

EXAMINATION OF PATIENTS WITH ACUTE ACOUSTIC TRAUMA

Umar B. Bobodzhonov, Jamol I. Kholmatov, Ravshan U. Bobodzhonov

Department of Otorhinolaryngology of the Tajik Medical University of the name Abuali ibni Sino

Corresponding author: Jamal I. Kholmatov, Department of Otorhinolaryngology of the Tajik Medical University of the name Abuali ibni Sino, e-mail: Kholmatovji@mail.ru

Abstract

The acute acoustic trauma leads to further injuries of various structures of the middle and inner ear. Complex audiological examination of hearing in order to reveal posttraumatic sensorineural hearing loss and timely rehabilitation is required to reveal injuries. It is especially necessary in case of suspicion of integrity damage of labyrinthine windows. In order to evaluate posttraumatic hearing loss, we consider complete audiological examination, including audiometry in the expanded range of frequencies of air-conduction and bone-conduction, and also urgent rehabilitation actions necessary.

Background

According to different authors ear traumas make 32–70% of all injuries both in war and a peace times. Decrease of their number is hard to estimate in the near future because of constant development of manufacture, increase of speed, instability of living standards and growth of household violence [1,3,6–8].

Occurring diagnostic difficulties, especially in cases of polytrauma of various ear structures and posttraumatic perilymph fistulas, which appear in 64% of head injuries, and the absence of common opinion concerning medical tactics cause the necessity of studying the character of damages and perfection of their diagnostics and treatment methods.

It is necessary to consider the trauma of the ear caused by palm strike with rupture of tympanic membrane, damage of ossicular chain, labyrinthine windows with liquorhea as a specific form of hearing loss.

The use of modern audiology tests in early detection of acoustic disturbances in people with sudden hearing loss resulting from traumas of the middle and inner ear defines the transformation mechanism of conductive hearing loss into its sensorineural form which demands purposeful methods of rehabilitation.

The aim of the study was complex examination of patients with ear traumas with the use of modern audiological and clinical methods.

Material and methods

520 patients were included in the research all with the acute trauma of middle and inner ear under observation. Detailed – audiological and clinical research was conducted in 300 patients. The age of patients was from 15 to 40 years old; 155 males and 145 females.

All patients with ear trauma reported decrease of hearing and tinnitus in the ears which was perceptible from the moment of trauma. The majority of patients suffered from abrupt hearing loss. The tinnitus was of various intensity and character.

Other implications of diseases were noted, such as pain and feeling of heaviness in the injured ear. 98 (32.7%) patients noted a short-term loss of consciousness immediately after trauma, later on they experienced dizziness, nausea and vomiting. During the operation it was discovered that these patients had their labyrinthine windows damaged. The brain concussion was found only in 9 (9.2%) patients from the group of 98. All patients had otomicroscopic examination, estimation of the tympanic membrane, mucosa of tympanic cavity, ossicles and character of secretion (in cases of damage of labyrinthine windows).

Results and discussion

Clinical pathway of an acute trauma of the ear in patients surveyed by us depended on the character and damage rate of parts of middle and inner ear. Besides tympanic membrane rupture the significant majority of patients had acute otitis media of different severity level accompanied the ear damage. In certain cases the ear trauma was limited to hemorrhages in the tympanic membrane and rupture of its vessels, sometimes with total destruction of tympanic membrane.

Tympanic membrane damage was often combined with damages of ossicles and labyrinthine windows. The form and size of defects of tympanic membrane had various configurations. The isolated damages of tympanic membrane with significant and subtotal defect were observed in 160 (53.3%) from 300 surveyed patients. Ruptured edges of tympanic membrane kept usually on a handle sagging in tympanic cavity or were completely separated and often necrotic. 37 (12.3%) patients with tympanic membrane rupture showed also damage of ossicular chain, which was proved by retraction of handle of malleus in tympanic cavity or hypermobility of the ossicular chain. Damage of

labyrinthine windows was detected in 32 (31.0%) from 93 patients. 10 (3.3%) people were diagnosed with multiple traumas of middle and inner ear parts (tympanic membrane rupture, ossicular chain damage, labyrinthine windows damage, etc.) [2].

Acumetry was used for pre-evaluation of hearing (experiments of Weber, Rinne and Shvabaha). In more detailed way hearing was examined by means of pure tone thresholds, and method of definition of acoustic sensitivity to ultrasound. The research of acoustic sensitivity to ultrasound was conducted according to B.M. Sagalovich technique [5]. Sound generator GZ-33 and radiator in the form of a package of crystals of potassium sodium tartrate, put in the duralumin case with resonant frequency 80 kHz were used as a sound source. In our research we studied perception of ultrasound (thresholds of acoustical sensitivity) and a phenomenon of lateralization of ultrasound.

Definition of the lowest level of perceived frequencies was conducted also by means of generator GZ-33 and electromagnetic ear-telephone Ton-1. The lowest level of perceived frequencies was defined at the maximum strain of the generator [4,5]. This technique had essential value because of unilateral hearing loss among surveyed patients. Results of examination have shown that 196 (65.3%) patients had the lowest level of hearing within 41–100 Hz, and 104 (34.7%) within 30–40 Hz that confirmed presence of the mixed hearing loss.

Speech audiometry in the Tadjik language was conducted according to the technique developed by I. B. Kholmatov. Speech audiometer РД-01 was used (model 465). Considering that the surveyed patients mostly had unilateral hearing loss and there was a possibility to hear the ultrasound with the better hearing ear, we used the method of lateralization of ultrasounds. The deviation occurred to the side of better hearing ear in 106 (35.3%) patients, in 186 (62.0%) to the side of worse hearing ear and in 8 (2.0%) in both ears.

In the set of audiology examinations one of the leading places was taken by audiometry in expanded frequency range of air-conduction and bone-conduction by B. M. Sagalovich technique [5]. Our research has revealed that at

the beginning acoustic sensitivity deteriorates at frequencies 10–12 kHz, and then extends to the voice and lower frequencies. That was proved by the results of examination of 40 patients with traumatic myringitis, who did not show any hearing disorder, according to the usual audiometry. Otomicroscopic image of these patients was characterized by tympanic membrane hyperemia, an edema on the handle of malleus and tympanic membrane bleeding. Results of audiometry in extended frequency range have shown that part of patients that did not have tympanic membrane rupture osteal thresholds on frequencies 10.0–12.0–16.0 kHz considerably raise. 14 (35.0%) people had them within the norm (0–5 dB), 26 (65.5%) had them raised up to 20–30 dB, on the average on frequency 10,0 kHz had them raised up to 20.9+2.1 dB, on 12 kHz – to 29.3+2.1 dB, on 16 kHz – to 16.3+1.9 dB, that showed the disturbance of function of the middle ear.

The choice of the urgent microsurgical intervention method depended on the character of damage of the middle ear parts [6,7]. Urgent myringoplasty, tympanoplasty, ossiculoplasty, stapedoplasty and secondary membrane formation was conducted based on medical evidence.

Conclusions

After examination of 300 patients we have come to the conclusion that the acute acoustic trauma leads to further injuries of various structures of the middle and inner ear. Complex audiological examination of hearing in order to reveal posttraumatic sensorineural hearing loss and timely rehabilitation is required to reveal injuries. It is especially necessary in case of suspicion of integrity damage of labyrinthine windows.

Thus, according to our research, at the acute trauma of the ear which has resulted from the palm strike, along with tympanic membrane rupture the ossicular chain and labyrinthine windows damage was characteristic. In order to make a true picture of posttraumatic hearing loss, we consider complete audiological examination, including audiometry in the expanded range of frequencies of air-conduction and bone-conduction, and also urgent rehabilitation actions necessary.

References:

1. Diskolenko VV, Suhushin VN: Otorhinolaryngology bulletin, 1991; 3: 75–76
2. Zadorozhnikov GK: Otorhinolaryngology bulletin, 1978; 3: 94–95
3. Patjakina OK, Fedorova OV: Diagnostics and treatment of patients with traumatic damages of ear structures: Manual for doctors, 1997
4. Sagalovich BM: Acoustical perception of ultrasound. (In:) Physiology and hygiene questions. 1975; 2: 126–35
5. Sagalovich BM: Early diagnostics of sensorineural hearing loss: Methodological Recommendations, 1988
6. Kholmatov IB: Urgent myringoplasty at tympanic membrane traumas: Works of the Tadjik state medical institute. Dushanbe, 1978; 4
7. Kholmatov IB, Bobodzhanov UB: Our experience of urgent myringoplasty at tympanic membrane traumas. Congress of otolaryngologists, Ukrainian SSR, 7th: Materials. Kiev 1989; 174–75
8. Griffin WL: Laryngoscope, 1979; 89: 261–82
9. Masala W, Meloni F, Capobiano F: Otorinolaringologia, 1987; 37(5): 391–404