Original Article

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Comparison of Treatment Modalities in Adult Idiopathic Sudden Hearing Loss: A 5-year Outcome from a Tertiary Referral Center

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Abstract

Aim: Although there are many treatment options for the treatment sudden idiopathic sensorineural hearing loss (SSHL), the most effective treatment method is still unclear. The purpose of this study was to determine the optimal treatment option for SSHL by examining the 5-years patient data of our clinic.

Methods: The patients who were diagnosed as SSHL in our clinic between January 1, 2016 and July 31, 2021 were included in the present study. The treatment in groups were only oral steroid (OS) (group 1, n=30), OS and hyperbaric oxygen therapy (HBOT) (group 2, n=30), OS and intratympanic steroid therapy (ITS) (group 3, n=30) and OS+ITS+HBOT (group 4, n=30). The baseline pure tone audiometry (PTA), 3rd month PTA averages, audiological hearing gains and treatment success (a gain more than 15 Db in PTA) were determined and compared statistically.

Results: The initial PTA averages (dB) in groups were 46.07±14.20, 45±12.49, 45.83±10.92, and 45.93±10.29, respectively. There were significant differences between the groups according to the PTA after treatment ($p<0.05$). In the after-treatment PTA threshold evaluation, the mean of group 4 was statistically significantly lowest ($p<0.05$). There were significant differences between the groups according to the PTA gain ($p<0.05$). In the paired comparisons of the groups according to PTA gain, the value of group 4 was significantly highest in all groups ($p<0.05$). No significant difference was found between the groups according to the other parameters ($p>0.05$).

Conclusion: In this study, the combined (oral+IT+HBOT) therapy was superior to other treatment modalities.

Keywords: Audiometry, pure tone, hearing loss, sudden/therapy, prognosis, hyperbaric oxygenation, steroids

Introduction

Sudden sensorineural hearing loss (SSHL) is described as a sensorineural hearing loss of at least thirty dB and above in at least 3 consecutive frequencies in pure tone audiometry (PTA) (1,2). It is one of the most common otorhinolaryngology emergencies with an incidence of 5-30 per 100000 people. It can affect all age groups. Together, it peaks in the 5-6th decade and the male-female ratio is equal (3). In almost all cases; it is unilateral and less than 2% has been reported as bilateral (4).

An underlying cause can be identified in 7-45% of patients presenting with SSHL (3,4). It is accepted as idiopathic SSHL if the etiology is not detectable after investigating autoimmune, infectious, functional, metabolic, neoplastic, neurological, otologic, toxic, traumatic and vascular causes. Many pathophysiological mechanism hypotheses have been proposed to explain SSHL. Among the most common hypotheses; viral infections, rupture of cochlear membranes and vascular events are blamed (5-10).

Different methods are used in the treatment of this situation, which is thought to have a spontaneous recovery rate of 32% to 65% (11-13). There are many agents and methods in the management of SSHL; hyperbaric oxygen (HBO) and bed rest, antimicrobials and anti-inflammatory drugs, vasodilators, calcium antagonists, vitamins,

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essential minerals, volume expanders, defibrinogens, diuretics are the main agents used in treatment (14). These options can be used alone or in combination. Oral steroid (OS) therapy is the first recommended treatment in the guidelines and its side effects are mostly tolerable (12,15-18). Intratympanic steroid (ITS) injection can be used as a stand-alone therapy, combined with OS therapy, or administered as a rescue therapy (17,19,20).

Although there is different information in the literature regarding the definition of success in the treatment of SSHL, Siegel (21) developed a classification according to the acquired hearing gain and divided the recovery into four categories; class I: patients with complete recovery class II: patients with a gain of more than 15 dB but who do not reach normal hearing, and average of better than 45 dB with a PTA, class III: Patients with a gain of more than 15 dB but worse than 45 dB in PTA, class IV: Patients with less than 15 dB gain or no gain at all. For the response to the treatment, starting the treatment late, hearing loss with descending audiogram curve, accompanied by vestibular symptoms and facial paralysis, bilateral hearing loss, total or near-total hearing loss, multiple vascular risk factors, and elderly patients were described as poor prognostic factor.

There are different studies in the literature regarding the superiority of treatment options for sudden hearing loss, which is still a matter of debate whether it requires treatment or not. In the present study, we purposed to determine the optimal treatment option by examining the 5-year patient data of our clinic, which is one of the largest centers in Turkey in terms of the number of patients admitted and followed.

Methods

This cross-sectional study was performed in Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Department of Otorhinolaryngology, after receiving the approval of the Cerrahpasa Faculty of Medicine Clinical Research Ethics Committee (decision date: 03.08.2021 and approval number: 604.01.01-152390) with the patients diagnosed as SSHL in our clinic between January 1, 2016 and July 31, 2021. This study was conducted retrospectively on the files of 120 patients who were diagnosed as sudden idiopathic sensorineural hearing loss and whose etiologies were not found.

All patients included in the study had at least 30 dB unilateral sensorineural hearing loss in at least three frequencies that started within 72 hours. The patients included in this study were between the ages of 18-60 and admitted to the hospital on the day of the onset of symptoms. Patients with acute or chronic infection in the affected ear, a history of surgery, and a known chronic disease were excluded from the study.

Among the patients whose diagnosis, treatment and follow-up were made in our clinic, 30 patients who received only OS (1 mg/kg prednisolone) treatment (group 1), 30 patients who received OS and HBO therapy (HBOT) (20 sessions in total for 2 hours at 2.5 atm pressure) (group 2) 30 patients (group 3) who received OS and ITS therapy (a single dose of 4 mg on the 1st, 3rd, 5th, 7th, 14th days) and 30 patients (group 4) who received all of these treatments in combination were included in the study.

OS treatments were administered as a single dose per day. HBO treatments were applied in the same center. Intratympanic injections were made using a microscope. After the patient's head was rotated 45 degrees to the opposite direction of the affected ear, local anesthesia was achieved by keeping a piece of cotton impregnated with 10% lidocaine for 10 minutes on the tympanic membrane. After anesthesia, puncture was performed with a 22 gauge needle from the anterior superior quadrant, followed by 1 cc dexamethasone (8 mg/2 mL) with a 27 gauge needle from the posterior inferior quadrant. After the procedure, the patient was kept in the same position for 30 minutes without swallowing or speaking.

PTA averages were evaluated at 0.5-1.0 and 2.0 kHz frequencies at the beginning of the treatment and at the 3rd month of admission. A gain of more than 15 dB in PTA test was determined as a treatment success criterion. In study groups; baseline, 3rd month PTA averages, audiological hearing gains and treatment success were determined. The obtained data were analyzed statistically. Informed consent forms were obtained from patients.

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) 22 (SPSS Inc., USA) was used for statistical analysis. The normal distribution and homogeneity of data were evaluated with the Kolmogorov-Smirnov test and Levene's test. Kruskal-Wallis test, Mann-Whitney U test and Pearson chi-square test were used to compare the groups. Statistically significant level was accepted as $p<0.05$.

Results

A total of 120 patients, 69 (57.5%) men and 51 (42.5%) women, were included in this study. The mean age of the patients was calculated as 40.84±7.29 (21-57) years. The groups were statistically similar according to the age characteristics of the patients ($p>0.05$) (Table 1).

When the initial PTA (dB) averages were evaluated, it was determined as 46.07±14.20 for group 1, 45±12.49 for group 2, 45.83±10.92 for group 3, and 45.93±10.29 for group 4. There was no significant difference between the groups according to initial PTA values ($p=0.958$, $p>0.05$) (Table 1).

When the PTA means (dB) were evaluated after the treatment, it was determined as 32.6±15.71 for group 1, 30.63±15.04 for group 2, 29.9±15.66 for group 3, and 22.73±11.51 for group 4. There was a significant difference between the groups according to the PTA values after treatment (p=0.04, p<0.05) (Table 1). In the pairwise comparisons made according to the PTA averages of the groups after the treatment, the value of group 4 was statistically significantly lower than all groups (respectively; p=0.07, p=0.029, p=0.04, p<0.05). No significant difference was obtained in the paired comparisons of the other groups (p>0.05) (Table 2).

When the groups were evaluated in terms of the mean PTA gains (dB) which were obtained with the treatment, it was determined as 13.47±7.78 for group 1, 14.37±9.47 for group 2, 15.93±10.84 for group 3, and 23.2±15.24 for group 4. There was a significant difference between the groups according to PTA values after treatment (p=0.022, p<0.05) (Table 1). In the pairwise comparisons made according to the PTA gain values of the groups obtained with the treatment, the value of group 4 was statistically significantly higher than all groups (respectively; p=0.07, p=0.012, p=0.029, p<0.05). No significant difference was found in the paired comparisons of the other groups (p>0.05) (Table 2).

When the groups were compared according to the determined audiological success criteria, no significant difference was obtained between the groups (p=0.309, p>0.05) (Table 3).

Discussion

Sudden idiopathic sensorineural hearing loss is one of the most controversial issues of otorhinolaryngology in terms of its etiology, prognosis, treatment modalities and the results of the modalities. In this study, we tried to reveal the optimal treatment method by retrospectively examining the data of our clinic, which is one of the largest otorhinolaryngology centers in Turkey. As a result of our study, we showed that the combination of OS+ITS+HBO is the treatment method that both provides the highest gain in post-treatment audiological thresholds and brings these thresholds closer to normal values. We did not detect a significant difference between the results of other treatment modalities.

Nowadays, various treatment protocols are applied for the treatment of SSHL. This diversity is due to the very different possible etiology and uncertainties in diagnosis. In its treatment, agents that provide hemodilution, antivirals, vasodilators, HBO and ozone therapy, and corticosteroids with different application routes are applied. Although many agents and combinations of agents are used in the treatment, oral corticosteroids are still preferred as the first treatment option in the treatment of SSHL (22).

In the present study, we purposed to determine the most effective treatment protocols using the data of our patients who met the inclusion criteria. Although we give different treatment combinations to patients with SSHL in our clinic, the steroids included in these treatments as a single dose in the morning to reduce the side effects (23). We applied ITS treatment every other day in order to increase patient compliance. We used the Siegel Criteria, one of the most frequently used criteria in the literature, to evaluate the success we achieved in the treatment of the patients in our study (21).

The American Academy of Otolaryngology-Head and Neck Surgery guidelines recommend an early treatment with steroids within 2 weeks (24). When we look from the perspective of ITS, although there are many protocols defined in the literature, there is no treatment protocol that has been shown to be superior (25). A published meta-analysis showed that ITS therapy alone was not superior to oral or IV steroid therapy (26). In terms of the combination of treatments, combined ITS and OS therapy have been shown to be superior to OS and ITS alone (27). In another study, combined intratympanicdexamethasone and OS therapy was not superior to OS alone (28). HBOT

Table 1. Statistical analysis of study parameters according to groups

Parameters		Treatment groups				p
		Group 1 (oral steroid)	Group 2 (oral steroid+hyperbaric oxygen)	Group 3 (oral+intratympanic steroid)	Group 4 (combination therapy)	
Age (years)	(min-max) (median)	21-57 38	28-55 44	25-55 41	25-50 42	0.529
Pre-treatment PTA (dB)	(min-max) (median)	30-90 41.5	30-80 45	30-70 45	32-80 42	0.958
Post-Treatment PTA (dB)	(min-max) (median)	2-70 30	5-60 33	3-60 33	7-63 21	**0.04***
Auditory gain (dB)	(min-max) (median)	5-32 11	2-40 10	2-42 11	5-70 20	**0.022***

*Kruskal-Wallis test p<0.05.
PTA: Pure tone average, min-max: Minimum-maximum

Table 2. Comparison of post-treatment values according to groups

	Groups	Post-treatment PTA	Auditory gain
p	1-2	0.801	0.830
	1-3	0.767	0.562
	1-4	**0.07***	**0.07***
	2-3	0.912	0.624
	2-4	**0.029***	**0.012***
	3-4	**0.04***	**0.029***

*Mann-Whitney U test p<0.05.
PTA: Pure tone average

Table 3. Evaluation of the treatment successes according to the treatment groups

Groups	Treatment results		p*
	Successful	Failing	
Group 1 **n (%)**	11 (36.7%)	19 (63.3%)	0.309
Group 2 **n (%)**	13 (43.3%)	17 (56.7%)	
Group 3 **n (%)**	13 (43.3%)	17 (56.7%)	
Group 4 **n (%)**	18 (60%)	12 (40%)	

*Pearson chi-square test p<0.05.

is a treatment method recommended not as a stand-alone option, but in combination with salvage therapy for severe hearing loss greater than 70 dB (29).

In the results of our study; although we determined that combined (oral+IT+HBOT) therapy was superior to other treatment modalities in terms of audiological gain, we could not detect a significant difference between the groups in terms of gaining more than 15 dB in the PTA test, which we determined as the treatment success criterion. Although there is a significant difference between the groups in terms of audiological values, the lack of difference between the groups in terms of patients considered successful can be explained by the small subject size of the present study.

Study Limitations

There are some limitations of this study, which we conducted to determine the most effective treatment method for SSHL. The major limitation is that our study includes a retrospective file review. The second limitation is that we could not detect all of the prognostic factors of the patients included in the study due to the fact that we performed the study on patient files. Although we did not include patients with known chronic diseases in the study and there was no statistical difference between the patient groups in terms of age criteria, we cannot say that the study groups were similar in terms of prognostic factors. Another limitation is that we only used audiologically hearing thresholds in the study. A study in which the speech discrimination values were also examined would have been more valuable.

Conclusion

SSHL is one of the emergencies in otorhinolaryngology which is the subject of discussion in every field from its etiology to its treatment. It can be said that the most effective treatment method for the treatment of the disease, which should be treated as soon as possible after the diagnosis is made, is the combination therapy.

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Ethics

Ethics Committee Approval: The study were approved by the Istanbul University-Cerrahpasa, Cerrahpaşa Faculty of Medicine Clinical Research Ethics Committee (decision date: 03.08.2021 and approval number: 604.01.01-152390).

Informed Consent: Retrospective study.

Authorship Contributions

Concept: Y.Z.Y., S.U., Design: Y.Z.Y., S.U., Data Collection or Processing: Y.Z.Y., S.U., Analysis or Interpretation: Y.Z.Y., S.U., Literature Search: Y.Z.Y., S.U., Writing: Y.Z.Y., S.U.

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