ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

FEATURES OF NEUROLOGICAL DISORDERS IN CHILDREN WITH CONGENITAL AND ACQUIRED SENSORINEURAL HEARING LOSS

Sh. Sh. Shamansurov, D.K. Makhkamova, I. K. Abdukadirova
Center for the Development of Professional Qualifications of Medical Workers, Department of Pediatric Neurology
Republican Specialized Scientific and Practical Medical Center for Eye Microsurgery
Tashkent, Uzbekistan

Article DOI: https://doi.org/10.36713/epra12230
DOI No: 10.36713/epra12230

ABSTRACT

Sensorineural hearing loss is currently the most important medical and social problem and is an urgent problem of neurology. According to various researchers, from 6% to 36% of the world's population suffers from ear pathology, of which 60-80% have sensorineural hearing impairment (damage to the cochleo-vestibular nerve receptor - the cochlea of the inner ear).Deafness is the most common defect in sensory systems in children and occurs in 1: 750 cases, and in adults 4-36% depending on age, which reflects the interaction of environmental factors and individual genetic predisposition (Tranebjaerg L., 2000).About 400 genetic syndromes that include hearing impairment have been described (Friedman T.V., Griffith A J., 2003).

KEY WORDS: ***sensorineural hearing loss, neurological disorders.***

Purpose: to study clinical and neurological features in patients with sensorineural hearing loss.

MATERIALS AND METHODS

105 children were examined. Of these, 67 were children with congenital NSHL and 38 were children with acquired NSHL. To characterize the state of the central nervous system, data on the neurological status of the examined patients were used. All patients underwent an extended clinical and neurological examination, SAEP, EEG, and MRI of the brain.

The subjects underwent an audiological examination by a computer audiometric method. Depending on the genesis of the development of hearing loss, the patients were divided into two groups: the 1st group - patients with NSHL that arose as a result of exposure to infectious-toxic factors in the perinatal period (congenital hearing impairment), the 2nd group - with NSHL formed as a result of exposure to exogenous environmental factors in postnatal ontogenesis, including infectious diseases transferred at an early age (acquired hearing loss).

Registration of the total bioelectrical activity of the brain (EEG) was carried out using a computer encephalograph. When examining patients, short-lateral auditory evoked potentials were recorded on a four-channel computer device "Neuro-MEP". To register SAEP, monoauricular acoustic stimulation was performed using headphones, with a rectangular tone stimulus with a frequency of 10 Hz. The stimulus intensity was selected individually based on 70 dB above the subjective threshold and ranged from 100 to 120 dB.

We analyzed the absolute latencies of peaks I, II, III, IV, V, VI, peak-to-peak intervals I-III, III-V, I-V, peak amplitudes as peak-to-peak I-Ia, III-IIIa, IIIa-IV, IV-V, V- Va, Va-VI, as well as the amplitude ratio of the peaks I-Ia/III-IIIa, I-Ia/V-Va and III-IIIa/V-Va.

RESULTS

The reason for patients to visit a specialist was complaints about the lack of speech and reaction to sounds, and violation of the stages of psychoverbal development, as a result of which sensorineural hearing loss of varying degrees and deafness were detected in these patients.

Hearing loss II degree was diagnosed in 9 (16%) of the examined, III degree - in 11 (17%), and IV degree - in 40 (67%).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

Table. 1

Pathological condition in children during the neonatal period, %

Pathological conditions	1 group, n=68	2 group, n=37
Asphyxia during childbirth	36	25*
Hyperbilirubinemia	3	72,5
Prematurity	49*	50
The use of ototoxic drugs	28	67**
Viral infections	13	37
Anemia	19	30

Note: * - p-values are < 0.05 **- p values are < 0.001

Asphyxia during childbirth among the examined groups 1 and 2 occurred in 36 and 25%, respectively, hyperbilirubinemia - in 72.5 and 3%. Ototoxic drugs were used in 67% and 28% of children, prematurity occurred in 49 and 50%.

Most children with NSHL were found to have diffuse organic neurological symptoms, as well as central insufficiency of the VII and XII pairs of cranial nerves, anisoreflexia, and revitalization of tendon reflexes.

In the examined patients, individual analysis of the parameters of the SAEP waves was carried out, provided that the intensity of the stimulating signal was counted from the hearing threshold of each patient (dB SL).

Table. 2

Latent periods of ABR waves when measuring the sound pressure value from the hearing threshold (dB SL) in persons with sensorineural hearing loss, M±m

dB	Waves SAEP		
	I	III	V
10	3,34±0,07 (80)	6,04±0,10 (80)	8,32±0,13 (80)
20	1,98±0,04 (80)	4,32±0,14 (80)**	6,26±0,13 (80)**
30	1,91±0,03(80)**	4,17±0,08 (80)**	5,96±0,09 (80)**
40	1,88±0,02 (80)**	3,94±0,06 (80)**	5,96±0,09 (80)**
50	1,85±0,03 (80)**	3,86±0,04 (80)**	5,77±0,06 (80)**
60	1,83±0,03 (65)**	3,75±0,04 (65)**	5,69±0,04 (65)**

Note: * - p-values are < 0.05 **- p values are < 0.001

By the results obtained in children aged 2-5 years with hearing impairments, the maximum for the P1 component was recorded in the occipital region. At the same time, in children with congenital sensorineural hearing loss, the registration of the maximum P1 component was detected in the right hemisphere, and in children with acquired it was found in the left area of the brain.

In children aged 3-6 years with NSHL, two maxima of the amplitude values of the N1 component were present in the frontal and left occipital regions. In addition, in these areas of the brain, an asymmetry in the formation of the N1 component was found: in children with acquired NSHL - mainly in the right, in children with congenital - in the left hemisphere.

When studying the results obtained in children with acquired sensorineural hearing loss, a wider display of interhemispheric connections was found than in children with congenital hearing loss or deafness.

Table. 3

The bioelectric activity of the brain in groups of patients, %

EEG data	1 group, n=68	2nd group, n=37
Delayed maturation	40,0	28,5
Diffuse changes	30,0*	28,2*
Focal changes	25,0	14,2
Paroxysmal activity	10,0*	21,4
Epileptiform activity	15,0	-
Variant of the age norm	-	-

Note. * - pvalue<0.001; ** - significant EEG differences between groups (p <0.001).

In 69.6% of patients, bilateral EEG asymmetry and asynchronization were detected, and a wide range of changes in the regulatory and organic genesis of mild to moderate severity was diagnosed.

The obtained EEG data in children with congenital NSHL indicate that they have more changes that are significant in the bioelectrical activity of the cerebral hemispheres than in children with acquired NSHL. In 25% of children of the 1st

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

and 14.2% of the 2nd group, focal changes are mainly represented by outbreaks of slow-wave activity.

Table. 4
MRI in the examined groups, %

MRI data	1group, n=68	2 group, n=37
Expansion of the subarachnoid spaces	61,1	31,7
Ventriculomegaly	61,1	31,7
Focal lesions of white matter and basal ganglia	27,9	7,3
Periventricular changes	16,8	4,7
Anomaly of development	2	-

In children with congenital NSHL, there was an expansion of the subarachnoid spaces (55.6%), ventriculomegaly (55.6%). Among children with congenital NSHL, developmental anomalies were noted in 2%, which characterizes a violation of the maturation of the nervous tissue in the background of intrauterine lesions.

CONCLUSIONS

1. Risk factors for the development of early hearing impairment in children are related to marriage (72.8%), the use of ototoxic drugs during pregnancy, as well as in the perinatal period (70%, 67%), hyperbilirubemia (72.5%).
2. An in-depth examination of children with hearing impairment using clinical, otoneurological, ophthalmic functional studies makes it possible to determine the structure of various factors that lead to hearing impairment and influence the further course of the disease.
3. Sensorineural hearing loss is characterized by disorganization and disruption of the configuration of the component composition of I, III, and V SAEP waves.
4. In children with sensoneural hearing loss, the process of formation of the alpha-rhythmic activity of the electroencephalogram is impaired relative to the control group

LITERATURE

1. *Joon S.Y, Park Y.A., Bong J.P., et al. Predictive value of neutrophil to lymphocyte ratio in first-time and recurrent idiopathic sudden sensorineural hearing loss // Auris nasus larynx. – 2015. – Vol. 42. – P. 438-442.*
2. *Puig T. Universal neonatal hearing screening versus selective screening as part of the management of childhood deafness / T. Puig, A. Municio, C. Meda //Cochrane Database Syst. Rev. - 2005.-№2.- P.31 -37.*
3. *Quintos M.R. Newborn hearing screening using the evoked otoacoustic emission: The Philippine General Hospital experience / M.R. Quintos, P.F.Isleta, C.C. Chiong [et al.] // Southeast Asian J. Trop. Med. Public. Health. -2003.-Vol.34.-№3.- P.231 -233.*
4. *Ramenghi L.A. Traditional nuclear magnetic resonance / L.A. Ramenghi //Pediatr. Med. Chir. - 2002.-Vol.24.-№6.- P.435 -439.*
5. *Ranee G. Hearing threshold estimation in infants using auditory steady-state responses / G. Range, R. Roper, L. Symons [et al.] // J. Am. Acad. Audiol. - 2005.-Vol. 16.-№5.- P.291 -300.*
6. *Rouev P. Universal newborn hearing screening program in Bulgaria /P.Rouev, H.Mumdzhiev, J. Spiridonova [et al.] // Int. J. Pediatr. Otorhi- nolaryngol. - 2004.-Vol.68.-№6.- P.805 -810.*
7. *Rutherford M. The role of imaging / M. Rutherford // Pediatr. Med. Chir. - 2002.-Vol.24.-№6.- P.470 -474.*
8. *Sano M. Sensorineural hearing loss in patients with cerebral palsy after as-phyxia and hyperbilirubinemia / M. Sano, K. Kaga, E. Kitazumi [et al.] // Int. J. Pediatr. Otorhinolaryngol. -2005.-Vol.69.-№9.-P.1211 -1217.*
9. *Santiago-Rodriguez E. Auditory steady-state responses in infants with peri-natal brain injury / E. Santiago-Rodriguez, T. Harmony, M. Bernardino [et al.] // Pediatr. Neurol. - 2005.-Vol.32.-№4.- P.236 -240.*
10. *Savman K. Cytokine response in cerebrospinal fluid from preterm infants with posthaemorrhagic ventricular dilatation / K.Savman, M. Blennow, H.Hagberg [et al.] // Acta Paediatr. - 2002.-Vol.91.-№12.- P.1357 -1363.*
11. *Shankaran S. Whole-body hypothermia for neonates with hypoxic-ischemic encephalopathy / S. Shankaran, A.R. Laptook, R.A. Ehrenkranz [et al.] //N.Engl. J. Med. - 2005.- Vol.353.-№15.- P.1574 -1584.*
12. *Shapiro S .M. Definition of the clinical spectrum of kernicterus and bilirubin- induced neurologic dysfunction (BIND) / S.M. Shapiro // J. Perinatol. - 2005.- Vol.25.-№l.- P.54-59.*
13. *Sharma A, Dorman MF, Spahr AJ. A sensitive period for the development of the central auditory system in children with cochlear implants: implications for age of implantation - Ear Hear. 2010 Apr;31(2):166-85. doi: 10.1097/AUD.0b013e3181c8e7b6.*
14. *Smith C.M. Auditory brainstem response detects early bilirubin neurotoxic¬ity at low indirect bilirubin values / C.M. Smith, G.P. Barnes, C.A. Jacobson [et al.] // J. Perinatol. - 2004.-Vol.24.-№11.- P.730 -732.*
15. *Stueve M.P. Estimation of hearing loss in children: comparison of auditory steady-state response, auditory brainstem response, and behavioral test methods / M.P. Stueve, C. O'Rourke // Am. J. Audiol. - 2003.-Vol.l2.-№2.- P.125 -136.*
16. *Suzuki N. Relation between predischarge auditory brainstem responses and clinical factors in high-risk infants / N. Suzuki, H. Suzumura // Pediatr. Int. - 2004.-Vol.46.-№3.- P.255 -263.*
17. *Takeoka M. Diffusion-weighted images in neonatal cerebral hypoxic- ischemic injury / M. Takeoka, T. B. Soman, A. Yoshii [et al.] // Pediatr. Neurol. - 2002.-Vol.26.-№4.- P.274 -281.*