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COMPUTER CHARACTERISTICS OF CLINICAL MANIFESTATIONS OF CONGENITAL ATRESIA OF THE EXTERNAL AUDITORY CANAL IN COMBINATION WITH ANOMALITY OF MIDDLE EAR DEVELOPMENT IN CHILDREN

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ANNOTATION

Based on the latest achievements in the field of information technology, the article discusses the identification of the type of hearing impairment using computer technology. The study was conducted between November 2021 and August 2023 at the Department of Plastic Surgery at Children's National Center.

As a result of the study, it was found that in 44 children with EAC, bilateral lesions were detected in 65.7%, and bilateral lesions in 23 (34.3%). Children more often received lesions on both sides, while the predominance of right-sided localization of EAS was typical for boys.

KEY WORDS: *congenital ear malformations, atresia of the external auditory canal, hearing loss*

RELEVANCE

Among all congenital malformations, ear malformation occurs in almost half of the cases in the practice of an ENT doctor, of which congenital malformations of the middle ear are observed in up to 22% of cases [4, 6, 8]. Among all congenital malformations of hearing abnormalities, atresia of the external auditory canal (EAC) is the most common, which is accompanied by defects of underdevelopment or absence of auditory ossicles, as well as fusion of the middle and inner ear [3, 7, 11]. According to research by Tasar M and a group of authors, "... malformations of the inner ear occur in 20% of patients with congenital sensorineural hearing loss."[10]

Until recently, many anomalies in the development of the inner ear were a strict contraindication to cochlear implantation. In particular, this was due to insufficient visualization of the structures of the tympanic cavity with some anomalies in the location of the sigmoid sinus and facial nerve during posterior tympanotomy [1, 9]. In connection with the improvement of methods of visualizing the bone and membranous structures of the inner ear, such interventions began to be carried out, but only in some cases. Alternative approaches to inner ear structures for cochlear implantation have been developed [2, 8, 11]. Considering the diversity of anatomical features of the structure of the temporal bones in congenital atresia of the external auditory canal and the high probability of obtaining unsatisfactory results and complications during surgical treatment, the issue of indications and contraindications, prediction of the results of surgery and the development of new methods of surgical tactics remains relevant.

PURPOSE OF THE STUDY

assessment of identification of the type of hearing impairment based on computer technology

MATERIALS AND METHODS OF RESEARCH

the study was conducted from November 2021 to August 2023 in the plastic surgery department of the Children's National Center. The study involved 67 children with congenital atresia of the external auditory canal in combination with an anomaly of the middle ear, aged from 1 to 16 years (Table 1).

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Table 1
Distribution of examined children depending on gender and age

Gender	Age							
	1-3 years		4-10 years		11-16 years		total	
	n	%	n	%	n	%	n	%
Boys	11	35,5	15	48,4	5	16,1	31	46,3
Girls	15	41,7	13	36,1	8	22,2	36	53,7
Total	26	38,8	28	41,8	13	19,4	67	100,0

The children examined underwent recording of short-latency auditory evoked potentials (SAEPs). The intensity range of the test signals was from 5 to 103 dB above the normal hearing threshold (or up to 133 dB sound pressure level). The stimulus intensity change step was 10 or 5 dB. The left and right ears were tested consistently.

As the main research method, all patients carried out computed tomography (CT) of the temporal bones. The slice thickness was 2 mm, the table step was 1 mm, that is, the tomographic layers were performed with an overlap of 50%, which contributed to a more accurate reconstruction of the secondary image in different planes (coronal and sagittal).

As statistical analysis software Excel MS Office functions were used.

RESULTS OF THE STUDY

as a result of examining children with EAC, we found that unilateral lesion was recorded in 44 children (65.7%), while bilateral lesion was recorded in 23 (34.3%). Boys were more likely to have unilateral defeats with a predominance of right-sided localization of EAC. In girls, the frequency of unilateral and bilateral lesions was equal, however, as in boys, the right side was more affected.

The combination of EAC is observed in 32 children (47.8%) with grade 2-3 microtia, and in 6 cases (8.9%) with anotia.
All patients or their parents complained of hearing impairment, complete atresia, deformation of the auricle or its absence.

Analysis of CT scans of the temporal bones was carried out with an emphasis on the structural features of the outer and middle ear. We assessed: the severity of narrowing of the external auditory canal (complete or partial); the degree of depression of the temporomandibular joint into the tympanic cavity; antrum size; degree of pneumatization of the mastoid process; size of the tympanic cavity; the presence or absence of auditory ossicles, as well as the degree of their development; presence or absence of fenestra vestibule and cochlea; location of the facial nerve canal (distance from the facial nerve canal to the beginning of the cochlear window niche); location of the sigmoid sinus (distance between the sigmoid sinus and the tympanic cavity).
The obtained data are presented in Table 2.

Table 2
CT scan data in children with EAC

Characteristics of the development of the middle and inner ear	**Number of children (n=67)**	
	n	**%**
Reducing the severity of the antrum	7	10,4
Presentation of the sigmoid sinus	13	19,4
Depression of the temporomandibular joint	10	14,9
Decreased pneumatization of the mastoid process	19	28,4
The volume of the middle ear is reduced	13	19,4
Facial nerve interposition	12	17,9
Missing hammer	9	13,4
No anvil	6	9,0
No stirrup	4	6,0
Absence of the vestibule window	12	17,9
Lack of cochlear window	15	22,4

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A more detailed analysis showed that among the examined patients, children with bone atresia predominated (71.6%), in which the bone part of the EAC is absent, and in its place a bone mass of a cellular or sclerotic structure is determined. Stenosis of the left joint were less common (26.9%). Soft tissue and mixed forms of atresia, which, according to our data, account for 1.5% each.

A well-developed pneumatic system of the mastoid process was identified in 52.3%, a mediocrely developed one in 19.3%, and a severely depleted cellular system or its absence in 28.4% of cases.

The patency of the auditory tube is of great importance for normal auditory function. Unchanged pneumatized bone mouth of the auditory tube was noted in 91.0%, absence of pneumatization - in 9.0%.

A pneumatized tympanic cavity of normal size was identified in 65.7%. Significantly reduced pneumatized tympanic cavity - 28.4%. In 7.5%, the tympanic cavity was either absent or represented by a narrow non-pneumatized slit.

In the majority of observations (86.2%), the location of the tympanic cavity was typical. In 13.8%, dystopia of the tympanic cavity was detected anteriorly and downward, with a direct location above the temporomandibular structure.

In 79.3% of observations, the antrum was developed, and in 10.4% it was absent. In 53.4%, the antrum had normal dimensions, in 25.9%, there was a decrease in the size of the antrum. In 69%, pneumatization of the antrum was not impaired, and in 10.3% it was absent.

The structures of the inner ear and the internal auditory canal during embryogenesis develop independently of the structures of the middle and outer ear, being a more ancient formation. Therefore, anomalies of the inner ear are much less common than anomalies of the outer and middle ear. We identified anomalies of the inner ear in children with EAC in 4.5%. Among them: stenosis of the internal auditory canal - 1.5%, common cavity of the cochlea and vestibule - 1.5%, anomaly of the vestibule and semicircular canals - 1.5%.

CONCLUSION

Computed tomography of the temporal bones is a highly effective method for studying the development of anomalies of the external and middle ear in children, allowing to diagnose not only malformations of the external auditory canal, tympanic cavity, auditory ossicles, labyrinthine windows, facial nerve canal, but also the structures of the inner ear.

REFERENCES

1. *Barbara Carrico1, Alessandra Giannella Samelli1, Carla Gentile Matas1, Femanda Cristina Leite Magliaro1, Renata Mota Mamede Carvallo1, Suelly Cecilia Olivan Limongi1, Ivone Ferreira Neves-Lobo1Peripheral hearing evaluation in children.*
2. *Bunt CW et al: Role of the family physician in the care of children. Am Fam Physician.(2009) 90(12):851-8, 2014*
3. *McBride,D.(2017)Noise-induced hearing loss and hearing protection in the mining industry/Occupational Medicine,67(5),367-373*
4. *4.Bain, S. K., & Allin, J. D. (2018). Book review: Stanford- Binet intelligence scales, fifth edition. Journal of Psychoeducational Assessment, 23, 87-9*
5. *Crawford D, Dearmun A. (2016) Nov 828(9):17. PMID: 27821010 DOI: 10.7748/ncyp.28.9.17. s19.*
6. *Cauwenbege P, Watelet JB, Dhooge I. (2015)Uncommon and unusual complications of otitis media with effusion. Int J Pediatr Otorhinolaryngol. 1999:49 Suppl 1:5119-25.*
7. *Fengchan Han®, Heping Yu*, Jiangping Zhang*, Cong Tian*, Cecilia Schmidt , Casey Nava*, Muriel T. Davisson and Qing Y. Zheng* Ofitis (2017)media in a mouse model for "Department of Otolaryngology-HNS, Case Western Reserve University, Cleveland, OH, USA and The Jackson Laboratory, Bar Harbor, ME, USA*
8. *Hunter, L. L., Keefe, D. H., Feeney, M. P,, Brown, D. K.,Meinzen-Derr, J, Elsayed, A. M., Amann, J. M., Manickam, V., Fitzpatrick, D., & Shott, S. R. (2017). Wideband acoustic immittance in children: prediction of middle-ear dysfunction, conductive hearing loss and patent PE tubes. International journal of audiology, 56(9), 622-634.*
9. *Hauser P. C. et al., (2010); Woll B., 2008; Van Naarden B. K. et al, 2015 Hook E. G. Epidemiology In: Pueschel, S. M.; Rynders, J. E. : Advances in Biomedicine and the Behavioral Sciences. Cambridge: Ware Press (pub.)- 1982, P. 11*
10. *Hassmann E, Skotnicka B, Midro AT, Musiatowicz M. Distortion products otoacoustic emissions in diagnosis of hearing loss. Int J Pediatr Otorhinolaryngol.(2003);45(3):199-206.*