Original Article

Comparative Efficacy of Systemic VS Intratympanic Corticosteroid Therapy in the Management of Sudden Sensorineural Hearing Loss

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ABSTRACT

Objective: To assess the efficacy of systemic versus intratympanic corticosteroid therapy for the treatment of sudden sensorineural hearing loss (SSNHL).

Study Design: This prospective study

Place and Duration of Study: This study was conducted at the ENT Department Hayatabad Medical Complex, Peshawar, from 1-1-2023 to 31-12-2023.

Methods: Total 124 patients with a diagnosis of SSNHL were included in the study; they were separated into 2 therapeutic groups: 72 received systemic corticosteroids, and 52 received intratympanic corticosteroids. The primary outcomes evaluated were hearing recovery rates, improvement in PTA, time to recovery, and adverse effects.

Results: The hearing recovery rate was 67.7%, with complete recovery in 32.3%, partial recovery in 35.5%, and no recovery in 32.3% of patients. The systemic therapy group had significantly superior recovery rates, with 40.3% achieving complete recovery vs. 21.2% in the intratympanic group (p=0.03). Mean PTA improvement was 24.6 ± 9.4 dB in the systemic group and 18.2 ± 8.7 dB in the intratympanic group (p=0.02). Systemic therapy patients also recovered faster (14.8 ± 3.7 days) than the corresponding cohort in the intratympanic group (18.6 ± 4.1 days, p=0.01).

Conclusion: Systemic corticosteroid therapy improved hearing recovery and reduced the time to hearing recovery than intratympanic corticosteroid therapy in patients diagnosed with SSNHL. Intratympanic therapy continues to be a safe and effective option for patients who cannot tolerate systemic treatment.

Key Words: SSNHL, Corticosteroid, Systemic, Intratympanic, Hearing Recovery, PTA.

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INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is a clinical condition characterized by a sudden loss of hearing that is usually defined as a decrease of 30 dB or more in three adjacent audiometric frequencies inside 72 hours. It can cause major effects on quality and life, for example, communication, emotional stability, and even social interactions.

In spite of its relatively low frequency, about 5 to 20 cases per 100,000 people on an annual basis, SSNHL appears to be a clinical emergency of the highest order and, thus, requires immediate evaluation and management for optimized results [1,2]

SSNHL is often idiopathic in etiology, but multiple mechanisms have been proposed, including viral infections, vascular compromise, autoimmune processes, and rupture of the cochlear membranes. These various pathophysiologic processes play a significant role in the heterogeneity of clinical presentations and response to treatment. Indeed, as many as 90% of cases are idiopathic in nature, with the remainder due to a variety of identifiable etiologies, including acoustic neuromas and systemic diseases[3,4].

Corticosteroid therapy has emerged as the fundamental treatment for SSNHL (sudden sensorineural hearing loss) because of its powerful anti-inflammatory and immunosuppressive properties. These corticosteroids are thought to mitigate cochlear damage by reducing inflammation, preventing cellular apoptosis and enhancing microcirculation within the inner ear[5]. Routes of administration encompass systemic (oral or intravenous) and local (intratympanic) therapies; studies have illuminated both the merits and drawbacks of each method. However, despite their extensive use,

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the effectiveness of corticosteroids in managing SSNHL remains a subject of ongoing debate. Some patients, for example, experience complete recovery, whereas others show little to no improvement (this variability contributes to the complexity of treatment decisions). Although corticosteroids are widely utilized, the inconsistency in patient outcomes complicates the overall assessment of their efficacy[6].

Several studies have investigated the role of corticosteroids in SSNHL, yielding mixed results[7,8]. Some studies suggest that early initiation of treatment—ideally within two weeks of symptom onset—significantly improves auditory outcomes. However, variability in study designs, patient populations, and outcome measures complicates the interpretation of these findings. However, uncertainties exist in clinical practice regarding the optimal dosage, duration, and route of administration[9,10].

Since spontaneous recovery occurs in approximately 32% to 65% of cases, determining the true efficacy of corticosteroid therapy poses a unique challenge in cases of SSNHL[11]. The present study aims to determine the auditory outcome of patients with SSNHL treated with systemic or intratympanic corticosteroids and to assess the efficacy of corticosteroid therapy in patients with SSNHL in an overall setting. Integrating results from this cohort with the current literature, this study attempts to provide evidence-based recommendations to assist in the clinical management of SSNHL.

METHODS

This was an observational prospective study conducted at Department of Ear, Nose, Throat (ENT), Hayatabad Medical Complex, Peshawar from 1st January 2023 to 31st December 2023. Two Hundred Eighty-four (284) patients diagnosed with SSNHL were included. The subjects participants were adults between 18 to 65 years with definitive diagnosis of SSNHL idiopathic. This was defined as ≥30 dB loss at three consecutive audiometric frequencies within 72 hours of onset. Participants had to present within 14 days after onset of symptoms and have normal hearing in the contralateral ear. Those with conductive or mixed hearing loss, SSNHL associated with treatable causes (eg, acoustic neuroma, autoimmune diseases, or head trauma), previous history of ear surgery or chronic ear diseases or pregnancy/contraindications to corticosteroid treatment were excluded from the study.

Participants were divided into two treatment groups according to how corticosteroids were administered:

1. Systemic Therapy Group: This group included 72 patients (58.1%) who were given oral prednisolone starting at a dose of 1 mg/kg/day, followed by a tapering schedule over 14 days.

2. Intratympanic Therapy Group: This group consisted of 52 patients (41.9%) who received intratympanic dexamethasone injections (4 mg/mL) on a weekly basis for four consecutive weeks.

The treatment choice was determined by patient preference, clinical indications, or any contraindications to systemic therapy. Patients who did not respond to systemic therapy were offered salvage intratympanic therapy. Baseline demographic and clinical data were collected, including age, gender, duration of symptoms, comorbidities, and audiometric findings. Audiological assessments were performed using pure-tone audiometry (PTA) at frequencies of 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, and 8 kHz. Hearing level improvement was defined as a gain of ≥10 dB in PTA or an improvement of ≥15% in speech discrimination scores.

Follow-up audiometry was conducted at baseline, 2 weeks, and 1 month after starting treatment. The main outcome measured was the extent of hearing recovery, classified as complete, partial, or no recovery according to Siegel's criteria. Secondary outcomes assessed included complications related to treatment and patient compliance. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Continuous variables, including age and hearing levels, were reported as means ± standard deviations (SD), while categorical variables, such as gender and treatment outcomes, were shown as frequencies and percentages. The chi-square test was applied to categorical data, and an independent t-test or a paired t-test was utilized for continuous variables. A p-value of ≤ 0.05 was considered statistically significant..

RESULTS

A total of 124 patients with sudden sensorineural hearing loss (SSNHL) were included in the study. The mean age of participants was 45.2 ± 11.6 years, ranging from 18 to 65 years. There were 79 males (63.7%) and 45 females (36.3%), with a male-to-female ratio of 1.75:1. The average duration from symptom onset to treatment initiation was 8.3 ± 3.4 days. Baseline audiometry showed a mean Pure tune audiometry (PTA) of 67.5 ± 12.8 dB across the study population. The systemic therapy group (n=72) had a mean age of 45.1 ± 12.3 years, with 46 males (63.9%) and 26 females (36.1%). The intratympanic therapy group (n=52) had a mean age of 45.4 ± 11.1 years, with 33 males (63.5%) and 19 females (36.5%). Table-1

Table No. 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	Overall (n=124)	Systemic Therapy (n=72)	Intratympanic Therapy (n=52)
Mean age (years)	45.2 ± 11.6	45.1 ± 12.3	45.4 ± 11.1
Gender (n, %)			

Characteristic	Overall (n=124)	Systemic Therapy (n=72)	Intratympanic Therapy (n=52)
- Male	79 (63.7%)	46 (63.9%)	33 (63.5%)
- Female	45 (36.3%)	26 (36.1%)	19 (36.5%)
Mean time to treatment (days)	8.3 ± 3.4	8.1 ± 3.3	8.6 ± 3.6
Baseline PTA (dB)	67.5 ± 12.8	68.3 ± 13.1	66.4 ± 12.4

The overall hearing recovery rate in the study population was 67.7% (n=84), with 32.3% (n=40) achieving complete recovery, 35.5% (n=44) showing partial recovery, and 32.3% (n=40) experiencing no recovery. A comparison of recovery outcomes between the two treatment groups revealed notable differences. In the systemic therapy group (n=72), complete recovery was observed in 40.3% (n=29), partial recovery in 36.1% (n=26), and no recovery in 23.6% (n=17). In contrast, the intratympanic therapy group (n=52) demonstrated complete recovery in 21.2% (n=11), partial recovery in 34.6% (n=18), and no recovery in 44.2% (n=23). Table-2

Pure tune audiometry (PTA) reduction was also evaluated as a measure of treatment efficacy. In systemic therapy group, the mean PTA improvement was 24.6 ± 9.4 dB compared to 18.2 ± 8.7 dB in the intratympanic therapy group, the difference was statistically significant (p=0.02). The duration to recovery was less in the systemic therapy group, which was 14.8 ± 3.7 days compared with 18.6 ± 4.1 days in the intratympanic therapy group. Adverse events were generally mild and occurred in 11 patients (15.3%) in the systemic therapy group. The intratympanic therapy group had no major complications. Table-2

Table No. 2: Comparison of Outcomes Between Systemic and Intratympanic Therapy Groups

Variable	Systemic Therapy Group (n=72)	Intratympanic Therapy Group (n=52)	p-value
Mean age (years)	45.1 ± 12.3	45.4 ± 11.1	0.84
Mean time to treatment (days)	8.1 ± 3.3	8.6 ± 3.6	0.52
Mean PTA at baseline (dB)	68.3 ± 13.1	66.4 ± 12.4	0.48
Complete recovery (n, %)	29 (40.3%)	11 (21.2%)	0.03*
Partial recovery (n, %)	26 (36.1%)	18 (34.6%)	0.87
No recovery (n, %)	17 (23.6%)	23 (44.2%)	0.02*
Mean PTA improvement (dB)	24.6 ± 9.4	18.2 ± 8.7	0.02*
Mean time to recovery (days)	14.8 ± 3.7	18.6 ± 4.1	0.01*
Adverse effects (n, %)	11 (15.3%)	0 (0%)	0.01*

DISCUSSION

Sudden sensorineural hearing loss (SSNHL) is a medical emergency with a major impact on a patient's quality of life. The underlying cause is usually unknown, but corticosteroid therapy remains the first-line treatment, with particular attention to reducing inflammation, edema, and immune-related damage to the cochlea[12].

The findings of this study were that systemic corticosteroid therapy resulted in higher hearing recovery rates, greater reductions in Pure tune audiometrys (PTA), and faster recovery time when compared with intratympanic therapies. More specifically, complete recovery rates were notably higher in the systematic group (40.3%) compared to the non-systematic group (21.2%), and showed greater mean PTA improvement (24.6 ± 9.4 dB versus 18.2 ± 8.7 dB), statistically significant (p=0.03; p=0.02, respectively). These findings align with previous studies including Amarillo E et al & Tripathi P et al which demonstrated that systemic corticosteroids significantly improve auditory outcomes compared with placebo or other therapies in patients with SSNHL.[13,14]

Although the systemic therapy group was overall more effective, intratympanic therapy is a reasonable alternative for patients who cannot tolerate systemic therapy, such as individuals with diabetes or significant gastrointestinal conditions. This is consistent with the guidelines set forth by the American Academy of Otolaryngology–Head and Neck Surgery, which endorses intratympanic corticosteroid injections as a reasonable alternative under these circumstances[15,16]. Moreover, the lack of systemic side effects in the intratympanic group reflects its safety profile, which is especially advantageous in high-risk patients [17].

Adverse effects in the systemic therapy group appeared to be associated with gastrointestinal discomfort and insomnia and were generally mild. This aligns with other studies addressing the potential for systemic adverse effects with systemic corticosteroids although these are controllable with appropriate measures[18,19].

The shorter recovery time noted in the systemic therapy group (14.8 ± 3.7 days compared to 18.6 ± 4.1 days, p=0.01) is clinically important, as a quicker return to normal hearing reduces the negative effects on communication and overall quality of life. Although intratympanic therapy was not as effective in this aspect, its success in achieving partial recovery in 34.6% of patients further highlights its value in certain clinical situations.

This study boasts several strengths, such as a large sample size, well-matched treatment groups, and the use of objective audiometric measures to assess treatment effectiveness. Additionally, including patients

who were treated within a specific time frame of symptom onset (≤14 days) adds to the reliability of the results, given that delayed treatment is linked to worse outcomes. However, the study is not without limitations. First, the single-center design, may limit generalizability to larger populations. Second, the relatively short follow-up period limits long-term hearing outcomes assessment. Moreover, due to non-randomization, there may be selection bias, although baseline characteristics were similar between groups. Further multi-center randomized controlled trials with long follow-up periods are needed to confirm these findings

CONCLUSION

The current study reinforces the effectiveness of systemic corticosteroid therapy in the management of SSNHL and showed significant improvement in hearing recovery, PTA transition, and the speed of symptom resolution compared to intratympanic therapy as initial treatment. For patients contraindicated for systemic therapy, intratympanic corticosteroid injections remain a potential valid alternative, with an excellent safety profile. These findings reinforce the importance of timely and individualized management in optimizing outcomes for patients with SSNHL..

Author's Contribution:

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REFERENCES

1. Sialakis C, Iliadis C, Frantzana A, Ouzounakis P, Kourkouta L. Intratympanic Versus Systemic Steroid Therapy for Idiopathic Sudden Hearing Loss: A Systematic Review and Meta-Analysis. Cureus 2022;14(3):e22887.
2. 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 Otolaryngol Head Neck Surg 2020;146(5):421–428.
3. Yang W, Li X, Zhong J, et al. Intratympanic versus intravenous corticosteroid treatment for sudden sensorineural hearing loss in diabetic patients: proposed study protocol for a prospective, randomized superiority trial. Trials 2020;21:135.
4. Ng B, Crowson MG, Lin V. Management of sudden sensorineural hearing loss among primary care physicians in Canada: a survey study. J Otolaryngol Head Neck Surg 2021;50:22.
5. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:0.
6. Li J, Ding L. Effectiveness of Steroid Treatment for Sudden Sensorineural Hearing Loss: A Meta-analysis of Randomized Controlled Trials. Annals of Pharmacotherapy 2020;54(10):949-957.
7. Mansour OI, Ezzat WFAA, Hamdy TAH, Shehata BNH. Sensorineural Hearing Loss; A Meta-analytical Study. The Egypt J Hospital Med 2018;72 (11):609-5615.
8. Zhao D, Tong B, Wang Q, Hellstrom S, Duan M. A comparison of effects of systemic and intratympanic steroid therapies for sudden sensorineural hearing loss: A meta-analysis. J Otol 2016;11(1):18-23.
9. Sialakis C, Iliadis C, Frantzana A, et al. Intratympanic Versus Systemic Steroid Therapy for Idiopathic Sudden Hearing Loss: A Systematic Review and Meta-Analysis. Cureus 2022;14(3): e22887.
10. Andrianakis A, Moser U, Kiss P, et al. Comparison of two different intratympanic corticosteroid injection protocols as salvage treatments for idiopathic sudden sensorineural hearing loss. Eur Arch Otorhinolaryngol 2022;279:609–618.
11. 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;305:2071–9.
12. Choi JW, Lee CK, Kim SB, Lee DY, Ko SC, Park KH, et al. Potential benefits of salvage intratympanic dexamethasone injection in profound idiopathic sudden sensorineural hearing loss. Eur Arch Otorhinolaryngol 2020;277:2219–27.
13. Amarillo E, Hernando M, Eisenberg G, Granda M, Plaza G. Efficacy of intratympanic corticosteroid as a salvage treatment in idiopathic sudden sensorineural hearing loss. Acta Otorrinolaringol Espanola 2019;70:207–14.
14. Tripathi P, Deshmukh P. Sudden sensorineural hearing loss: a review. Cureus 2022;14:e29458.
15. Zhao D, Tong B, Wang Q. A comparison of effects of systemic and intratympanic steroid therapies for sudden sensorineural hearing loss: A meta-analysis. J Otol 2016;11(1):161-65.

16. Li Sung Sang CCY, Zhen E, Shaw CKL. Evaluating and comparing the efficacy of intratympanic high dose dexamethasone (24 mg/mL) and high dose methylprednisolone (125 mg/mL) as a primary and salvage treatment for idiopathic sudden sensorineural hearing loss. Aust J Otolaryngol 2019;2:26.
17. Shewel Y, Asal SI. Intratympanic injection of dexamethasone 4 mg/mL versus 10 mg/mL for management of idiopathic sudden sensorineural hearing loss. Egypt J Otolaryngol 2002;36:3.
18. Ahmadzai N, Kilty S, Cheng W, Esmaeilisaraji L, Wolfe D, Bonaparte JP, et al. A systematic review and network meta-analysis of existing pharmacologic therapies in patients with idiopathic sudden sensorineural hearing loss. PLoS ONE 2019;14:e0221713.
19. Modgil N, Surapaneni H, Sowmya NV. Comparison of efficacy between two doses of dexamethasone as an intratympanic injection in Idiopathic Sudden Sensorineural Hearing Loss. Int J Health Sci 2022;6(S10):735–746.