Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4533 - 4537
Received 15 December 2020; Accepted 05 January 2021.

# Indicators of Objective Methods of Research of Hearing in different Periods of Menier's Disease

**Sayfiddin S. Arifov[1], Murod B. Tukhtaev[2]**

[1]Head of the Department of Center for the Development of Professional Qualifications of Medical Workers of Ministry of Health of Republic of Uzbekistan, Uzbekistan.

[2]Researcher of the Department of Center for the Development of Professional Qualifications of Medical Workers of Ministry of Health of Republic of Uzbekistan, Uzbekistan.

**ABSTRACT**

Purpose of the study. Comparative evaluation of the results of electrophysiological and electroacoustic methods for studying hearing in patients with Meniere's disease during an attack and between attacks.

**KEYWORDS**

Otoacoustic Emission (TEOAE), ABR Peaks and Lengthen their Latency, Psychophysiological Research.

## Introduction

A total of 47 patients were under observation with a reliable or confirmed diagnosis of BM, which made up the main group. In all patients, the process was one-sided. 30 healthy individuals constituted the control group.

The following objective research methods were used - impedance measurement, registration of delayed evoked otoacoustic emission (TEOAE), registration of the product of distortion of otoacoustic emission (PIOAE), registration of short- and long-latency auditory evoked potentials.

TEOAE was not registered in the period between attacks in 89.4%, PIOAE - in 76%, while this indicator during the period of BM initiation was 100% and 89,4%.

During an attack of BM, there is a significant shift in the pressure of the tympanogram peak to the zone of positive pressure in relation to the control group and the period between attacks, an increase in the threshold, a decrease in amplitude lengthening of the latent period of acoustic reflexes.

In both periods of BM, changes in ABR were characterized by a tendency to decrease the amplitude of all ABR peaks and lengthen their latency, as well as a significant change in the inter-peak intervals on the affected side as compared to the control group.

An increase in the latency and a decrease in the amplitude of the ATP peaks were revealed, the changes in which did not differ significantly during the onset and between the onset periods. Although both analyzed parameters during the attack had a significant difference from the values of the control group ($P < 0,1$).

Meniere's disease (BM) is a chronic, relatively common disease with an estimated prevalence of 17 to 513 patients per 100,000 [2, 9]. It in most cases occurs in the form of a unilateral lesion, although it cannot be bilateral [6].

The clinical manifestations of BM are most clearly manifested during an attack of the disease [11]. However, often these manifestations are varied, and therefore certain difficulties arise in the diagnosis of the disease. Often, BM patients are admitted to the emergency department with sudden dizziness and the disease may be inaccurately diagnosed [3]. In such situations, a scrupulous analysis of all clinical manifestations of the disease comes to the fore [7]. An important and most permanent clinical manifestation of BM is changes in the organ of hearing [5]. In assessing the state of the organ of hearing in BM, both psychophysiological and electrophysiological and electroacoustic research methods are used. However, due to a number of circumstances, psychophysiological research methods are most widely used among them. In particular, this is due to their availability for doctors of various levels of health care, the presence of direct constant communication between the researcher and the subject, and the high information content of the results obtained. In this regard, in the sources of recent years,

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4533 - 4537
Received 15 December 2020; Accepted 05 January 2021.

psychophysiological research methods are included in the list of basic research methods for patients with BM [1, 8, 10]. Over the past decades, objective methods of hearing research have been widely used to diagnose, predict the course and result of BM treatment [10]. Their advantage is the speed of implementation, the independence of receiving a response from the psychosomatic state of the patient, the ability to assess all parts of the organ of hearing [4].

In this regard, it is of interest to study the results of objective methods of hearing research, their features of manifestation in patients during an attack of BM.

**Purpose of the Study**

Comparative evaluation of the results of electrophysiological and electroacoustic methods for studying hearing in patients with Meniere's disease during an attack and between attacks.

## Material and Research Methods

A total of 47 patients were under observation with a reliable or confirmed diagnosis of BM, which made up the main group. In all patients, the process was one-sided. 30 healthy individuals constituted the control group.

When diagnosing BM, the tenth revision of the International Statistical Classification of Diseases and Health Problems (ICD-10) was followed. Until 2017, she additionally used the classification of criteria for the accuracy of diagnosis of Meniere's disease of the American Academy of Otorhinolaryngology and Head and Neck Surgery (AAO - HNS, 1995). Since 2018, the classification of criteria for the accuracy of diagnosis of Meniere's disease has been used by the European Academy of Otology and Otoneurology, the American Academy of Otorhinolaryngology and Head and Neck Surgery, the Barani Society, the Japan Society for Equilibrium Research, and the Korean Society for the Study of Equilibrium (2016).

To assess the degree of hearing loss, the international classification of hearing impairments was used (WHO, 1997).

All patients underwent examination of ENT organs and examination of the state of the organ of hearing and balance. The study of patients included the study of complaints, history of the development of the disease and life, assessment of the state of organs and body systems, endoscopic examination of the ENT organs. To assess the state of the hearing organ, the following objective research methods were used - impedance measurement, registration of delayed evoked otoacoustic emission (TEOAE), registration of the product of distortion of otoacoustic emission (PIOAE), registration of short-, long-latency auditory evoked potentials.

## Research Results

Comprehensive examination of patients was carried out in the period between the attacks of BM.

The analysis of TEOAE and PIOAE indices can serve as a prognostic criterion in assessing the compensatory and adaptive capabilities of the organ of Corti in patients with moderate hearing loss. In patients with BM TEOAE, the period between attacks was recorded in 5 patients, while in them during the period of an attack it was not recorded. Only in one patient, after an attack, the registration of TEOAE was restored, in others it was not subsequently registered.

PIOAE in patients with BM was recorded between attacks in 16 patients; during an attack, their number decreased to 5 and then restored in 8 cases.

Impedansometry during the seizure period was carried out in all 47 patients and its results are shown in Table 1.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4533 - 4537
Received 15 December 2020; Accepted 05 January 2021.

In a comparative aspect in relation to the results of the interictal period, the following differences were revealed:

- displacement of the pressure of the peak of the tympanogram to the zone of positive pressure (the period of an attack is + 40 ± 5,25 daPa and the period between attacks is -25,0 ± 5,70 daPa);
- registration of a tympanogram type C (40,4%) and, due to this, a decrease in registration of a tympanogram type A (59,6%), while in the period between attacks, the latter was recorded 100%.
- an increase in the threshold of acoustic reflexes (the period of an attack is 105 ± 3.75 dB and the period between attacks is -95 ± 4,75 dB);
- a decrease in the amplitude of the formed acoustic reflexes (the period of an attack is 5.7 ± 0.76 ml and the period between attacks is 7,1 ± 0,18 ml);
- lengthening of the latent period of acoustic reflexes (seizure period - 162 + 2.2 ms and the period between seizures -127 ± 3,35 ms);
- an increase in the ratio of the forms of acoustic reflexes, unchanged and altered, towards the latter forms (the period of an attack - 16/84% and the period between attacks - 32/68%).

In 36 patients, during an attack of BM, ABR and DSVP were registered. Analyzed the indicators of latency, amplitude, peak-to-peak intervals of ABR and DSP.

A similar picture was observed, which was obtained in the period between attacks, i.e., on the affected side there was a tendency to decrease the amplitude of all ABR peaks and lengthen their latency, which were combined with a significant increase in the inter-peak intervals I-III, IV, III-V in relation to control group (table 2).

When registering APS, a lengthening of the latency and a decrease in the amplitude of the APS peaks were revealed, the changes in which did not have a significant difference during the attack and between the attack periods. Although both analyzed indicators during the attack had a significant difference from the values of the control group (Table 3).

Thus, although psychophysiological research methods are at the top of the list of the main research methods for patients with BM. but objective methods of hearing research make it possible to assess in detail and objectively the state of each section of the organ of hearing.

## Findings

1. TEOAE was not recorded in the period between attacks in 89,4%, PIOAE - in 76%, whereas this indicator during the period of BM initiation was 100% and 89,4%.
2. During an attack of BM, a significant shift in the pressure of the tympanogram peak to the zone of positive pressure, an increase in the threshold, and a decrease in amplitude are noted in relation to the control group and the period between attacks lengthening of the latent period of acoustic reflexes.
3. In both periods of BM, changes in ABR were characterized by a tendency to decrease the amplitude of all ABR peaks and lengthen their latency, as well as a significant change in the inter-peak intervals on the affected side as compared to the control group.
4. The latency lengthening and the decrease in the amplitude of the DSVP peaks were revealed, the changes in which did not differ significantly during the onset and between the onset periods. Although both analyzed parameters during the attack had a significant difference from the values of the control group (P <0,1).

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4533 - 4537
Received 15 December 2020; Accepted 05 January 2021.

**Table 1.** Comparative indices of impedance measurements during an attack and between attacks in patients with meniere's disease

| Index | Control group (n = 30) | Attacks period (n = 47) | The period between attacks (n = 47) |
|---|---|---|---|
| The amplitude of the peak of the tympanogram, mmho | 1,78±0,03 | 1,67±0,04 | 1,67±0,04 |
| Tympanogram peak gradient, daPa | 100±5,05 | 68±7,35 | 95±5,65 |
| Tympanogram peak pressure, daPa | -20±6,25 | +40±5,25*< | -25,0±5,70 |
| Tympanogram type:<br>type A,%<br>type C,% a shift in the positive zone,% | <br><br>100% | <br>59,6%<br>40,4% | <br>100%<br>– |
| Acoustic reflex threshold, dB | 87,4±4,25 | 105±3,75*< | 95±4,75 |
| Amplitude of the formed acoustic reflex, ml | 8,9±0,76 | 5,7±0,76*< | 6,8±0,18< |
| Latent period of acoustic reflex, ms | 107+2,7 | 162+2,2*< | 137±3,35< |
| The rise time of the acoustic reflex, ms | 310+13,2 | 349+10,8 | 338+11,3 |
| Relaxation period of the acoustic reflex, ms | 330+10,6 | 380+10,6 | 367+9,9 |
| General view of acoustic reflexes<br>not changed,%<br>modified,% | <br>94%<br>6% | <br>16%<br>84% | <br>32%<br>68% |

Note:
* - differences with respect to the data of the period between attacks are significant (* - P <0.05).
<- differences relative to the data of the control group are significant (<- P <0.05).

**Table 2.** Comparative indicators of ABR during an attack and between attacks in patients with Meniere's disease

| Index | Control group (n = 30) | Attacks period (n = 36) | The period between attacks (n = 36) |
|---|---|---|---|
| Wave latency, ms | | | |
| I | 1,76±0,01 | 1,88±0,16 | 1,87±0,14 |
| III | 3,78±0,02 | 3,86±0,13 | 3,82±0,12 |
| V | 5,71±0,02 | 5,91±0,12 | 5,87±0,11 |
| Wave amplitude, μV | | | |
| I | 0,42±0,06 | 0,32±0,08 | 0,34±0,07 |
| III | 0,52±0,08 | 0,39±0,04 | 0,40±0,02 |
| V | 0,72±0,06 | 0,62±0,03 | 0,64±0,02 |
| Peak intervals, ms | | | |
| I-III | 2,06±0,02 | 2,22±0,02* | 2,18±0,03* |
| III-V | 1,91±0,03 | 2,18±0,02* | 2,11±0,01* |
| I-V | 3,94±0,04 | 4,33±0,03* | 4,29±0,02* |

Note: * - differences relative to the data of the control group are significant
(* - P <0.1)

**Table 3.** Comparative indicators of DSVP during an attack and between attacks in patients with Meniere's disease

| Index | Control group (n = 30) | Attacks period (n = 36) | The period between attacks (n = 36) |
|---|---|---|---|
| Wave latency, ms | | | |
| P1 | 50,22±0,04 | 69,05±3,11* | 59,54±3,76 |
| N1 | 111,92±0,02 | 122,22±2,5* | 116,45±2,33 |
| P2 | 170,24±0,04 | 179,23±3,72* | 174,66±3,76 |
| N2 | 251,11±0,05 | 285,12±9,11* | 271,17±11,87 |
| Wave amplitude, μV | | | |
| N1-P2 | 10,03±0,05 | 5,89±0,91* | 6,24±1,15 |
| P2-N2 | 9,58±0,05 | 5,77±0,87* | 6,10±0,787 |

Note: * - differences relative to the data of the control group are significant
(* - P <0,1)

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4533 - 4537
Received 15 December 2020; Accepted 05 January 2021.

## References

[1] Basura, G.J., Adams, M.E., Monfared, A., Schwartz, S.R., Antonelli, P.J., Burkard, R., & Buchanan, E.M. (2020). Clinical practice guideline: Ménière's disease. *Otolaryngology–Head and Neck Surgery*, *162*(2_suppl), S1-S55. https://doi.org/10.1177/0194599820909438

[2] Bruderer, S.G., Bodmer, D., Stohler, N.A., Jick, S.S., & Meier, C.R. (2017). Population-based study on the epidemiology of Ménière's disease. *Audiology and Neurotology*, *22*(2), 74-82. https://doi.org/10.1159/000475875

[3] da Costa, S.S., De Sousa, L.C., & Piza, M.R. (2002). Meniere's disease: overview, epidemiology, and natural history. *Otolaryngologic Clinics of North America*, *35*(3), 455-495. https://doi.org/10.1016/s0030-6665(02)00028-2

[4] Gnezditsky, V.V. (2003). *Evoked brain potentials in clinical practice.* M: MEDpress-inform, 264.

[5] Kryukov, A.I., Fedorova, O.K., Antonyan, V.G., & Sheremet, A.S. (2006). Clinical aspects of Meniere's disease. Monograph. M. Medicine, 240.

[6] Bartels, L.J., Danner, C.J., & Kyle, P.B.J. (2016). Allen from Phi Ménière's Disease Management *Operational Techniques in Otolaryngology*, *27*, 225-234.

[7] opez-Escamez, J.A., Carey, J., Chung, W.H., Goebel, J.A., Magnusson, M., Mandalà, M., & Bisdorff, A. (2015). Diagnostic criteria for Menière's disease. *Journal of vestibular research*, *25*(1), 1-7. https://doi.org/10.3233/VES-150549

[8] Meniere's disease. (2014). *Clinical guidelines.* Compiled by A.I. Kryukov, N.L. Kunelskaya, E.V. Garov and others. M-SPb. 21.

[9] Nakashima, T., Pyykkö, I., Arroll, M.A., Casselbrant, M.L., Foster, C.A., Manzoor, N.F., & Young, Y.H. (2016). Meniere's disease. *Nature reviews Disease primers*, *2*(1), 1-18. https://doi.org/10.1038/nrdp.2016.28

[10] Otorhinolaryngology. National leadership. / ed. V.T. Palchun. - M: GEOTAR-Media, (2020) -1060. ISBN: 978-5-9704-3746-9.

[11] Palchun, V.T., Guseva, A.L., & Levina, Y.V. (2016). Méniere's disease: epidemiology, etiology, diagnostics, management. *Consilium Medicum*, *18*(3), 107-116. https://doi.org/10.26442/2075-1753_2016.3.107-116