

Delayed recovery of pediatric sudden sensorineural hearing loss treated with acupuncture

A case report

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Abstract

Rationale: The rate of spontaneous recovery of sudden sensorineural hearing loss (SSNHL) has been reported to be as high as 32% to 65%. Although the majority of spontaneous recoveries occur within 2 weeks, treatment of refractory SSNHL failing conventional therapy is difficult. In particular, it is more difficult to treat children—who have a worse prognosis than adults—with SSNHL refractory to conventional therapy. No studies reported delayed recovery of pediatric SSNHL later than 3 months after onset, or delayed recovery treated with acupuncture.

Patient concerns: A 15-year-old girl experienced hearing loss after acquiring a cold.

Diagnosis: She did not undergo audiometry and only took medicine for a common cold after diagnosis by an internal medicine doctor. Ninety-three days after onset, she visited an otorhinolaryngology clinic and was diagnosed with SSNHL. Seven rounds of intratympanic steroid (ITS) treatment were performed 93 to 135 days after onset; audiogram at 149 days did not demonstrate improvement.

Interventions: Two-hundred sixty-six days after onset, she visited to TKM hospital and was admitted for 21 days and received outpatient treatment for 1 month after discharge. She was treated acupuncture, transcutaneous electrical nerve stimulation, and moxibustion.

Outcomes: She experienced improvement in experienced improvement in pure tone average, speech recognition threshold, and word recognition scores after acupuncture treatment. Delayed ITS treatment at 93 to 135 days after onset did not improve the patient's hearing loss. However, slight recovery was achieved at the conclusion of treatment. Lessons: Acupuncture may be a therapeutic option for individuals who do not experience improvement after the use of steroids or miss early treatment.

Abbreviations: ITS = intratympanic steroid, PTA = pure tone average, SRT = speech recognition threshold, SSNHL = sudden sensorineural hearing loss, TENS = transcutaneous electrical nerve stimulation, TKM = traditional Korean medicine, WRS = word recognition scores.

Keywords: acupuncture, complementary medicine, sudden sensorineural hearing loss, transcutaneous electrical nerve stimulation

1. Introduction

Sudden sensorineural hearing loss (SSNHL) is defined as rapidly developing hearing loss more than 30 dB across 3 consecutive frequencies within less than 3 days.^[1] The annual incidence of SSNHL is 27 per 100,000 population in the United States.^[2]

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SSNHL is more prevalent in the adult population, and the pediatric patients incidence is approximately 6.6% of the adult incidence.^[3]

The rate of spontaneous recovery has been reported to be as high as 32% to 65%. Although the majority of spontaneous recoveries occur within 2 weeks, and often in the first few days, refractory SSNHL failing conventional therapy is difficult. In particular, it is more difficult to treat children—who have a worse prognosis than adults—with SSNHL refractory to conventional therapy.^[4–6] For this reason, few studies have reported the delayed recovery of adult SSNHL later than 3 months after onset,^[7,8] and no studies reported delayed recovery of pediatric SSNHL later than 3 months after onset.

Acupuncture is widely used in Asian countries, and several studies have investigated the efficacy of acupuncture for SSNHL. In a previous case series, 8 of 17 patients who failed conventional therapy demonstrated improvement in hearing loss after acupuncture treatment.^[9] A systematic review investigating the acupuncture therapy for SSNHL published in 2015 reported that combination of acupuncture and Western medicine demonstrated a better effect than Western medicine alone.^[10]

To date, delayed recovery of pediatric SSNHL later than 3 months after onset or delayed recovery treated with

acupuncture has not been reported. The present case involved a 15-year-old girl who experienced improvement in pure tone average (PTA), speech recognition threshold (SRT), and word recognition scores (WRS) after acupuncture treatment 266 to 314 days after the onset of SSNHL.

2. Case report

A 15-year-old Korean girl who experienced SSNHL in her left ear 8 months previously presented to the traditional Korean medicine (TKM) hospital. The patient was healthy with no family history of hearing loss or other disease history. A couple of days after acquiring a cold, hearing loss and tinnitus arose. However, she did not undergo audiometry and only took medicine for a common cold after diagnosis by an internal medicine doctor. Ninety-three days after onset, she visited an otorhinolaryngology clinic and was diagnosed with SSNHL after PTA testing. Seven rounds of intratympanic steroid (ITS) treatment were performed 93 to 135 days after onset; audiogram at 149 days did not demonstrate improvement. Tympanometry, auditory brainstem response, distortion product otoacoustic emission, and magnetic resonance imaging were also performed, and no eustachian tubal disorder, vestibular schwannoma, or central brain abnormalities were observed. Two-hundred sixty-six days after onset, she visited to TKM hospital and was admitted for 21 days and received outpatient treatment for 1 month after discharge. This case study involves no more than minimal risk to human subjects. For this reason, this study was approved a waiver of informed consent from the institutional review board of the Kyung Hee University Hospital at Gangdong (KHNMC-OH-IRB 2018-07-006).

2.1. Treatment

The patient underwent manual and/or electroacupuncture, transcutaneous electrical nerve stimulation (TENS), and moxibustion, and did not receive Western medicine treatment during these treatments. Acupuncture needles (0.25 mm diameter, 30 mm length, Dong Bang, Gyeonggi-do, Korea) were manually inserted subcutaneously or intramuscularly. Acupuncture points included both sides of LI4 and ST36 (distal acupoints) and the affected side of TE21, SI19, GB2, ST7, and TE17 (local acupoints). After the needles were inserted, local acupoints were connected to an electroacupuncture stimulator (ES-160, Ito Co., Ltd., Tokyo, Japan) and stimulated using constant mode at a frequency of 30 Hz. The stimulation was adjusted to relatively high intensity but was neither unpleasant nor painful. Needle

retention time was 15 minutes. Acupuncture treatment was performed twice per day during inpatient treatment, or once per week during outpatient treatment.

TENS treatment was performed using a low-frequency electrical stimulator (Pointron 802, Dae Yang Medical Co., Ltd., Wonju, Korea). A pair of electrodes was attached to the tender point of the sternocleidomastoid muscle, trigger point of the masseter muscle, and the temporomandibular joint in front of the tragus. Subsequently, electrical stimulation (30 Hz) was applied for 10 minutes. Stimulation was adjusted to a relatively high intensity but was neither unpleasant nor painful. TENS treatment was performed twice per day during inpatient treatment, and or once per week during outpatient treatment.

Moxibustion (Cettum, Hansang Medix Co., Ltd., Ilsan, Korea) was performed using an electronic device. This device was maintained temperature of contact surface at 43°C for 15 minutes when activated. It was applied in front of the affected ear during acupuncture treatment.

2.2. Outcome

Audiometry was performed before, after ITS (at hospital A), and on admission day, discharge day, and 1 month after discharge in hospital B. PTA was calculated at an average threshold of, 0.5, 1, 2, and 4 kHz. During treatment, PTA, SRT, and WRS changed from 66.3 to 51.3 dB, 70 to 30 dB, and 16 to 36%, respectively (Table 1). No adverse events have occurred during treatment.

3. Discussion

There have been few reports describing delayed recovery of adult SSNHL, 1 of which described the delayed recovery of maximum speech discrimination score (SDS) 11 to 13 months after SSNHL onset, without the recovery of PTA change (from 71.0 ± 19.6 to $79.3 \pm 16.4\%$).^[7] In another study, only 2 of 156 patients achieved a final hearing level later than 3 months after discharge (24 weeks and 32 weeks, respectively).^[8] To date, delayed recovery of pediatric SSNHL later than 3 months after onset or delayed recovery treated with acupuncture, has not been reported.

In the present case, delayed ITS did not change the patient's hearing loss; however, slight improvement (Siegel's criteria^[11]) was achieved at the conclusion of acupuncture treatment.

The etiology of SSNHL is unclear in most patients, however, viral infection, impaired blood supply in the inner ear, intracochlear membrane rupture or inner ear disease are considered to be possible causes. The therapeutic mechanism of acupuncture

Table 1

The change in audiogram.

Period (days after onset)	Pure tone audiometry, dB							Speech audiometry	
	250	500	1k	2k	4k	8k	Average [‡]	SRT	WRS
Before ITS* (93)	20	55	70	65	60	60	62.5	55	85dB/16%
After ITS* (149)	15	50	70	70	55	65	61.3	50	80dB/12%
Admission [†] (266)	20	55	65	75	70	75	66.3	70	75dB/16%
Discharge [†] (285)	5	45	65	60	60	60	57.5	35	75dB/28%
End of Tx [†] (314)	5	40	60	50	55	60	51.3	30	70dB/36%

ITS = intratympanic steroids, SRT = speech recognition threshold, Tx = treatment, WRS = word recognition score.

* Performed at hospital A.

† Performed at hospital B.

‡ Average threshold of, 0.5, 1, 2, and 4 kHz.

has been reported in many studies. It was observed that acupuncture increases peripheral blood flow and oxygen supplied to ear.^[12,13] Furthermore, acupuncture is known to increase parasympathetic nervous activity, and this could be helpful for blood circulation near the ear in patients with SSNHL.^[14] TENS is known to stimulate the vagus nerve and reduce tinnitus of various hearing level.^[15,16] Using warm stimulation, moxibustion increases blood flow to the locally attached lesion, and this activity could be helpful in patients with impaired blood supply in the inner ear.

In the SSNHL guidelines, early use of oral steroids or ITS is recommended due to their anti-inflammatory properties.^[1] Hemodilution agents and hyperbaric oxygen are used to patients who were refractory to steroid treatment based on their vasodilation effects,^[17] which are equivalent to the activities of acupuncture, TENS, and moxibustion treatments.

Patients with SSNHL who do not experience improvement after the use of steroids or miss early treatment have few therapeutic options. In this case, a girl who missed early treatment and did not respond to ITS experienced slight improvement after acupuncture treatment. However, as this patient underwent combination treatment including acupuncture, TENS, and moxibustion, it is difficult to assess the independent efficacy of acupuncture. Nevertheless, in the real world, most acupuncture treatment is performed with other treatment; therefore, combination treatment could better reflect actual clinical practice. This study suggests that acupuncture may be a therapeutic option for individuals who do not experience improvement after the use of steroids or miss early treatment. As the first study reporting the delayed recovery of pediatric SSNHL after acupuncture treatment, this study could be the guidance for future clinical trial.

Author contributions

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