

KOXLEAR IMPLANTATSIYA BOSQICHLARIDA BOLALARNI KOMPLEKS AUDIOLOGIK BAHOLASH VA OLIB BORISH TAKTIKASI: 400 HOLAT TAHLILI

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РЕЗЮМЕ

Цель исследования. Оценить комплекс аудиологических показателей у детей с тяжёлой сенсоневральной тугоухостью на этапах кохлеарной имплантации и определить клиническое значение регулярности использования слуховых аппаратов до операции.

Материал и методы исследования. В одноцентровое наблюдательное исследование включены 400 детей в возрасте 6 месяцев-5 лет с двусторонней сенсоневральной тугоухостью IV степени и глухотой. До кохлеарной имплантации проводили акустическую импедансометрию, отоакустическую эмиссию, КСВП/Multi-ASSR и оценку DataLogging слуховых аппаратов. По среднесуточному времени ношения выделяли недостаточное (меньше 4 ч/сут), субоптимальное (4-8 ч/сут) и регулярное (более 8 ч/сут) использование. Интраоперационно оценивали импедансную телеметрию, ECAP и ESRT; после подключения речевого процессора - LittleEARS, IT-MAIS и CCIPP.

Результаты. Средние пороги слухового восприятия ≥ 90 дБ выявлены у 64,9% детей, 75-85 дБ - у 35,1%; отоакустическая эмиссия отсутствовала у всех обследованных. Среднесуточное использование слуховых аппаратов составило $3,73 \pm 0,9$; $7,76 \pm 1,5$ и $8,25 \pm 2,1$ ч/сут соответственно. Через 3 месяца прирост IT-MAIS был наиболее выражен при регулярном ношении. Средний порог ECAP снижался от $20,6 \pm 7,45$ qu в группе недостаточного использования до $15,9 \pm 4,4$ qu в группе регулярного использования; для ESRT - от $29,1 \pm 3,77$ до $27,0 \pm 6,11$ qu. Через 24 месяца после кохлеарной имплантации в группе регулярного предоперационного использования слуховых аппаратов показатели LittleEARS составили $30,5 \pm 1,50$ балла, IT-MAIS - $34,8 \pm 3,40$ балла, а CCIPP - $89,4 \pm 4,6$ балла; при недостаточном использовании - $26,11 \pm 3,47$, $30,5 \pm 2,19$ и $61,5 \pm 4,2$ балла соответственно.

Заключение. Объективный контроль регулярности слухопротезирования с помощью DataLogging дополняет стандартную аудиологическую оценку кандидатов на кохлеарную имплантацию. В данной выборке регулярное использование слуховых аппаратов до операции ассоциировалось с более благоприятной динамикой слухового поведения и функциональных результатов после кохлеарной имплантации.

SUMMARY

Objective. To assess a comprehensive set of audiological parameters in children with severe sensorineural hearing loss across the stages of cochlear implantation and to determine the clinical significance of regular hearing-aid use before surgery.

Materials and methods. This single-center observational study included 400 children aged 6 months to 5 years with bilateral grade IV sensorineural hearing loss or deafness. Before cochlear implantation, acoustic immittance, otoacoustic emissions, ABR/Multi-ASSR and hearing-aid DataLogging were assessed. According to mean daily use, hearing-aid wear was categorized as insufficient (<4 h/day), suboptimal ($4-<8$ h/day), or regular (≥ 8 h/day). Intraoperative assessment included impedance telemetry, ECAP and ESRT; after processor activation, auditory outcomes were evaluated using LittleEARS, IT-MAIS and CCIPP.

Results. Mean hearing thresholds ≥ 90 dB were observed in 64.9% of children and thresholds of 75-85 dB in 35.1%; otoacoustic emissions were absent in all participants. Mean daily hearing-aid use was 3.73 ± 0.9 , 7.76 ± 1.5 and 8.25 ± 2.1 h/day, respectively. At 3 months, the largest IT-MAIS gain was observed in the regular-use group. Mean ECAP thresholds decreased from 20.6 ± 7.45 qu in the insufficient-use group to 15.9 ± 4.4 qu in the regular-use group; ESRT decreased from 29.1 ± 3.77 to 27.0 ± 6.11 qu. At 24 months after cochlear implantation, children with regular preoperative hearing-aid use had LittleEARS scores of 30.5 ± 1.50 , IT-MAIS scores of 34.8 ± 3.40 and CCIPP scores of 89.4 ± 4.6 , compared with 26.11 ± 3.47 , 30.5 ± 2.19 and 61.5 ± 4.2 , respectively, in the insufficient-use group.

Conclusion. Objective monitoring of hearing-aid use with DataLogging complements standard audiological assessment of pediatric cochlear implant candidates. In this cohort, regular preoperative hearing-aid use was associated with more favorable auditory-behavior and functional outcomes after cochlear implantation.

Keywords: sensorineural hearing loss, cochlear implantation, hearing aids, DataLogging, ECAP, ESRT, LittleEARS, IT-MAIS.

Ключевые слова: сенсонеvральная тугоухость, кохлеарная имплантация, слуховые аппараты, DataLogging, ECAP, ESRT, LittleEARS, IT-MAIS.

Ikki tomonlama og'ir sensonevral eshitish pasayishi bo'lgan bolalarni koхlear implantatsiyaga tayyorlash va keyingi rehabilitatsiya natijalarini baholash faqat eshitish chegaralarini aniqlash bilan cheklanmaydi. Klinik qaror qabul qilishda bolaning operatsiyagacha eshitish apparatlaridan foydalanish davomiyligi, kuchaytirilgan tovush signaliga moslashuvi, operatsiya vaqtida qayd etiladigan elektrofiziologik javoblar hamda implantatsiyadan keyingi funksional eshituv rivojlanishi birgalikda ko'rib chiqilishi zarur. Bolalarda eshitish apparatlaridan foydalanish vaqtini obyektiv qayd etuvchi DataLogging ma'lumotlari ota-ona hisobotlariga qo'shimcha ravishda kundalik foydalanish rejimini baholashga imkon beradi [1-3].

Adabiyotlarda eshitish texnologiyalaridan uzoqroq va muntazam foydalanish eshituv tajribasining ko'payishi hamda keyingi nutq va eshituv natijalari bilan bog'liqligi ko'rsatilgan [4-8]. Shunga qaramay, operatsiyagacha eshitish apparatlaridan foydalanish, koхlear implantatsiya vaqtida olingan ECAP va ESRT ko'rsatkichlari hamda uzoq muddatli funksional natijalarni yagona ketma-ket klinik tizim sifatida baholovchi ishlar nisbatan kam.

TADQIQOT MAQSADI

Ikki tomonlama og'ir sensonevral eshitish pasayishi bo'lgan bolalarda koхlear implantatsiyaning preoperativ, intraoperativ va postoperativ bosqichlaridagi audiologik ko'rsatkichlarni kompleks baholash hamda eshitish apparatlaridan foydalanish muntazamligining keyingi natijalar bilan bog'liqligini aniqlash.

MATERIAL VA USULLAR

Tadqiqot 2022-2025 yillarda Respublika ixtisoslashtirilgan pediatriya ilmiy-amaliy tibbiyot markazining tug'ma va orttirilgan LOR kasalliklari bo'limida o'tkazildi. Tadqiqotga ikki tomonlama IV darajali sensonevral eshitish pasayishi yoki karligi bo'lgan 400 nafar bola kiritildi. O'rtacha yosh $2,8 \pm 1,1$ yilni tashkil

etdi; bolalarning 64% i 6 oylikdan 3 yoshgacha, 36% i 3-5 yosh oralig'ida edi.

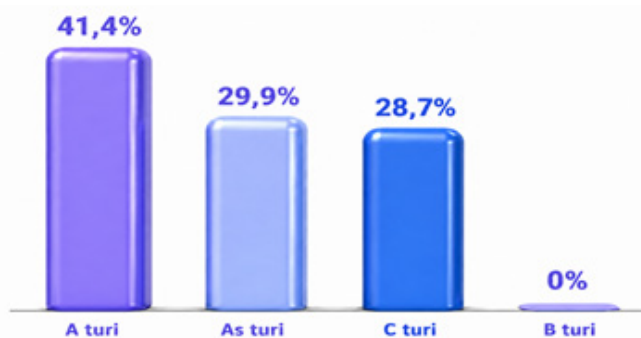
Operatsiyagacha tekshiruv akustik impedansometriya, otoakustik emissiya (KCHOAE va PIOAE), QCHEP/Multi-ASSR hamda eshitish apparatlarining DataLogging ma'lumotlarini o'z ichiga oldi. Bir yoshgacha bo'lgan bolalarda 1000 Gts zond tonli, bir yoshdan katta bolalarda 226 Gts zond tonli timpanometriya qo'llanildi. Barcha bolalar ikki tomonlama Ultra Power sinfidagi eshitish apparatlari bilan eshitish protezidan o'tkazildi.

Eshitish apparatlaridan foydalanish rejimi 3 oydan so'ng DataLogging asosida o'rtacha sutkalik davomiylik bo'yicha baholandi: I guruh - yetarli bo'lmagan foydalanish (<4 soat/kun; $n=115$), II guruh - suboptimal foydalanish ($4-8$ soat/kun; $n=96$), III guruh - muntazam foydalanish (≥ 8 soat/kun; $n=189$). Eshituv xulq-atvori IT-MAIS shkalasi yordamida baholandi.

Barcha bolalarda bir tomonlama koхlear implantatsiya bajarildi: o'ng tomonda 333 (83,3%), chap tomonda 67 (16,7%) holatda. Operatsiya vaqtida impedans telemetriyasi, ECAP va ESRT qayd etildi. Nutq protsessori ulangandan keyin eshituv idroki LittleEARS, funksional eshituv xulq-atvori IT-MAIS, hayot sifati esa CCIPP so'rovnomasi bilan dinamik baholandi. Natijalar foiz va $M \pm m$ ko'rinishida taqdim etildi; manba ma'lumotlarida statistik ahamiyat mezonini $p \leq 0,05$ deb qabul qilingan.

NATIJALAR

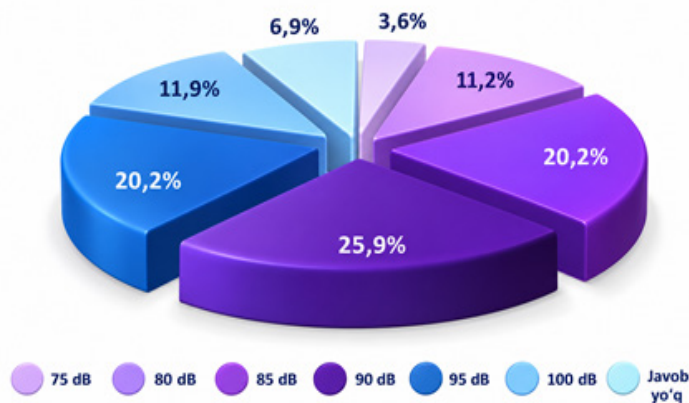
Akustik impedansometriya 800 quloqda bajarildi. A tip timpanogramma 41,4%, As tip 29,9%, C tip 28,8% holatda qayd etildi; B tip aniqlanmadi (rasm 1). 500 Gts da akustik refleks 2,3% holatda qayd etilgan, 97,7% holatda aniqlanmagan. Otoakustik emissiya barcha bolalarda qayd etilmadi.



1-rasm. Akustik impedansometriya natijalari

Chastotaga xos QCHEP natijalari past chastotalarda qoldiq eshitish mavjudligini, yuqori chastotalarda esa ko'proq og'ir pasayishni ko'rsatdi. Umumiy baholashda bolalarning 64,9% ida o'rtacha eshitish chegarasi 90 dB

va undan yuqori, 35,1% ida 75-85 dB diapazonida bo'ldi (rasm 2). Klinik tasnif bo'yicha karlik 61,0%, IV darajali sensonevral eshitish pasayishi 39,0% holatda qayd etildi.



2-rasm. Operatsiyagacha asosiy audiologik ko'rsatkichlar

DataLogging ma'lumotlariga ko'ra eshitish apparatlaridan o'rtacha sutkalik foydalanish I guruhda $3,73 \pm 0,9$ soat, II guruhda $7,76 \pm 1,5$ soat va III guruhda $8,25 \pm 2,1$ soatni tashkil etdi (jadval 1). Uch oylik eshitish protezidan

so'ng IT-MAIS barcha guruhlarda oshdi, biroq eng katta mutlaq o'sish muntazam foydalanish guruhida qayd etildi: 2,3 ball. Yetarli bo'lmagan foydalanish guruhida o'sish 1,1 ball, suboptimal foydalanishda 1,7 ball bo'ldi.

1-jadval

DataLogging va 3 oylik eshitish protezidan keyingi IT-MAIS dinamikasi

Guruh	n	EA, soat/kun	IT-MAIS boshlang'ich	IT-MAIS 3 oy
I - yetarli bo'lmagan	115	$3,73 \pm 0,9$	$3,8 \pm 1,2$	$4,9 \pm 1,4$
II - suboptimal	96	$7,76 \pm 1,5$	$3,9 \pm 1,3$	$5,6 \pm 1,5$
III - muntazam	189	$8,25 \pm 2,1$	$3,7 \pm 1,1$	$6,0 \pm 1,6$

Operatsiya vaqtida impedans telemetriyasi bo'yicha guruhlar o'rtasida klinik jihatdan muhim farqlar qayd etilmadi. ECAP chegaralari I guruhdan III guruhga qarab $20,6 \pm 7,45$ qu dan $15,9 \pm 4,4$ qu gacha pasaydi (jadval

2). ESRT ko'rsatkichlarida ham shu yo'nalishdagi tendensiya kuzatilib, o'rtacha qiymat $29,1 \pm 3,77$ qu dan $27,0 \pm 6,11$ qu gacha kamaydi.

2-jadval

Koxlear implantatsiya vaqtida ECAP va ESRT ko'rsatkichlari

Ko'rsatkich	I guruh	II guruh	III guruh
ECAP, qu	$20,6 \pm 7,45$	$17,6 \pm 5,28$	$15,9 \pm 4,4$
ESRT, qu	$29,1 \pm 3,77$	$27,6 \pm 7,33$	$27,0 \pm 6,11$

Koxlear implantatsiyadan keyingi kuzatuvda eshitish apparatlaridan operatsiyagacha muntazam foydalangan bolalarda funksional ko'rsatkichlarning yanada yuqori dinamikasi kuzatildi. LittleARS bo'yicha 24 oyda III guruh $30,5 \pm 1,50$ ballga, I guruh $26,11 \pm 3,47$ ballga yetdi (3-rasm).

IT-MAIS 24 oyda mos ravishda $34,8 \pm 3,40$ va $30,5 \pm 2,19$ ballni tashkil etdi. CCIPP orqali hayot sifati 12 va 24 oyda muntazam foydalanish guruhida yuqoriroq bo'lib, farq manba ma'lumotlarida $p < 0,01$ sifatida ko'rsatilgan.

XULOSA

1. Ikki tomonlama og'ir sensonevral eshitish pasayishi bo'lgan bolalarda koxlear implantatsiya oldidan obyektiv audiologik tekshiruvni eshitish apparatlaridan real foydalanishni DataLogging orqali baholash bilan

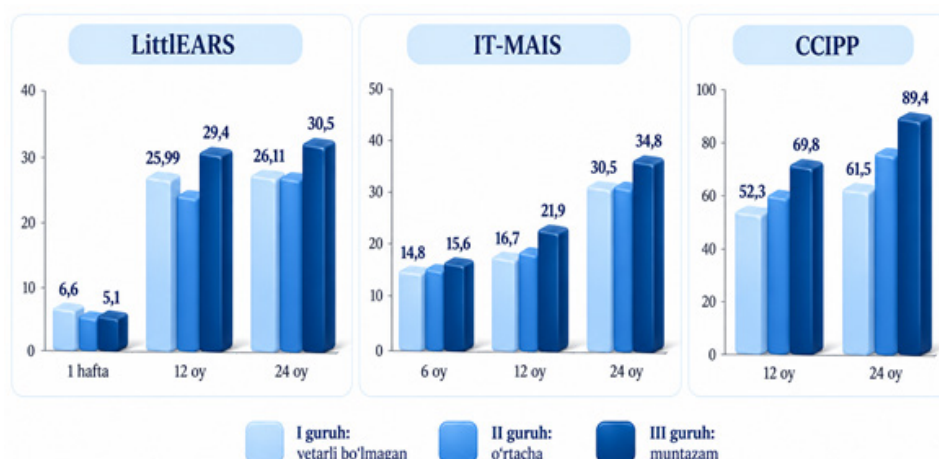
to'ldirish maqsadga muvofiq.

2. Eshitish apparatlaridan muntazam foydalanish guruhida 3 oylik IT-MAIS o'sishi eng yuqori bo'lib, bu ko'proq kundalik eshituv tajribasi bilan mos keldi.

3. Muntazam foydalanish guruhida ECAP va ESRT chegaralari nisbatan past bo'ldi; ushbu ko'rsatkichlar boshqa klinik va elektrofiziologik ma'lumotlar bilan birgalikda baholanishi kerak.

4. Koxlear implantatsiyadan 24 oy o'tgach, operatsiyagacha eshitish apparatlaridan muntazam foydalangan bolalarda LittleARS, IT-MAIS va CCIPP natijalari yaxshiroq bo'ldi.

5. Natijalar eshitish apparatidan foydalanish muntazamligini koxlear implantatsiya oldi tayyorgarligi va keyingi rehabilitatsiya jarayonining muhim kuzatuv ko'rsatkichi sifatida qo'llash zarurligini ko'rsatadi.



3-rasm. Koxlear implantatsiyadan keyingi funksional ko'rsatkichlar dinamikasi.

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