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Prognostic factors in sudden sensorineural hearing loss: a retrospective study using interaction effects

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hearing loss, sudden; regression analysis; vertigo.

Abstract

The prognostic significance of vertigo in patients with idiopathic sudden sensorineural hearing loss (SSNHL) remains a matter of debate.

Objective: This paper aims to verify the difference between a group with vertigo and a group without vertigo, and to analyze vertigo's validation as a prognostic factor in patients with SSNHL.

Method: This study involved 183 patients with SSNHL. A *t*-test was used to compare group A (SSNHL with vertigo, n = 31) and group B (SSNHL without vertigo, n = 152). Also we want to verify the interaction effects between vertigo and other prognostic factors using multiple regression analysis.

Results: There was a significant difference between group A and group B: the initial hearing level of group A was lower than group B, and their treatment onset was also shorter. In addition, vertigo itself didn't affect hearing improvement, but the interaction variable between vertigo and initial hearing level did affect hearing improvement significantly.

Conclusion: The clinical characteristics of patients with vertigo did not directly affect hearing improvement with SSNHL; however, vertigo had an influence on SSNHL though its interaction with the initial hearing levels.

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INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is a loss that is greater than 30 dB in three contiguous frequencies and that occurs in less than 3 days[1]. SSNHL affects approximately 5-20 people per population of 100,000. It is almost always unilateral and is commonly associated with tinnitus and aural fullness. Multiple treatment protocols and agents have been proposed to treat SSNHL. Steroids, antiviral agents, anticoagulants, vasodilators, and others have been proposed as therapeutic agents to treat SSNHL[2-4].

A maximum of 32% to 65% of cases of SSNHL may recover spontaneously. Prognosis for recovery is dependent on a number of factors, including patient age, presence of vertigo at onset, degree of hearing loss, audiometric configuration, and time between the onset of hearing loss and treatment. Even though some studies have reported vertigo as a prognostic factor to SSNHL, it is often considered a poor prognostic factor and the effect of vertigo as related to SSNHL[5-7] is still debated. The reason for these inconsistent results is that vertigo is not a specific disease, but rather a symptom caused by many different etiologies. Although there were some attempts to verify the relationship between the results of caloric tests and prognoses[8-10], the relation between SSNHL and vertigo has not been clearly determined.

METHOD

This study used the medical records of 183 patients with SSNHL. All patients experienced idiopathic unilateral sensorineural hearing loss that developed within 3 days and excluded other known pathologies, including Meniere's disease, autoimmune disease, ototoxicity, or neoplasm.

The patients had a minimum hearing loss of 30 dB at three consecutive frequencies. Patients received steroid treatment (injection of prednisolone 60 mg/kg for six days then tapered over four days) started concomitantly with low molecular weight dextran, and checked 3 months after treatment. This study was approved by the institution's Ethics Committee and given permit number EU12-31.

The hearing loss classification was as follows: mild (26~40 dB), moderate (41~55 dB), moderately severe (56~70 dB), severe (71~90 dB), and profound (over than 91 dB). The Siegel[11] classification was used to evaluate the hearing improvement of patients on the last visit, using an average gain in four audiometric speech frequencies of 500 Hz, 1,000 Hz, 2,000 Hz, and 4,000 Hz.

Patient characteristics and clinical details are given in Table 1. In 183 patients (108 female and 75 male) with a mean age of 45.11 (± 15.79) years, 152 patients did not have vertigo. The degree of hearing loss was relatively evenly distributed: mild (15.8%), moderate (18.0%), moderately severe (17.5%), severe (23.0%), and profound (25.7%). Treatment onset was distributed: within 3 days (161 patients), and over 3 days (22 patients).

Table 1. Demographics and clinical characteristics of the study population.

Factors	No. (%)
Age	
≤ 10	3 (1.6)
11-20	6 (3.3)
21-30	26 (14.2)
31-40	29 (15.8)
41-50	45 (24.6)
51-60	34 (18.6)
≥ 61	40 (21.9)
Vertigo	
(+)	31 (16.9)
(-)	152 (83.1)
Treatment onset (days)	
≤ 3	161 (88.0)
4-7	15 (8.2)
8-10	3 (1.6)
11-28	3 (1.6)
≥ 29	1 (0.5)
Initial hearing level	
Mild	29 (15.8)
Moderate	33 (18.0)
Moderately severe	32 (17.5)
Severe	42 (23.0)
Profound	47 (25.7)

RESULTS

Statistical analyses were carried out with PASW Statistics ver. 18.0. A *t*-test was performed to identify statistically significant differences between group A (SSNHL with vertigo, n = 31) and group B (SSNHL without vertigo, n = 152). Multiple regression analysis was used to find prognostic factors associated with hearing improvement, and analyze the interaction effects of vertigo.

The *t*-test results revealed that no significant difference in SSNHL between the two groups existed; however, a significant difference of 0.05 was found in the initial hearing level and treatment onset, as shown in Table 2 and Figure 1.

In addition, multiple regression analysis was used to identify predictors of hearing improvement in patient