

ปัจจัยที่มีผลต่อการได้ยินดีขึ้นในผู้ป่วยโรคประสาทหูเสื่อมเฉียบพลันชนิดไม่ทราบสาเหตุ
ที่ได้รับการรักษาซ้ำด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูหลังจากรักษาด้วย
การรับประทานเพรดนิโซโลนแล้วไม่ได้ผล

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บทคัดย่อ

บทนำ: การฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูเข้าสู่หูชั้นกลางสามารถช่วยยกระดับการได้ยินในผู้ป่วยโรคประสาทหูเสื่อมเฉียบพลันที่รักษาด้วยการรับประทานยาเพรดนิโซโลนแล้วไม่ได้ผล การศึกษาปัจจัยที่ส่งผลต่อความสำเร็จในการรักษาเป็นสิ่งสำคัญที่สามารถช่วยในการพยากรณ์โรคได้

วัตถุประสงค์: เพื่อศึกษาหาปัจจัยที่มีผลต่อการได้ยินที่ดีขึ้นในผู้ป่วยโรคประสาทหูเสื่อมเฉียบพลันกลุ่มที่ได้รับการรักษาซ้ำด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูภายหลังจากที่ได้รับการรักษาด้วยการรับประทานเพรดนิโซโลนแล้วไม่ได้ผล

วิธีการศึกษา: ศึกษาแบบพรรณนาย้อนหลังจากเวชระเบียนผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคประสาทหูเสื่อมเฉียบพลันชนิดไม่ทราบสาเหตุที่ได้รับการรักษาซ้ำด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูภายหลังจากที่ได้รับการรักษาด้วยการรับประทานเพรดนิโซโลนแล้วไม่ได้ผล ณ โรงพยาบาลราชบุรี ตั้งแต่ กรกฎาคม 2557 ถึง ธันวาคม 2563 นำข้อมูลระดับการได้ยินด้วยเสียงบริสุทธิ์เฉลี่ย (pure-tone average, PTA) และระดับความสามารถในการแยกแยะเสียงพูด (speech discrimination testing, SD) มาวิเคราะห์และนำเสนอผลเป็นจำนวน ร้อยละ ค่าเฉลี่ย และส่วนเบี่ยงเบนมาตรฐาน วิเคราะห์ปัจจัยที่ส่งผลต่อการรักษาด้วย t-test independent, chi-square test

ผลการศึกษา: ผู้ป่วยที่นำมาศึกษา 58 ราย พบว่าอายุที่มากกว่า 56 ปี โรคเบาหวาน การสูบบุหรี่ ระดับการสูญเสียการได้ยินก่อนการรักษาด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูเข้าสู่หูชั้นกลาง และระยะเวลาที่ได้ฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูนับจากเกิดอาการเกิน 6 สัปดาห์ มีผลต่อการได้ยินที่ดีขึ้นอย่างมีนัยสำคัญทางสถิติ ($p < .05$)

สรุป: ปัจจัยที่มีผลต่อการได้ยินดีขึ้นในผู้ป่วยโรคประสาทหูเสื่อมเฉียบพลันชนิดไม่ทราบสาเหตุที่ได้รับการรักษาซ้ำด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูหลังจากรักษาด้วยการรับประทานเพรดนิโซโลนแล้วไม่ได้ผลคือ อายุมาก โรคเบาหวาน การสูบบุหรี่ ระดับ PTA ก่อนการรักษาด้วยการฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูเข้าสู่หูชั้นกลาง และการเริ่มต้นฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหูนานหลัง 6 สัปดาห์นับจากวันที่มีอาการครั้งแรก

คำสำคัญ: โรคประสาทหูเสื่อมเฉียบพลัน การรักษาด้วยการรับประทานเพรดนิโซโลนแล้วไม่ได้ผล การฉีดเดกซาเมทาโซนผ่านเยื่อแก้วหู

**Factors Effecting Hearing Improvement in Idiopathic Sudden Sensorineural Hearing Loss
Patients with Intratympanic Dexamethasone Injection as a Salvage Treatment
after Failure of Oral Prednisolone Therapy**

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ABSTRACT

Background: Intratympanic dexamethasone injection (ITD) as a salvage treatment after failure of oral prednisolone therapy can promote additional hearing recovery in idiopathic sudden sensorineural hearing loss (ISSNHL) cases. The study of factors affecting hearing improvement is an important thing to evaluate the prognosis after therapy.

Objective: To study factors affecting hearing improvement in ISSNHL patients with ITD as a salvage treatment after failure of oral prednisolone therapy.

Methods: The retrospective descriptive study was analyzed among ISSNHL patients who underwent ITD injection after the failure of oral prednisolone therapy. The medical records from the Ratchaburi hospital's HOSxP program were collected from July 2014 to December 2020. Pretreatment and post-treatment audiometric evaluations, including pure-tone average (PTA) and speech discrimination score (SDS), were analyzed. The data was presented in percentage, average, and standard deviation. T-test independent and chi-square test were implemented for the analysis of the factors relating to hearing recovery.

Results: Fifty-eight patients met the inclusion criteria of the study. Statistically significant factors were noted in those patients above the age of fifty-six, diabetes, smoking, the severity of ISSNHL, and the first ITD after 6 weeks from the onset of symptoms ($p < 0.05$).

Conclusion: Based on the present study, the adverse hearing recovery prognosis factors for ITD as salvage therapy after the failure of oral prednisolone in ISSNHL are advanced age, diabetes, smoking, the severity of ISSNHL and delayed first ITD after six weeks from the onset of symptoms.

Keywords: Sudden Sensorineural hearing loss, failure of oral prednisolone therapy, intratympanic dexamethasone injection.

INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is defined as the loss of hearing in sensorineural nature of 30 decibels (dB) or greater over at least three contiguous frequencies, which occurs within a 72-hour window.¹ The majority of SSNHL is idiopathic, in which viral infection, vascular compromise, tumors, and immunologic diseases are most discussed.² Nonidiopathic causes of SSNHL can be identified during management. The most pressing of these are vestibular schwannoma, stroke, malignancy, noise, and ototoxic agents.³

The proper management of idiopathic sudden sensorineural hearing loss (ISSNHL) has been the subject of debate for many years. The lack of consensus on the treatment is due to the difficult identification of the true deafness etiology.⁴ However, steroid therapy is the current mainstay treatment for ISSNHL.⁵ It aims to reduce inner ear inflammation and reverse the apoptotic pathway of the injured cochlear hair cells.⁶ Clinicians may offer systemic corticosteroids as initial therapy to patients with ISSNHL within two weeks of symptom onset.⁷ Nevertheless, about 50% of patients have incomplete recovery after the treatment.⁸

Intratympanic steroid (ITS) injection is increasingly used in the treatment of inner ear disorders, especially in patients with ISSNHL who have failed systemic therapy. At the department of otolaryngology, Ratchaburi hospital, the clinician may prescribe oral

prednisolone 1 mg/kg/d (the usual maximal dose is 60 mg/d) for 10-14 days in ISSNHL cases who have no contraindication to systemic steroid therapy. After that, if patients still suffer from incomplete hearing recovery, ITS is considered as salvage treatment. This study was undertaken to review the experience with 4 mg/mL intratympanic dexamethasone (ITD) as a salvage therapy. Special attention was to evaluate the factors affecting hearing improvement, including age, underlying disease, smoking habit, associated symptoms, prior therapy, audiogram configuration, the severity of SSNHL, and duration from clinical presentation to the onset of ITD therapy.

METHODS

A retrospective study was performed among adult patients (aged more than 20 years) who suffered from ISSNHL and had incomplete recovery treatment with oral prednisolone (1 mg/kg/day, maximum 60 mg/day) for 10 - 14 days. The patients were excluded if the causes of SSNHL were identified as follows: trauma, middle ear pathology, Meniere's disease, tumor, autoimmune disease, infection, ototoxic agent, radiation-induced, and any other identifiable etiology for hearing loss. Moreover, the patients who were initially treated with oral prednisolone after 30 days of disease onset were excluded from the study as well.

The data was collected from 1 July 2014 to 31 December 2020. Examining validity content through the use of two otoneurologists and one audiologist expert opinion was performed (content validity

index: CVI = 1). This study was reviewed and approved to be conducted by the Ratchaburi hospital clinical research ethics committee (Reference Number: RBHEC 019/64) on September 6, 2021.

The patient examination included history taking, otoscopic findings, and a peripheral vestibular organ function examination. The hearing level was evaluated by an advanced clinical audiometer under the operation of a 40-year experienced audiometric technician. Results such as pure-tone audiometry at 0.5, 1, 2, 4, 8 kHz and pure-tone average (PTA) of 0.5, 1 and 2 kHz were collected. Speech reception threshold (SRT) and speech discrimination score (SDS) data were evaluated as well.

Local anesthesia by 5% prilocaine cream, intratympanic-Dexamethasone 4 mg/ml injection was done under microscopic view at the posteroinferior quadrant of the tympanic membrane while patients were in supine position with head turn to the unaffected side. After the solution completely filled in the middle ear, the patients were instructed to maintain their head position, and avoid swallowing and speaking for 30 minutes. Once the procedure was completely done, patients were further observed for at least 30 minutes to reassure that they were in stable condition before being discharged. The second dose of ITD injection was given on the next day, and the other three doses were performed for three consecutive weeks. After completing a total of five ITD injections, the follow-up post-treatment audiograms were measured at one

week, one month, three months, and six months consecutively.

The significant indicating criteria of hearing improvement were 10 dB in PTA and/or 10% in SDS gain better when comparing pretreatment ITD injection and the six-month audiometry results. Data was gathered in a database of factors affecting hearing improvement in ISSNHL patients with ITD as salvage treatment after the failure of oral prednisolone therapy. Statistical analysis was done with the use of IBM[®] SPSS version 21.0, copyright of the fifth-regional health promotion center, Ratchaburi province. Absolute and relative frequencies were calculated for qualitative variables, while quantitative variables were summarized as number, range, percentage, and mean (SD). Categorical variables were analyzed using the chi-square test and differences in means were compared by the independent t-test. The significance level chosen for all analyses was 0.05, two-tailed.

RESULTS

During the study period, 153 patients were diagnosed with SSNHL. Twenty-one patients were excluded because of identifiable causes. According to steroid's side effect awareness, 15 of 132 patients refused to take oral prednisolone. Therefore, 117 people were prescribed systemic steroid therapy. Forty-nine cases achieved complete hearing recovery, while 68 people were still suffering from incomplete or non-hearing improvement. Fifty-eight patients decided to continue

treatment with ITD and enrolled in this study. After the ITD application, temporary dizziness was experienced in three subjects and was relieved after short resting. No other post-procedure complications such as infection or permanent tympanic membrane perforation were detected in this study. Finally, 35 cases had hearing improvement, however, 23 cases did not respond to the treatment.

Among 58 patients who were available for the study, 27 (47%) were men and 31 (53%) were women. The mean age was 47.62 ± 10.65 with a range from 28 to 72 years

of age. The ITD treatment was performed with a mean delay of 24.5 ± 23.6 days from the onset of symptoms. The mean initial audiometric level before oral prednisolone therapy was 60.12 ± 23.33 dB and the SDS was 72.36 ± 9.96 . The average hearing threshold after the oral prednisolone therapy was 54.05 ± 14.40 dB and the average PTA after ITD administration was 40.51 ± 17.93 dB. The mean PTA improvement was 14.63 ± 36.82 dB. The pre-ITD SDS was $77.68 \pm 9.96\%$, while the post-ITD SDS was $88.78 \pm 9.15\%$. Demographic and audiometric data of the study are shown in table 1.

Table 1: Demographic characteristics and audiometric data (n=58)

Age	
Mean $\pm$ S.D. (Range)	47.62 ± 10.65 (28-72)
Gender	
Male	27 (46.6%)
Female	31 (53.4%)
Initial PTA	
Mean in dB $\pm$ S.D. (Range)	60.12 ± 23.33 (30-90)
Mean in SDS $\pm$ S.D. (Range)	72.36 ± 9.96 (68-100)
Salvage treatment delay from initial symptoms	
Mean in days $\pm$ S.D. (Range)	24.5 ± 23.6 (14-93)
Pre-ITD	
Mean in dB $\pm$ S.D. (Range)	54.05 ± 14.40 (30-80)
Mean in SDS $\pm$ S.D. (Range)	77.68 ± 9.96 (72-100)
Post-ITD	
Mean in dB $\pm$ S.D. (Range)	40.51 ± 17.93 (10-80)
Mean in SDS $\pm$ S.D. (Range)	88.78 ± 9.15 (72-100)
Difference audiometric between pre and post-ITD	
Mean in dB $\pm$ S.D. (Range)	14.63 ± 36.82 (10-40)
Mean in SDS $\pm$ S.D. (Range)	9.98 ± 5.45 (0-12)

Diabetes was noted in 20 (34.5%) patients and 22 (37.9%) cases suffered from dyslipidemia. Moreover, 20 (34.5%) people presented hypertension and 3 (5.2%) had chronic kidney disease. Fourteen (24.1%) patients showed a history of smoking habit, which more than 10 cigarettes per day. Vertigo was presented in 4 (6.9%) cases and 53 (91.4%) patients were prescribed betahistine.

The severity of SSNHL in 28 (48.3%) cases of the pre-ITD group was classified as moderate SSNHL and 27 (46.6%) patients as severe SSNHL. Furthermore, the number of cases who presented pretreatment abnormal

audiogram configuration with high-frequency SSNHL, low-frequency SSNHL, flat, mid-frequency SSNHL, and profound hearing loss patterns were 12 (20.7%), 18 (31.0%), 17 (29.3%), 8 (13.7%) and 3 (5.2%) respectively.

The statistically significant factors affecting hearing improvement in ISSNHL with ITD as a salvage treatment after failure of oral prednisolone were age (p-value=<0.01), diabetes (p-value = 0.044), smoking (p-value=<0.01), pre-ITD moderate SSNHL (p-value=0.045) and ITD administration within 6 weeks after the onset of symptoms (p-value = <0.01) as displayed in the table2.

Table 2: Factors and hearing outcomes in ISSNHL patients with ITD as a salvage treatment after failure of oral prednisolone therapy (n=58)

Factors	Number of patients (%)	Hearing outcome		p-value
		improved	Not improved	
Age				<.001*
Mean±S.D.	47.62±10.65	41.83±7.39	56.43±8.68	
Range	28-72			
Gender				1.000 [†]
Male	27 (46.6)	16 (45.7)	12 (52.2)	
Female	31 (53.4)	19 (54.3)	11 (47.8)	
Diabetes				.044 [†]
Yes	20 (34.5)	8 (22.9)	12 (52.2)	
No	38 (65.5)	27 (77.1)	11 (47.8)	
Dyslipidemia				.125 [†]
Yes	22 (37.9)	10 (28.6)	12 (52.2)	
No	36 (62.1)	25 (71.4)	11 (47.8)	
Hypertension				.748 [†]
Yes	20 (34.5)	11 (31.4)	9 (39.1)	
No	38 (65.5)	24 (68.6)	14 (60.9)	
Chronic kidney disease				.556 [†]
Yes	3 (5.2)	1 (2.9)	2 (8.7)	
No	55 (94.8)	34 (97.1)	21 (91.3)	

Table 2: Factors and hearing outcomes in ISSNHL patients with ITD as a salvage treatment after failure of oral prednisolone therapy (n=58)

Factors	Number of patients (%)	Hearing outcome		p-value
		improved	Not improved	
Smoking				<.001 [†]
Yes	14 (24.1)	2 (5.7)	12 (52.2)	
No	44 (75.9)	33 (94.3)	11 (47.8)	
Vertigo				1.000 [†]
Yes	4 (6.9)	2 (5.7)	2 (8.7)	
No	54 (93.1)	33 (94.3)	21 (91.3)	
Betahistine				.639 [†]
Yes	53 (91.4)	31 (88.6)	22 (95.7)	
No	5 (8.6)	4 (11.4)	1 (4.3)	
Pre-ITD Moderate SSNHL(41-69dB)				.045 [†]
Yes	28 (48.3)	18 (51.4)	10 (43.4)	
No	30 (51.7)	17 (48.6)	13 (56.6)	
Pre-ITD Severe SSNHL(70-94dB)				.059 [†]
Yes	27 (46.6)	17 (48.6)	10 (43.4)	
No	31 (53.4)	18 (51.4)	13 (56.6)	
Profound SNHL (≥95dB)				0.878 [†]
Yes	3 (5.2)	0 (0)	3 (13.0)	
No	55 (94.8)	35 (100)	20 (87.0)	
High-frequency SNHL				.856 [†]
Yes	12 (20.7)	7 (20)	5 (21.7)	
No	46 (79.3)	28 (80)	18 (78.3)	
Low-frequency SNHL				.056 [†]
Yes	18 (31.0)	11 (31.4)	7 (30.4)	
No	40 (69.0)	24 (68.6)	16 (69.6)	
Flat type				.061 [†]
Yes	17 (29.3)	10 (28.5)	7 (30.4)	
No	41 (70.7)	25 (71.5)	16 (69.6)	
Mid-frequency SNHL				.531 [†]
Yes	8 (13.7)	5 (14.3)	3 (13.0)	
No	50 (86.3)	30 (85.7)	20 (87.0)	
First ITD within 6 weeks after onset of symptoms				<.001 [†]
Yes	32 (55.2)	26 (74.3)	6 (26.1)	
No	26 (44.8)	9 (25.7)	17 (73.9)	

* Chi-square test , [†] t-test independent

DISCUSSION

High-dosage systemic steroid therapy has become the currently accepted treatment for ISSNHL. Some studies tried to explain the possible potential side effect of steroids action in ISSNHL. For instance, Rarey and colleagues discovered that both glucocorticoid and mineralocorticoid receptors are found in the inner ear.⁹ Effects of steroids may be mediated through these receptors within the cytoplasm and play a significant role in modulating cochlear functions, such as positive effects to decrease labyrinth inflammation¹⁰ and increase cochlear blood flow.¹¹ However, a few patients may show systemic steroid adverse effects such as insomnia, gastrointestinal problems, suppression of hypothalamic-pituitary-adrenal axis, Cushing's-like syndrome, opportunistic infection, and hyperglycemia, especially in cases with diabetes mellitus.¹²

After systemic steroid therapy, approximately 50% of patients have incomplete hearing recovery or do not respond to the initial treatment.⁸ In these refractory cases, ITS injections have been proposed as a rescue therapy for additional hearing recovery. Steroids delivered intratympanically could reach higher concentrations in perilymph than administered by systemic routes.¹³ Based on a preponderance of benefit over harm, clinicians should offer ITS therapy when patients have incomplete recovery from ISSNHL.⁸

In this study, the five-time ITD injection was used as a salvage therapy because of

the following only one meta-analysis which Ng JH et al. showed ITS with dexamethasone provided significantly better outcomes than methylprednisolone.¹⁴ Moreover, Yixu W. reported that the more frequent ITS, the more benefits for hearing recovery, and the especially optimal number of ITS injections was six.¹⁵ However, the existing reference trials showed many considerable variabilities in experimental methods among studies, such as the definition of hearing recovery, the timing of initial ITS salvage therapy, number of injections, the type and concentration of steroids. Therefore, cohort-controlled studies with large sample sizes in identical methodology are needed to confirm the proper administration of ITS therapy as a salvage therapy for ISSNHL.

Advanced age is generally assumed to be a negative prognosis factor for SSNHL in some studies. Weerawong R. examined 273 ISSNHL cases and discovered that old age was the only adverse prognosis factor found in the retrospective descriptive data.¹⁶ However, Slattery WH and colleagues studied 24 ISSNHL cases and reported that ITS injection improved PTA or SDS in patients who failed to benefit from oral steroids. However, old age was not a statistically significant adverse factor.¹⁷ In this present study, the results showed a significant difference in hearing improvement between patients aged forty and fifty. From the author's point of view and based on the preponderance of benefit over harm,

patients who are diagnosed with refractory ISSNHL after oral prednisolone treatment should be encouraged to receive ITS especially in early middle age adulthood or younger patients if the ITD contraindication is not indicated.

This literature discovered that hearing recovery in the group with diabetes was significantly lower than in the non-diabetic group, while other underlying diseases showed no significant influence on the outcome. Diabetic patients were felt to have poorer overall recovery from ISSNHL. Fukui and colleagues reported that 16% of SSNHL patients with type II diabetes had more severe hearing loss.¹⁸ On the other hand, from this study's data, there are three well-controlled diabetic patients (HbA1C level less than 5.5%) who presented high-frequency ISSNHL but responded to salvage ITD. However, they were excluded from the improved group because PTA which was calculated at 0.5, 1, and 2 kHz, were not changed. Therefore, further studies are needed to determine which factors in diabetic patients, such as HbA1c values, and duration of diabetes, are likely to be predisposed factors influencing the outcome.

Tobacco smoking was reported as a significant hearing loss risk by some studies. Because of the direct ototoxic agent, smoking consumption caused ischemia in the cochlea through the production of carboxyhemoglobin, vasospasm, increased blood viscosity, and atherosclerosis.¹⁹ This study showed a

significant failure of ITD as a salvage therapy in smoking cases. This conclusion should be informed when planning ITD as a salvage treatment for patients who have a history of cigarette smoking.

The presence of vertigo has been shown to be a poor prognostic sign in several studies. Wu HP and colleagues suggest that vestibular symptoms may be poor prognostic factors for salvage ITS therapy.²⁰ In contrast to this study's result, vertigo was not statistically significant with the treatment outcome. However, the limitation of the present study was primarily designed as a retrospective of a small population. Well-controlled cohort studies with larger sample sizes are needed to confirm this finding of ITD as a salvage therapy for ISSNHL.

Vasodilator agents have been tried in the management of SSNHL. In the present study, vasodilator was not statistically significant with hearing recovery. Although a systematic review of vasodilators for SSNHL showed no benefit of vasodilators alone, there was a possible benefit of vasodilators when administered with steroids.⁸ Nevertheless, the majority of papers display differences in the type, dosage, and duration of vasodilator treatment used in each of these studies. Therefore, further prospective studies should be conducted to analyze the results in a more detailed manner.

The severity of ISSNHL is considered an adverse prognosis. Yimtae K. studied the

clinical presentation and prognostic affecting ISSNHL and concluded that the severity of hearing loss significantly influenced the prognosis.²¹ Conlin's systematic review showed that 70–80 dB of hearing loss is a cut-off level affecting the outcome of ISSNHL therapy.²² From this data, three patients in the profound ISSNHL group did not gain any hearing recovery after a full course of treatment, while the moderate and severe ISSNHL groups did. Interestingly, although the recovery rate in the severe ISSNHL group was not statistically significant, it was still high. This was presumed that people with severe initial hearing loss might choose to consult a physician early, which leads to a greater chance of improvement. On the other hand, those with better initial hearing levels might delay going to hospitals, moreover they had little room to improve. Thus, it showed less hearing gain in this group of patients.²¹ However, this literature was slightly different because it was studied during the COVID-19 pandemic era. It was assumed that some cases who were suffer from severe ISSNHL did not go to the hospital early in a few days because they were afraid to get COVID-19 infection from the crowded hospital waiting room. Therefore, hearing recovery in the severe ISSNHL group from this study was not high when compared to other reports.

Not only the severity of ISSNHL, but also the audiogram configuration affected the outcome. Patients who present with

low-frequency, mid-frequency SSNHL, and flat type audiograms may have a better prognosis than patient with high-frequency SSNHL.²³ Park KH et al explained that hair cells in the basal turn of the cochlear are more susceptible to noise and ototoxic agents than those in the apex. Therefore, basal turn damage that present high-frequency SNHL has a worse prognosis, although there are more glucocorticoid receptors in this area.²³ Moreover, other otologic diseases, such as Meniere's diseases, can present initially with ISSNHL symptoms.²⁴ In this literature, all of the patients in the study were followed up for six months for history-taking and audiology testing. If the patients were suspected to be probable Meniere's disease, they were excluded from the study. According to the results, patients with hearing loss in the high-frequency, mid-frequency and profound SSNHL had poorer recovery rates than those with hearing loss in the low-frequency band and flat type. This was similar to Psillas G's conclusion in that low-tone SSNHL was one good predictor of prognosis, while profound SSNHL was the negative prognostic effect on hearing recovery.²⁵

Although the optimal duration from the onset of ISSNHL to the initiation of ITS treatment is still not concluded, the time window is reported by some authors to be an important prognostic factor. The sooner treatment is initiated, the better outcome is promoted. Tongwiset S. studied 51 retrospective

data and reported a significant positive outcome in patients who were prescribed salvage ITD within 4 weeks after initial symptoms.²⁶ In this study, the result exhibited statistically significant factors affecting hearing improvement when ITD administration as a salvage therapy within 6 weeks after onset of symptoms. According to the result, this present study supports the American Academy of Otorhinolaryngology-Head and Neck Surgery clinical practice guideline that clinicians should offer ITS therapy when patients have incomplete recovery from ISSNHL within two to six weeks after the onset of symptoms.⁸ Therefore, public relations for hearing loss awareness and a quick effective referral system to clinicians who can perform ITS injection are important because early diagnosis and intervention lead to a better outcome, especially in refractory ISSNHL patients who need ITS injection.

CONCLUSION

Based on the present study, the adverse hearing recovery prognosis factors of ITD as a salvage therapy after failure of oral prednisolone are advanced age, diabetes, smoking, the severity of hearing loss, and delaying the first ITD after six weeks from the onset of symptoms.

ACKNOWLEDGEMENTS

Thank you to Dr. Wichian Wutsathirapinyo, M.D. former Ratchaburi hospital director, for project support, and Dr. Patcharin Somboon for statistical consultation.

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