

Transient Otoacoustic Emissions with tone pip in Individuals with Sensorineural Hearing Loss

Thays Bueno Takeda¹, Daniela Gil²

Keywords:

hearing,
hearing loss,
sensorineural,
speech, language and
hearing sciences.

Abstract

Otoacoustic Emissions are generated by the cochlea in response to sound stimuli. They can be generated by clicks or specific frequency stimuli, such as tone pips. This is a quick and objective test with several applications.

Objective: To investigate the influence of the type of stimulus achieving otoacoustic emissions in individuals with mild and moderate sensorineural hearing loss of sloping configuration.

Material and Method: Thirty-two male and female patients aged from 17 to 63 years, with symmetric sensorineural hearing loss with a sloping configuration were evaluated. All subjects underwent transient otoacoustic emissions testing elicited by clicks and 2.000Hz and 4.000Hz tone pips.

Results: The degree of hearing loss and gender influenced otoacoustic emissions; it was significant for click stimulus and tone pips at 2.000Hz. Emissions were absent more often in females with both procedures.

Conclusions: Otoacoustic emissions evoked with clicks coincided with the emissions of tone pips at 2.000Hz. Tone pips at 4.000Hz were more sensitive than clicks for detecting impairment in individuals with high frequencies hearing loss. Gender and the degree of hearing loss were factors that affected OAE registration.

¹ Specialist, speech therapist.

² Doctoral degree. Adjunct professor in the Hearing Disorders Discipline, Sao Paulo Federal University (Universidade Federal de São Paulo).
Paper submitted to the BJORL-SGP (Publishing Management System – Brazilian Journal of Otorhinolaryngology) on August 15, 2010;
and accepted on October 1, 2010. cod. 7266

INTRODUCTION

Otoacoustic emissions (OAEs) consist of low intensity sound energy that after amplification may be recorded in the outer ear canal. OAEs originate in the cochlea, specifically in outer hair cells^{1,2}.

OAEs are an important tool for objectively evaluating the function of the inner ear, especially the outer hair cells of the cochlea^{1,2}.

It is a quick, objective, non-invasive, and easily applied procedure that may be done at any age³.

OAEs are not used for quantifying hearing loss, but rather to detect their presence, as they are present in all normally functioning ears. OAEs become absent when behavioral auditory thresholds are above 30 dBNA, that is, when there is any degree - even if mild - of hearing loss^{2,4,5}.

OAEs have several clinical uses, including neonatal and school-age hearing screening, in the differential diagnosis of cochlear and retrocochlear hearing losses, in monitoring subjects exposed to noise or ototoxic drugs, in analyzing and defining the progression of sudden and progressive hearing loss, and in studying cochlear dysfunction. OAEs may be tested in all age groups, including those that are hard to test³.

Transient otoacoustic emissions (TOAEs) are responses evoked by short stimuli, such as clicks at 500 to 6,000 Hz. OAE responses may be seen per frequency band. However, these responses are due to a filtering process in the equipment, which separates them by frequency band. Click-generated responses do not necessarily match the cochlear region involved in that specific frequency; they reflect a global cochlear response⁶.

A more specific method for evaluating OAEs by frequency is to use a tone pip stimulus. Tone pips present the energy as a single frequency pure tone uncontaminated by the frequencies of adjacent energies. This stimulus causes the basilar membrane of the cochlea to move in the frequency cochlear region that coincides with the stimulus frequency⁶.

Low frequencies are preserved - or at least with lower auditory thresholds - in sloping sensorineural hearing loss. Patients with this type of hearing loss may present TOAEs when stimulated by clicks because of lack of frequency selectivity in responses.

The purpose of this study was to compare TOAEs with clicks and tone pips at 2,000 Hz and 4,000 Hz in subjects with mild and moderate sloping sensorineural hearing loss; the variables were gender, degree of hearing loss, and first ear to be tested.

MATERIAL AND METHODS

The institutional review board analyzed and approved the study design (no. 01988/08). All subjects were informed beforehand about the procedures, and participants signed a free informed consent form.

Inclusion criteria were: being a patient of the institution, having mild or moderate bilateral sloping sensorineural hearing loss, presenting a bilateral type A tympanometric curve, and aged from 15 to 65 years.

A clinical history was taken of the selected patients, followed by visual inspection of the outer ear canal, pure tone and voice audiometry, acoustic immittance testing, and recording of TOAEs with clicks and tone pips.

OAEs were recorded by placing a probe in the outer ear canal - this probe has a miniature microphone that seals the outer ear canal with an olive-shaped tip. The stimulus passes from an amplifier to an analog-digital converter and a digital signal processor, which makes it possible to analyze the recorded sounds spectrally and to separate them from other sounds generated in the body.

TOAEs were recorded following a click and then a tone pip at 2,000 Hz and 4,000 Hz. Testing took place in a non-acoustically lined silent room; the testing device was an ILO 88 - otoacoustic emissions analyzer (Otodynamics Ltd., version 88) coupled to a microcomputer. The probe was placed only once; OAEs were recorded with both stimuli first on one side and then on the other. Testing started on the right ear in half of the sample, and on the left ear in the other half.

A 260 click recording was used; the gain was adjusted to keep stimulus intensities between 75 and 85 dB in the full-menu mode (20 ms window). The criteria for the presence of responses was a general reproducibility correlation of at least 50%, by tested frequency (3 dB above signal to noise - S/R), and general amplitude (response), and wave stability above 70% with both stimuli.³

OAEs with tone pips required the equipment to be modified. Before testing, the examiner selected on the screen: "menu", "stimulus", "tone pip" and entered the frequency at which testing was done - first 2,000 Hz, then 4,000 Hz.

Statistical analysis of the data aimed at comparing OAEs obtained with clicks and tone pips at 2,000 Hz and 4,000 Hz. The equality of two proportions test was applied, as well as measurements of the median, standard deviation, 1st and 3rd quartiles, and confidence intervals at a 95% statistical confidence level.

Results where statistical significance was attained are marked with the symbol (*); the p-value was 0.05.

Download English Version:

<https://daneshyari.com/en/article/4106478>

Download Persian Version:

<https://daneshyari.com/article/4106478>

[Daneshyari.com](https://daneshyari.com)