



Acupuncture an alternative treatment for patients with refractory sudden sensorineural hearing loss

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ABSTRACT

Objectives: This study aims to investigate the effect of acupuncture treatment on hearing and tinnitus in patients with sudden sensorineural hearing loss (SNHL) refractory to treatment.

Patients and Methods: Between January 2013 and May 2015, a total of 25 patients (8 males, 17 females; median age: 43.3 years; range, 18 to 65 years) resistant to medical treatment who underwent acupuncture as salvage therapy were retrospectively analyzed. The patients were evaluated with pure-tone audiometry, Speech Discrimination Score (SDS), and Tinnitus Handicap Inventory (THI) at pre-treatment (T0), and after 10th (T1) and 20th sessions (T2) of acupuncture.

Results: Hearing loss evaluated according to the four-frequency pure-tone average (PTA; 500, 1,000, 2,000, and 4,000 kHz) showed a statistically significant improvement at the end of the 10th session of acupuncture (p=0.017). There was also a significant improvement in the PTA values of the worst three consecutive frequencies at the end of the 20th session (p=0.034). A significant improvement in SDS (p=0.022) and THI (p<0.001) was found at the end of the 20th session.

Conclusion: Acupuncture treatment yields promising results in the improvement of PTA. The therapeutic effect of acupuncture is also evident in the treatment of tinnitus secondary to SNHL.

Keywords: Acupuncture, salvage therapy, sudden sensorineural hearing loss, tinnitus, treatment.

Sudden sensorineural hearing loss (SNHL) is defined as a sensorineural hearing loss of an average of 30 dB or more at least in three consecutive frequencies, which develops within ≤72 h.^[1] Its incidence is 5 to 20/100,000, and most patients are accompanied by tinnitus (66 to 93%).^[2,3] Tinnitus is a disturbing symptom which is usually delineated as sound perception that a person perceives independently of the external stimulus.^[4] Both hearing loss and

tinnitus are the medical conditions which lead to quality of life impairment.^[5,6] There has been no common consensus in the treatment of SNHL, and even the most commonly used steroid treatment is controversial.^[7] Besides, the improvement in tinnitus has been also correlated with the response of hearing loss to treatment.^[8,9]

Acupuncture, which is a popular treatment in many diseases such as pain control, emesis, allergy rhinitis, is a traditional Chinese medicine

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that has been practiced for a very long time for SNHL and tinnitus, in the Far East with 3,000 years of history.^[10] Acupuncture is a therapeutic technique involving the insertion and manipulation of needles at particular points in the body.^[5] There are a number of mechanisms that have been considered to be responsible for the emergence of the effect. The possible mechanisms are listed as follows: (i) it can reveal an electric charge, leading to movement potentials of particles for rebalancing the neurophysiological system or function of the olivocochlear nucleus;^[5,11] (ii) it may relieve or prevent local ischemic and anaerobic conditions by promoting peripheral blood circulation and alleviating blood viscosity;^[12] and (iii) it may improve local blood circulation.^[12]

Acupuncture has been applied as combined with medical treatment, or as a salvage treatment in the treatment of SNHL.^[13,14] However, there is still a debate about the effectiveness of acupuncture in SNHL and tinnitus. To date, there has been no sufficient evidence on acupuncture to be included in the treatment algorithm.^[11,13,15-17] The lack of a standard treatment strategy and the absence of high-quality studies are the most significant limitations.^[12] Moreover, the heterogeneity in the acupuncture initiation time make it difficult to evaluate its effectiveness. While 30 to 40% improvement rates were found in a randomized-controlled study with early application,^[18] higher improvement rates (47%) were reported in another study with a late-onset acupuncture.^[13] In addition, total recovery was shown in two cases with very long refractory period.^[19] Although there has been no clear consensus on the time of the application of acupuncture, these aforementioned results may support the use of this therapeutic option for treatment-resistant patients. Based on this hypothesis, in our study, we aimed to investigate the effectiveness of acupuncture on hearing loss and tinnitus in the SNHL patients resistant to standard and salvage treatments.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Otorhinolaryngology between January 2013

and May 2015. A total of 25 patients (8 males, 17 females; median age: 43.3 years; range, 18 to 65 years) resistant to medical treatment who underwent acupuncture as salvage therapy were retrospectively analyzed. Inclusion criteria were as follows: age between 18 and 70 years, having a diagnosis of SNHL with more than 30 dB hearing loss at least three frequencies within 72 h, having hearing loss and tinnitus symptoms, and unresponsiveness or partial response to initial and salvage treatment protocols. Exclusion criteria were as follows: having acute or chronic otitis media and a history of surgery in the affected ear, hearing loss due to retrocochlear pathology, ototoxicity, perilymphatic fistula, acoustic trauma, or systemic genetic diseases, presence of serious diseases such as cardiac, hepatic or renal insufficiency or coagulation disorders, and pregnancy and breastfeeding at the time of the study. A written informed consent was obtained from each patient. The study protocol was approved by the University of Health Sciences, Dışkapı Yıldırım Beyazıt Training and Research Ethics Committee (No: 53/3; Date: 28/05/2015). The study was conducted in accordance with the principles of the Declaration of Helsinki. Patient files were retrospectively analyzed. Demographic and audiological characteristics of the patients, accompanying tinnitus, systemic disorders, the time elapsed since the beginning of hearing loss, and otoscopic findings were recorded.

All patients with SNHL were hospitalized before the initial medical treatment and parenteral methylprednisolone was administered as 250 mg on Day 1, 150 mg on Day 2, and 100 mg on Day 3. After Day 3, by reducing the dose of 16 mg in every three days, 1 mg/kg/day oral methylprednisolone treatment was started. In addition to steroid therapy, all patients received intravenous dextran at a dose of 5 mg/kg for five days and oral piracetam 1,600 mg t.i.d. until the end of treatment. As a salvage treatment, the patients who did not fully recover after systemic corticosteroid treatment were treated with five doses of intratympanic (IT) dexamethasone 2 mg once in every two days. As a secondary salvage treatment, a hyperbaric oxygen treatment protocol of 120 min continued for 20 sessions, with 1.5 atm pressure was implemented. Acupuncture

treatment was recommended to the patients who did not respond to salvage treatments.

Acupuncture treatment

Acupuncture treatment was applied by a physical therapy and rehabilitation specialist with more than 15 years of acupuncture experience who was trained and certified in this procedure. The patients underwent a total of 20 sessions (10 weeks) of acupuncture, two sessions per week. Sterile, disposable needles at 0.25×25-mm and 0.20×13-mm in sizes (Shanghai Kangnian Medical Co., Shanghai, China) were used for acupuncture. The points of BI 62, LV3, GB42, Ki3, Ki7, Sp6, St36, He7, PG LI4, PG, LI4, GB2, SJ21, Ble, SI19, GB21, SJ18, Ex-HN3 (Yin Tang), Du20 were selected, and bilateral manual acupuncture was applied to these points. To achieve the feeling of de Qi, the needles were manually turned slightly leftward and rightward, and were kept for 30 min.

Outcome measurement

The evaluation was made with the audiometry test and Tinnitus Handicap Inventory (THI) at pre-treatment (T0), and after 10th (T1) and 20th sessions (T2) of acupuncture. The audiological assessment was done in two ways. First, the median values (min-max) of the four frequency averages (0.5, 1, 2, and 4 kHz) were calculated. Second, the pure-tone average (PTA) levels of the worst three consecutive frequencies in the audiogram were noted. Hearing loss was classified based on hearing criteria as mild (26-40 dB), moderate (41-55 dB), moderately severe (56-70 dB), severe (71-90 dB) and profound (≥ 91 dB). Also, the distribution of the patients according to this classification was examined. The Speech Discrimination Scores (SDS) were examined at

pre-treatment, and after the 10th and 20th sessions of acupuncture. Finally, the THI scores were analyzed. In THI form, each question has three answer options: "Yes," "Sometimes," and "No," and the scoring (range, 0 to 100) was based on the scores "4," "2," and "0," respectively.^[20]

Statistical analyses

Statistical analysis was performed using the IBM SPSS for Windows version 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed in mean \pm standard deviation (SD) or median (min-max), while categorical variables were expressed in number and percentage. The Friedman test was used to evaluate whether there was a change in numerical variables over time. In the event of difference, the time that made the difference was determined using the Dunn test. A *p* value of <0.05 was considered statistically significant.

RESULTS

Among 25 patients, 48% of the affected ears were on the left side, while 52% were on the right side. The shortest and the longest periods from the diagnosis to the initiation of acupuncture treatment were one month and 66 months, respectively (median: 2 months).

According to the median value of four-frequency (0.5, 1, 2, 4 kHz) PTA levels, there was a significant difference ($p=0.017$) between pre-treatment (71.25 dB [20-118.75]) and the 10th session evaluation (67.50 dB [11.25-118.75]), but no significant difference existed between the pre-treatment and the 20th session values (70 dB [10-118.75]). The PTA levels of the worst three consecutive frequencies showed no significant difference between pre-treatment and the 10th session (73.3 dB [33.3-120] vs. 70 dB [26.6-118.3]).

Table 1. The comparison of PTA, SD and THI scores according to acupuncture treatment sessions

		T0	T1	T2	p
PTA (dB)	4 frequency average	71.25 ^a (20-118.75)	67.50 ^b (11.25-118.75)	70 ^{ab} (10-118.75)	0.017
	3 frequency average	73.3 ^a (33.3-120)	70 ^b (26.6-118.3)	70 ^{ab} (10-120)	0.034
SD%		24 ^a (0-100)	56 ^{ab} (0-100)	60 ^b (0-100)	0.022
THI score		54 ^a (2-98)	42 ^{ab} (0-90)	40 ^b (0-98)	0.000

PTA: Pure-tone average; SDS: Speech Discrimination Scores; THI: Tinnitus Handicap Inventory; T0: Pre-treatment; T1: 10th session of treatment; T2: 20th session of treatment; SD: Standard deviation; *p*: Shows the difference of a from b.

Table 2. The distribution of the patients according to hearing loss classification within frequency subgroups

Hearing loss groups		Lowest 3 frequency average						4 frequency average					
		T0 (n=25)		T1 (n=25)		T2 (n=25)		T0 (n=25)		T1 (n=25)		T2 (n=25)	
		n	%	n	%	n	%	n	%	n	%	n	%
Normal	0-25	-	-	-	-	1	4	2	8	4	16	3	12
Mild	26-40	1	4	2	8	1	4	3	12	3	12	2	8
Moderate	41-55	4	16	6	24	2	8	3	12	2	8	3	12
Moderately severe	56-70	5	20	5	20	9	36	3	12	4	16	5	20
Severe	71-90	9	36	9	36	9	36	8	32	8	32	6	24
Profound	91--	6	24	3	12	3	12	6	24	4	16	6	24

T0: Pre-treatment; T1: 10th session of treatment; T2: 20th session of treatment.

Table 3. The distribution of the patients with respect to THI score classification within treatment sessions

Tinnitus Handicap Index Score Classification		T0		T1		T2	
		n	%	n	%	n	%
1	0-16	1	4	5	20	6	24
2	18-36	4	16	5	20	6	24
3	38-56	9	36	7	28	5	20
4	58-76	5	20	5	20	6	24
5	78-100	6	24	3	12	2	8

THI: Tinnitus Handicap Inventory; T0: Pre-treatment; T1: 10th session of treatment; T2: 20th session of treatment.

However, a significant improvement at the 20th session of acupuncture compared to pre-treatment was found (70 dB [10-120]) vs. 73.3 dB [33.3-120]; $p=0.034$) (Table 1). According to SDS, we observed a significant difference between pre-treatment and the 20th session (24% [0-100] vs. 60% [0-100]); $p=0.022$) assessments, but no significant difference was found between pre-treatment and the 10th session (24% [0-100] vs. 56% [0-100]) (Table 1).

The distribution of the patients concerning hearing loss classification was presented in Table 2. According to PTA levels of the worst three consecutive frequencies, we observed that half of the patients with a hearing loss >90 dB showed an improvement (fell below 90 dB, showing an improvement, while one patient completely recovered at the end of the 20th session.

The distribution of THI scores is shown in Table 3. Accordingly, there was a significant difference between pre-treatment (54 [2-98]) and the 20th session values (40 [0-98]) ($p=0.000$); however, no significant difference was observed between the pre-treatment and the 10th session (42 [0-90]) (Table 1).

DISCUSSION

Sudden sensorineural hearing loss constitutes one of the emergencies in otology, which still does not have a definitive treatment algorithm. There is a chance of spontaneous recovery in 32 to 65% of the patients.^[21] Due to rapid recovery of the patients and not applying to the hospital, this ratio may not necessarily reflect the truth. On the other hand, approximately 30 to 50% of patients given oral or intravenous steroid treatment do not respond to treatment at the end of two weeks.^[22] Therefore, it is recommended

to resort to salvage treatments.^[23,24] The success of IT steroid as a salvage treatment ranges from 26 to 39%.^[25] Hyperbaric oxygen therapy applied as a salvage treatment is recommended to be started along with steroid treatment within the first two weeks.^[26] Some patients without complete recovery after the salvage treatment further demand for alternative medications. As a salvage treatment of acupuncture therapy, many publications with positive results have been reported in the literature.^[13,19,27] Unfortunately, due to a lack of sufficient evidence, there are no documented primary treatment outcomes of the acupuncture. Yin et al.^[13] described an improvement with acupuncture in eight of 17 patients who were resistant to conventional therapy, although refractory time was quite long (213.9 days). A case report representing an improvement observed in hearing and tinnitus with salvage acupuncture treatment applied in the late period also supports this conclusion.^[19] In this study, we aimed to reveal the effect of acupuncture on hearing loss and tinnitus in treatment-resistant SNHL patients.

Currently, no consensus has been reached upon regarding the classification and assessment of improvement in SNHL; therefore, some authors have evaluated different frequencies in their studies.^[28,29] According to the study of Inoue et al.,^[29] recovery rates significantly differed with respect to the frequencies used. In our study, audiological data were evaluated in two ways, as the PTA of four frequencies (0.5, 1, 2, 4 kHz), and as the worst three consecutive frequency PTAs. Based on the median values of the four-frequency PTA, a significant improvement of the hearing was found in the 10th session of acupuncture. However, when the duration of treatment was extended to 20 session, the significant improvement on hearing disappeared.

In the evaluation of the worst three consecutive frequencies, we observed an improvement in hearing at the end of the 20th session ($p=0.034$). Also, in half of the patients ($n=3$) with hearing loss greater than 90 dB ($n=6$), an improvement was observed (Table 2). Some studies evaluating patients' audiometry curves by dividing them into groups examine improvement rates at the most affected frequencies. As in Wilson et al.^[30] study, if the frequencies of 0.5, 1, 2 kHz were examined,

it would not be possible for us to evaluate the patients with high-frequency involvement, or *vice versa*. While evaluating the success of the salvage treatments, the effect of the treatment applied on the non-improving frequencies should be targeted. Undoubtedly, its reflection on the functional hearing should be also examined, and standardized frequency determination by a consensus may be included in this evaluation. However, evaluation of the fixed frequencies of the PTA values in different audiogram curves may cause errors in determining the effectiveness of the treatment. The improvement of hearing in the worst three consecutive frequency analysis is also supported by the results of the SDS and THI improvements. In our study, we found that improvement was statistically significant in SDS and THI scores, as the quantity of the acupuncture session increased. In addition, the American Academy of Otolaryngology/Head and Neck Surgery (AAO/HNS) Clinical Practice Guideline recommends the use of the THI and SDS for the evaluation of treatment effectiveness.^[26] Yin et al.^[13] also support this result, even if the refractory duration in their study was longer than that in our study. The improvement rates increase with the increase of acupuncture sessions. Qui et al.^[27] showed that electroacupuncture combined with medical treatment was more effective in improving hearing loss, particularly at high frequencies, compared to the medical monotherapy. Moreover, Shang et al.^[18] described a 30 to 40% improvement with acupuncture treatment in their randomized-controlled study. According to a meta-analysis, although there is insufficient evidence to speculate that acupuncture is useful, along with medical treatment, acupuncture was shown to be more effective than medical treatment alone.^[14]

Hearing loss is highly (66 to 93%) associated with tinnitus.^[3] Improvement in tinnitus correlates with the treatment response of SNHL.^[9] Currently, studies examining the effect of acupuncture on tinnitus secondary to SNHL are limited and most of them address idiopathic subjective tinnitus. Okada et al.^[17] reported that acupuncture was effective in this regard, while Axelsson et al.^[15] showed no pronounced attenuating effect on tinnitus. In the meta-analysis

of Liu et al.,^[10] it was concluded that the number of studies was largely confined to establish a substantial consensus. In our study, unlike some other studies,^[12,14] we found an improvement in tinnitus secondary to SNHL, compatible with the increasing number of sessions. Huang and Li^[31] also indicated the improvement in tinnitus with acupuncture in their case reports, as seen in our study. To the best of our knowledge, our study is the first in the literature to show the positive effect of acupuncture in tinnitus secondary to SNHL.

Nonetheless, the present study has some limitations. First, it has a retrospective design without a control group. Second, long refractory interval and the fact that we were unable to evaluate the psychosomatic changes based on tinnitus constitute another limitation. Third, our small sample size and short follow-up time preclude to draw a firm conclusion on this subject.

In conclusion, 20 sessions of acupuncture treatment contributed to PTA improvement of the most distorted three consecutive frequencies in the salvage treatment of SNHL. Based on these findings, this therapeutic approach may be an effective alternative option in the treatment of tinnitus secondary to SNHL. Acupuncture has been promising as a salvage treatment. Thus, our study is a pioneering research for further large-scale, randomized-controlled trials in this field.

Declaration of conflicting interests

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REFERENCES

- Haberkamp TJ, Tanyeri HM. Management of idiopathic sudden sensorineural hearing loss. *Am J Otol* 1999;20:587-92.
- Kuhn M, Heman-Ackah SE, Shaikh JA, Roehm PC. Sudden sensorineural hearing loss: A review of diagnosis, treatment, and prognosis. *Trends Amplif* 2011;15:91-105.
- Ding X, Zhang X, Huang Z, Feng X. The characteristic and short-term prognosis of tinnitus associated with sudden sensorineural hearing loss. *Neural Plast* 2018;2018:6059697.
- Seidman MD, Standing RT, Dornhoffer JL. Tinnitus: Current understanding and contemporary management. *Curr Opin Otolaryngol Head Neck Surg* 2010;18:363-8.
- Kim JI, Choi JY, Lee DH, Choi TY, Lee MS, Ernst E. Acupuncture for the treatment of tinnitus: A systematic review of randomized clinical trials. *BMC Complement Altern Med* 2012;12:97.
- Härkönen K, Kivekäs I, Rautiainen M, Kotti V, Vasama JP. Quality of life and hearing eight years after sudden sensorineural hearing loss. *Laryngoscope* 2017;127:927-31.
- Conlin AE, Parnes LS. Treatment of sudden sensorineural hearing loss: II. A Meta-analysis. *Arch Otolaryngol Head Neck Surg* 2007;133:582-6.
- Dobie RA. A review of randomized clinical trials in tinnitus. *Laryngoscope* 1999;109:1202-11.
- Rah YC, Park KT, Yi YJ, Seok J, Kang SI, Kim YH. Successful treatment of sudden sensorineural hearing loss assures improvement of accompanying tinnitus. *Laryngoscope* 2015;125:1433-7.
- Liu F, Han X, Li Y, Yu S. Acupuncture in the treatment of tinnitus: A systematic review and meta-analysis. *Eur Arch Otorhinolaryngol* 2016;273:285-94.
- de Azevedo RF, Chiari BM, Okada DM, Onishi ET. Impact of acupuncture on otoacoustic emissions in patients with tinnitus. *Braz J Otorhinolaryngol* 2007;73:599-607.
- Chen S, Zhao M, Qiu J. Acupuncture for the treatment of sudden sensorineural hearing loss: A systematic review and meta-analysis: Acupuncture for SSNHL. *Complement Ther Med* 2019;42:381-8.
- Yin CS, Park HJ, Nam HJ. Acupuncture for refractory cases of sudden sensorineural hearing loss. *J Altern Complement Med* 2010;16:973-8.
- Zhang XC, Xu XP, Xu WT, Hou WZ, Cheng YY, Li CX, et al. Acupuncture therapy for sudden sensorineural hearing loss: A systematic review and meta-analysis of randomized controlled trials. *PLoS One* 2015;10:e0125240.
- Axelsson A, Andersson S, Gu LD. Acupuncture in the management of tinnitus: A placebo-controlled study. *Audiology* 1994;33:351-60.
- Borton TE. Acupuncture and sensorineural hearing loss: A review. *South Med J* 1976;69:600-1.
- Okada DM, Onishi ET, Chami FI, Borin A, Cassola N, Guerreiro VM. Acupuncture for tinnitus immediate relief. *Braz J Otorhinolaryngol* 2006;72:182-6.
- Shang K, Ma X, Liu HL, Jing YY, Zeng L, Li N, et al. Acupuncture as an early treatment for idiopathic sudden sensorineural hearing loss (ISSNHL) patients with flat or high-frequency drop audiograms: Study protocol for a randomized controlled trial. *Trials* 2018;19:356.
- Arpornchayanon W, Teekachunhatean S. Complete recovery following electroacupuncture therapy in refractory unilateral sensorineural hearing loss. *J Acupunct Meridian Stud* 2019;12:95-101.
- Newman CW, Jacobson GP, Spitzer JB. Development of the tinnitus handicap inventory. *Arch Otolaryngol Head Neck Surg* 1996;122:143-8.

21. Lim HJ, Kim YT, Choi SJ, Lee JB, Park HY, Park K, et al. Efficacy of 3 different steroid treatments for sudden sensorineural hearing loss: A prospective, randomized trial. *Otolaryngol Head Neck Surg* 2013;148:121-7.
22. Plaza G, Herráiz C. Intratympanic steroids for treatment of sudden hearing loss after failure of intravenous therapy. *Otolaryngol Head Neck Surg* 2007;137:74-8.
23. Pezzoli M, Magnano M, Maffi L, Pezzoli L, Marcato P, Orione M, et al. Hyperbaric oxygen therapy as salvage treatment for sudden sensorineural hearing loss: A prospective controlled study. *Eur Arch Otorhinolaryngol* 2015;272:1659-66.
24. 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.
25. Haynes DS, O'Malley M, Cohen S, Watford K, Labadie RF. Intratympanic dexamethasone for sudden sensorineural hearing loss after failure of systemic therapy. *Laryngoscope* 2007;117:3-15.
26. Chandrasekhar SS, Tsai Do BS, Schwartz SR, Bontempo LJ, Faucett EA, Finestone SA, et al. Clinical practice guideline: Sudden hearing loss (Update). *Otolaryngol Head Neck Surg* 2019;161(1_suppl):S1-S45.
27. Qiu L, Zheng X, Xie F, Zhang M, Zhang J, Yuan S, et al. Clinical observation on the different frequency hearing damages in sudden deafness treated by electroacupuncture combined with western medicine comprehensive therapy. *World Journal of Acupuncture – Moxibustion* 2012;22:22-7.
28. Bogaz EA, Suzuki FA, Rossini BA, Inoue DP, Penido Nde O. Glucocorticoid influence on prognosis of idiopathic sudden sensorineural hearing loss. *Braz J Otorhinolaryngol* 2014;80:213-9.
29. Inoue DP, Bogaz EA, Barros F, Penido Nde O. Comparison of hearing recovery criteria in sudden sensorineural hearing loss. *Braz J Otorhinolaryngol* 2012;78:42-8.
30. 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;106:772-6.
31. Huang N, Li C. Acupuncture in treating sudden sensorineural hearing loss: A report of 2 cases. *Forsch Komplementmed* 2014;21:246-9.