Delayed Recovery in Idiopathic Sudden Sensorineural Hearing Loss

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Introduction

Idiopathic sudden sensorineural hearing loss (ISSNHL) is naturally restored in 47–63% of patients within 2 weeks. As recommended in the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) guidelines, a clinician managing patients with ISSNHL should be aware of the prognosis and proper time to start rehabilitation. Recent AAO-HNS guidelines have recommended that the recovery course should be observed for up to 6 months. However, patients who have not yet reached a complete recovery demand the information in real clinics and are eager to determine how long to wait.

In the present study, we investigated the **long-term prognosis of ISSNHL** and aimed to determine **which factors are associated with delayed recovery**. We applied strict diagnostic criteria and provided uniform treatment. This minimized the possibility that the results could be distorted due to nonuniform conditions

Methods and Materials

We retrospectively reviewed patients who were diagnosed with sudden sensorineural hearing loss (SNHL). Sudden SNHL was diagnosed by pure-tone audiometry, according to its audiometric criteria, which was a hearing loss of ≥30 dB compared to the opposite ear's threshold, occurring in at least three consecutive frequencies. The hearing recovery grade was classified according to the criteria proposed by the AAO-HNS (Table 1).

We also analyzed the actual hearing gain immediately after treatment and 2 months after treatment completion. We used the interaural hearing difference (IHD) between affected and unaffected ears to estimate the actual hearing loss of the individuals. The change of IHD over time was considered a hearing gain. For example, the hearing gain immediately after the treatment was calculated by subtracting the IHD immediately after treatment from the IHD before treatment. The delayed hearing gain was calculated by subtracting IHD 2 months after treatment completion from the IHD immediately after treatment (Figure 1).

Grade	Hearing outcome
I. Complete recovery	PTA within 10dB of the unaffected ear
II. Partial recovery, serviceable hearing	≥10dB improvement in PTA, PTA ≤ 50dB
III. Partial recovery, non-serviceable hearing	≥10dB improvement in PTA, PTA > 50dB
IV. No recovery	<10 dB improvement in PTA

Table 1. Hearing recovery grading system according to the pure-tone average

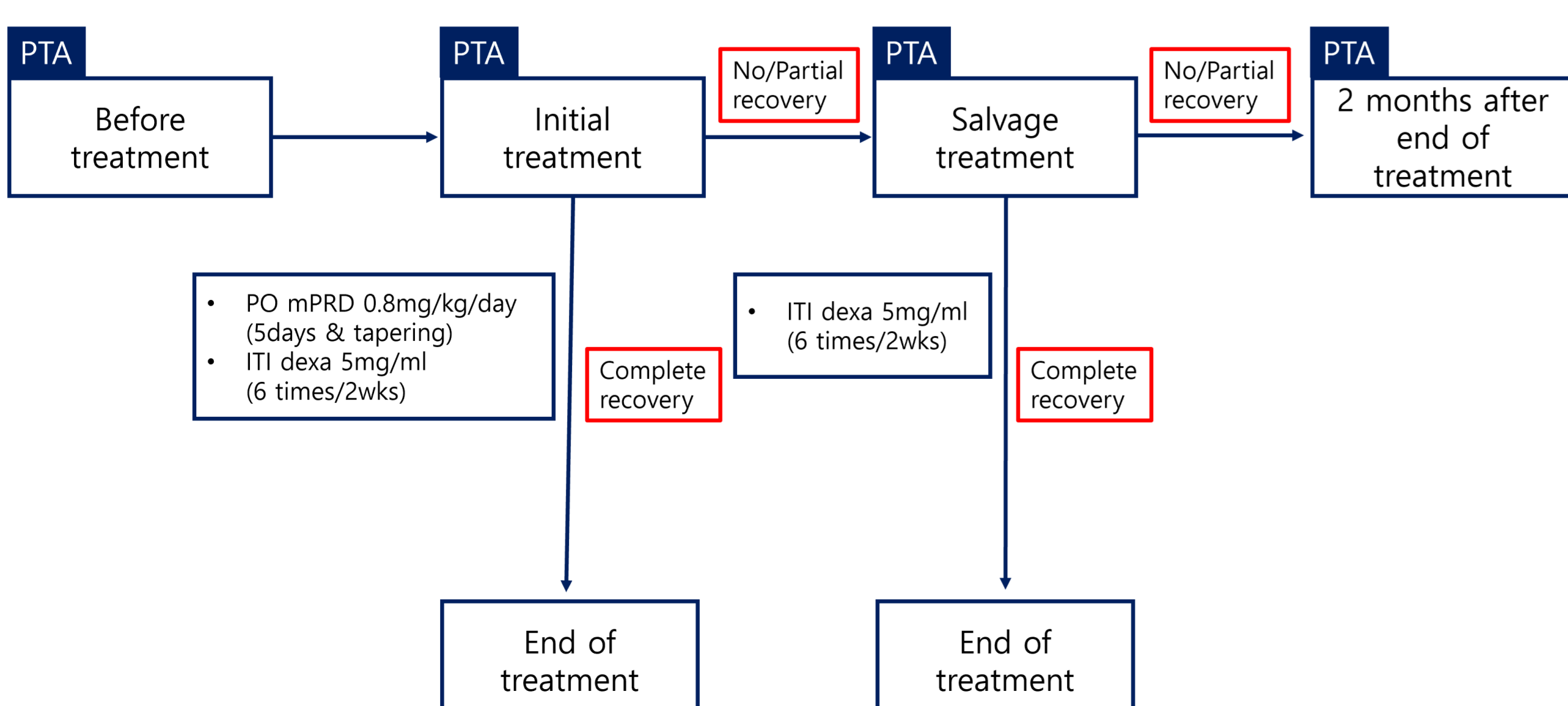| Inclusion criteria	Exclusion criteria
• Age ≥ 19 years • Time from symptom onset to initial corticosteroid therapy ≤ 14 days • Completion of the authors' protocols for the follow-up schedule	• The presence of underlying conditions associated with sudden SNHL(retrocochlear lesion, infection, trauma, ototoxic medication) • Bilateral ISSNHL • Recurrent fluctuating hearing loss • SNHL combined with vertigo • Accurate treatment outcomes that cannot be achieved

Table 2. Inclusion and Exclusion criteria

Figure 1. Treatment protocol

Results

• **Patient information**

Total 473 patients visited the clinic for sudden SNHL, and 343 patients were excluded according to the inclusion and exclusion criteria (Table 1). Finally, 130 patients were included in the study (Figure 2).
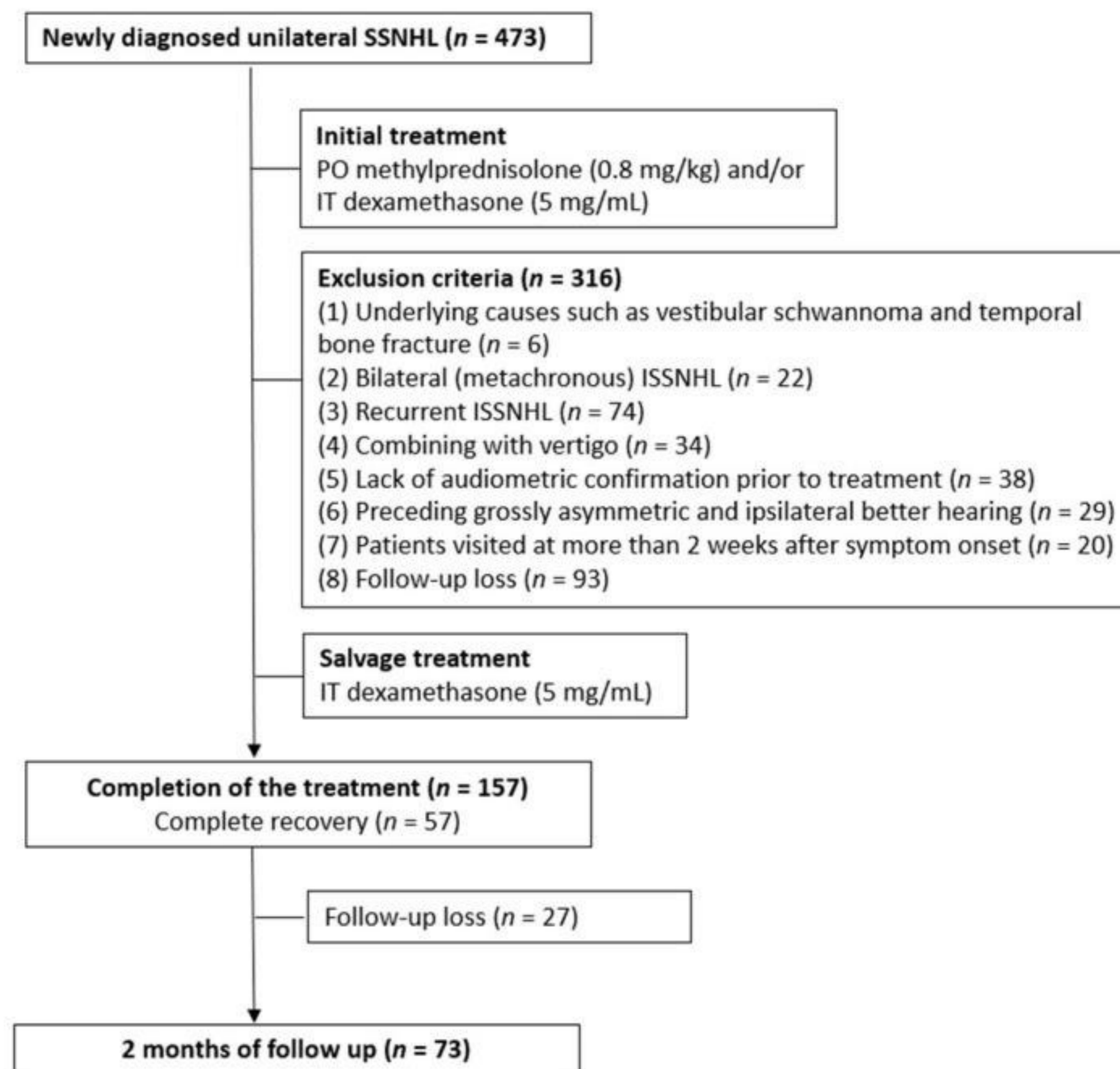

Figure 2. The diagram presenting the number of subjects, exclusion criteria and treatment protocol

• **Hearing recovery pattern according to the AAO-HNS criteria**

The hearing recovery pattern was analyzed immediately after treatment and 2 months after treatment completion (Figure 3).
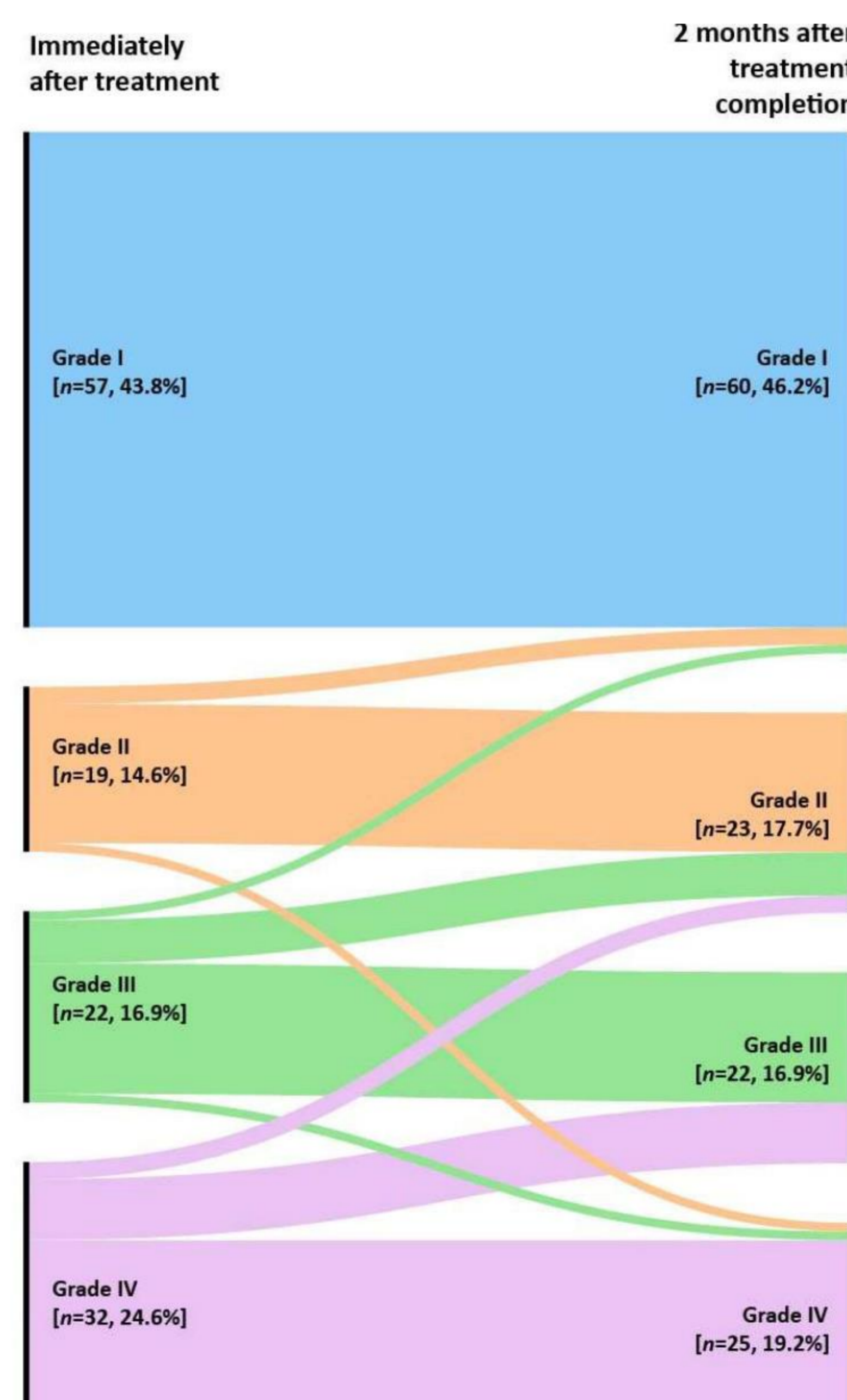

Figure 3. Changes in the hearing recovery patterns

Results

• **Delayed hearing recovery pattern**

An RM-ANOVA and multiple linear regression were conducted to estimate the degree of hearing recovery over time in 73 patients with incomplete hearing recovery. An RM-ANOVA with a Greenhouse–Geisser correction determined that the IHD differed statistically significantly between time points (F (1.270, 91.44) = 63.01, $p < 0.001$). The mean IHDs were 58.58 ± 26.25, 42.0 ± 23.84, and 36.96 ± 22.18 dB HL initially, immediately after treatment, and 2 months after treatment completion, respectively. Post hoc tests using Bonferroni correction revealed a significant hearing improvement from pretreatment to immediately after treatment (mean 16.58 dB HL, 95% confidence interval (CI) 11.14–22.01, $p < 0.001$) and immediately after treatment and 2 months after treatment completion (mean 5.041 dB HL, 95% CI 2.504–7.578, $p < 0.001$)(Figure 4).
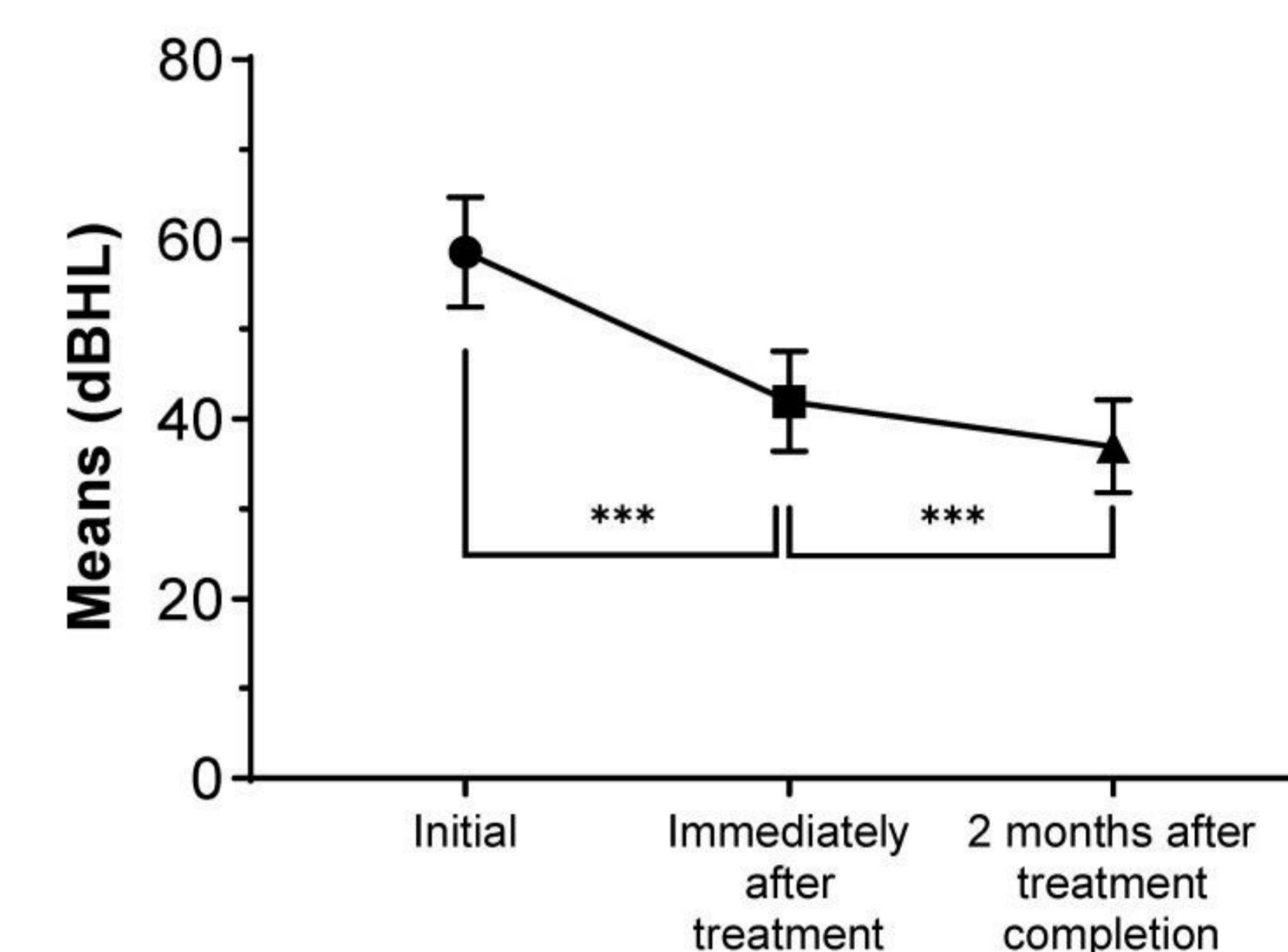

Figure 4. The repeated measures analysis of variance graph of the interaural hearing differences(IHD) over time.
*** p-value less than 0.001.

• **Associated factors of delayed hearing recovery**

A stepwise multiple linear regression demonstrated the associated factors regarding the degree of delayed hearing recovery (F = 8.836, $p < 0.001$, adjusted R^2 = 0.246). It was revealed that the initial IHD before the treatment, age, and the recovery grade immediately after treatment were significantly associated with a delayed recovery rate (Figure 5, $p < 0.001$). When the other patient factors were controlled for, a more severe the initial hearing loss ($p < 0.001$), the older the age of the patient ($p < 0.01$), and worse patient recovery ($p < 0.05$) were found to be associated with a more delayed recovery. Other factors, such as sex, hypertension, diabetes, and the duration up to the treatment, did not significantly affect the delayed hearing improvement.

Effect	B	95% Confidence Interval		Beta	p-Value
		Lower	Upper		
Constant *	−17.038	−26.402	−7.674		0.001
Initial IHD (dB HL) *	0.182	0.106	0.259	0.541	<0.001
Age *	0.172	0.055	0.289	0.311	0.004
Recovery Grade 4 *	4.843	0.958	8.728	0.274	0.015
Sex				−0.089	0.399
HTN				0.138	0.197
DM				0.012	0.918
Days before the treatment				−0.070	0.521
Recovery Grade 3				−0.199	0.166

Figure 5. Stepwise multiple linear regression model predicting the association between delayed hearing gain and the independent variables (n = 73)

Summary & Conclusion

• Delayed spontaneous recovery occurred within 2months in more than 20% of patients with ISSNHL.
• A poorer hearing level at the time of onset and immediately after treatment might be a sign of a slower recovery rather than a poorer prognostic factor.
• The treatment outcome of ISSNHL should be evaluated at least 2 months after treatment completion, and counseling is required on the need for long-term follow-up in patients with ISSNHL.