A Study of Tinnitus Treatment by a Phase-shifted sound stimulation

Takeya TOYAMA1,2, Daishi TAKAHASHI1, Yousuke TAGUCHI1, Ichiro FUKUMOTO2
1‘1Kitasato Junior College of Health and Hygienic sciences
2Institute of Biomedical Engineering, Nagaoka University of Technology

Abstract—The aim of this study is to research whether the proposed novel method what gives a phase shift sound stimulation for tinnitus is dispersed tinnitus.

I. INTRODUCTION

It is said that about twenty percent of Japan’s population had experienced a tinnitus. Of them, the numbers of people who have various troubles for their life are estimated to reach into five percent or more. A curative treatment for tinnitus is difficult in many cases due to occurring as complication of a basic disease. Therefore, treatment for the basic disease becomes a first-line choice. We have been studied a relief of tinnitus by physical acoustic stimulation and have been proposed a novel treatment method. The purpose of this study is to research whether the novel method what gives a phase reversing sound for tinnitus is dispersed tinnitus as if the electric signal disappears by adding an electric sin-wave signal to an electric cosine-wave signal.

II. METHOD

A preliminary test using healthy adult volunteers without tinnitus. Main examination intended for patients with tinnitus were demonstrated for evaluating an efficacy of a novel treatment method. In the preliminary test, two types of a virtual tinnitus model were proposed.

2-1 Preliminary test using healthy subjects

The Ipsi model (Fig. 1) was assumed as an intracochlear sound synthesis model of tinnitus caused by cochlear lesion.

The Contra model (Fig. 2) was defined as a sound synthesis model in central origin. In both models, an auditory response was measured using auditory brainstem response (ABR) audiometry system (M4104/MEB5304, NIHON KOHDEN CORPORATION).

Figure1. The Ipsi model

Figure2. The Contra model

II. METHOD

2-2 Experiments with tinnitus patients

In this examination, 2 patients with unilateral tinnitus participated. The phase reversing load test was executed in patients who had tinnitus as a major complaint. After obtaining a written informed consent from patients, patients filled out Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS). Next the tinnitus sound such as frequency and loudness was researched by pitch-match frequency test and loudness balance test.

III. RESULTS

The ABR results (Fig. 3) obtained in each tinnitus model suggested the relevance of the present method, and the treatment method used in the experimental study tinnitus was improved by time delay in sound stimulation and was eliminated by phase shift. main examination by VAS (Fig. 4) suggest that the present method can be used as an effective novel treatment method for tinnitus.

IV. CONCLUSION

REFERENCES