



ASSESSMENT OF THE QUALITY OF LIFE OF CHILDREN WITH NATAL SPINAL INJURY AND OPTIMIZATION OF REHABILITATION MEASURES

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ABSTRACT

*The purpose of this study was to compare upper limb function and quality of life in preschool children with complications of birth injuries to the cervical spinal cord and spine. **Research methods:** the study used a clinical neurological examination and the results of the Pediatric Outcomes Data Collection Instrument (PODCI) scale, neurofunctional (electroneuromyography - ENMG), neuroimaging (ultrasound - ultrasound of the cervical spinal cord and spine) research methods. **Results and discussion.** Upper extremity dysfunction is an area that primarily reduces quality of life in children with HSDD. This result highlights how difficult it is to manipulate objects with the upper limbs during certain activities, such as lifting heavy books, pouring milk, opening a previously opened can, using cutlery, combing hair, buttoning clothes, putting on a coat, and writing with a pencil. All of these may be related to the limited range of motion in these children, which is impaired by muscle weakness, simultaneous activation of antagonists, differences in the length of the affected limb, and contractures. Subsequently, children with HSDD demonstrate limitations in performing functional tasks that are necessary for independence in daily activities and quality of life, as well as tasks requiring fine motor skills. **Conclusion.** Thus, the quality of life of preschool children before treatment was reduced on all scales. When the results for each domain were analyzed separately, both groups showed poor results in the domain that reflects hand activity among all domains. Impaired hand function is the main area that reduces the quality of life in children with complications of PTSD. This domain has the lowest score compared to other domains, which has also been confirmed by other studies. As a result of the course of rehabilitation measures, a positive statistically significant dynamics of quality of life indicators was noted*

KEYWORDS. Children, natal spinal injury, the quality of life, rehabilitation measures.

1. INTRODUCTION

In domestic pediatrics, the concept of studying the quality of life (QoL) of a child was developed at the beginning of the 21st century. This concept, on the one hand, allows us to return to the most important principle of clinical practice, to treat not the disease, but the patient, on the other hand, it offers a well-developed methodology that allows us to obtain reliable data on the quality of life of children both in clinical practice and in scientific research. The use of the QOL assessment method will make it possible to comprehensively solve a wide range of problems in children's healthcare in our country, among which we should note the high incidence of morbidity and disability, the increase in neuropsychiatric disorders and social maladaptation of school-age children (Volodin N.N., 2001; Novik A.A., 2008; Razumov A.N., 2009).

In the world, special attention is paid to a wide range of scientific research aimed at studying the modern approach to early rehabilitation of children and improving the quality of life with complications of birth injury of the cervical spinal cord and spine (COFBIOTCSCAS). Romanova L. A. et al. (2014) assessed the dynamics of the quality of life of school-age children with natal cervical spine injury (CSI) against the background of complex spa treatment including manual therapy. It turned out that the quality of life of school-age children before treatment was reduced on all scales. As a result of the course of rehabilitation measures using manual therapy, positive statistically significant dynamics of quality of life indicators were noted. During the follow-up study after a year, the achieved results of improved quality of life were maintained in the main group.

The main problem in the rehabilitation of patients with complications of this pathology is the lack of a unified concept, strategy for developed rehabilitation technologies and criteria for assessing the effectiveness of treatment. In addition, it should be particularly noted that the subjective assessment of parents showed that, in their opinion, children with COFBIOTCSCAS have worse general functions and a lower quality of life. In this regard, it is important to identify the causes of PTSD, prevent the occurrence of complications, and also resolve issues related to predicting the possible consequences of this pathology. For this reason, of particular



importance is the search for more effective methods of rehabilitation and prediction of the consequences of the disease, based on an in-depth study of clinical-neurological, neuroimaging and neurofunctional research methods, reflected in improving the quality of life of these children and aimed at reducing the complications of the disease in children with consequences of COFBIOTCSCAS.

All of the above prompted us, in order to obtain our own opinion on this matter, to study the effectiveness of rehabilitation measures for children with the consequences of COFBIOTCSCAS.

2. THE PURPOSE OF THE RESEARCH

The purpose of this study was to compare upper limb function and quality of life in preschool children with complications of birth injuries to the cervical spinal cord and spine.

3. METHODS

The study used a clinical neurological examination and the results of the Pediatric Outcomes Data Collection Instrument (PODCI) scale, neurofunctional (electroneuromyography - ENMG), neuroimaging (ultrasound - ultrasound of the cervical spinal cord and spine) research methods.

The Pediatric Outcomes Data Collection Instrument (PODCI) was created to assess functional status, therapeutic needs, and post-treatment changes in children and adolescents aged 2 to 18 years with orthopedic problems. PODCI has three forms; parent form for children, parent and self-report forms for adolescents. The instrument includes 86 items assessing "upper limb and physical function", "transfer and basic mobility", "sports and physical function", "pain/comfort", "happiness", "general functioning" and "expectations from treatment domains".

Depending on the treatment, the patients were divided into two groups: the main group (n=46) - patients with COFBIOTCSCAS, who received standard therapy in combination with modeling of the musculoskeletal system using complex rehabilitation methods, namely electromyostimulation and kinesiotaping; comparison group (n=44) - patients with COFBIOTCSCAS who received basic standard therapy. The control group (n=32) consists of practically healthy children who underwent a medical examination at their place of residence in a family clinic.

To assess the quality of life of children with complications of COFBIOTCSCAS aged from 2 to 17 years, according to the PODCI survey, patients were divided into two groups: group 1 - preschool children (n=28), group 2 - school-age children (n=29).

4. RESULTS AND DISCUSSION

Upper extremity dysfunction is an area that primarily reduces quality of life in children with HSDD. This result highlights how difficult it is to manipulate objects with the upper limbs during certain activities, such as lifting heavy books, pouring milk, opening a previously opened can, using cutlery, combing hair, buttoning clothes, putting on a coat, and writing with a pencil. All of these may be related to the limited range of motion in these children, which is impaired by muscle weakness, simultaneous activation of antagonists, differences in the length of the affected limb, and contractures. Subsequently, children with HSDD demonstrate limitations in performing functional tasks that are necessary for independence in daily activities and quality of life, as well as tasks requiring fine motor skills (for example, writing).

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Upper extremity dysfunction is known to be the area that primarily reduces quality of life in children with HSDD. This result highlights how difficult it is to manipulate objects with the upper limbs during certain activities, such as lifting heavy books, pouring milk, opening a previously opened can, using cutlery, combing hair, buttoning clothes, putting on a coat, and writing with a pencil. All of these may be related to the limited range of motion in these children, which is impaired by muscle weakness, simultaneous activation of antagonists, differences in the length of the affected limb, and contractures. Subsequently, children with HSDD demonstrate limitations in performing functional tasks that are necessary for independence in daily activities and quality of life, as well as tasks requiring fine motor skills (for example, writing).



Table 1
Quality of life questionnaire results PODCI in preschool children

Domains	Before rehabilitation		After rehabilitation	
	Main group (M±m)	Comparison group (M±m)	Main group (M±m)	Group comparisons (M±m)
Upper limb function	56.98±3.25	51.18±3.7	91.95±2.19 *	69.92±3.13 ^ °
Basic mobility and transmission	56.95±1.54	53.77±3.35	92.87±0.66 *	77.55±2.63 ^ °
Sport	68.96±2.25	70.7±2.25	91.53±1.77 *	77.92±2.11 ^ °
Comfort/pain	52.09±2.21	55.53±2.35	93.76±1.20 *	73.86±2.58 ^ °
Happiness function	68.9±1.27	68.12±3.55	96.71±0.71 *	72.5±3.09 ^ °
Global function	58.75±1.56	59.94±2.05	92.64±1.0 *	67.5±1.82 ^ °

Note: * reliability of data before and after treatment in the main group (* - P <0.05)

^ - reliability of data before and after treatment in the comparative group (^ - P <0.05)

° - reliability of the difference after rehabilitation between the main and comparative groups (° - P <0.01).

Table No. 1 presents the results of data on quality of life in preschool children according to the questionnaire PODCI. In children with COFBIOTCSCAS, there was a decrease in the function of the upper extremities. It was found that the data of the children of the compared groups before rehabilitation did not have a statistically significant difference, which indicates the equivalence of the groups. It should be noted that the rehabilitation measures carried out had a significant positive trend in the studied indicators. In particular, the function of the upper limbs in children of the main group improved significantly: 56.98±3.25 and 91.95±2.19, respectively. Although this function also significantly improved in children of the control group - 51.18±3.7 and 69.92±3.13, it was significantly lower (P<0.01) than in children of the main group.

The domain “Basic mobility and transfer” in children of the compared groups also had its own characteristics. The treatment contributed to a significant improvement in performance. Thus, if in children of the main group this parameter was 56.95±1.54, then after treatment it increased to 92.87±0.66 (P <0.05). Despite the improvement in this indicator in children of the control group, it was still significantly lower than in children of the main group - 77.55±2.63 and 92.87±0.66, respectively.

It is known that children with COFBIOTCSCAS participate little in sports activities. The Sports and Physical Functions domain covers tasks such as walking, running, stair climbing and cycling, as well as participation in non-competitive sports and games compared to competitive sports with other children of the same age. That’s why we decided to highlight “Sports” on the domain. As can be seen from the table, after the rehabilitation measures were taken, this indicator increased significantly. So, if before rehabilitation this domain was equal to 68.96±2.25, then after treatment it significantly increased and became equal to 91.53±1.77.

The treatment also contributed to an increase in this indicator in the comparison group (70.7±2.25 and 77.92±2.11, respectively), but a significantly smaller increase than in the main group (P<0.01). Consequently, it can be noted that the rehabilitation measures carried out to the children of the main group turned out to be more effective.

The indicators for the Comfort/Pain domain turned out to be even more clear than the previous indicators. Thus, in the children of the main group, before rehabilitation measures, the domain was equal to 52.09±2.21 and during treatment it increased to 93.76±1.20. The treatment contributed to a significant increase in the children of the comparison group - 55.53±2.35 and 73.86±2.58, respectively, but still significantly lower than in the main group.

Children with COFBIOTCSCAS may be less happy than children with typical development. COFBIOTCSCAS reported lower scores in the happiness domain of the PODCI, which asked about children's satisfaction with their appearance, body, clothes and shoes, ability to do the same things as their peers, and general health. It turned out that the lowest scores in this area could be associated with feelings of irritation and distress, which are often found in children due to differences in the level of performance of the same tasks as their normal peers. Our research on the “Happiness Function” domain also yielded interesting data. It was found that treatment significantly increased the value of this parameter. Before treatment in children of the main group it was 68.9±1.27, and after treatment - 96.71±0.71. Despite the increase in this indicator in children of the comparison group, it was still significantly lower than in children of the main group (P<0.01).



Rehabilitation measures had a more pronounced increase in the “Global Function” domain in the main group. Thus, before treatment, this indicator in children of the main group was 58.75 ± 1.56 and did not differ significantly from that in the comparison group - 59.94 ± 2.05 . After treatment, this domain increased in both the main and comparison groups - 92.64 ± 1.0 and 67.5 ± 1.82 , respectively. However, in the main group, as the figures show, the improvement was more significant.

Thus, the studies showed that rehabilitation measures significantly improved the quality of life in preschool children. According to all parameters of the questionnaire PODCI, a more significant increase in all domains, without exception, was noted in children of the main group.

We also conducted a study of the dynamics of the function of the upper limbs in preschool children.

Table 2
Dynamics of upper limb function in preschool children

Domains	Main group		Comparison group	
	Before treatment (M±m)	After treatment (M±m)	Before treatment (M±m)	After treatment (M±m)
Lift heavy books?	49.68±4.09	87.5±3.95	47.91±4.82 *	68.75±4.48 ^ °
Pour a half gallon of milk?	45.31 ±5.69	78.12±8.18	47.91±4.82 *	64.58 ±4.82 ^ °
Open a jar that has been opened before?	53.12 ±6.4	89.06±6.44	50.0 ±5.33 *	68.33 ±7.1 ^ °
Use a fork and spoon?	52.37 ±3.86	90.62 ±3.12	54.16 ±2.8 *	68.33 ±3.55 ^ °
Comb his/her hair?	59.37 ±3.12	93.75 ±2.79	58.33 ±3.55 *	74.58 ±3.71 ^ °
Button up ?	39.06 ±7.55	65.62 ±11.6	38.2 ±9.23 *	45.0 ±9.23 ^ °
Put on his /her coat o?	50.0 ± 7.9	71.87 ±10.91	49.16 ±9.14 *	63.33 ±10.33 ^ °
Write with a pencil?	60.93 ±3.93	95.3 ±2.51	59.16 ±9.14 *	79.16 ±9.14 ^ °

Note: * - reliability of data before and after treatment in the main group (* - P <0.05)

^ - reliability of data before and after treatment in the comparative group (^ - P <0.05)

° - reliability of the difference after rehabilitation between the main and comparative groups (° - P <0.01)

Table No. 2 presents the results of data on the dynamics of the function of the upper limbs in preschool children. It should be noted that the indicators of children in both groups - the main group (who received special rehabilitation measures) and the comparison group (children who received standard basic therapy) did not actually differ before treatment. A detailed analysis showed that special rehabilitation measures had a more significant positive effect than standard therapy. Thus, after treatment, the children of the main group began to do better work such as “lifting heavy books” than the children of the comparison group - 87.5 ± 3.95 and 68.75 ± 4.48 , respectively.

Such a function as “pouring half a liter of milk” improved in children of both groups, however, more significant positive dynamics were noted in children who received special rehabilitation measures (64.58 ± 4.82 and 78.12 ± 8.18 , respectively).

Children of both groups coped equally poorly with such a manipulation as “Open a jar that was opened earlier” - 53.12 ± 6.4 and 50.0 ± 5.33 , respectively. The therapeutic measures carried out contributed to the improvement of the children’s abilities, most significantly in the main group (68.33 ± 7.1 and 89.06 ± 6.44).

It has long been known that mastering a skill such as skillful use of kitchen utensils - a fork and a spoon - takes more time than other skills. Moreover, it takes even more time to restore these skills. The study of this fact in the observed groups showed that the restoration of the skill of “using a fork and spoon” occurred in a significantly larger number of children in the main group than in the comparison group. Thus, before treatment, this indicator was 52.37 ± 3.86 in children of the main group and 52.37 ± 3.86 in the comparison group. Treatment contributed to an increase in this trait by 90.62 ± 3.12 and 68.33 ± 3.55 , respectively.

Interesting data was obtained when studying such a domain as “Combing his/her hair.” Before treatment, the indicator was the same in both groups - 59.37 ± 3.12 and 58.33 ± 3.55 , respectively. Special exercises in children of the main group contributed to an increase in this indicator to 93.75 ± 2.79 , while in children in the comparison group it increased to 74.58 ± 3.71 .



The domain “Button up” significantly increased after treatment in children of the main group : 65.62 ± 11.6 , versus 45.0 ± 9.23 in the control group. Although before treatment this indicator did not differ significantly in the compared groups - 39.06 ± 7.55 and 38.2 ± 9.23 , respectively. These data once again prove the more pronounced positive impact of special treatment methods.

The next domain was “Put on his /her coat”. Special treatment methods administered to the children of the main group resulted in a more significant positive effect. Before treatment, the indicators of the main and comparison groups were 50.0 ± 7.9 and 49.16 ± 9.14 , respectively, and did not have a statistically significant difference. After treatment, this indicator increased to 71.87 ± 10.91 in children of the main group, versus 63.33 ± 10.33 in children of the comparison group.

The skill “Write with a pencil” in children of the main group increased to 95.3 ± 2.51 , against 60.93 ± 3.93 before treatment. Positive dynamics were also noted in children of the comparison group - 59.16 ± 9.14 and 79.16 ± 9.14 , respectively, but significantly lower than in children of the main group.

Thus, the studies showed that rehabilitation measures significantly improved the quality of life in children, especially in the form of positive dynamics in the function of the upper limbs in preschool children. For all parameters, the indicators of children who received special treatment methods were significantly higher than those of children who received standard treatment.

CONCLUSION

Thus, the quality of life of preschool children before treatment was reduced on all scales. When the results for each domain were analyzed separately, both groups showed poor results in the domain that reflects hand activity among all domains. Impaired hand function is the main area that reduces the quality of life in children with complications of PTSD. This domain has the lowest score compared to other domains, which has also been confirmed by other studies [Medeiros DL et al., 2020]. As a result of the course of rehabilitation measures, a positive statistically significant dynamics of quality of life indicators was noted.

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