

AUDIOMETRY IN AN EXPANDED FREQUENCY RANGE FOR DIAGNOSIS OF HEARING LOSS

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Abstract

In the present article authors argue about the necessity of application of audiometric method in the expanded range of frequencies in a complex of audiologic methods of the research, that allow to test acoustical sensitivity to high-pitch tones (12.0–20.0 kHz) in patients with various forms of relative deafness. It is established that at these high frequencies the earliest pre-clinical signs of relative deafness are found. As a result of the use of the given research method in connection with audiologic methods authors have revealed early forms of relative deafness at the surveyed patients. It has allowed to conduct the timely adequate therapy, that finally warns invalidation of the patient on a hearing condition.

Background

At the present day there are many audiometric tests used in diagnostics of hearing pathologies, among which extended high-frequency audiometry (EHFA) by air-conduction and bone-conduction according to the method of professor B. M. Sagalovich becomes more popular [1]. The EHFA method allows to reveal a sensorineural component of hearing loss among patients with the latent forms of hearing loss at early stages. Extension of the frequency range allows to find out the earliest function shifts in the inner ear, which cannot be detected in the usual frequency range (0.125–8 kHz). This allows to investigate the dynamics of reaction of the receptor apparatus on the development of pathological process in the whole auditory pathway. Thanks to this method it is possible to plan the

ways of treatment and prophylaxis of any acoustic disorder which leads to the invalidism in long-term period of time.

The aim of the study was to estimate the value of extended high-frequency audiometry in early, pre-clinical diagnostics of hearing loss, as the method that reveals development of hearing disability.

Material and methods

68 patients with various forms and degrees of hearing loss have been examined in an ENT clinic from 2009 to 2010. High degree of hearing loss (stage IV) resulting from chronic adhesive otitis media (3 degree in hearing disability) was found in 38 patients (1st – basic group) and the latent form of sensorineural hearing loss was found in

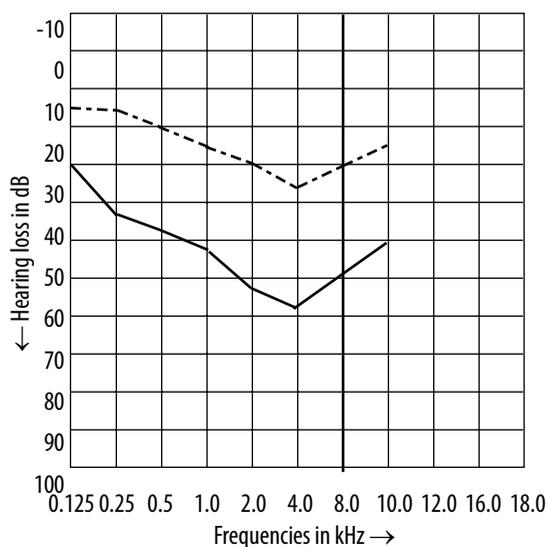


Figure 1. Extended high-frequency audiogram of patient M from group 1. - - - bone-conduction; — air-conduction.

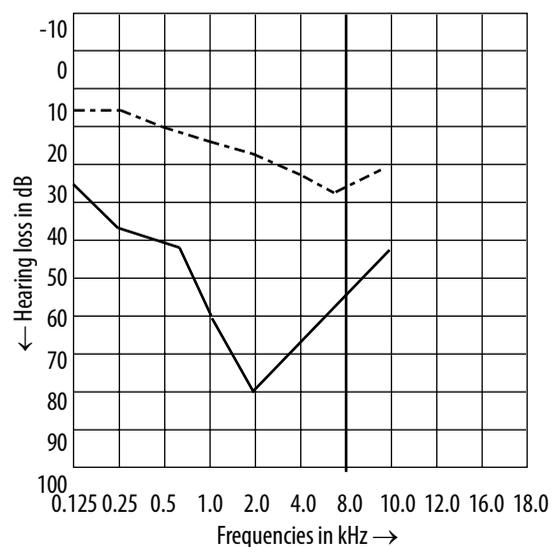


Figure 2. Average indexes of extended high-frequency audiogram of patients from group 1. - - - bone-conduction; — air-conduction.

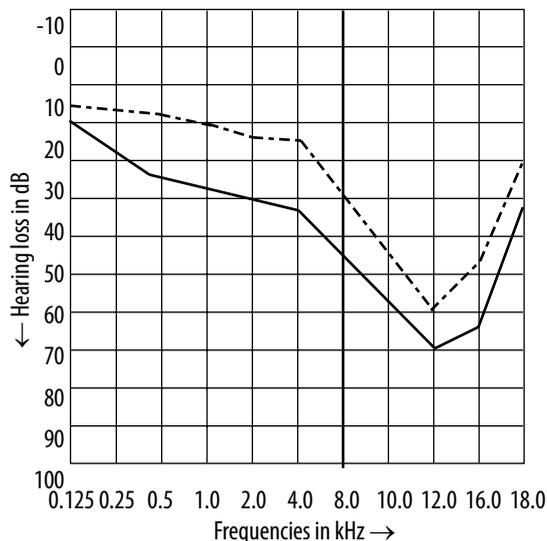


Figure 3. Extended high-frequency audiogram of patient C from group 2. - - - bone-conduction; — air-conduction.

30 patients (2st – control group), who did not report special complaints concerning hearing.

After preliminary general clinical examination all patients in the conditions of isolation chamber of the ENT clinic underwent pure tone air and bone conduction threshold audiometry in standard (to 8,0 kHz), and in extended (20 kHz) frequency ranges.

Results and discussion

Special deviations from the norm were not revealed during the general clinical examination, hemodynamic indicators were within norm limits. Otomicroscope examination revealed scar tissue and changes on the tympanic membrane in all patients from group 1, 6 of these patients were also diagnosed with tympanosclerosis. The audiological examination has shown that the threshold of acoustic sensitivity was defined at air-conduction up to 10 kHz in the patients from the group 1 (Figure 1). Average indexes of extended high-frequency audiometry of this group’s patients presented high thresholds of hearing in the speech area and high frequencies up to 80 dB (Figure 2). The

References:

1. Sagalovich BM: Acoustical perception of ultrasound. Moscow, 1988; 250
2. Kholmatov JI: Methodic of hearing research in the expanded frequency range. (In:) Kholmatov JI (ed.), Methodical references for audiologist, clinical interns and masters of otorhinolaryngology. Dushanbe, 2004; 14

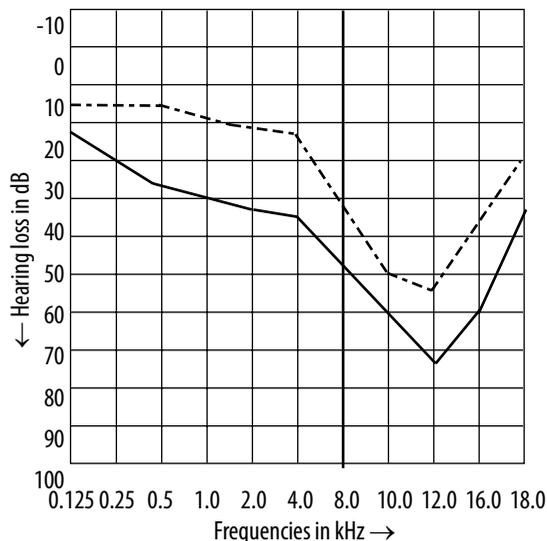


Figure 4. Average indexes of extended high-frequency audiogram of patients from group 2. - - - bone-conduction; — air-conduction.

hearing threshold of the 2 group’s patients was defined on high frequencies up to 16 kHz inclusive, however, hearing thresholds were high up to 70 dB (Figure 3). Interestingly all patients from the group 2 had selective increase of thresholds at air-conduction and bone-conduction on 12 and 16 kHz frequencies (Figure 4), which showed the impairment of receptor apparatus of the auditory pathway.

Conclusions

To sum up all data, it is possible to conclude that hearing research in the expanded frequency range allows to reveal the earliest shifts of functions of the inner ear in both the patients with initial forms/stages of hearing disorders and in the patients with progressive hearing loss of a various origin, which cannot be detected by the conventional audiometry.

Frequency range expansion, in relation to which acoustic sensitivity is investigated, eliminates limitations of the modern pure-tone threshold audiometry and opens new prospects of estimation of hearing condition at various hearing pathologies.