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EVALUATION OF THE EFFECTIVENESS OF THE USE OF STEROID MEDICINES IN SUDDEN SENSORINEURAL HEARING LOSS

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Key words: Sudden sensorineural hearing loss, intratympanic injection, dexamethasone, radio wave

Abstract

According to epidemiological data, approximately 6% of the world's population suffers from a decrease or loss of hearing. According to the World Health Organization, 360 million people worldwide suffer from various degrees of hearing loss. In Russia, this figure was 13 million. The percentage of sensorineural hearing loss is 74%, and at the same time, the number of patients with this pathology is constantly increasing. Sudden sensorineural hearing loss (SSHL) is a unilateral or bilateral sensorineural hearing loss of at least 30 dB in three adjacent frequencies for 72 hours or less [9]. SSHL is a form of hearing loss up to complete deafness, characterized by damage to the sound-receiving part of the auditory analyzer. Damage can be from the receptors of the shell (organ of Corti) to the central structures of the brain. Acute sensorineural hearing loss is widespread and has a large number of etiological factors.

Introduction

Sudden sensorineural hearing loss (SSHL) is a unilateral or bilateral sensorineural hearing loss of at least 30 dB in three adjacent frequencies for 72 hours or less [1, 2]. Hearing loss is a common pathology in recent times, with an average of 5 to 20 cases per 100,000 people [1]. Sudden sensorineural hearing loss, usually occurs between 43 and 59 years of age, and is equally distributed by gender. The main symptom of SSHL is a sudden decrease in hearing. In addition, patients are bothered by tinnitus (41-90%) and dizziness (29-56%) [4, 5, 6]. Acute sensorineural deafness is widespread and has a large number of etiological factors [5-8].

1. Infectious diseases. Most often, hearing loss is observed after influenza virus, measles, as well as scarlet fever,

diphtheria and wounds.

2. Toxic effects: ototoxic drugs (aminoglycosides, diuretics, chemotherapy drugs).

3. Vascular diseases.

4. Diseases of the cervical spine, for example, spondylosis, spondylolisthesis of the cervical spine.

5. Acoustic trauma

In most cases, the cause of the development of SSHL remains unclear, in which case the hearing loss is classified as idiopathic. Currently, anti-inflammatory (corticosteroid hormones), nootropic, blood circulation improving, antibacterial treatment, hyperbaric and oxygen chambers and plasmapheresis are used for the treatment of SSHL. Steroids are the most important first-line drugs in the treatment of SSHL. In addition, corticosteroids are effective in the treatment of SSHL of various genesis due to the fact that they are anti-inflammatory and improve blood circulation in the inner ear. Unlike systemic administration of steroids, intratympanic administration bypasses the hematoperipheral barrier and ensures delivery of the drug to the entire affected area, which is associated with side effects such as gastric ulcers, adrenal insufficiency, cataracts, and hyperglycemia. significantly reduces the development of secrets. The literature describes the topical use of dexamethasone, methylprednisolone, and solumedrol in patients with OSNG. After intratympanic and intravenous administration of dexamethasone to guinea pigs, its levels in the perilymph were measured 1, 2, 4, and 6 hours later, and higher concentrations of dexamethasone were detected after intratympanic administration [6]. In guinea pigs, dexamethasone was administered intravenously and directly into the tympanic cavity, and its concentration in the perilymph was compared. It has been shown that the concentration of dexamethasone in the perilymph by topical application to the tympanic cavity is almost 3 times higher than by intravenous administration. Steroid injection directly into the tympanic cavity is considered a current treatment method and requires a lot of research.

Methods

In this study, the results of examination and treatment

of 73 patients with acute sensorineural hearing loss were analyzed. All clinical examinations, diagnostics and treatment were carried out from 2018 to 2023 on the basis of the Department of Otorhinolaryngology and Dentistry of TTA. The age of the patients is from 18 to 69 years. 38 of them are women, 35 are men. Based on treatment methods, all patients were divided into 2 groups.

Group I – Patients with acute sensorineural hearing loss (36 patients). These patients were prescribed direct intratympanic steroids and conventional systemic therapy. Patients received 4 mg intratympanic (through shunt) dexamethasone daily for 1 month. All patients in this group had shunts placed before treatment.

Group II - Patients with acute sensorineural hearing loss (37 patients) - traditional systemic therapy, including steroids, drugs which improve cerebral microcirculation, cochlear blood flow, blood rheology, nootropic drugs, vitamin therapy.

Patients were followed up for 6 months. All patients were systematically examined before treatment, 10 days, 1, 3 and 6 months after the start of therapy.

Audiological examination of patients includes hearing studies using speech and whispering, tuning fork testing, tonal threshold audiometry, and acoustic impedancemetry.

Tone threshold audiometry was performed in a specially equipped audiometric room using an AC40 apparatus (Interacustics, Denmark). Tonal threshold audiometry examined sound transmission through air at 125-8000 Hz and through bone at 250-4000 Hz. Tone threshold audiometry was performed several times (2-3 times) before treatment to determine the exact hearing threshold.

Acoustic impedance measurement was performed on an AZ26 apparatus (Interacoustics, Denmark). Only patients with type A tympanogram were included in the study.

Distribution of patients into groups according to gender, age, presence of dizziness and average values of hearing thresholds (EBO'Q) in the entire range of frequencies tested before treatment is presented in Table 1.

TABLE 1.

	Patients the number	Sex		Average age	Dizziness		Before treatment dB (M ± a)
		E	A		Yes	YNo	
Group I	36	21	16	49 (35 - 52)	6	30	41.0 ± 12.87
Group II	37	22	14	50 (30-53)	7	30	37.1 ± 16.67
Total	73	43	30	46(33 - 52)	13	60	39.1 ± 15.49

The results obtained

The effectiveness of treatment was assessed based on pre- and post-treatment hearing threshold audiometry data. Hearing assessment was performed as follows: full hearing recovery - hearing recovery within 15 dB; partial recovery of hearing - improvement of 50% or more from the initial hearing; hearing improvement – reduction of the hearing threshold by 15 dB or more. To assess hearing ability, the average threshold value was calculated at four frequencies (500, 1000, 2000, 4000 Hz).

To determine the factors affecting the effectiveness of treatment, patients were divided according to the following criteria:

1. age
2. according to the international classification of hearing loss
3. according to the time of begins of treatment,
4. according to the frequency characteristics of hearing threshold audiometry.

Outcomes of patients treated with intratympanic steroid and traditional systemic therapy.

36 patients were treated with steroids directly into the tympanic cavity and conventional systemic therapy. All patients complained of hearing loss, 24 patients complained of tinnitus, 14 patients complained of ear blockage, and 6 patients complained of dizziness. After treatment, complete recovery of hearing (CR) was observed in 22 patients, partial recovery (PR) - in 8 patients, hearing improvement (HI) - in 3 patients, unchanged hearing (UH) in 3 patients. Hearing impairment was not observed in this group (Table 2).

TABLE 2

Treatment effectiveness	Follow-up period		
	1 month	3 months	6 months
CR	9	16	22
PR	9	7	8
HI	7	9	3
UH	11	4	3
Deterioration	0	0	0
Total	36	36	36

Treatment final efficiency treatment 6 months from the start after and shunt take from being thrown after and no more curtain completely from recovery so was evaluated.

Patients were divided by age as follows: 10 patients under 35 years old, 10 patients from 36 to 50 years old, 51 and older - 16 patients. In all 10 patients under 35 years of age, hearing was completely restored.

According to the degree of hearing loss: 17 degrees of hearing loss in the patient; Level II - 14 in the patient ; Level III - 3 in the patient ; IV degree - 2 identified in the patient. Hearing was fully restored in 13 patients with I degree hearing loss, 5 patients with II degree hearing loss, 1 patient with III degree hearing loss and 2 patients with IV degree hearing loss.

According to the time of initiation of treatment, patients were divided as follows: up to 7 days - 15 patients; in 8-14 days - 13 patients; 15 or more days - 8 patients. Illness up to 7 days from the start to hear of ability completely recovery in 12 patients, from 8 to 14 days - in 6 patients, 15 and from him more than day during - in 4 patients observed.

The effect of the treatment on different frequency ranges (low, middle and high frequencies) was analyzed. The frequency range of 125, 250 Hz was taken as low frequencies; average - 500, 1000, 2000 Hz; high - 4000, 8000 Hz. Before treatment, the average hearing threshold at low frequencies was 35.1 ± 19.6 dB, after 6 months it decreased to 11.5 ± 6.2 dB ($p < 0.05$). Before treatment, the average hearing threshold in middle frequencies was 38.5 ± 16.1 dB, after 6 months they decreased to 14.9 ± 9.6 dB ($p < 0.05$). Before treatment, the average hearing threshold at high frequencies was 50.1 ± 15.0 dB, after 6 months they decreased to 23.0 ± 13.4 dB ($p < 0.05$). In this group, a decrease in hearing thresholds was observed in all frequency ranges during the entire observation period.

Results of traditional complex treatment of patients. Conventional complex treatment was performed in 37 patients. All patients complained of hearing loss, tinnitus in 22 patients, tinnitus in 10 patients, and dizziness in 7 patients. After treatment, complete recovery of hearing (CR) was observed in 7 patients, partial recovery (PR) in 4 patients, improvement (HI) in 6 patients, unchanged hearing in 19 patients (UH), deterioration of hearing in 1 patient (3 table).

ADVAL 3.

Treatment effectiveness	Follow-up period			
	10 days	1 month	3 months	6 months
CR	7	7	7	7
PR	4	4	4	4
HI	4	6	6	6
UH	20	19	19	19
Deterioration	2	1	1	1
Total	37	37	37	37

Age according to patients as follows distributed: 12 patients under 35 years old, 9 patients from 36 to 50 years old, 51 and from him older - 16 patients. Under 35 years old in 6 patients with to hear completely recovered, from 36 to 50 years old - in 1 patient, 51 years old and from him big - none in whom to hear completely not restored.

According to of hearing loss: 23 patients had I degree of hearing loss; II degree - in 9 patients; III degree - in 2 patients; IV degree - in 3 patients. Hearing was completely restored in 7 patients with hearing loss of the first degree. II, III and IV degree in groups of patients never in one to hear ability completely not restored

Treatment start on time according to patients as follows distributed: up to 7 days - 8 patients; 8-14 days - 11 patients; 15 or from him more than day in - 5 patients. Illness up to 7 days from the start to hear of ability completely recovery in 3 patients, from 8 to 14 days - in 2 patients, 15 and from him many pin days - of patients never in one completely recovery not observed.

From treatment before this in the group studied of frequencies whole in the range to hear please forgive me ' average the value is 37.1 ± 16.7 dB the organize did _ The mean hearing threshold at low frequencies before treatment was 32.9 ± 22.0 dB, after 6 months it decreased to 23.4 ± 18.6 dB ($p < 0.05$). Before treatment, the average

hearing threshold in middle frequencies was 35.2 ± 17.0 dB, after 6 months they decreased to 25.7 ± 17.2 dB ($p < 0.05$). Before treatment, the average hearing threshold at high frequencies was 44.3 ± 18.4 dB, after 6 months they decreased to 35.5 ± 20.2 dB ($p < 0.05$).

this group, the positive dynamics of treatment is observed in the first 10 days, when hearing thresholds decrease in all frequency ranges. Average values of hearing thresholds did not change during the observation period from 10 days to 6 months.

Discussion of results

During the examination, the distribution of patients according to the following characteristics: sex, age, presence of noise in the ears, dizziness, and the information obtained by us about the often one-sided course of the disease did not fundamentally differ from the literature. In our study, patients were divided by gender as follows: 48% were men, 52% were women. According to M. Nakamura et al., OSNG is equally common in men and women [10]. The average age of our patients was 43.5 - 46 years. According to many authors, the average age of patients is 45.4-49.7 years [11,15]. Dizziness, according to our data, was observed in 14 of 73 patients. According to the literature, dizziness is observed in 24-40% of cases [12, 13]. We recorded tinnitus in 48 out of 73 people. According to some authors, tinnitus occurs in 70-76% of OSNG [17, 18].

To determine the factors affecting the effectiveness of treatment, patients were divided according to the following criteria: age, level of hearing loss according to the international classification, time of treatment initiation and characteristics of hearing threshold audiometry frequencies. Despite the same effectiveness of treatment for 1 month in both groups, in the analysis of the effect of the treatment method on different frequency ranges, a higher efficiency was found when steroids were directly injected into the drum cavity compared to conventional therapy. In the group of patients who received steroids in the tympanic cavity, positive dynamics were observed during the entire period of therapy - the average value of the threshold decreased. In the second group that received the traditional complex, the dynamics were observed within 10 days after the start of treatment.

According to our data, the effectiveness of the treatment was influenced by the age of the patients and the time of initiation of treatment. At the same time, less positive changes were observed in older age groups. Also, when the treatment started for more than 7 days, a decrease in the percentage of complete recovery of hearing was found.

Conclusion

Steroid injection directly into the tympanic cavity and traditional systemic therapy for 1 month differed in effectiveness (68%) from conventional complex treatment (48%). Steroid injection directly into the drum cavity is individual for each patient. The effectiveness of treatment is affected by the age of the patient and the time of initiation of treatment. In patients older than 35 years and in patients who started treatment later than 7 days, a decrease in the percentage of complete recovery of hearing was found.

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