

NeuroQuantology

An Interdisciplinary Journal of Neuroscience and Quantum Physics



ISSN 1303 5150

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Shokhrukh Yusupov, Navruz Djabborov

Title: **AUDIOLOGICAL CHARACTERISTICS OF ACUTE
SENSONEURAL HEARING LOSS OF DIFFERENT GENESIS**

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Audiological Characteristics of Acute Sensorineural Hearing Loss of Different Genesis

Ulugbek Khasanov^{1*}, Ulugbek Abdullaev², Jamolbek Djuraev³, Abdurasul Botirov⁴,
Shokhrukh Yusupov⁵, Navruz Djabborov⁶

Abstract

This article presents the audiological characteristics of acute sensorineural hearing loss of various origins. One of the main problems of modern clinical audiology is sensorineural hearing loss - a hearing pathology associated with damage to the sound-receiving apparatus, when, for one reason or another, the process of converting mechanical vibrations into the energy of nerve impulses and its further transportation from the auditory receptors to the corresponding centers of the cerebral cortex is disrupted. As evidenced by numerous publications in the world and domestic literature, sensorineural hearing loss occurs quite often and occupies a rather large proportion among diseases of the ENT organs. According to the World Health Organization, the population with socially significant hearing impairments in 2016 ranges from 0.6 to 20%, in particular in Russia the number of such patients is approaching 13 million, of which 750 thousand are children, and in Europe it is sensorineural. hearing loss accounts for up to 37.2% of the pathology of the organ of hearing.

Key Words: Sensorineural Hearing Loss, Hearing, Ear, Audiometry.

DOI Number: 10.14704/nq.2022.20.6.NQ22353

NeuroQuantology 2022; 20(6):3476-3488

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Introduction

Acute hearing loss is an extremely frightening symptom, as a rule, which is the reason for the patient's immediate referral to a specialist [16-19]. Most often, this type of hearing loss is a violation of sound perception and is characterized by a sharp decrease in hearing more often in one ear, accompanied in some cases by symptoms such as dizziness and noise in the affected ear. Acute sensorineural hearing loss (SWNT) was first described by De Kleyn [20-24]. Since then, a huge number of studies devoted to this pathology have been carried out, however, there is probably not a single laryngotorinological (ENT) disease, where there would be so many contradictions both in the etiology and pathogenesis of the disease, and in relation to treatment [25]. Acute perceptual hearing loss is often defined as unilateral hearing loss that occurred no more than 24 to 72 hours ago, with a hearing loss of 30 dB or more on the tonal threshold audiogram at at least 3 adjacent frequencies. Impairment of sound perception, or

sensorineural (sensorineural, perceptual) hearing loss, occurs equally often in both men and women; from 5 to 20 people per 100,000 population suffer from this pathology. According to WHO statistics, up to 4000 new cases of sensorineural hearing loss are registered annually [1, 2].

The attention of otorhinolaryngologists has long been attracted by the form of sensorineural hearing loss, which occurs suddenly. This clinical sign was the reason for designating it with the term "sudden deafness" or "hearing loss" (Sudden deafness - in English, Hörsturz - in German). The idea of such hearing loss as an independent nosological form developed gradually over a long period of time. It is interesting and even somewhat strange for the modern conditions of public availability of scientific interests in English and German-language scientific literature that German authors are counting the development of the problem and the very designation of the described picture of hearing loss, as an independent form from scientific researchers from abroad in 2014 [3].

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Unfortunately, they are few in comparison with the number of works performed, and they mainly relate to the establishment of the place of sudden hearing loss in the general group of diseases, designated by the term "sensorineural hearing loss", and to the coordination of the clinical picture of the development of the disease. It is fundamentally important in this sense that the fact of nosological independence of sudden hearing loss is almost unanimously recognized, and this is how the designation of sudden hearing loss should be understood by the term "idiopathic hearing loss" [4-7].

Several classifications of sensorineural hearing loss have been described in the literature. Of particular interest is the classification depending on the duration of the course of the disease. There are sudden (no more than 12 hours have passed since the onset of onset), acute (up to 1 month), subacute (duration from 1 to 3 months) and chronic (more than 3 months) [1,2] Some authors distinguish as a separate form "sudden deafness "or" fulminant hearing loss "[7,26].

The most difficult and significant problem seems to be acute (SWNT) and sudden (SWNT) sensorineural hearing loss, the frequency of such cases, according to various sources, is slightly less than 1% of all hearing impairments [8].

Acute sensorineural hearing loss develops within a few days and is characterized by an increase in tonal thresholds for tissue sound conduction of varying degrees of severity, that is, a decrease in hearing in one or both ears, impaired speech intelligibility, distorted sound perception, tinnitus. In some patients, systemic dizziness and other vestibular disorders are observed, ototoxic disorders, impairment of noise tolerance, loud harsh sounds and other symptoms may occur [9].

Sudden sensorineural hearing loss is characterized by a lightning-fast or within several hours development of the pathological process and a high degree of hearing loss, up to complete deafness. Spontaneous recovery, according to various studies, occurs only in 32–65% of cases [10]. This task, however, is far from simple and by no means new. But if at first the systematization of auditory pathology was not so acute, now it should be considered as paramount [11]. And this is understandable, because at the initial stages of the formation of the dASHLrline of sensorineural hearing disorders, the need to differentiate them from conductive disorders and the characteristics of manifestations and mechanisms of occurrence, in

general, without detailed differentiation, came to the fore. In addition, the success of the surgical treatment of sound-conducting hearing disorders somewhat overshadowed sensorineural pathology and determined the main focus of audiological diagnostics on the differentiation of conductive (amenable to radical treatment) and sensorineural (not amenable to any treatment) hearing loss [12-15].

Such observations are consistent with the clinical features of the described form of hearing loss, although the authors themselves, on their basis, conclude that the spiral ganglion cells do not participate in the pathogenesis of that disease and, apparently, consider it impossible to separate the concepts of labyrinthitis and sudden sensorineural hearing loss, casting doubt on the viral theory of its origin. Perhaps it is more correct and careful to conclude by the same authors that modern ideas about the causes of acute sensorineural hearing loss of an allergic nature do not go beyond reflections and assumptions. All of the above predetermined the purpose of this study.

The aim of this work is to study the audiological characteristics of acute sensorineural hearing loss of various origins.

Material and Methods

In accordance with the purpose of the study and to fulfill the assigned tasks, clinical studies were carried out in 82 patients with acute sensorineural hearing loss of various origins who were hospitalized in the ENT department of the TMA multidisciplinary clinic in 2018-2020. All patients underwent a comprehensive examination, including the collection of complaints, examination of the ENT organs, endoscopy of the ear and audiological examinations.

We used audiometric studies of subjective ear noise and determined its frequency response and intensity in 82 patients with ASHL of various etiology. Of 82, 67 (81.7%) patients had subjective noise.

When studying the frequency characteristics of subjective noise, we found the following: out of 82 patients, 61 (74.4%) had mid-frequency and high-frequency noise, with ASHL in 31 (37.8%), which is characteristic of perceptual hearing loss. Ear murmur prevails in patients with ASHL. The following features were revealed depending on the etiological factor. With allergic etiology, 22 (26.8%) of 31 patients had a low-frequency nature of subjective noise, the intensity of which ranged from



10 to 50 dB, which is not typical for other forms of sensorineural hearing loss.

Results

Subjective tinnitus is a common symptom that occurs with damage to the organ of hearing, both with conductive and perceptual hearing loss. In this regard, on the basis of the nature of subjective noise, it is possible to draw certain diagnostic conclusions, while spectral noise measurement,

which was developed by N.V. Timofeev, B.V. Tolokonnikov, K.P. Pokryapova, A.N. Lopotko, I.B. Soldatov.

We used audiometric studies of subjective ear noise and determined its frequency response and intensity in 82 patients with ASHL and TSA of various etiologies. Of 82, 67 (81.7%) patients had subjective noise. The results of studies of subjective ear noise in patients with ASHL and SSSL are presented in Table 1.

Table 1. Results of studies of subjective ear noise in patients with acute and sudden sensorineural hearing loss

№	Form ASHL and SSSL	Subjective noise frequency (Hz)								Intensity sub. noise (dB)		Number of patients from sub. Noise	Total
		125	250	500	1000	2000	4000	8000	Белый шум	10-20	21-50 и более		
1.	Infection	1	1		2	1	3	13	3	1	23	24	29
	a) ASHL	1	1	-	1	1	1	6	2	-	13	13	17
	б) SSSL	-	-		1	-	2	7	1	1	10	11	12
2.	Vascular	1	-	1	1	1	1	5	3	2	11	13	18
	a) ASHL	-	-		-	1		1	1	0	3	3	4
	б) SSSL	1		1	1	-	1	4	2	2	8	10	14
3.	Allergic ASHL	2	1			1	2	3	8	3	14	17	17
4.	Ototoxic ASHL		-	-	1	-	1	-	1	1	2	3	8
5.	Trauma ASHL	-	-	-	1	-	1	3	2	-	7	7	7
6.	On the ground												
	osteocondrosis of the cervical spine				-	-	-	2	1		3	3	3
	Spine (SSHL)												
	Total:	4	2	1	5	3	8	26	18	7	60	67	82
		5,9 %	2,9%	1,4%	7,4%	4,4%	11,9 %	38,8 %	26,8%	10,5%	89,5%	81,7%	100%

The table shows that out of 82 patients, 67 (81.7%) had subjective ear murmur, of which 43 (64.1%) persons with ASHL and 24 (35.8%) persons with SSSL. In the study of the frequency characteristics of subjective noise, we found the following: of 67 patients, 42 (62.6%) had mid-frequency and high-frequency noise, with ASHL in 24 (57.1%), and with VCT - in 18 (42.9%) , which is typical for perceptual hearing loss. Tinnitus is more prevalent in patients with ASHL. The following features were revealed depending on the etiological factor. With allergic etiology, 3 (17.6%) of 17 patients had a low-frequency nature of subjective noise, the intensity of which ranged from 10 to 50 dB, which is not typical for other forms of sensorineural hearing loss.

Thus, the results of studies of subjective ear noise in patients with ASHL and VCT of various etiologies

showed that in the majority of 42 (62.6) patients, subjective noise has a high-frequency nature, which indicates a lesion of the cochlear receptor.

Most of the patients we observed with acute and sudden sensorineural hearing loss and deafness suffered from pronounced hearing loss.

Of the 82 examined patients, 54 (65.8%) had ASHL and 28 (34.2%) had SSSL, of which 30 patients did not perceive whisper speech (ASHL - 16 (53.3%), ASHL - 14 (46,7%), within the range from 0.5 to 2 m - 12 people (7 with ASHL and 5 with SSSL), from 3 to 6 m - 40 people (ASHL 30 and 10 SSSL).

Spoken language was not perceived by 8 people, 3 of them with sudden sensorineural hearing loss, perceived it within 0.5-2 m - 17 patients and from 3 to 6 m 57, of which 20 patients - VT. All this can be seen from the data presented in table 2.



Table 2. Perception of whispering and colloquial speech by patients with acute and sudden sensorineural hearing loss of various etiologies

№	Acute and sudden forms sensorineural hearing loss	Whispering speech perception (vm)				Colloquial speech perception (vm)				Total
		Do not accept	0,5	1-2	3-6	Do not accept	0,5	1-2	3-6	
	Infection	8	1	3	17	1	1	3	24	29(34,8%)
1.	a) ASHL	2	1	1	13	-	1	1	15	17(60,4%)
	б) SSHL	6	-	2	4	1	-	2	9	12(39,6%)
	Vascular	10	1	1	6	3	2	4	9	18(22%)
2.	a) ASHL	3	-	-	1	1	1	1	1	4(24%)
	б) SSHL	7	1	1	5	2	1	3	8	14(76%)
3.	Allergic ASHL	6	-	2	9	1	1	3	12	17(20,8%)
4.	Ototoxic ASHL	3	1	-	4	2	-	2	4	8(10%)
5.	Trauma ASHL	2	-	2	3	1	-	1	5	7(8%)
6.	On the basis of osteochondrosis of the cervical spine SSHL	1	1	-	1	-	-	-	3	3(4%)
	Total	30	4	8	40	8	4	13	57	82(100%)

As evidenced by our data, studies of whispering and colloquial speech hearing have a certain diagnostic value in the preliminary diagnosis of various forms of ASHL and SSHL. With this simplest definition of the hearing level in the examined patients, we were able to identify the following features:

First, in case of hearing impairment due to allergies, the difference in the perception of whispering and speaking, as a rule, was significantly less than in hearing loss due to ASHL of a different etiology.

Secondly, when a healthy ear was muffled with a Barani ratchet in patients with ASHL of allergic etiology, in contrast to other forms of ASHL, speech intelligibility changed little.

The data characterizing the configuration of the audiometric curves, the average value of the hearing threshold for air and bone conduction at speech frequencies of 500, 1000, 2000 and 4000 Hz, the value of the interval between the air and bone conduction curves for various forms of ASHL and BST are given in Table 3.

From the data given in the table it follows that with acute and sudden sensorineural hearing loss of

various etiology in 62 patients, the configurations of the audiometric curves are horizontally descending. Of the 62 with SSHL - 19, and 43 with ASHL. Such curve configurations, in particular, were observed in the infectious form in 25 out of 29 patients, in the vascular form - 11 out of 18, with the medication - 6 out of 8, with the traumatic - 6 out of 7, with hearing loss due to osteochondrosis of the cervical spine - in 2 of the 3, and with ASHL of allergic etiology - 13 out of 17 patients.

Thus, comparing the data of tone-threshold audiometry in patients with ASHL and SSHL of different etiology, the following was established: the configurations of the audiogram curves resemble all signs of sensorineural hearing loss, that is, descending, horizontal and horizontal descending with the absence of an air-bone gap. As for patients with ASHL of allergic, traumatic (mine-explosive) and infectious etiology, their characteristic feature is the presence of a bone-air gap.

Table 3. Data from a study of hearing tonal threshold audiometry in patients with acute and sudden hearing loss

№	Form ASHL and SSHL	Total	Audiometric curve type				The average value of the auditory thresholds at 4 speech frequencies in air conducting sound, in dB.							
			Rising	Descending	Horizontal	Horizontal descending	До 20	21-30	31-40	41-50	51-60	61-70	71-80	81 and more
1.	Infection	29(34,8)	-	1	3	25	-	12	4	6	1	3	1	2
	a) ASHL	17(60,4)	-	1	1	15	-	9	3	4	-	-	-	1
	б) SSHL	12(39,6)	-	-	2	10	-	3	1	2	1	3	1	1
2.	Vascular	18(22%)	-	-	7	11	-	2	4	3	4	2	1	2
	a) ASHL	4(24%)	-	-	1	3	-	1	1	1	1	-	-	-
	б) SSHL	14(76%)	-	-	7	7	-	1	3	2	3	2	1	2
3.	Allergic ASHL	17(20,8)	-	1	3	13	-	3	2	5	4	2	1	-
4.	Ototoxic ASHL	8(10%)	-	1	1	6	-	1	4	2	-	-	1	-
5.	Traumatic ASHL	7(8%)	-	1	-	6	-	3	1	2	1	-	-	-
6.	On the ground osteochondrosis of the cervical department. spine (SSHL)	3(4%)	-	1	-	2	-	1	1	1	-	-	-	-
	Total:	82(100%)	-	5 (6 %)	14 (18,4 %)	62 (75,6 %)	-	22	16	19	10	7	4	4



Audiometric studies of 8 persons with ASHL on the basis of ototoxic antibiotics showed that in 6 persons (75%) the audiogram curve had a horizontal descending character and in 1 (12.5%) it was horizontal and in 1 (12.5%) it was horizontal. descending type with no bone-air gap.

Carrying out tone-threshold audiometry, as the main method of studying the state of hearing, it should be noted that the thresholds of hearing cannot fully characterize the auditory function, since auditory communication between people is carried out at suprathreshold levels of intensity.

Along with tone-threshold audiometry, in 67 patients with ASHL and IAT, suprathreshold audiometry was performed in the form of determining the differential threshold of perception of sound strength according to Lushcher and determination of the index of small increments of sound intensity "SI-SI" (or "IMPI") test at frequencies of 500, 1000, 2000, 4000 Hz. The

magnitude of the differential threshold for the perception of the strength of sound was judged on the presence and severity of the phenomenon of accelerated increase in loudness (FUNG) in the examined patients. The results of these studies are presented in table 4.

As follows from the data given in the table, FUNG is mainly characteristic of patients with VT and ASHL of infectious, vascular, drug and traumatic hearing loss due to osteochondrosis of the cervical spine. In patients with ASHL of allergic etiology, in contrast to other forms, 13 (76.5%) of 17 patients had a negative FUNG and only 3 (17.6%) had a weakly positive FUNG and 1 (5.9%) patients had FUNG. positive.

Thus, with ASHL and VT of non-allergic etiology, 51 (76.1%) of 67 patients and 16 (23.9%) patients suffering from ASHL of an allergic nature, mainly had positive and weakly positive FUNG, regardless of bone hearing loss conductivity.

Table 4. The severity of the phenomenon of the acceleration of the increase in loudness according to the indications of the differentiated thresholds of the perception of the strength of sound in patients with various forms of ASHL and SSSL

№	Forms ASHL and SSSL	The severity of the phenomenon				Total patients
		Negative	Weakly positive	Positive	Strongly positive	
1.	Infection	1	1	6	14	22
	a) ASHL	1	1	4	8	14
	б) SSSL			2	6	8
2.	Vascular		2	5	7	14
	a) ASHL		2	4	3	9
	б) SSSL			1	4	5
3.	Allergic ASHL	12	3	1	-	16
4.	Ototoxic ASHL			7	1	8
5.	Traumatic ASHL	-	1	1	2	4
6.	On the ground osteochondrosis of the cervical spine	-	-	2	1	3
	Total:	13 19,4%	7 10,5%	22 32,8%	25 37,3%	67 100%

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To clarify the audiological characteristics of patients with ASHL and SSSL, we conducted a study of resistance to white noise in all 82 patients in terms of the threshold of auditory discomfort. The results of the studies carried out are shown in table 5.7.

It follows from the table that in 58 of 82 patients with ASHL and SSSL, the tolerance of filtered 1/3 ASHLave noise was reduced to one degree or

another: at a noise intensity of 70-80 dB in 37 patients (63.8%) (with SSSL - 28, with ASHL - 9), unpleasant sensations arose. By itself, this fact is undoubtedly diagnostic interest, since impaired tolerance of 1/3 ASHLave noise is characteristic of sudden sensorineural hearing loss. This indicator is not typical for ASHL (including those with allergic etiology), in which there is generally good tolerance of 1/3 ASHLave noise.



Table 5. Thresholds of auditory discomfort in patients with various forms of acute and sudden sensorineural hearing loss

№	The form of acute and sudden neurosensory deafness	General number of patients	The total number of examinations. Patients	Hearing discomfort threshold, in dB				
				40-50	51-60	61-70	71-80	81-90
1.	Infection	29	18				13	5
	a) ASHL	17	7	—	—	—	2	5
	б) SSHL	12	11				11	0
2.	Vascular	18	18				15	3
	a) ASHL	4	4	—	—	—	1	3
	б) SSHL	14	14				14	0
3.	Allergic ASHL	17	10	—	—	—	1	9
4.	Ototoxic ASHL	8	5	—	—	—	3	2
5.	Traumatic ASHL	7	4	—	—	—	2	2
6.	Hearing loss due to osteochondrosis of the cervical spine	3	3	—	—	—	3	0
Total:		82 (100%)	58 (70,7%)	(0%)	(0%)	(0%)	37(63,8%)	21 (36,2%)

Speech audiometry is of great importance for judging the functional state of the sound-perceiving apparatus of the inner ear. Studies have shown that of 82 examined, 48 (58.5%) patients lacked 100% speech intelligibility, while 34 (41.6%) patients had 100% speech intelligibility. Specific data characterizing the intelligibility of speech in patients with ASHL and SSHL of various etiologies are presented in Table 6.

As follows from the above table, of 29 patients with infectious etiology, 16 (55.1%) had 100% speech intelligibility, and the remaining 13 (44%) patients retained 100% speech intelligibility, however, the speech intelligibility curve in all patients in this group had gentle character. In 16 (55.1%) of 29 patients with speech intensity up to 110 dB, there was a lack of 100% speech intelligibility.

Speech audiometry, performed in 18 patients with vascular etiology, revealed the absence of 100%

speech intelligibility in 17 (94%) people, with medication - in 5 (62.5%) of 8, with traumatic - in 5 (71.4%) of 7 and with hearing loss due to osteochondrosis of the cervical spine - in 2 (66%) of 3 patients.

Speech audiometry in 17 patients with ASHL of allergic etiology, revealed the absence of 100% speech intelligibility in only 3 patients (18%). 14 people had 100% speech intelligibility, which is 82%. It should be noted that the increase in speech intensity in this group of patients up to 110 dB, in contrast to other forms of ASHL, does not lead to a deterioration in speech intelligibility (Table 5.8).

Thus, in the majority of patients with 14 (82%) acute sensorineural hearing loss of an allergic nature, speech intelligibility does not undergo such impairments that would indicate a deep damage to the sound-receiving apparatus.

Table 6. Speech audiometry data in patients with acute and sudden sensorineural hearing loss of various etiology

№	Forms of acute sudden sensorineural hearing loss	Speech intelligibility in %					No 100%	Speech intelligibility when intensity 110 dB		Total number
		Speech perception threshold	20	50	80	100		No 100 %	100 %	
1.	Infectious	29	29	29	29	13	16	16	13	29
	a) ASHL	19	19	19	29	13	6	6	13	19
	b) stand	10	10	10	0	0	10	10	0	10
2.	Vascular	18	18	18	18	1	17	17	1	18
	a) ASHL	4	4	4	4	1	3	3	1	4
	b) stand	14	14	14	14	0	14	14	0	14
3.	Allergic ASHL	17	17	17	17	17	3	3	14	17
4.	Ototoxic ASHL	8	8	8	8	3	5	5	3	8
5.	Traumatic ASHL	7	7	7	7	2	5	5	2	7
6.	Hearing loss due to osteochondrosis of the cervical spine.	3	3	3	3	3	2	1	2	3
Total:		82 (100 %)	82 (100 %)	82 (100 %)	82 (100 %)	34 (41,6%)	48 (58, 5 %)	48(58,5 %)	34 (41,5%)	82 (100%)



Thus, our observations show that in the majority of patients 48 (58.5%) of 82 examined persons with ASHL and SSHL of infectious, vascular, drug, traumatic etiology and hearing loss due to osteochondrosis of the cervical spine, there is a lack of 100% speech intelligibility at the threshold and suprathreshold intensity of speech audiometry. In patients with ASHL and SSHL, there was no particular difference. At the same time, in 14 (82%) of the majority of individuals with ASHL of an allergic nature, compared with ASHL of a different etiology, 100% speech intelligibility is determined and the nature of the curve configuration in these patients corresponds to impairments of the sound-conducting system. This indicates that in ASHL of an allergic nature, the function of the cochlear receptor is preserved in most patients.

Determination of the lower limit of the perceived frequencies is a relatively simple, reliable method in the differential diagnosis of perceptual and conductive hearing loss.

We have determined the lower limit of the perceived frequencies by the method of B.M. Sagalovich (1965) in 82 patients with various forms of acute and sudden sensorineural hearing loss. The results of this survey are presented in Table 7.

The table shows that the lower limit of the perceived frequencies in patients with sudden hearing loss is significantly lower than in patients with acute sensorineural hearing loss, in particular, patients with ASHL of allergic etiology.

From the above table it can be seen that out of 17 patients with ASHL of infectious genesis in 13 (82.4%) people the lower limit of the perceived frequencies was within 16-20 Hz; in 4 (23.5%) patients - 20-30 Hz, and out of 11 in 6 (54.5%) patients with VT - within 16-20 Hz, in 0 (0%) - 20-30 Hz, in 5 (45.5%) patients - 30-100 Hz, and only 2 patients did not have the perception of low tones.

Table 7. The lower limit of the perceived sound frequencies in patients with various forms of acute and sudden sensorineural hearing loss of various etiologies

№	Acute and sudden sensorineural hearing loss	Total number patients	Lower limit, Hz											No perception
			16	18	20	21-25	26-30	31-40	41-50	51-60	61-70	71-80	81-100	
1.	Infection	29	10	4	4	3	2	1	1	1	0	1	1	1
	a) ASHL	17	6	3	4	3	1							
	б) SSHL	12	4	1	0	0	1	1	1	1	0	1	1	1
2.	Vascular	18	9	1	1	1	1	1	0	1	1	0	1	1
	a) ASHL	4	1	1	0	0	0	1						1
	б) SSHL	14	8	0	1	1	1	0	0	1	1	0	1	0
3.	Allergic ASHL	17	3	-	-	-	-	6	7	1	-	-	-	0
4.	Ototoxic ASHL	8	1	2	2	-	-	-	-	3	-	-	-	-
5.	Traumatic ASHL	7	2	1	-	-	-	-	1	2	-	-	-	1
6.	Hearing loss due to osteochondrosis of the cervical spine.	4	-	-	-	-	-	1	-	1	-	-	1	1
7.	Total:	82	25	8	7	4	2	9	9	9	1	1	3	4

With a vascular form (18 patients), in 10 out of 14 with sudden hearing loss, the hearing limit was within the range of 16-30 Hz, in 4 within the range of 30-100 Hz. In 4 patients with ASHL of vascular etiology in 2 - 16-30 Hz, in 1 - 30-40 Hz, and 1 patient did not perceive the lower limit of the perceived frequencies.

With the ASHL of the drug form in 3 out of 8 patients, the lower limit of hearing was in the range of 16-20 Hz, in 3 - 20-60 Hz.

In 3 out of 7 ASHL patients, the lower limit of hearing was within the range of 16-20 Hz due to

the previous trauma, in 3 patients from 30 to 60 Hz, and in 1 patients the lower frequencies were not perceived, which mainly concerned patients with a high degree of unilateral hearing loss.

Out of 4 patients with hearing loss due to osteochondrosis of the cervical spine, in 3 patients the lower limit of hearing was within 30-100 Hz, in 1 it was not perceived. In 2 out of 3 patients with SSHL, unilateral hearing loss was observed, and only in 1 - bilateral.

It should be especially noted the results of the study of the lower limit of hearing in patients with



acute sensorineural hearing loss of an allergic nature.

As shown by the results of our studies, these patients had an increased threshold for perception of low tones compared to other forms of sensorineural hearing loss. In particular, out of 17 examined patients with ASHL of allergic etiology, 6 had the lower limit of perceived frequencies in the range from 30 to 40 Hz, 6 - 16-20 Hz, 8 - 40-60 Hz, and 0 - the lower limit of perceived frequencies was not at all. was determined.

Thus, when determining the lower limit of the spectrum of perceived frequencies in patients suffering from acute and sudden sensorineural hearing loss of various etiologies, it should be noted that in most patients the lower limit of hearing was in the range of 16-20 Hz, which indicates damage to the sound-receiving system, and in the allergic form In acute sensorineural hearing loss, the lower limit of hearing ranged from 20 to 60 Hz, that is, an increase in the lower limits of hearing was observed, which confirms the presence of a conductive component of the hearing loss.

The use of this method in clinical audiology is of particular importance in acute lesions of the auditory analyzer, if it is impossible to determine with sufficient accuracy the sensitivity of the ear to ultrasound due to the possibility of bone rehearing. This situation occurs mainly with unilateral hearing loss, or when there is a significant difference in the degree of hearing loss in the left and right ear.

Thus, the study of hearing with low-frequency tones, along with other audiological tests, is of great diagnostic value in the study of unilateral hearing loss, especially in conditions of bone ultrasound hearing.

Along with subjective audiological tests, we used objective audiometry, tympanogram recording, and acoustic reflex recording.

We performed objective audiometry (impedance measurement) in 42 patients with ASHL and SSSL out of 82, which is 51.2%. The results of tympanometry in 42 patients with ASHL and SSSL of various etiology showed that in 29 (69,%) patients, a tympanogram of type "A", that is, a normal type of tympanogram, was recorded, in 8 (19%) patients a tympanogram of type "B" was obtained, which indicated about the limitation of the mobility of the tympanic membrane, due to tubular dysfunction or the presence of exudate in the tympanic cavity, and only 5 (11.9%) patients had a type C tympanogram, which indicated negative pressure in the tympanic cavity. Among the surveyed persons, 2 (25%) obtained a type "B" tympanogram curve, which occurs in patients with ASHL of allergic etiology. The results of reflexometry in the same patients showed that in 2 patients there was no acoustic reflex both during contralateral and ipsilateral stimulation of sound, including with ASHL of allergic etiology, it was observed in 2 persons and in 15 patients an acoustic reflex was recorded.

Table 8. Results of impedance measurements in patients with various forms of acute and sudden sensorineural hearing loss

№	Form ASHL and SSSL	Tympanogram type			Acoustic reflex			FUNG availability	Total number patient	Total number of examinations other patients	
		«A»	«B»	«C»	Missing	There is	FUNG availability				
							pos.				negative
1.	Infection	2	3	1	2	4	4	2	29	6	
	a) ASHL	1	2	1	1	3	3	1	17	4	
	б) SSSL	1	1	0	1	1	1	1	12	2	
2.	Vascular	6	1	0	3	4	4	3	18	7	
	a) ASHL	2	1	0	2	1	1	2	4	3	
	б) SSSL	4	0	0	1	3	3	1	14	4	
3.	Allergic ASHL	14	2	1	2	15	14	3	17	17	
4.	Ototoxic ASHL	2	1	2	2	3	3	2	8	5	
5.	Traumatic ASHL	2	1	1	2	2	2	2	7	4	
6.	Hearing loss due to osteochondrosis of the cervical spine SSSL	3	0	0	0	3	3	0	4	3	
	Total:	29	8	5	11	31	30	12	82	42	
		(69%)	(19%)	(11,9%)	(26,1%)	(73,8%)	(71,4%)	(28,5%)	(100%)	(51,2%)	

Thus, a number of features were identified, that is, a deviation from the norms, a tympanogram curve of type "B" and the absence of an acoustic reflex in 2 (25.6%) patients with ASHL of allergic etiology, which is uncharacteristic in other forms of

seisoevral hearing loss. However, the antiallergic therapy carried out in these persons gave positive results: hearing improved, the type "A" tympanogram curve normalized, and an acoustic reflex was recorded.



We see the explanation of the obtained facts in the violation of intracoustic conduction and, possibly, functional changes in the receptor. An allergic factor can contribute to this: since the first studies of A.D. Ado and his colleagues talked about allergy as an irritant of the nervous system, it is considered to be the possibility of their active influence on receptor formations (vascular, respiratory receptors, etc.), then this direction was developed in otorhinolaryngology. Science currently has extensive data on shifts in the function of the auditory receptor, not to mention other formations of the inner ear, under conditions of allergization of the body, which were obtained both experimentally and partly confirmed by clinical observations. The disappearances of the intra-aural acoustic reflex discovered by us in such conditions confirm the data on this issue.

Discussion

The scientific work is devoted to the study of audiological indicators, as well as the role of allergy in the development of ASHL. Until now, acute and sudden sensorineural hearing loss have been combined into a single concept: acute cochlear neuritis, sudden hearing loss, sudden deafness, acute sensorineural hearing loss. As for their division into acute and sudden sensorineural hearing loss, depending on the time of onset and etiological factors, such studies have practically not been carried out.

Meanwhile, each of them is of significant interest both in scientific and, directly, in practical terms. At the same time, clarification of a number of general questions is required. In the domestic and foreign literature, these issues are insufficiently covered in methodological and factual terms.

Since the cochlear and vestibular analyzers are closely related, and with ASHL, profound changes occur in the inner ear, therefore, its timely and comprehensive examination plays an important role at the present stage for the early diagnosis of pathological conditions. In the ENT department (TMA multidisciplinary clinic), we conducted clinical and audiological studies of 24 patients with ASHL of various etiology.

In addition to the generally accepted research methods, we used tonal threshold audiometry in the assessment of auditory function, determination of subjective ear noise in frequency and intensity, Weber's audiometric test was determined at frequencies of 125, 250, 500, 1000 Hz, suprathreshold audiometry was performed in the

form of determining the volume balance according to Fowler (with unilateral hearing loss) and determination of the differential threshold of perception of sound strength according to Luscher, determination of the index of small increments of sound intensity - SI-SI (or "IMPI"), and also determined the threshold of auditory discomfort when exposed to a third of an ASHLave filtered noise with a fundamental frequency of 250 - 8000 Hz ...

For the differential diagnosis of various forms of acute and sudden sensorineural hearing loss, objective audiometry was performed (dynamic impedance measurement in the form of registration of an intra-ear acoustic reflex and tympanometry according to the generally accepted method).

The characterization of auditory function in acute sensorineural hearing loss of an allergic nature seems to be more complicated than in other forms of sensorineural hearing loss, since the audiological and vestibulological diagnosis of acute sensorineural hearing loss, as well as the clinical characteristics of this disease, have not yet been described. It is quite obvious that etiologically different forms of acute sensorineural hearing loss should also have different audiological characteristics. Revealing the features inherent in this respect to each form of acute and sudden sensorineural hearing loss has not only scientific, but also directly practical significance.

A study of the distribution of patients by sex revealed a high prevalence of acute and sudden sensorineural hearing loss among 14 men (60%).

The distribution of patients by age showed that the prevalence of the disease reaches its maximum value in the young, most able-bodied age of 5-50 years - 22 (75.8%).

Depending on the time of the onset of hearing loss, we divided the patients into two groups: the first group included patients whose hearing loss came on suddenly from several hours to one day or within 24 hours. They were referred to which the hearing loss occurred within one day to one month. They were classified as patients with acute sensorineural hearing loss (ASHL).

Analysis of the anamnestic data showed that the majority of patients indicated a possible etiological factor for the occurrence of ASHL and SSHL. ASHL included the following: 1) infectious - 29 (35.4%); 2) vascular - 18 (21.9%); 3) allergic - 17 (20.7%); 4) medication - 8 (9.7%); 5) traumatic - 7 (8.5%); 6) hearing loss due to osteochondrosis of the cervical spine - 3 (3.8%).

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The duration of the disease in the examined patients varied from several hours to one month, and the majority of patients were admitted to the hospital within two weeks from the onset of hearing loss - 16 (40%).

The objective picture of ENT organs in most patients with acute sensorineural hearing loss of an allergic nature was characterized by pathological changes in the nasal mucosa, which is not typical for acute sensorineural hearing loss of a different etiology.

The otomicroscopic picture was within normal limits, except for patients with ASHL of an infectious and traumatic etiology of the disease: in infectious pathology upon admission of patients to the hospital, hyperemia and edema of the nasal mucosa and tympanic membrane were revealed, as well as in most patients - a violation of the tubular function, manifested by retraction tympanic membrane, lack of light reflex. As for the ASHL of traumatic etiology, all patients with mine-blast injuries showed different degrees of damage to the tympanic membrane.

Thorough audiological examination made it possible to characterize the audiometric curves, to establish a definite relationship with different configurations of the audiogram curves with the size of the bone-air interval of the audiogram. But the most significant of the data obtained is the fact that both the level of hearing loss during bone conduction of sounds and the size of the bone-air interval cannot in some cases serve as a reliable criterion for differentiating hearing loss due to allergy with other forms of acute sensorineural hearing loss.

When performing tonal threshold audiometry, unilateral hearing loss was revealed in most patients with ASHL. In patients with acute sensorineural hearing loss of allergic and non-allergic etiology, the threshold curves of the tonal audiogram indicated signs of sensorineural hearing loss, that is, the configuration of the curves was descending, horizontally descending and horizontal with the presence of a bone-air gap. Consequently, a characteristic feature of tonal threshold audiometry in acute sensorineural hearing loss of an allergic nature, in contrast to other forms, is the presence of a bone-air interval, which does not depend on the duration of the disease. As for the tuning fork tests, they gave not entirely clear results. So, the Rinne test often falls out negative, and this fits into the idea of its dependence on the

size of the bone-air interval and the level of hearing during bone conduction of sound.

Weber's audiometric test in patients with acute sensorineural hearing loss of an allergic nature is characterized by the lateralization of tones in the worse hearing ear, in contrast to other forms of sensorineural hearing loss.

Determination of the phenomenon of acceleration of the increase in loudness by the indicator of the differential threshold of perception of the strength of sound can provide information about the state of the cochlear receptor apparatus, but the method itself is not very reliable in order to rely on it with sufficient reason in diagnostic practice. In a number of cases, discrepancies arise between the data of threshold and suprathreshold tests, the explanation of which in the light of modern concepts is rather difficult to find.

In general, the negative and weakly positive phenomenon of accelerated increase in loudness (LUD) is observed in patients with acute sensorineural hearing loss of an allergic nature, infectious etiology (colds), and in some types of ASHL of traumatic etiology (mine explosive injuries), in which the threshold curves of the audiogram do not depend on the degree of bone conduction hearing loss. However, the absence of FUNG is often observed in patients in whom, according to other acumetric and audiometric data, it is possible to assume that the receptors are damaged. In some patients with a positive FUNG-ohm, on the contrary, other audiometric and acumetric data do not confirm the defeat of the sound-perceiving elements of the cochlea. As for patients with TSI of infectious, vascular etiology and due to osteochondrosis of the cervical spine, they have a positive or sharply positive phenomenon of increasing loudness in terms of the differential threshold of sound power perception and the SI-SI test, which indicates the presence of a lesion in the sound-receiving apparatus. In patients with ASHL, these indicators were mild, (weakly positive) or (in a small number of patients) - positive.

The study of the threshold of auditory discomfort in terms of the tolerance of one-third ASHLave filtered noise showed that there is a significant percentage of impairments to its tolerance in patients with evidence of sound-perceiving hearing loss. This indicator is not typical for acute sensorineural hearing loss (ASHL), in which there is generally good tolerance of one-third ASHLave filtered noise.



Among the examined 82 patients with different forms of ASHL, speech intelligibility impairment was observed in 48 (58.5%) individuals, of whom 34 (41.5%) patients with ASHL, 100% speech intelligibility was observed in 34 (41.6%) of 82 patients (34 (100%) patients with ASHL and only 2 (0%) patients with TCT). It should be especially noted that an increase in speech intensity up to 110 dB in patients with acute sensorineural hearing loss of allergic, infectious and traumatic etiology, unlike other forms, does not lead to a deterioration in speech intelligibility. At the same time, in the non-allergic form of acute sensorineural hearing loss, the speech intelligibility curves have a flat configuration and do not reach 100% intelligibility. Consequently, the results of speech audiometry showed that impaired speech intelligibility was observed in the majority of patients with SSSL, which indicated damage to the sound-receiving apparatus of the inner ear.

In order to clarify the nature of auditory disorders in 24 patients with acute and sudden sensorineural hearing loss, we determined the sound sensitivity to ultrasound according to B.M. Sagalovich. Particular attention is drawn to the results of determining the auditory sensitivity to ultrasound in patients with sudden sensorineural hearing loss. In contrast to acute sensorineural hearing loss, where there is an increase in the threshold of ultrasound perception from 10 to 30 volts, with ASHL of infectious, vascular, allergic, traumatic and drug etiology, normal perception of ultrasound or its slight increase from 3 to 10 volts is characteristic.

We studied the phenomenon of lateralization of ultrasound in comparison with the lateralization of tones of the audible spectrum with different configurations of curves of tonal audiograms in all patients with acute and sudden sensorineural hearing loss.

When determining the lateralization of ultrasound in patients with ASHL, the majority of patients showed lateralization in the worse hearing ear. This was more common in patients with sudden sensorineural hearing loss of infectious, vascular etiology and hearing loss due to osteochondrosis of the cervical spine.

Of no small importance in establishing audiological criteria for acute and sudden sensorineural hearing loss is the study of the lower boundary of the perceived frequencies. This study is of particular importance in patients with unilateral or bilateral (with a significant difference in the degree of

hearing loss in the left and right ear), when conditions arise for rehearing ultrasound with a better hearing ear. Studies have shown that in most patients with ASHL, this border was shifted to the right up to 50 Hz, which confirmed the presence of conductive hearing loss.

Along with subjective audiological tests, we used objective audiometry, tympanogram recording, and acoustic reflex recording.

We performed objective audiometry (impedance measurement) in 42 patients with ASHL out of 82, which is 51.2%. The results of tympanometry in 42 patients with ASHL of various etiology showed that in 29 (72.5%) patients a tympanogram of type "A" was recorded, that is, a normal type of tympanogram, in 8 (19%) patients a tympanogram of type "B" was obtained, which indicated limitation of the mobility of the tympanic membrane, due to tubular dysfunction or the absence of exudate in the tympanic cavity, and only 5 (11.9%) patients had a type C tympanogram, which indicated negative pressure in the tympanic cavity. Among the examined persons, 2 (25%) obtained a tympanogram curve of type "B", which falls on patients with ASHL of allergic etiology, and the results of reflexometry in these patients with ONT and VNT of various etiology showed that 31 (73.8%) had acoustic reflex both with contralateral and ipsilateral sound stimulation, in 11 (26.1%) patients the acoustic reflex was absent, including in 2 (28.6%) patients with ASHL of allergic etiology.

Thus, a number of features were identified, that is, a deviation from the norms, a tympanogram curve of type "B" and the absence of an acoustic reflex in patients with ASHL of allergic etiology, which is uncharacteristic in other forms of sensorineural hearing loss. However, the antiallergic therapy carried out in these persons gave positive results: hearing improved, the type "A" tympanogram curve normalized, and an acoustic reflex was recorded.

Thus, in conclusion, let us state the conviction that acute and sudden sensorineural hearing loss are independent nosological forms of cochlear analyzer pathology and, depending on the etiopathogenesis, have their own clinical course, presenting an important problem of modern clinical audiology that has great prospects for further study.

Conclusion

According to the clinical course and rate of development, sudden sensorineural hearing loss (developing up to 24 hours) and acute sensorineural hearing loss (developing within one



to 30 days) should be distinguished. Acute sensorineural hearing loss most often develops against the background of vascular pathology as a result of hemodynamic disturbances in the vertebrobasilar basin (arterial spasm, vasodilation, venous congestion, atherosclerotic changes in the vascular wall, B-shaped deformity or tortuosity of the vertebral arteries), as well as a result of viral infection and in individuals with a burdened allergic history. Acute sensorineural hearing loss is bilateral in 92% of cases and is characterized by a gradual hearing loss, and in 78.7% - by the presence of a positive phenomenon of an accelerated increase in loudness. Acute sensorineural hearing loss can develop in people with a history of allergy. It is accompanied by autophony, subjective ear noise of varying intensity, head and ear pains, and impaired vestibular function (in 52% of patients). Acute and sudden sensorineural hearing loss of allergic etiology is characterized by a number of audiological signs (descending configuration of audiological curves with no bone-air gap, slightly increased auditory sensitivity to ultrasound; 100% speech intelligibility), indicating a combination of disturbances in sound conduction in the inner ear with functional shifts in the cochlear receptor ... In acute hearing loss arising from allergies, 11.2% of patients have a type B tympanogram due to the concomitant presence of exudate in the tympanic cavity, the absence of an acoustic reflex and the appearance of an air-bone gap.

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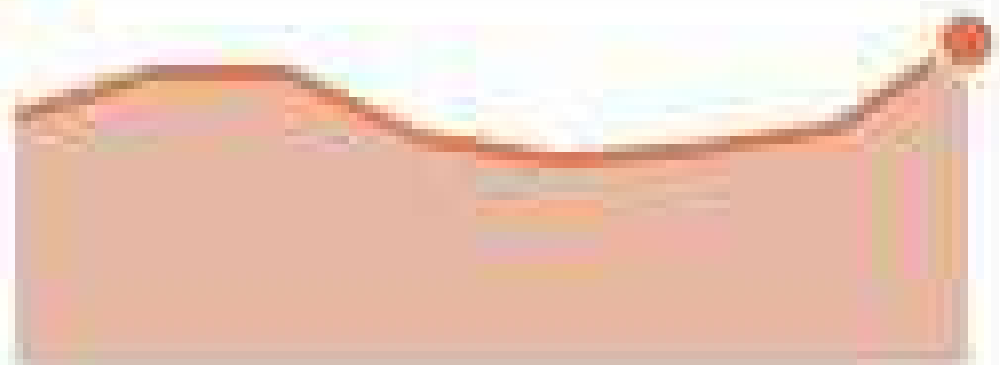
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