



IMPROVING HEARING AND SPEECH EFFICIENCY IN CHILDREN WITH EXTERNAL AUDITORY PATHWAY ATRESIA USING PONTO SOFT BAND

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Restoring hearing function in children with developmental defects of the ear is a complex task, requiring the joint work of audiologists, otolaryngologists-surgeons and deaf educators. Ear defects account for 50% of all congenital defects encountered in ENT practice (H.Weerda, 2004).

ABSTRACT

99 children with congenital defects of the external and middle ear who were treated on an outpatient basis at the Children's National Medical Center in 2021-2023. Of these, 59 (59.5%) were boys and 40 (40.4%) were girls. The average age of the children was 4.2 ± 0.7 . The control group consisted of 20 practically healthy children. All patients underwent a general ENT examination, collection of anamnesis data, X-ray (MSCT), specialist examination (neurologist, geneticist, pediatric maxillofacial surgeon, deaf educator, psychoneurologist), audiometry, KLCHEP, MultiASSR and statistical analysis. According to the above age groups and speech formation, the children were divided into 2 groups. Clinical group 1 included 31 children under 3 years old, that is, the prelingual group, (18 boys, 13 girls) with external and middle ear defects; Clinical group 2 included 68 children aged 4-7 years old, that is, the postlingual group, (41 boys, 27 girls) with external and middle ear defects.

Restoring hearing function in children with developmental defects of the ear is a complex task, requiring the joint work of audiologists, otolaryngologists-surgeons and deaf educators. Ear defects account for 50% of all congenital defects encountered in ENT practice (H.Weerda, 2004).

The aim of the study was to evaluate the development and effectiveness of hearing in children with congenital bilateral auditory atresia after using a digital bone conduction device - the Ponto device soft band.

Research material: 99 children with congenital defects of the external and middle ear who were treated on an outpatient basis at the Children's National Medical Center in 2021-2023. Of these, 59 (59.5%) were boys and 40 (40.4%) were girls. The average age of the children was 4.2 ± 0.7 . The control group consisted of 20 practically healthy children. All patients underwent a general ENT examination, collection of anamnesis data, X-ray (MSCT), specialist examination (neurologist, geneticist, pediatric maxillofacial surgeon, deaf educator, psychoneurologist), audiometry, KLCHEP, MultiASSR and statistical analysis. According to the above age groups and speech formation, the children were divided into 2 groups. Clinical

group 1 included 31 children under 3 years old, that is, the prelingual group, (18 boys, 13 girls) with external and middle ear defects; Clinical group 2 included 68 children aged 4-7 years old, that is, the postlingual group, (41 boys, 27 girls) with external and middle ear defects;

Research results: All children with congenital defects of the external and middle ear of different ages were divided into two subgroups for hearing rehabilitation. The second subgroup was recommended to wear a digital bone conduction device - the Ponto device.

In the cross-sectional study, the auditory integration scale scores of patients in group 1 were 4.31 ± 0.32 points after 1 year of wearing the hearing aid, 7.65 ± 0.40 points after 2 years, and 12.18 ± 0.24 points after 3 years, while in group 2 patients were 4.18 ± 0.35 points after 1 year of wearing the hearing aid, 7.42 ± 0.82 points after 2 years, and 10.52 ± 0.24 points after 3 years. These indicators indicate that prosthetic hearing in children at an early age allows them to pay attention to surrounding sounds and distinguish sounds at a higher level.

When analyzing the assessment scale for the use of oral speech, the scores of patients in group 1 after 1 year of wearing a hearing aid were 1.75 ± 0.11 points, 2.18 ± 0.14 points, and 3.75 ± 0.14 points, while those in group 2 after 1 year of wearing a hearing aid were 1.87 ± 0.12 points, 2.15 ± 0.13 points, and 3.38 ± 0.15 points. These indicators indicate that the child uses speech reactions to communicate, uses oral speech for communication, and tries to explain with speech when he does not understand, which is highly effective when hearing prosthesis is performed early.

At the initial stage, speech perception indicators in children of group 1 were significantly lower: monosyllabic words were $34.1 \pm 20.7\%$, and disyllabic words were $42.9 \pm 18.3\%$. When compared with the control group, the difference was statistically significant, estimated at $p < 0.05$. At the intermediate stage, monosyllabic words were recognized to $82.4 \pm 5.8\%$, and disyllabic words to $85.4 \pm 7.2\%$, which showed a significant positive trend compared to the initial indicators ($p < 0.05$). At the final stage, speech perception indicators improved further, and monosyllabic words were recognized to $93.8 \pm 6.3\%$, and disyllabic words to $97.5 \pm 2.9\%$. This increase was also statistically significant when compared with the middle stage ($p < 0.05$).

In group 2, the acceptance of monosyllabic words at the initial stage was $38.6 \pm 23.6\%$, and of two-syllable words was $45.5 \pm 21.1\%$. These indicators were significantly lower than those of the control group, $p < 0.05$ was noted.

In the middle stage, the level of speech acceptance improved significantly, reaching $78.5 \pm 4.4\%$ for monosyllabic words and $80.7 \pm 5.2\%$ for two-syllable words ($p < 0.05$). In the final stage, the acceptance of monosyllabic words was $88.2 \pm 4.7\%$, and of two-syllable words was $83.4 \pm 3.1\%$. When compared with the initial indicators, the positive dynamics were found to be statistically significant ($p < 0.05$).

The results obtained confirm that hearing impairment in children with congenital defects of the external and middle ear has a significant negative impact on the process of speech perception. At the same time, as a result of complex treatment and rehabilitation measures, a gradual improvement in speech indicators was observed in all age groups.

The convergence of the final indicators in the group under 3 years of age to the control group is explained by the early treatment and high neuroplasticity. In the older age group, although the positive dynamics were preserved, the incomplete achievement of some indicators to the norm may be associated with late diagnosis.

In the study, the quality of life of children was assessed using the PedsQL (Pediatric Quality of Life Inventory) questionnaire. The results obtained before and after treatment in different age groups are presented as mean values and standard deviations ($M \pm SD$). According to the results of statistical analysis, the changes observed after treatment in all main indicators were considered reliable ($p < 0.05$).

Before treatment, the quality of life indicators in the first age group were relatively low, especially in the emotional and social activity domains. Physical activity was 91.38 ± 4.74 , emotional activity was 70.36 ± 4.63 , and social activity was 68.21 ± 4.25 .

After treatment, a significant increase in indicators was observed in all domains. In particular, emotional activity increased to 92.56 ± 3.56 , and social activity to 97.29 ± 2.35 . The differences obtained were statistically significant, $p < 0.05$. This indicates that the treatment had a positive effect on the quality of life in early childhood.

In the second age group, the physical activity index was high before treatment (99.45 ± 4.35), but emotional (79.09 ± 4.48) and social activity (79.09 ± 4.84) remained at a relatively moderate level. After treatment, significant positive dynamics were noted in all indicators. In particular, the increase in emotional activity to 94.38 ± 3.55 , and social activity to 92.58 ± 3.67 was statistically significant, $p < 0.05$. This confirms the improvement of the psychoemotional state and the level of social adaptation of children. According to the results obtained, the applied treatment method had a positive effect on the quality of life indicators of children in all age groups. It was found that the changes noted after treatment in all main domains were statistically significant ($p < 0.05$). In particular, a significant increase in emotional and social activity indicators confirms not only the clinical, but also the psychosocial effectiveness of the treatment.

Conclusion: The use of the Ponto soft band in children with congenital defects of the outer and middle ear allows for the restoration of speech and hearing function

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