

Passing Otoacoustic Emissions as a Complementary Method in the Topodiagnosis of the Neurosensory Hearing Loss

Emissões Otoacústicas Transientes como Método Complementar no Topodiagnóstico das Perdas Auditivas Neurossensoriais

*Cacinelis Marion de Franceschi**, *Tania Tochetto***, *Larissa Lautenschlager****.

* Speech therapist. Student of the Post-Graduation in Human Communication Disorders, Universidade Federal CAPES.

** PhD in Human Communication Disorders. Associate Professor of Speech Therapy UFSM.

*** Speech therapist. Student of the Post-Graduation in Human Communication Disorders UFSM.

Institution: Universidade Federal de Santa Maria.
Santa Maria / RS - Brazil.

Mail address: Cacinelis Marion de Franceschi -1044/303, Benjamin Constant St- Centro, Santa Maria / RS - Brazil - ZIP CODE: 97050-022 - Telephone: (+55 55) 9113-9339 - E-mail: cacimf@gmail.com

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SUMMARY

Introduction:

To evaluate the otoacoustic emissions (EOAETs) in patients with neurosensory hearing loss do not belong to the clinical routine. However it would obtain valuable information concerning the topodiagnosis.

Objective:

To identify signs of retro cochlear alteration in individuals with neurosensory dysacusis diagnosis.

Method:

A transversal, observational, quantitative and, prospective study. Were analyzed 34 patients' records of users of the Speech Therapy Attendance Service. In the study were included individuals with neurosensory hearing loss of moderate to deep degree. An evaluation of Passing Otoacoustic Emissions (EOAETs) was performed in all the individuals of the sample. Those that do not presented EOAETs had the external and middle ear' condition evaluates through meatoscopy and tympanometry to eliminate ears with signs of conductive alteration.

Results:

Before that the exclusion criteria were applied, they have remained 13 individuals, totalizing 26 ears: four with hearing loss of moderate degree (15%), four with moderately severe degree (15%), two with severe degree (8%), 15 with deep degree (58%) and, one with deafness (4%). The tympanometric curves found were 22 (85%) Type A and, four (15%) Type C. It was verified the presence of EOAETs in only two ears (8%) of a same individual.

Conclusion:

It was verified the predominance of the EOAETs absence in individuals with neurosensory hearing loss of moderate to deep degree. In one case the EOAETs were registered, that suggest retrocochlear alteration. Raising suspicion of retrocochlear alterations.

Keywords:

neurosensory hearing loss, differential diagnosis, cochlea, cochlear nerve.

RESUMO

Introdução:

Não faz parte da rotina clínica avaliar as emissões otoacústicas (EOAETs) em pacientes com perda auditiva neurossensorial. Entretanto obter-se-ia informações valiosas em relação ao topodiagnóstico.

Objetivo:

Identificar sinais de alteração retrococlear em indivíduos com diagnóstico de disacusia neurossensorial.

Método:

Estudo prospectivo, quantitativo, observacional e transversal. Foram analisados 34 prontuários de usuários do Serviço de Atendimento Fonoaudiológico. Foram incluídos no estudo indivíduos com perda auditiva neurossensorial de grau moderado a profundo. Realizou-se avaliação de Emissões Otoacústicas Transientes (EOAETs) em todos os indivíduos da amostra. Os que não apresentaram EOAETs tiveram a condição das orelhas média e externa avaliadas por meio de meatoscopia e timpanometria para eliminar orelhas com sinais de alteração condutiva.

Resultados:

Após aplicados os critérios de exclusão, restaram 13 indivíduos, totalizando 26 orelhas: quatro com perda auditiva de grau moderado (15%), quatro com grau moderadamente severo (15%), duas com grau severo (8%), 15 com grau profundo (58%) e uma com anacusia (4%). As curvas timpanométricas encontradas foram 22 (85%) Tipo A e quatro (15%) Tipo C. Verificou-se presença de EOAETs em apenas duas orelhas (8%) de um mesmo sujeito.

Conclusão:

Verificou-se predomínio de ausência de EOAETs em sujeitos com perda auditiva neurossensorial de grau moderado a profundo. Em um único caso as EOAETs foram registradas, o que sugere alteração retrococlear. Levantando a suspeita de alterações retrococleares.

Palavras-chave:

perda auditiva neurossensorial, diagnóstico diferencial, cóclea, nervo coclear.

INTRODUCTION

In the sensorineural hearing loss the pure tone audiometry's findings do not inform about the necessary topodiagnosis of the lesion, if it is a sensory (cochlear) or neural (retrocochlear).

Among the testing methods to establish the differential diagnosis only a few tests as EOAEs, electrocochleography and evaluation of auditory evoked potentials (BAEP) are able to differentiate sensory from neural lesions (1).

Examination of Otoacoustic Emissions (EOAs) provides data that allow us to infer the cochlear condition. The presence of OAEs indicates no change in the auditory pathway to the outer ciliated cells of the organ of Corti. EOAEs are generated by external ciliated cells when stimulated by a click or two pure tones, called transient or distortion product, respectively (2).

The EOAETs are elicited by brief acoustic stimuli such as clicks or tone pipes (2). The stimulus activates the cochlea simultaneously on a vast region of the basal to apical. The answers are not captured in pathological ears with better hearing than about 30dB (1).

Therefore the analysis of otoacoustic emissions can be part of the battery of tests used for the topographic diagnosis of hearing loss, contributing to the identification of conditions such as Acoustic Neurinoma (retrochlear), and Meniere's disease induced hearing loss (NIHL) (cochlear) and even auditory neuropathy.

The relevance of the work is in knowing the topographic change this hearing to allow the choice of most appropriate intervention for each case.

The aim of this study was to identify retrocochlear's signs of change in individuals diagnosed with sensorineural dysacusis.

METHOD

A prospective, quantitative, observational and transversal study, in which the sample of patients assisted at the Habilitation and Rehabilitation of Hearing Service Center Speech Therapy (SAF), Universidade Federal de Santa Maria (UFSM). Carried out the analysis of patients' records.

Parents or guardians were informed about the objectives and proposed procedures and, being in agreement, signed an informed consent.

This work is linked to the project "Research database in hearing health" registered in the Ethics in Research Committee UFSM under the number 019731.

The individuals of two to 16 years of age with sensorineural hearing loss, moderate, moderately severe, severe and profound, each previously diagnosed with auditory evoked potential (BAEP) and / or pure tone audiometry (PTA). These data were extracted from patient files in the SAF. The criterion for determining the degree of hearing loss was 41 dB to 55 moderate, 56 to 70dB moderately severe, 71 to 90 dB severe above 90 dB deep (3).

The study excluded the patients who had hearing loss of mild (16 to 25 dB) or mild (26 to 40 dB) (4) because the EOAETs may be registered in the degree of hearing loss, external ear malformation and / or average, signs of change as conductive tympanometric curve type B or Ar (5) in one or both ears.

The individuals who showed signs of conductive alteration were excluded and referred for an ENT evaluation.

The data were analyzed by ear, as some individuals had hearing loss of different types and degrees.

Assessment was carried out of otoacoustic emissions (EOAETs) the frequencies 700, 1000, 1400, 2000, 2800 and 4000 Hz EOAETs was considered present when the signal to noise ratio was greater than or equal to 3 dB in at least four frequencies. EOAETs analysis was performed in quiet place, with the device Otoread brand Interacoustics Clinical / Audiotest, by the same evaluator.

The individuals who did not EOAETs had the condition of the middle and external ears assessed. Meatuscopy was performed using the otoscope Adva-Lite. The Acoustic Impedance measurements were checked with the brand Interacoustics audiometer, model AZ-7/AZ-7R. Were kept in the study only the ears with tympanograms type A and C (5).

Individuals without evidence of conductive alteration were classified according to presence or absence of EOAETs. It was considered cochlear hearing loss when EOAETs were absent and retro-cochlear when present.

RESULTS

The medical records of 34 individuals, members of the SAF. Twenty-one were excluded due to mild hearing loss, conductive and / or alteration of the middle ear, cochlear malformation or had been disconnected from the

SAF. They failed to appear for the exam offered seven individuals.

The remaining 13 individuals totaled 26 ears. Table 1 shows the distribution of the ears studied according to the degree of hearing loss.

Of the 26 ears studied 22 (85%) had type A tympanometric curve and four (15%) type C.

In 24 ears (92%) the EOAETs not come forward. Noticed the presence of EOAETs in both ears of the same individual.

DISCUSSION

Hearing loss can result from injury to various parts of the auditory system, with different consequences and different forms of intervention.

The EOAETs evaluate the biomechanics of the cochlea, integrity and functionality of the outer hair cells (2,6). Thus, it is expected absence of EOAETs when there is damage in outer hair cells. Since the lesions located in the inner hair cells in the auditory nerve or in the synapse between these elements (7), it is expected presence of EOAETs.

The tympanometric curve type A was present in 85% of the ears and type C in 15%. Ears with tympanometry type C may show EOAETs with amplitude (6,8).

In this study two ears (8%) of the same subject showed EOAETs. Other studies report the occurrence of EOAETs from 2.44% to 8.44% of sensorineural hearing loss (9,10,11,12,13).

The presence of EOAETs in both ears of the same subject with hearing loss points to possible change retrocochlear. This person has no risk factors known to retrocochlear damage according to the criteria of existing JCIH (14). Nor is evidence of other causes mentioned in the literature, such as prematurity, hyperbilirubinemia, hypoxia, ischemia, neural immaturity of the central nervous system, antibiotics and diuretics in intensive care units and heredity (12,13,15,16). Considered the possibility of auditory neuropathy, as the hearing thresholds found by the ATL the one subject that had EOAETs gifts are profound (10,11,12,13,14).

Considering the individuals studied, and not the ears, it was found that there is a predominance of cochlear involvement, evidenced by the absence of EOAETs in 12 (92%) of cases. Although the association

Table 1. Distribution of the ears studied according to the degree of hearing loss.

Hearing loss degree	Nº of ears	%
Moderate	4	15
Moderately severe	4	15
Severe	2	8
Deep	15	58
Deafness	1	4
Total	26	100

of retrocochlear alterations in these cases should not be discarded (2,6).

Changes purely retrocochlear disorders are rare. In the present study only one child (8%) showed signs of such change. This index is lower than that reported by international studies, which report the occurrence of change retrocochlear in 11% to 15% of individuals with sensorineural hearing loss (15,17). It is recognized that study performed with a larger number of persons to provide data other than those mentioned.

Although the sensorineural hearing loss there was a predominance of cochlear damage, alert to the possible existence of retrocochlear alterations that may jeopardize the rehabilitative efforts. Thus, it is suggested to include assessment of EOAETs protocol audiological evaluation for establishing the topographic diagnosis between cochlear and retrocochlear damage.

CONCLUSION

In individuals with sensorineural hearing loss of moderate to profound predominance of cochlear evidenced by the absence of otoacoustic emissions.

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