N, et al. Efficacy of systemic and intratympanic corticosteroid combination therapy versus intratympanic or systemic therapy in patients with idiopathic sudden sensorineural hearing loss: a randomized controlled trial. *European Archives of Oto-Rhino-Laryngology*. 2018;275(1):89–97. doi: 10.1007/s00405-017-4808-0. [DOI] [PubMed] [Google Scholar]
 22. Kosyakov S, Atanesyan A, Gunenkov A, Ashkhatunyan E, Kurlova A. Intratympanic steroids for sudden sensorineural hearing loss. *J Int Adv Otol*. 2011;7(3):323. [Google Scholar]
 23. Battaglia A, Burchette R, Cueva R. Combination therapy (intratympanic dexamethasone+ high-dose prednisone taper) for the treatment of idiopathic sudden sensorineural hearing loss. *Otology & Neurotology*. 2008;29(4):453–60. doi: 10.1097/MAO.0b013e318168da7a. [DOI] [PubMed] [Google Scholar]
 24. Rauch SD, Halpin CF, Antonelli PJ, Babu S, Carey JP, Gantz BJ, et al. Oral vs intratympanic corticosteroid therapy for idiopathic sudden sensorineural hearing loss: a randomized trial. *Jama*. 2011;305(20):2071–9. doi: 10.1001/jama.2011.679. [DOI] [PubMed] [Google Scholar]
 25. Hong SM, Park CH, Lee JH. Hearing outcomes of daily intratympanic dexamethasone alone as a primary treatment modality for ISSHL. *Otolaryngology--Head and Neck Surgery*. 2009;141(5):579–83. doi: 10.1016/j.otohns.2009.08.009. [DOI] [PubMed] [Google Scholar]
 26. Lai D, Zhao F, Jalal N, Zheng Y. Intratympanic glucocorticosteroid therapy for idiopathic sudden hearing loss: Meta-analysis of randomized controlled trials. *Medicine*. 2017;96:50. doi: 10.1097/MD.00000000000008955. [DOI] [PMC free article] [PubMed] [Google Scholar]
 27. Chiossoine-Kerdel JA, Baguley DM, Stoddart RL, Moffat DA. An investigation of the audiologic handicap associated with unilateral sudden sensorineural hearing loss. *Otology & Neurotology*. 2000;21(5):645–51. [PubMed] [Google Scholar]
 28. Nosrati-Zarenoe R, Hultcrantz E. Corticosteroid treatment of idiopathic sudden sensorineural hearing loss: randomized triple-blind placebo-controlled trial. *Otology & Neurotology*. 2012;33(4):523–31. doi: 10.1097/MAO.0b013e31824b78da. [DOI] [PubMed] [Google Scholar]
 29. Si Y, Jiang HL, Chen YB, Chu YG, Chen SJ, Chen XM, et al. Round window niche drilling with intratympanic steroid is a salvage therapy of sudden hearing loss. *Audiology and Neurotology*. 2018;23(6):309–15. doi: 10.1159/000493086. [DOI] [PubMed] [Google Scholar]
 30. Mühlmeier G, Baguley D, Cox T, Suckfull M. tinnitus related to idiopathic sudden sensorineural hearing loss. *Otology & Neurotology*. 2016;37(6):634. doi: 10.1097/MAO.0000000000001081. [DOI] [PMC free article] [PubMed] [Google Scholar]
 31. Elayoubi S-E, Salahaldin L, Chahed T, editors Admission control-based pricing in UMTS. *Proceedings 2004 International Conference on Information and Communication Technologies: From Theory to Applications*, 2004. 2004 IEEE. [Google Scholar]
 32. Ben-David J, Luntz M, Magamsa I, Fradis M, Sabo E, Podoshin L. Tinnitus as a prognostic sign in idiopathic sudden sensorineural hearing loss. *The international tinnitus journal*. 2001;7(1):62–4. [PubMed] [Google Scholar]
 33. LIAN H, Idrus RB, Saim LB, Saim AB. Intratympanic Methylprednisolone Injection in Idiopathic Sudden Sensorineural Hearing Loss after Failure of Systemic Corticosteroid Therapy. *Sains Malaysiana*. 2018;47(11):2777–82. [Google Scholar]
 34. Deenadayal D, Vidyasagar D, Bommakanti V, Goel K, Naeem N. Role of Intratympanic Steroids in the Management of Meniere's Disease—A Review of 151 Cases. *International Journal of Otolaryngology and Head & Neck Surgery*. 2016;5(2):108–13. [Google Scholar]
 35. Choi SJ, Lee JB, Lim HJ, In SM, Kim JY, Bae KH, et al. Intratympanic dexamethasone injection for refractory tinnitus: Prospective placebo-controlled study. *The Laryngoscope*. 2013;123(11):2817–22. doi: 10.1002/lary.24126. [DOI] [PubMed] [Google Scholar]
 36. Shim HJ. Intratympanic steroid injection in tinnitus management. *Hanyang Medical Reviews*. 2016;36(2):125–30. [Google Scholar]