

# A Retrospective Assessment of the Efficacy of Short Course Intravenous Methylprednisolone in the Management of SSNHL

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Conflict of interest: Nil

## Abstract

**Aim:** To determine the efficacy of short course intravenous methylprednisolone in the management of SSNHL.

**Material & Methods:** A retrospective assessment of the recorded data of the cases with SSNHL who received short course methylprednisolone therapy over a period of one year was conducted in the Department of ENT, MP Birla Hospital & Priyamwada Birla Cancer Research Institute, Satna (MP), India.

**Results:** Record data of 40 patients who met the inclusion criteria were included in the study. The pre-steroid PTA and post-steroid PTA values separately for each category using Wilcoxon sign rank test, only those with severe SSNHL showed statistically significant improvement following methylprednisolone injection ( $p < 0.05$ ), whereas mild and moderate SSNHL, didn't show statistically significant improvement ( $p > 0.05$ ).

**Conclusions:** Short course intravenous methylprednisolone is effective in the treatment of SSNHL with minimal side effects.

**Keywords:** Sudden sensorineural hearing loss, Methylprednisolone, Steroids

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## Introduction

Sudden sensorineural hearing loss (SSNHL) is an otological emergency that prompts urgent recognition and treatment. [1-3] Kleyin in 1944 first described it. [4] SSNHL is defined as a rapid decline in hearing over 72 hours or less affecting three or more contiguous frequencies by 30 dB or greater. [5] It has an estimated incidence of 5 to 20 per 100,000 persons per year. [6] Viral infection is considered the most common of all etiological factors. The other etiologies are vascular occlusion, intracochlear membrane rupture, autoimmune inner ear disease, and acoustic neuroma. [7-8]

The clinical practice guideline for SSNHL recommends that clinicians may offer systemic corticosteroids as initial therapy as an option, and intratympanic (IT) steroid infiltration for salvage therapy as a recommendation, based on reviews of randomized control trials with a balance between benefit and harm. [9] In clinical practice, oral steroid therapy is the mainstay of therapy, and IT steroid infiltration being utilized by an increasing number of otolaryngologists. Some are using IT for salvage therapy as recommended, [10] while others are using IT as combined treatment with oral therapy, [11-12] or as singular treatment

when oral therapy is contraindicated or not preferred. [13-14]

There has been no consensus on the mode of delivery, dose, and duration of the treatment, although steroid has been a mainstay in treating this disease. Moreover, it has got several adverse effects. Thus, steroids should be administered in such a way that an adequate dose is provided within a short period of time so that there are minimal complications. Thus, the objective of this study was to determine the efficacy of short-course intravenous methylprednisolone in the management of sudden sensorineural hearing loss.

### **Material & Methods:**

A retrospective assessment of the recorded data of the cases with SSNHL who received short course methylprednisolone therapy over a period of one year was conducted in the Department of ENT, MP Birla Hospital & Priyamwada Birla Cancer Research Institute, Satna (MP)

### **Methodology**

This assessment encompassed the variables like pre-treatment hearing loss level, time of presentation since the onset of the symptoms, duration of therapy, post-treatment hearing level, and associated comorbid factors. Record data with incomplete documentation of the aforementioned variables were excluded from the analysis. As per our departmental protocol, we consider intravenous methylprednisolone in cases that present with SSNHL within seven days of its onset. Intravenous methylprednisolone is not considered in cases with uncontrolled DM, hypertension, and any other medical conditions where systemic steroids are contraindicated. These patients receive steroids via the intratympanic route. On admission, the patients receive injection methylprednisolone 1 gm. IV stat followed by 500 mg IV once daily for two consecutive days. Cases that do not

recover completely are prescribed with 1 mg/kg/day of oral prednisolone for 11 days.

In this study, we have however assessed the hearing improvement after completion of methylprednisolone therapy only. The criteria for audiological recovery were further classified as: (i) complete recovery if the hearing level is within 10 dB of the normal hearing ear, (ii) partial recovery if improvement of >10 dB pure tone threshold, and (iii) no recovery if no improvement or improvement of <10 dB in pure tone threshold.

Statistical analysis was done using the paired-t test, chi-square, and Wilcoxon signed-rank test.

SPSS version 20 was used for the analysis.

### **Results:**

Record data of 40 patients who met the inclusion criteria were included in the study. There were 23 males and 17 females. The age of the patients ranged from 18 to 72 years, with the mean age being 40.30 years.

Vertigo was present in 7 patients and tinnitus in 26 patients. Out of the 40 patients, 12 patients had comorbidities. The presence of vertigo, tinnitus or comorbidities didn't have any significant bearing on hearing recovery (Table 1).

Cases with mild SSNHL showed complete recovery in most of the cases, whereas most of the cases with severe SSNHL had no significant improvement at all. Collectively 32 patients showed complete recovery, 8 showed partial recovery. Response to treatment according to the severity of the hearing loss is shown in (Table 2) and the hearing outcome in patients after intravenous steroids is shown in (Table 3).

Pre-steroid PTA and post-steroid PTA values were compared by using paired t-test, which showed a statistically

significant difference when applied for the entire sample together ( $p < 0.05$ ). But when we compared the pre-steroid PTA and post-steroid PTA values separately for each category using Wilcoxon signed rank test, only those with severe SSNHL showed statistically significant

improvement following methylprednisolone injection ( $p < 0.05$ ), whereas mild and moderate SSNHL, didn't show statistically significant improvement ( $p > 0.05$ ). Pre- and post-steroid PTA paired sample statistics and correlations are shown in (Table 4).

**Table 1: Hearing improvement in patients with and without vertigo, tinnitus, and comorbidities.**

Vertigo/tinnitus/ Co-morbidity	Hearing improvement			P value
	Complete recovery	Partial recovery	No recovery	
Vertigo present	1	1	5	0.528
Vertigo absent	2	8	7	
Tinnitus present	4	9	10	0.668
Tinnitus absent	0	5	3	
Co-morbidities absent	2	7	5	0.521
Co-morbidities present	1	2	8	

**Table 2: Response to treatment according to severity of hearing loss.**

Patient category	Average hearing loss prior to treatment (db)	Average hearing loss post treatment (db)
Mild SSNHL	33.4	31.7
Moderate SSNHL	54.7	45.8
Severe SSNHL	91.6	80.5

**Table 3: Hearing outcomes in patients after intravenous steroids.**

Hearing at discharge			
Hearing loss at presentation	Complete recovery [14]	Partial recovery [15]	No recovery [11]
Mild SSNHL	14	0	1
Moderate SSNHL	0	5	2
Severe SSNHL	0	10	8

**Table 4: Pre and post steroid PTA paired sample statistics and correlations.**

Variables	Mean	N	SD	Std. Error mean	Correlation	Sig. p value paired t test
Pre-steroid PTA	75.81	34	27.810	3.621	0.692	0.000
Post-steroid PTA	63.73	34	30.728	4.720		

### Discussion:

To determine whether steroid treatment might constitute the gold standard in the treatment of SSNHL, all studies that

compared steroid therapy with any other active treatment were reviewed. Two studies were identified. Active treatments of carbogen inhalation [15] and

fibrinolysis [16] were compared with treatment with steroids alone.

Cinamon and colleagues[17] treated 10 patients with carbogen inhalation (5% carbon dioxide and 95% oxygen) for 30 minutes 6 times per day for 5 days and another 11 patients with prednisone, 1 mg/kg daily for 5 days. Reported outcome measures were improvement in average hearing level ( $\leq 15$  dB), speech frequency, and high tone hearing level soon after treatment (6 days) and at follow-up (average, 33 days). They found no significant differences between treatments with carbogen vs. treatment with steroids. [15]

Ho and colleagues[18] randomized patients in whom a 10- day course of conservative treatment with methylprednisolone, nicametate, vitamin B, fludiazepam, and carbogen had failed with 2 treatment groups: intratympanic dexamethasone (1 mg/mL weekly for 3 weeks) vs. continuation with nicametate, vitamin B, and fludiazepam. Patients were categorized as complete, marked, slight, or no recovery on the basis of PTA at 1 and 4 weeks after treatment. A significantly greater number of patients had improvement of at least 30 dB in hearing in the intratympanic dexamethasone group (53.3%) vs. the control group (7.1%) ( $P_{.05}$ ); however, the length of time after treatment at which this effect was measured was not reported.

Side-effects of steroid therapy should be considered and monitored while under therapy. Some complications of short-term steroid therapy include exacerbation of glaucoma, increased coagulability and intravascular thrombosis, avascular hip necrosis, and insomnia.[19]Relative contraindications to systemic steroid use include breast feeding, Cushing's syndrome, diverticulitis, peptic ulcer disease and bleeding ulcers, diabetes, heart failure, myasthenia gravis, osteoporosis, psychosis, renal disease, and ulcerative

colitis.[19-20]Use of proton-pump inhibitors or H2 antagonists should be considered in selected cases to reduce gastrointestinal upset; sleep medication may be used to treat insomnia.

A study done by Wilson et al in 1980 brought steroids as a treatment for SSNHL showing a recovery rate of 61%. [21] Eftekharian et al showed there was a significant improvement in hearing while using pulse methylprednisolone although it showed no superiority over oral conventional steroid therapy. In their study, out of 29 patients receiving the steroids, seven had complete, 10 had partial and 12 had no recovery.[22]Veldmann et al showed an effective response to glucocorticoid treatment in six (50%) of 12 patients, whereas only six (32%) of 19 non-treated patients showed similar results.[23]In another study by Narozny et al the group receiving pulse methylprednisolone showed significant improvement in hearing when compared to a group receiving oral prednisolone.[24].

### Conclusion:

Short course intravenous methylprednisolone is effective in the treatment of SSNHL with minimal side effects. Short course Methylprednisolone can be an effective choice in a patient with SSNHL. Hearing outcomes are better in patients who do not have comorbidities. Treatment must be of short duration to avoid complications although an adequate dose has to be provided.

### References:

1. Chandrasekhar S, Do B, Schwartz S, Bontempo L, Faucett E, Finestone S et al. Clinical Practice Guideline: Sudden Hearing Loss (Update). *Otolaryngol Head Neck Surg.* 2019;161: S1-45.
2. Alexander TH, Harris JP. Incidence of sudden sensorineural hearing loss. *Otol Neurotol.* 2013; 34:1586-9.

3. Byl FM. Seventy-six cases of presumed sudden hearing loss occurring in 1973: prognosis and incidence. *Laryngoscope*. 1977; 87:817-25.
4. Kleyn AD. Sudden complete or partial loss of function of the octavus-system in apparently normal persons. *Acta Oto- Laryngologica*. 1944;32(5-6): 40729.
5. 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(12):772-6.
6. Byl FM, Jr. Sudden hearing loss: eight years' experience and suggested prognostic table. *Laryngoscope*. 1984; 94:647-61.
7. Stokroos RJ, Albers FW, Schirm J. The etiology of idiopathic sudden sensorineural hearing loss. Experimental herpes simplex virus infection of the inner ear. *Am j otol*. 1998;19(4):447-52.
8. Fetterman BL, Saunders JE, Luxford WM. Prognosis and treatment of sudden sensorineural hearing loss. *Otology Neurotol*. 1996;17(4):529-36.
9. Stachler RJ, Chandrasekhar SS, Archer SM, et al. American Academy of Otolaryngology Head and Neck Surgery. Clinical practice guideline: sudden hearing loss. *Otolaryngol Head Neck Surg*. 2012 Mar;146(3Suppl): S1-35
10. Haynes DS, O'Malley M, Cohen S, et al. Intratympanic dexamethasone for sudden sensorineural hearing loss after failure of systemic therapy. *Laryngoscope*. 2007 Jan;117(1):3-15.
11. Battaglia A, Burchette R, Cueva R. Combination therapy (intratympanic dexamethasone + high-dose prednisone taper) for the treatment of idiopathic sudden sensorineural hearing loss. *Otol Neurotol*. 2008 Jun; 29(4):453-60.
12. Arastou S, Tajedini A, Borghei P. Combined intratympanic and systemic steroid therapy for poor-prognosis sudden sensorineural hearing loss. *Iran J Otorhinolaryngol*. 2013;25(70):23-8.
13. Rauch SD, Halpin CF, Antonelli PJ, et al. Oral vs. intratympanic corticosteroid therapy for idiopathic sudden sensorineural hearing loss: a randomized trial. *JAMA*. 2011 May 25;305(20):2071-9.
14. Labatut T, Daza MJ, Alonso A. Intratympanic steroids as primary initial treatment of idiopathic sudden sensorineural hearing loss. The Hospital Universitario Ramón y Cajal experience and review of the literature. *Eur Arch Otorhinolaryngol*. 2013 Nov;270(11):2823-32.
15. Cinamon U, Bendet E, Kronenberg J. Steroids, carbogen or placebo for suddenhearing loss: a prospective double-blind study. *Eur Arch Otorhinolaryngol*. 2001; 258:477-480.
16. Kubo T, Matsunaga T, Asai H, et al. Efficacy of defibrinogenation and steroid therapies on sudden deafness. *Arch Otolaryngol Head Neck Surg*. 1988; 114:649-652.
17. Ogawa K, Takei S, Inoue Y, Kanzaki J. Effect of prostaglandin E1 on idiopathic sudden sensorineural hearing loss: a double-blind clinical study. *OtolNeurotol*.2002;23:665-668.
18. Ho HG, Lin HC, Shu MT, Yang CC, Tsai HT. Effectiveness of intratympanic dexamethasone injection in sudden deafness patients as salvage treatment. *Laryngoscope*. 2004; 114:1184-1189.
19. Gold Standard. Prednisone. In: *Clinical Key*. Atlanta, GA: Elsevier. c2015. [https://www.clinicalkey.com/#!/content/drug\\_monograph/6-s2.0-505](https://www.clinicalkey.com/#!/content/drug_monograph/6-s2.0-505). Accessed September 13, 2015.
20. Saag KG, Furst DE. Major Side Effects of Systemic Glucocorticoids. Up to Date. <http://www.uptodate.com/contents/major-side-effects-of->

- systemic-glucocorticoids. Updated July 9, 2014. Accessed September 14, 2015.
21. Kleyn AD. Sudden complete or partial loss of function of the octavus-system in apparently normal persons. *Acta Oto-Laryngologica*. 1944;32(5-6): 40729.
  22. Eftekharian A, Amizadeh M. Pulse steroid therapy in idiopathic sudden sensorineural hearing loss: A randomized controlled clinical trial. *Laryngoscope*.2016;126(01):150-55.
  23. Veldman JE, Hanada T, Meeuwse F. Diagnostic and therapeutic dilemmas in rapidly progressive sensorineural hearing loss and sudden deafness a reappraisal of immune reactivity in inner ear disorders. *Actaotolaryngologica*. 1993;113(3):303-6.
  24. Narozny W, Sicko Z, Przewozny T, Stankiewicz C, Kot J, Kuczkowski J. Usefulness of high dosed of glucocorticoids and hyberbaric oxygen therapy in sudden sensorineural hearing loss treatment. *OtolNeurotol*. 2004; 25:916-23.
  25. Namukwambi, R. N., Tuhadeleni, O., & Van Neel, R. The Knowledge and Practices of Handwashing Among Street Food Vendors in the Keetmanshoop Municipal Area: none. *Journal of Medical Research and Health Sciences*, 2022;5(4), 1860–1865.