

Original Research Article

Role of short course intravenous methylprednisolone in the management of sudden sensorineural hearing loss

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ABSTRACT

Background: Steroids have proven efficacy in the management of sudden sensorineural hearing loss (SSNHL); however, the mode of delivery and the duration of the treatment varies amongst different centres and a consensus is yet to be established. The aim of this study was to determine the efficacy of short course intravenous methylprednisolone in the management of SSNHL.

Methods: This retrospective study was conducted in the department of ENT and head and neck surgery, TUTH, institute of medicine, Kathmandu, Nepal. Record data of the cases from January 2019 to May 2020, who met the criteria of SSNHL and had received intravenous methylprednisolone for three days, were assessed for the demographic profile, duration and degree of hearing loss, co-morbidities, and hearing improvement after the therapy. Cases with incomplete documentation were excluded. Pre-admission and three days post steroid therapy pure tone audiogram investigation were compared to see the improvement retrospectively. Institutional review committee clearance was taken.

Results: Out of 32 patients, the male: female ratio was 1.7:1. Mean hearing loss prior to intravenous Methylprednisolone was 77.84 dB whereas mean hearing loss three days post intravenous methylprednisolone was 69.41dB. Three patients had complete recovery, sixteen had partial recovery and thirteen had no recovery after giving three days of intravenous methylprednisolone.

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

Keywords: Sudden sensorineural hearing loss, Methylprednisolone, Steroids

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}

SSNHL is usually unilateral and is commonly associated with tinnitus, aural fullness, and sometimes vertigo. For recovery and improvement of the patient, early diagnosis and treatment are needed and steroids have been the mainstay for the treatment of SSNHL.⁵ Nowadays, they are given either alone or in combination with other drugs. Apart from steroids, the other treatment modalities include antiviral agents, vasodilators, hyperbaric oxygen, plasmapheresis, etc. along with the treatment of the underlying cause. Factors affecting the prognosis include the time of initial presentation, age of the patient, severity of the hearing loss, the frequencies affected, presence of vertigo, tinnitus, and various associated comorbidities.

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.

METHODS

A retrospective review of the record data of the cases with SSNHL who received short course methylprednisolone therapy from January 2019 to May 2020 was conducted in the department of ENT-head and neck surgery, institute of medicine, Maharajgunj medical campus, Kathmandu, Nepal after obtaining ethical clearance from the institutional review committee. This review 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 32 patients who met the inclusion criteria were included in the study. There were 20 males (62.5 %) and 12 females (37.5%). The age of the patients ranged from 18 to 72 years, with the mean age being 40.59 years. In the age group 0-20 years there were three (9.37%) patients, in 20-40 years there were 16 (50%) patients, in 40-60 years there were nine (28.12%) patients, and in >60 years there were four (12.5%) patients. Twenty (62.5%) were admitted within three days of presentation and 12 (37.5%) were after three days. At presentation, four (12.5%) patients had mild hearing loss, six (18.75%) had moderate, and 22 (68.75%) had severe hearing loss. Vertigo was present in seven (21.87%) patients and tinnitus in 27 (84.35%) patients. Out of the 32 patients, 13 (40.62%) patients had comorbidities, with nine having hypertension, five having diabetes mellitus, and three having hypothyroidism. 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 9.37% of patients showed complete recovery, 50 % showed partial recovery, 40.62% of cases showed no 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 value<0.05). But when we compared 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 value<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 co-morbidities.

Vertigo/tinnitus/ Co-morbidity	Hearing improvement			P value
	Complete recovery	Partial recovery	No recovery	
Vertigo present	1	2	4	0.4371
Vertigo absent	2	14	9	
Tinnitus present	3	13	11	0.7137
Tinnitus absent	0	3	2	
Co-morbidities absent	2	11	6	0.4513
Co-morbidities present	1	5	7	

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	32.25	30.25
Moderate SSNHL	51.83	47.33
Severe SSNHL	93.22	82.54

Table 3: Hearing outcomes in patients after intravenous steroids.

Hearing loss at presentation	Hearing at discharge		
	Complete recovery (3)	Partial recovery (16)	No recovery (13)
Mild SSNHL	3	0	1
Moderate SSNHL	0	4	2
Severe SSNHL	0	12	10

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	77.84	32	26.657	4.712	0.852	0.000
Post-steroid PTA	69.41	32	29.307	5.181		

DISCUSSION

Despite many treatment regimens tried in the past, only steroids have been proven as the most beneficial in the management of SSNHL. Steroids act as a potent inflammatory agent and are known to cause vasodilation with increased microvascular blood flow in the cochlea.⁹ However, no consensus has yet been established regarding the dose, mode of delivery and duration of therapy. Having a greater possibility of increased concentration of the drug in the inner ear, either intratympanic or intravenous route is often considered. However, intratympanic route of delivery is often associated with pain, vertigo, and perforation of the tympanic membrane. Moreover, various studies have shown no difference in the efficacy of systemic and intratympanic steroids. A study done by Baysal et al comparing the effectiveness of systemic steroid versus combined systemic and intratympanic steroid treatment for SSNHL showed both had the same effect on the restoration of hearing.¹⁰ Similarly, RCT done by Rauch et al which compared systemic and intratympanic steroids in 16 centres enrolling 250 patients showed the hearing outcome did not differ between patients who received prednisolone and those who received four doses of intratympanic methylprednisolone over 14 days.¹¹ Based on these results, we considered the use of steroids systemically. This study aimed to assess the efficacy of a short course methylprednisolone given intravenously in cases with SSNHL presenting earlier i.e., within one week of the disease onset.

Our study showed the disease was more common in males than in females with a ratio of 1.6:1, mostly presenting at second to fourth decades of life. Thirteen patients were found to have premorbid conditions where the majority of cases had hypertension followed by type 2 DM. A systemic review and meta-analysis done by Lin et al showed hypertension was found in 13.6% of SSNHL patients, whereas only 0.5% of the control populations were hypertensive. Diabetes was found in 6.5% of

SSNHL patients compared to 0.15% of the control subjects.¹²

In our study out of 32 patients, three patients had a complete recovery, 16 had partial recovery and 13 had no recovery at all. Among the 19 patients who had no comorbidities, two had a complete recovery, 11 had partial recovery and six had no recovery at all. Similarly, out of 13 patients with co-morbidities, one had complete, five had partial and seven had no recovery. All patients with mild, moderate, and severe hearing loss showed improvement during the course of treatment. The majority of mild SSNHL cases had a complete recovery and the majority of the moderate, and severe SSNHL cases had a partial recovery. Cases presenting within less than 72 hours and those with mild to moderate hearing loss had better recovery rates.

A study done by Wilson et al in 1980 brought steroids as a treatment for SSNHL showing a recovery rate of 61%.⁴ 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.¹³ 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.¹⁴ 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.¹⁵

In our study mean hearing level before treatment was 77.84 dB (HL) and after treatment was 69.41 dB (HL), showing significant improvement in PTA, with a mean improvement of 8.43 dB. Similar to our study, Raghunandan et al using intravenous steroids also showed significant improvement in hearing loss with mean hearing level improving from an average of 79.53

dB (HL) before treatment to 42.33 dB (HL) after treatment.¹⁶

A large sample size study is needed to draw a definite conclusion. Also, as the natural course of this disease is not known, further studies are required to compare the disease progression naturally and with the use of steroids.

CONCLUSION

Comparing hearing loss, there was significant improvement after a short course of Methylprednisolone therapy. 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.

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