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### *Hearing loss in chronic alcoholics*

Alcohol has a local and general influence. Its particularly harmful effect is observed when it is used frequently and in high concentrations. Chronic excessive drinking of alcohol leads to deterioration of sight, hearing loss and psychical disorders. Severe alcohol intoxication results in balance disorders, nystagmus and vertigo. These symptoms suggest brain stem damage. Chronic alcoholism also leads to the defect of brain stem in Wernicke-Korsakoff syndrome and degenerative changes in the cerebellum (1, 2).

The brain stem responses proved that various neurological diseases include brain stem structures and cause the changes in amplitude and latence of individual waves in ABR (1). The mechanism of neurological changes occurrence and of the disorders of sense organs is surely the complex one. There is a direct alcohol influence on neurons and the harmful activity of the products of metabolism which gather in the organism because of the damage of *parenchymatous* organs.

The aim of the study was the evaluation of the degree and the place of the hearing organ damage in 30 alcoholics. They were subjected to pure-tone and impedance audiometry, otoacoustic emissions and evoked brain stem responses tests.

#### MATERIAL AND METHODS

The study material included 30 patients aged 26-55 (mean 43.6), with the period of drinking alcohol ranging from 5 to 30 years (mean 17.5 years), who were subjected to therapy in the Anonymous Club for Alcoholics. The period of abstinence was 1-9 month (mean 3 months).

In all of the studied subjects the following clinical tests were performed: otoscopy, pure-tone and impedance audiometry with ipsilateral stapedial reflexes and the evoked acoustic otoemissions (TEOAE) as well as the brain stem responses (ABR).

The audiogram was performed with application of Midimte 622; the impedance audiometry – with Zodiac 901. ABR tests (90dB nHL, 30 impulses/sec, click 125 ms half-wave square) were done of ERA-2250 Madsen Electronics. The correction for presbycusis was considered. Otoacoustic emission tests were performed in a quiet room with application of ILO 88 DP of “Otdynamic”, using 2-channel sound for registration TEOAE (non-linear click stimulus lasting for 80  $\mu$ s and intensity 84 dB SPL in outer ear canal, measured from 500-5000 Hz, for 20ms after stimulus, the stimulus was considered to be existing when its intensity was at least 3 dB higher than the noise threshold).

## RESULTS AND DISCUSSION

The audiometric threshold tests were performed on 30 persons excessively drinking alcohol and they proved in 8 cases normal hearing, in 18 cases – high frequency hearing loss lasting approximating 60 dB, and in 4 subjects – sensorineural hearing loss in all of the tested frequencies. With relation to the obtained hearing tests (audiograms) results the patients were divided into 3 subgroups. Impedance audiometry confirmed normal condition of middle ear in the studied group. Stapedial reflexes in 53 ears were noticed, however they were not observed in 7 ears. According to H a b e n e r, the threshold of stapedial reflex does not change with age considerably in subjects aged 10-60 (2). Retrocochlear damage of hearing organ is confirmed by the absence of loudness requirement and pathologic adaptation. ABR test proved latency elongation of wave I in 28 ears, of wave III in 50 ears and wave V in 54 ears. Interpeak latency I-III concerned half of the studied ears (30). Interval III-V was elongated in 28 ears, however of I-V – in 41 ears.

TEOAE was found in 14 ears, including 12 ears with correct threshold audiogram and in 2 ears with decrease on high frequencies. The results of audiological tests were correlated with time of excessive alcohol drinking and the abstinence period. The performed analysis proved that in the group of subjects with correct threshold audiogram excessive drinking of alcohol was 5 years on the average, however the mean period of detoxication was 4.2 months. In the subgroup II (with the hearing loss on high frequencies) the period of excessive alcohol drinking was 18 years, and the period of abstinence – 3.8 months. In the subgroup III (with sensorineural hearing loss bigger than 40-50 dB) the period of excessive drinking was 28 years, however the detoxication period was only 1 month.

N a i S h i n C h u and co-authors obtained similar results of ABR. The ABR records were correlated with the changes in EEG and CT of the brain. They did not confirm any relationship between EEG and ABR. However, in their tests the high correlation between ABR (83%) and brain ischaemia was confirmed in CT test (4). Similarly, R o s e n h a m e r thinks that alcoholism leads to brain stem damage, which is indicated in the ABR record (5). C o u r v i l l e and V i c t o r stated that due to excessive drinking of alcohol there is a degeneration of cerebellum and demyelination of pons (4, 6). C a d a v e i r a's research confirmed irregularities in ABR in alcoholics in the form of the signal transmission decrease in the hearing pathways, particularly in the pons. The authors think that this is the effect of demyelination connected with the electrolyte disorders (1, 4, 6).

A slow (lasting several years) recovery to normal value of ABR confirmed in abstinent may be due to the decrease in the number of neurons in the inferior olives and vestibular nuclei according to V i c t o r's research (6). The absence of acoustic otoemission in 46 ears indicates the damage of outer hear cells. The absence of loudness requirement and pathologic adaptation in impedance audiometry indicates the retrocochlear damage of hearing organ. The obtained results of ABR tests define the place of the hearing pathway damage in the brain stem. The decrease in neurons number and demyelination due to excessive alcohol drinking result in the changes in all of the levels of hearing pathway.

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#### SUMMARY

Alcohol has a local and general influence. A specially harmful effect is observed when it is abused – used frequently and in high concentrations. Chronic excessive drinking of alcohol results in sight deterioration, hearing loss and psychical disorders.

The study aimed at evaluating the degree and place of the hearing organ damage in 30 alcoholics. They were subjected to audiologic examinations including: pure-tone and impedance audiometry, otoacoustic emissions and evoked brain stem responses tests.

The patients were diagnosed with sensorineural hearing loss, lack of otoemission indicating the damage of outer hear cells as well as hearing pathway damage in the brain stem.

#### Ubytek słuchu w przewlekłym alkoholizmie

Alkohol wykazuje działanie miejscowe oraz ogólne. Szczególnie szkodliwe działanie występuje przy dużym stężeniu i częstym spożywaniu. Przewlekłe nadużywanie alkoholu w wyniku działania na komórki nerwowe prowadzi do osłabienia wzroku, niedosłuchu odbiorczego i zaburzeń psychicznych. Celem pracy była ocena stopnia i miejsca uszkodzenia narządu słuchu. Badania przeprowadzono w grupie 30 alkoholików, u których wykonano badania audiologiczne, obejmujące audiometrię tonalną i impedancyjną, otoemisję akustyczną i badanie potencjałów wywołanych z pnia mózgu. W badanej grupie występowały niedosłuchy czuciowo-nerwowe, brak otoemisji wywołanej z komórek słuchowych zewnętrznych oraz zaburzenia w przewodnictwie wewnątrzprawnym.

