Intratympanic Dexamethasone for Refractory Sudden Sensorineural Hearing Loss

Niran Hunchaisri MD*,
Suprapol Chantapant MD*, Nongyouw Srinangyam MA*

** Department of Otolaryngology, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand*

Background: *The standard medical regimen for SSNHL is systemic steroid therapy. Unfortunately, some patients either do not or poorly respond to systemic steroids. Intratympanic administration of steroids has been suggested as an alternative to systemic therapy.*
Objective: *To determine if intratympanic dexamethasone injection (ITDI) is an effective treatment for sudden sensorineural hearing loss (SSNHL) in patients that systemic steroid treatment has failed.*
Material and Method: *A prospective, non-randomized, controlled study evaluated the hearing outcomes in 14 SSNHL patients treated with ITDI as compared with the outcome of seven patients not treated. Intratympanic dexamethasone was administered through a spinal needle under local anesthesia. ITDI was performed once every week for maximum of three sessions. Hearing was assessed immediately before the therapy and 4 weeks after the therapy.*
Results: *Hearing improvement was documented in six of 14 patients (43%) who underwent ITDI compare to none of the seven patients (0%) in no ITDI group. However, this was not statistically significant (p = 0.055).*
Conclusion: *Intratympanic dexamethasone (ITDI) may have benefits for patients with SSNHL who failed systemic steroid therapy.*

Keywords: *Sudden sensorineural hearing loss, Intratympanic, Dexamethasone, Steroid*

J Med Assoc Thai 2010; 93 (12): 1406-14
Full text. e-Journal: *http://www.mat.or.th/journal*

Sudden sensorineural hearing loss (SSNHL), commonly described as an abrupt onset of hearing loss, generally within three days, of more than 30-dB hearing loss at three consecutive frequencies[1]. It is reported to occur in 5 to 20 per 100,000[1,2]. The etiology of SSNHL is idiopathic, however, viral infection, vascular occlusion, rupture of cochlear membranes, and immunologic diseases are discussed[3,4]. Collected evidence showed that viral inflammation is the most common cause of SSNHL[3]. The treatments of SSNHL include steroids, vasodilator, antiviral agents, diuretics, and low-salt diets. About 30% to 60% of patients had spontaneous recovery, usually within two weeks after onset[5]. High-dose systemic steroid is currently the treatment of choice for SSNHL because of its high anti-inflammatory effect, especially for moderate to severe SSNHL[1,6]. Despite a course of systemic steroid, approximately 30% to 50% of patients show no response to any treatments[1,5]. In these circumstances, many patients might have used high-dose steroid for a long time with chances of side effects such as facial flush, edema, gastrointestinal bleeding, liver function disorders, and glucose intolerance[7]. Intratympanic steroid injection introduces steroid through the tympanic membrane into the middle ear space, resulting in higher perilymph steroid level and reduced systemic steroid toxicity[10,11]. Reports of intratympanic steroid injections show as high as 38% to 72% successful outcomes[10-16], but some reports show lower results[12,17]. Dexamethasone and methylprednisolone are the two most common steroids used for this procedure[11,12]. The purpose of the present study was to evaluate the effectiveness of intratympanic dexamethasone injection (ITDI) in patients with SSNHL who showed poor response to systemic steroid treatment.

Correspondence to:
Hunchaisri N, Department of Otolaryngology, Faculty of Medicine, Srinakharinwirot University, Nakorn Nayok 26120, Thailand.
Phone: 037-395-085-6 ext. 11301, Fax: 037-395-085-6 ext. 11303
E-mail: niranhun@hotmail.com

Material and Method

Between June 2008 and May 2009, a non-randomized, prospective controlled trial was performed

Table 1. Inclusion and exclusion criteria for SSNHL

Inclusion criteria
1. SSNHL patients who failed from oral prednisolone therapy
2. Patients who accept ITDI and sign the written informed consent
Exclusion criteria
1. Patients with medical conditions that may cause SSNHL such as infections, trauma, diabetes, hyperlipidemia, including patients who intake ototoxic drugs
2. Patients with previous otologic surgery
3. Pregnancy and nursing women

in the patients with SSNHL meeting the criteria listed in Table 1. Twenty-one patients enrolled into the present study, which was approved by the Ethic Review Boards of the Faculty of Medicine, Srinakharinwirot University.

Data collected

SSNHL was diagnosed by a certified audiologist (third researcher). Data included age, sex, occupation, site of hearing loss, associated symptoms (tinnitus, vertigo), duration before treatment and duration before ITDI. All patients underwent a complete history, ENT examination and blood test for complete blood count, blood sugar, lipid profiles, thyroid hormones and serology for syphilis. Auditory brainstem response was sent for anyone in whom retrocochlear lesions needed to be ruled out. CT or MRI of the temporal bones and brain was done in the patients suspected for intracranial pathology. Audiologic data included pure-tone average (PTA) and speech discrimination score (SDS). PTA was calculated as an average of the threshold measured at 0.5, 1.0 and 2.0 KHz. SDS was tested by calculating the percent correct of a phonetically balanced, monosyllabic word list (Ramathibodi Hospital).

ITDI protocol

All patients received oral prednisolone, 60 mg/day in adults and 1 mg/kg /day in children, for seven days combined with betahistine and mecobalamin or vitamin B1-6-12. The patients who showed no improvement were advised for ITDI as a further treatment. The patients who refused ITDI were continually treated with betahistine and mecobalamin or vitamin B1-6-12. They were considered as the control group whereas the patients who accepted ITDI were the study group. ITDI was performed once every week for a maximum of three sessions according to the audiologic improvement or co-operation of the patients. Audiometric values (PTA and SDS) were assessed before and after each injection. If there was an improvement in PTA or SDS, the next ITDI was advised but if there was no improvement then the injection was stopped. Audiometric tests were done at the first week and one month after the last ITDI.

ITDI technique

The affected ear was anesthetized with 10% lidocaine spray (Xylocaine, 10 mg/dose; Astra Zeneca, Thailand), which was left in the ear for thirty minutes. The dexamethasone solution of 4 mg/mL was warmed in the water before the injection. Under microscope, approximately 0.3-0.4 mL of the solution was injected into the middle ear through the posteroinferior part of the tympanic membrane via a 25-gauge spinal needle. The patient lay in the supine position with the head turned 45° away from the treated ear and did not swallow for 30 minutes.

Criteria for hearing improvement

The criteria was used to define a successful recovery after the therapy differs in the literature pertaining to intratympanic steroids. A 10-dB improvement in PTA or a 15% improvement in SDS was considered a successful therapeutic intervention for this study.

Statistical analysis

Qualitative variables were compared with Chi-square or Fishers' exact test, whereas quantitative variables were done with Student's t-tests or Mann-Whitney-U-test as appropriate. The criterion for statistical significance was $p < 0.05$.

Results

Twenty-one patients were enrolled in the present study of which fourteen were treated with ITDI and seven patients were not.

Table 2. Comparison of the characteristics between the group receiving intratympanic dexamethasone injection (ITDI) and the control group

Value	ITDI group+	Control group	p-value
Number	14	7	
Mean age in years ± SD (range)	45.6 ± 16.2 (14-65)	53.1 ± 20.1 (25-80)	0.205*
Site (right:left)	7:7	3:4	0.562**
Sex (male:female)	9:5	3:4	0.319**
Mean duration from onset to treatment in weeks ± SD (range)	4.6 ± 6.2 (1-20)	3.3 ± 2.6 (1-8)	0.256*

+ Patients who were treated with a course of ITDI therapy
* Independent t-test
** Fishers' exact test

Regarding the ITDI group, there were no serious complications, only mild pain in two cases and mild, transient vertigo in two cases that were resolved without any treatment. There were no infections or perforation of the ear drum. ITDI was performed in an average of 1.2 sessions per patient.

The average amount of dexamethsone was 0.34 mL (range = 0.3-0.4 mL). The average age of the patients was 45.6 ± 16.2 (14-65) years in the ITDI group and 53.1 ± 20.1 (25-80) years in the control group, which was not statistically significant (p = 0.205) (Table 2). The male-to-female ratio was 9:5 in the ITDI group and 3:4 in the control group. Time of onset to start of the initial therapy averaged 4.6 ± 6.2 (1-20) weeks in the ITDI group and 3.3 ± 2.6 (1-8) weeks in the control group. Both sex ratio and duration of the initial treatment were not significantly different (p = 0.319, 0.256) (Table 2). There was also no significant difference related to the affected sites in the ITDI and the control group (p = 0.562) (Table 2). Tinnitus was present in 10/14 of the ITDI patients and 6/7 of the non-ITDI group whereas vertigo was present in 3/14 of the ITDI patients and 0/7 of the non-ITDI group.

The initial hearing impairment was an average of 63.6 dB PTA (± 9.4 SD) and 67.4% SDS (± 24.9 SD) in the control group, 65.8 dB PTA (± 20.4 SD) and 47.3% SDS (± 29.8 SD) in the improvement group and 61.3 dB PTA (± 20.8 SD) and 64.5%SDS (± 31.4SD) in the failure group. After finishing the treatment, hearing improvement was noted in six of fourteen patients (43%) of the ITDI group and none of the 7 in the control group. This was not statistically significant (p = 0.055) (Table 3). In these responders, the mean improvement of the PTA value before and after the ITDI was -17.5 dB PTA (± 17.0 SD) compared to a change by 0.6 dB PTA (± 3.2 SD) in the failure group and -3.6 dB PTA (± 2.4 SD) in the control group. This was statistical significance (p = 0.006 and 0.026) (Table 4). The SDS change was 28.7% SDS (± 19.7 SD) in the improvement group compare to 1.5% SDS (± 8.8 SD) in the failure group, and 2.3% SDS (± 3.9 SD) in the control group. This was also statistical significance (p = 0.002 and 0.002) (Table 4). Note that there was a significant improvement of PTA after treatment in the control group (p = 0.025) (Table 5) but did not reach the successful criteria. Regarding the treatment group, there were no statistical differences in hearing improvement compared to age (p = 0.489), sex ratio (p = 0.494), duration of treatment (p = 0.124), and presence of vertigo (p = 0.222) (Table 6).

Table 3. Clinical outcome after ITDI injection

	ITDI	Control	p-value*
Improvement (%)	6	0	0.055
Failure (%)	8	7	
Total	14	7	

ITDI = intratympanic dexamethasone injection
* Fishers' exact test

Discussion

High-dosage systemic steroid therapy has become widely used for treatment of SSNHL[1,6]. The exact mechanism in which steroids may improve hearing is unknown. The effects of steroids are mediated through glucocorticoid and mineralocorticoid receptors found within the cytoplasm in the inner ear, which play a significant role in modulating cochlear function[18]. Many studies have shown systemic steroids to have a positive effect on cochlear function such as decrease inflammation from labyrinthitis[19], improve cochlear blood flow[20], protect against cochlear ischemia[21],

Table 4. Comparison of average PTA and SDS change before and after treatment in the ITDI (improvement, failure group) and control group

	PTA change	p-value*	SDS change	p-value*
Improvement group	-17.5 ± 17.0		28.7 ± 19.7	
p*1		0.006		0.002
Failure group	0.6 ± 3.2		1.5 ± 8.8	
Control	-3.6 ± 2.4		2.3 ± 3.9	
p*2		0.026		0.002

PTA = pure-tone average; SDS = speech discrimination scores; ITDI = intra tympanic dexamethasone injection
* Wilcoxon rank sum test (p*1 = comparison between improvement and failure group, p*2 = comparison between improvement and control group)

Table 5. Comparison of average PTA and SDS before and after treatment in the ITDI (improvement, failure group) and control group

	PTA before (dB)	PTA after (dB)	p-value*	SDS before (%)	SDS after (%)	p-value*
Improvement group	65.8 ± 20.4	48.3 ± 17.5	0.033	47.3 ± 29.8	76.0 ± 31.1	0.026
Failure group	61.3 ± 20.8	61.9 ± 22.0	0.564	64.5 ± 31.4	66.0 ± 30.9	0.477
Control group	63.6 ± 9.4	60.0 ± 10.4	0.025	67.4 ± 24.9	69.7 ± 25.2	0.161

PTA = pure-tone average; SDS = speech discrimination scores, ITDI = intra tympanic dexamethasone injection
* Wilcoxon matched pairs sign rank test

Table 6. Comparison of the two groups according to the responsiveness of intratympanic dexamethasone injection (ITDI) in the ITDI group

	Improvement group	Failure group	p-value
NUMBER	6	8	
AGE in years (mean ± SD)	45.5 ± 17.7	45.8 ± 16.3	0.489*
SEX (male:female)	4:2	5:3	0.494**
Duration from onset to ITDI in weeks (mean ± SD)	4.5 ± 3.3	8.0 ± 7.1	0.124*
Associated vertigo	2/6	1/8	0.222**

Responsive group = patients who showed hearing improvement of 15 dB or more in pure tone average and 10% of SDS with ITDI therapy; Nonresponsive group = patients who showed no hearing improvement with ITDI therapy
* Independent t-test
** Fishers' exact test

protect against noise-induced hearing loss[22], and improve stria vascularis function and morphology[23]. Since stria vascularis might be a site for potential pathology in SSNHL[24], steroids have the potential to recover hearing after SSNHL.

Many studies have reported that intratympanic steroids are safe without any evidence of histological changes or cochlear dysfunction[12,25-28] while some studies have reported unfavorable results[31-33]. Intratympanic steroids were shown to increase cochlear blood flow[12,25], prevent aminoglycoside toxicity[29], prevent noise-induced hearing loss from drill[26] and improve ion homeostasis necessary for cochlear function[28]. Intratympanic steroids were also shown to have a protective effect on stria vascularis changes after otitis media[30]. Some studies suggest that intratympanic steroids may cause decreased cochlear function[31], round

window inflammation[32] and ineffective at preventing immune-mediated labyrinthitis[33].

A few patients may experience adverse effects during systemic steroid therapy such as gastrointestinal problems, gluteal abscess formation, abnormal liver function, and avascular necrosis, especially, in patients with hypertension or diabetes mellitus, which are common disorders in SSNHL patients[34,35].

However, after systemic steroid therapy, approximately 30% to 50% of patients showed no response[1,5]. In these failure patients, intratympanic steroid injections have been proposed as rescue therapy. It allows an increase in local concentration of steroids at the inner ear through the tympanic membrane and results in reduced systemic steroid toxicity[10,11,36].

Silverstein in 1996[12] published the first report of intratympanic steroid in the treatment of SSNHL. This was followed by Parnes in 1999[10]. Thereafter, many reports on the effect of intratympanic steroid injection in SSNHL have been published[10-18,34-45]. As shown in the present study and the literature, intratympanic steroid injection is very useful as a secondary treatment after the initial systemic treatment of SSNHL[10-16]. Nevertheless, it is not clear whether this effect is actually from intratympanic steroid, or natural pathophysiological course, or delayed effect of systemic steroid from the previous treatment[37]. A few controlled studies have been published comparing the results between intratympanic steroid treatment and other approaches as salvage treatment in refractory cases of SSNHL[14,15,35,37,38]. Ho et al[14] reported a prospective randomized trial after failure with oral steroid treatment. Fifty-three percent showed hearing improvements in the ITDI group compared with 7% of patients in the control group, which has statistical significance. Choung et al[15] reported a case-control study on patients with SSNHL after failure from oral steroid treatment, comparing a prospective series of 33 patients who were treated by ITDI with a retrospective group of 33 patients who were not treated. Hearing improvement was observed in 39% of the ITDI group and 6% in the non-ITDI group, but there was no statistical difference in mean PTA improvement. Plaza and Herraiz[35] reported a prospective study designed in a similar way, using patients who refused the intratympanic methylprednisolone therapy as control. There were nine cases in each group. The mean improvement of PTA showed similar, but statistically significant, results (55% and mean PTA improvement of 33 dB, versus 0% and 2 dB). These findings have also been confirmed by Xenellis et al[38] who have reported a prospective randomized study in SSNHL patients after failure from intravenous steroid treatment. Nineteen patients received intratympanic methylprednisolone. Of these, nine (47%) showed hearing improvement (mean PTA improvement was 15 dB), whereas a control group of 18 received placebo and none showed any improvement (mean PTA improvement was 0.8 dB), a significant difference. Roebuck and Chang[37] presented a prospective non-randomized trial on SSNHL cases after failure from oral steroid treatment. Patients were advised on treatment options and self-selected into a group of 31 patients who were treated by ITDI and a control group of 30 patients who were only treated with oral steroids. The mean PTA improvement was 12 dB in 39% of the ITDI group and 10 dB in 10% of the control group, although this difference was not significant. In the present study, the result also showed an improvement in 43% (6 in 14) of the treated patients compared to 0% (0 in 7) of the control. However, this was not statistically significant ($p = 0.055$) (Table 3).

In these series and the present series, it showed that the natural history or residual systemic steroid effect gave the control group a minimum hearing recovery compared to the treatment group. Therefore, hearing improvement seems to be related to intratympanic steroid treatment. However, these results are based on small sample sizes that showed a response varied between 12% and 75% (Table 8). Therefore, larger sample sizes are needed to establish valid conclusions in the future.

Nevertheless, these promising results after failure of systemic steroids have made some authors promote its use as first-line therapy in all SSNHL cases[35,39]. Kakehata et al[35] presented a case-control study, showing that ITDI gives successful hearing improvement in 70% (41 dB mean PTA improvement) compared with a control group of 21 patients who were treated with intravenous dexamethasone and had successful hearing improvement in 67% (25 dB mean PTA improvement), a significant difference. Banarjee and Parnes[39] have reported successful hearing improvement in 50% (mean PTA improvement was 27 dB) when intratympanic methylprednisolone was used as an initial treatment. Regarding these good results, it seems that intratympanic steroid treatment might be a preferable choice as an initial therapy, as it has been shown as rescue or salvage treatment for

refractory SSNHL. Again, controlled studies with larger sample sizes are needed to confirm these findings included cohorts with hundreds of subjects to show a statistically significant benefit of intratympanic steroid therapy for SSNHL.

The duration from onset of hearing loss to the initiation of intratympanic treatment was reported by some authors to be an important prognostic factor. The sooner treatment is initiated, the better is the outcome[15-17,39,40,42]. Ho et al[15] and Plaza and Herraiz[16] have reported that onset to therapy within seven days was related to more hearing improvement. Banarjee and Parnes[39] have reported that the hearing outcome would be worse if the intratympanic treatment was delayed for more than ten days. Hanes et al[17] found a better result when the treatment was started within fourteen days. Slattery et al[40] also reported a favorable result when starting intratympanic treatment within one month. Herr and Marzo[42] demonstrated a trend toward better outcomes in patients in whom treatment was initiated sooner. The average time to therapy in treatment successes was 4.7 weeks compared to 8.3 weeks for failures. In contrast to these reports, some studies did not find any significant differences[14,38,41,45]. In the present study, there was also no critical difference in the outcome when starting ITDI within or beyond two weeks (p = 0.692) (Table 7).

Age is considered by some to be another prognostic factor, as older patients have a worse outcome[39,46]. Others found no correlation between age and outcome[14-17,41,42,45]. In the present study the authors treated patients aged 14 to 65 years and found no significant difference between the group of patients under or equal to 60 years of age and the patients over 60 years of age (66.7% vs. 75%, respectively; p = 0.594) (Table 7).

The limitations of the present study lie primarily in the clinical experience from a single institution in the treatment of SSNHL and a small control group. Other limitations might be the type of steroid used and the dosing schedule applied. Dexamethasone has good round window diffusion; however, the profile may not be as beneficial as methylprednisolone. Parnes[10] showed that methylprednisolone had a higher concentration and longer duration in perilymph after transtympanic administration than hydrocortisone or dexamethasone. Nevertheless, the effectiveness of both drugs summarized in Table 8 show no difference between them. The authors used dexamethasone, 4 mg/mL, in this study because its price is much cheaper when compared to methylprednisolone or high-concentration dexamethasone, and is available in every hospital.

Table 7. Relationship between age, treatment delay time, duration before ITDI and clinical outcome of group receiving ITDI

	Improvement (%)	Failure (%)	p-value*
Age(years)			
60 or less	4 (66.7)	6 (75)	0.594
> 60	2 (33.3)	2 (25)	
Duration before ITDI			
2 week or less	1 (16.7)	1 (12.5)	0.692
> 2 week	5 (83.3)	7 (87.5)	

ITDI = intratympanic dexamethasoneinjection
* Fishers' exact test

Table 8. Published results after intratympanic treatment of SSNHL

	Type of steroid	No. of ears	Percent with successful
Chandrasekhar[11]	D	10	70%
Gianoli and Li[29]	D, MP	23	44%
Ho et al[15]	D	15	53%
Banerjee and Parnes[23]	D, MP	26	50%
Battista[27]	D	25	12%
Gouveris et al[28]	D	40	62%
Herr and Marzo[26]	D	17	53%
Slattery et al[24]	MP	20	55%
Choung et al[14]	D	34	39%
Dallan et al[25]	MP	8	75%
Kakehata et al[19]	D	10	70%
Hanes et al[17]	D	40	27.5%
Roebuck and Chang[21]	D	31	39%
Xenellis et al[22]	MP	19	47%
Plaza and Herraiz[16]	MP	9	55%
Present study	D	14	43%

D = dexamethasone; MP = methylprednisolone

Conclusion

This nonrandomized prospective clinical trial shows that intratympanic dexamethasone may improve the outcome of SSNHL after failure of oral steroid treatment. As reported in other control studies in the literature, intratympanic steroids actually are an effective and safe therapy in SSNHL cases that are failure to standard systemic steroid treatment.

Nevertheless, the number of injections, the type of steroid, and the most adequate doses must be defined in randomized prospective clinical trials with larger sample sizes. Furthermore, these randomized studies will allow establishment of an evidence-based treatment for SSNHL as initial and as salvage treatment.

Acknowledgment

The authors thank Assistant professor Kittipong Kongsomboon, M.D., for assistance in statistical analysis.

References

1. 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.
2. Fetterman BL, Saunders JE, Luxford WM. Prognosis and treatment of sudden sensorineural hearing loss. Am J Otol 1996; 17: 529-36.
3. Wilson WR, Veltri RW, Laird N, Sprinkle PM. Viral and epidemiologic studies of idiopathic sudden hearing loss. Otolaryngol Head Neck Surg 1983; 91: 653-8.
4. Gussen R. Sudden deafnfess of vascular origin: a human temporal bone study. Ann Otol Rhinol Laryngol 1976; 85(1 Pt 1): 94-100.
5. Mattox DE, Simmons FB. Natural history of sudden sensorineural hearing loss. Ann Otol Rhinol Laryngol 1977; 86(4 Pt 1): 463-80.
6. Moskowitz D, Lee KJ, Smith HW. Steroid use in idiopathic sudden sensorineural hearing loss. Laryngoscope 1984; 94(5 Pt 1): 664-6.
7. Alexiou C, Arnold W, Fauser C, Schratzenstaller B, Gloddek B, Fuhrmann S, et al. Sudden sensorineural hearing loss: does application of glucocorticoids make sense? Arch Otolaryngol Head Neck Surg 2001; 127: 253-8.
8. Doyle KJ, Bauch C, Battista R, Beatty C, Hughes GB, Mason J, et al. Intratympanic steroid treatment: a review. Otol Neurotol 2004; 25: 1034-9.
9. Spandow O, Anniko M, Hellstrom S. Hydrocortisone applied into the round window niche causes electrophysiological dysfunction of the inner ear. ORL J Otorhinolaryngol Relat Spec 1989; 51: 94-102.
10. Parnes LS, Sun AH, Freeman DJ. Corticosteroid pharmacokinetics in the inner ear fluids: an animal study followed by clinical application. Laryngoscope 1999; 109(7 Pt 2): 1-17.
11. Chandrasekhar SS. Intratympanic dexamethasone for sudden sensorineural hearing loss: clinical and laboratory evaluation. Otol Neurotol 2001; 22: 18-23.
12. Silverstein H, Choo D, Rosenberg SI, Kuhn J, Seidman M, Stein I. Intratympanic steroid treatment of inner ear disease and tinnitus (preliminary report). Ear Nose Throat J 1996; 75: 468-71, 474, 476.
13. Park YS, Jeon EJ, Yeo SW, Park SN, Park JW, Kim KB. The effect of intratympanic steroid injection for sudden sensorineural hearing loss. Korean J Otolaryngol 2002; 45: 1136-40.
14. Choung YH, Park K, Shin YR, Cho MJ. Intratympanic dexamethasone injection for refractory sudden sensorineural hearing loss. Laryngoscope 2006; 116: 747-52.
15. Ho HG, Lin HC, Shu MT, Yang CC, Tsai HT. Effectiveness of intratympanic dexamethasone injection in sudden-deafness patients as salvage treatment. Laryngoscope 2004; 114: 1184-9.
16. Plaza G, Herraiz C. Intratympanic steroids for treatment of sudden hearing loss after failure of intravenous therapy. Otolaryngol Head Neck Surg 2007; 137: 74-8.
17. 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.
18. Silverstein H, Choo D, Rosenberg SI, Kuhn J, Seidman M, Stein I. Intratympanic steroid treatment of inner ear disease and tinnitus (preliminary report). Ear Nose Throat J 1996; 75: 468-71, 474, 476.
19. Rarey KE, Luttge WG. Presence of type I and type II/IB receptors for adrenocorticosteroid hormones in the inner ear. Hear Res 1989; 41: 217-21.
20. Stokroos RJ, Albers FW, Schirm J. The etiology of idiopathic sudden sensorineural hearing loss. Experimental herpes simplex virus infection of the inner ear. Am J Otol 1998; 19: 447-52.
21. Nagura M, Iwasaki S, Wu R, Mizuta K, Umemura K, Hoshino T. Effects of corticosteroid, contrast medium and ATP on focal microcirculatory disorders of the cochlea. Eur J Pharmacol 1999; 366: 47-53.
22. Tabuchi K, Oikawa K, Uemaetomari I, Tsuji S, Wada T, Hara A. Glucocorticoids and dehydroepiandrosterone sulfate ameliorate ischemia-induced injury of the cochlea. Hear Res 2003; 180: 51-6.
23. Lamm K, Arnold W. The effect of prednisolone

and non-steroidal anti-inflammatory agents on the normal and noise-damaged guinea pig inner ear. Hear Res 1998; 115: 149-61.
24. Trune DR, Wobig RJ, Kempton JB, Hefeneider SH. Steroid treatment improves cochlear function in the MRL.MpJ-Fas(lpr) autoimmune mouse. Hear Res 1999; 137: 160-6.
25. Lin DW, Trune DR. Breakdown of stria vascularis blood-labyrinth barrier in C3H/lpr autoimmune disease mice. Otolaryngol Head Neck Surg 1997; 117: 530-4.
26. Shirwany NA, Seidman MD, Tang W. Effect of transtympanic injection of steroids on cochlear blood flow, auditory sensitivity, and histology in the guinea pig. Am J Otol 1998; 19: 230-5.
27. El Hennawi DM, El Deen MH, Abou-Halawa AS, Nadeem HS, Ahmed MR. Efficacy of intratympanic methylprednisolone acetate in treatment of drill-induced sensorineural hearing loss in guinea pigs. J Laryngol Otol 2005; 119: 2-7.
28. Yilmaz I, Yilmazer C, Erkan AN, Aslan SG, Ozluoglu LN. Intratympanic dexamethasone injection effects on transient-evoked otoacoustic emission. Am J Otolaryngol 2005; 26: 113-7.
29. Fukushima M, Kitahara T, Uno Y, Fuse Y, Doi K, Kubo T. Effects of intratympanic injection of steroids on changes in rat inner ear aquaporin expression. Acta Otolaryngol 2002; 122: 600-6.
30. Himeno C, Komeda M, Izumikawa M, Takemura K, Yagi M, Weiping Y, et al. Intra-cochlear administration of dexamethasone attenuates aminoglycoside ototoxicity in the guinea pig. Hear Res 2002; 167: 61-70.
31. Sone M, Hayashi H, Yamamoto H, Tominaga M, Nakashima T. A comparative study of intra-tympanic steroid and NO synthase inhibitor for treatment of cochlear lateral wall damage due to acute otitis media. Eur J Pharmacol 2003; 482: 313-8.
32. Spandow O, Hellstrom S, Anniko M. Impaired hearing following instillation of hydrocortisone into the middle ear. Preliminary report from an animal study. Acta Otolaryngol Suppl 1988; 455: 90-3.
33. Nordang L, Linder B, Anniko M. Morphologic changes in round window membrane after topical hydrocortisone and dexamethasone treatment. Otol Neurotol 2003; 24: 339-43.
34. Yang GS, Song HT, Keithley EM, Harris JP. Intratympanic immunosuppressives for prevention of immune-mediated sensorineural hearing loss. Am J Otol 2000; 21: 499-504.
35. Lautermann J, Sudhoff H, Junker R. Transtympanic corticoid therapy for acute profound hearing loss. Eur Arch Otorhinolaryngol 2005; 262: 587-91.
36. Kakehata S, Sasaki A, Oji K, Futai K, Ota S, Makinae K, et al. Comparison of intratympanic and intravenous dexamethasone treatment on sudden sensorineural hearing loss with diabetes. Otol Neurotol 2006; 27: 604-8.
37. Alles MJ, der Gaag MA, Stokroos RJ. Intratympanic steroid therapy for inner ear diseases, a review of the literature. Eur Arch Otorhinolaryngol 2006; 263: 791-7.
38. Roebuck J, Chang CY. Efficacy of steroid injection on idiopathic sudden sensorineural hearing loss. Otolaryngol Head Neck Surg 2006; 135: 276-9.
39. Xenellis J, Papadimitriou N, Nikolopoulos T, Maragoudakis P, Segas J, Tzagaroulakis A, et al. Intratympanic steroid treatment in idiopathic sudden sensorineural hearing loss: a control study. Otolaryngol Head Neck Surg 2006; 134: 940-5.
40. Banerjee A, Parnes LS. Intratympanic cortico-steroids for sudden idiopathic sensorineural hearing loss. Otol Neurotol 2005; 26: 878-81.
41. Slattery WH, Fisher LM, Iqbal Z, Friedman RA, Liu N. Intratympanic steroid injection for treatment of idiopathic sudden hearing loss. Otolaryngol Head Neck Surg 2005; 133: 251-9.
42. Dallan I, Bruschini L, Nacci A, Bruschini P, Traino C, Rognini F, et al. Transtympanic steroids as a salvage therapy in sudden hearing loss: preliminary results. ORL J Otorhinolaryngol Relat Spec 2006; 68: 247-52.
43. Herr BD, Marzo SJ. Intratympanic steroid perfusion for refractory sudden sensorineural hearing loss. Otolaryngol Head Neck Surg 2005; 132: 527-31.
44. Battista RA. Intratympanic dexamethasone for profound idiopathic sudden sensorineural hearing loss. Otolaryngol Head Neck Surg 2005; 132: 902-5.
45. Gouveris H, Selivanova O, Mann W. Intratympanic dexamethasone with hyaluronic acid in the treatment of idiopathic sudden sensorineural hearing loss after failure of intravenous steroid and vasoactive therapy. Eur Arch Otorhinolaryngol 2005; 262: 131-4.
46. Gianoli GJ, Li JC. Transtympanic steroids for treatment of sudden hearing loss. Otolaryngol Head Neck Surg 2001; 125: 142-6.
47. Byl FM. Sudden Hearing Loss Research Clinic. Otolaryngol Clin North Am 1978; 11: 71-9.

การฉีดยา dexamethasone เข้าหูชั้นกลาง เพื่อการรักษาโรคประสาทหูเสื่อมเฉียบพลันที่ดื้อยา

นิรันดร์ หุ่นฉายศรี, สุประพล จันทพันธ์, นงเยาว์ ศรีนางแย้ม

วัตถุประสงค์: *เพื่อประเมินประสิทธิภาพของการฉีดยา Dexamethasone เข้าหูชั้นกลางในการรักษาผู้ป่วยโรคประสาทหูเสื่อมเฉียบพลันที่ดื้อต่อการให้ยา systemic steroid*

วัสดุและวิธีการ: *การรักษาด้วย systemic steroid ในผู้ป่วยประสาทหูเสื่อมเฉียบพลันถือเป็นการรักษามาตรฐานในปัจจุบัน แต่ยังมีผู้ป่วยบางรายที่ไม่ได้ผลจากการรักษาวิธีนี้ ต่อมาได้มีการฉีดยา steroid เข้าหูชั้นกลาง เพื่อเป็นอีกวิธีหนึ่งของการรักษาโรคนี้ งานวิจัยนี้จึงต้องการศึกษาแบบ prospective, non-randomized, controlled เพื่อประเมินผลของการได้ยินในผู้ป่วยประสาทหูเสื่อมเฉียบพลันที่ไม่ได้ผลจากการกิน steroid โดยแบ่งผู้ป่วยเป็น 2 กลุ่ม กลุ่มหนึ่งจะได้รับการรักษาด้วยวิธีฉีดยา Dexamethasone เข้าหูชั้นกลาง เปรียบเทียบกับอีกกลุ่มหนึ่งที่ไม่ได้รับการฉีดยา โดยการฉีดยา Dexamethasone เข้าหูชั้นกลางจะใช้เข็ม spinal ฉีดผ่านเยื่อแก้วหูภายใต้ยาชาเฉพาะที่ การฉีดยาจะฉีดทุก 1 สัปดาห์ แต่ไม่เกิน 3 ครั้ง การประเมินการได้ยินจะกระทำก่อนการฉีดยาทุกครั้งและหลังการรักษา 4 สัปดาห์*

ผลการศึกษา: *ผลการได้ยินดีขึ้นพบ 6 ใน 14 ราย (ร้อยละ 43) ในกลุ่มที่ฉีดยา และไม่พบว่าดีขึ้นในกลุ่มที่ไม่ได้ฉีดยา (0 ใน 7 ราย) อย่างไรก็ตามยังไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ (p = 0.055)*

สรุป: *การฉีดยา Dexamethasone เข้าหูชั้นกลางน่าจะมีประโยชน์สำหรับการรักษาผู้ป่วยประสาทหูเสื่อม เฉียบพลันที่ไม่ได้ผลจากการใช้ systemic steroid*