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Irral conductivity in children with acute polyneuropathy in the background of treatment

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ABSTRACT: *In children, neural conduction is reduced and has age-related characteristics as a result of the process of myelination, which continues until the child's 10 years of age, the absence of changes in the maximum STI during the period of clinical manifestation of symptoms in AIDP, as well as high interindividual variability of STI indicators in childhood, requires the search for new additional ENMG indicators for assessing the conductive properties of peripheral nerves [3,2]. For this purpose, a stress test can be used, thanks to which it is also possible to assess the reserve capabilities of the peripheral nervous system, as well as to study the effect of short-term local ischemia of peripheral nerves, the so-called turnstile test, on the conductivity and excitability of axons. When carrying out a turnstile test in adults, it was shown that nerve fibers in various pathological conditions are resistant to ischemia. It is assumed that the changes in neural conduction detected during the turnstile test in adults are early signs of the onset of polyneuropathy [5,7,8].*

KEYWORDS: *Acute inflammatory demyelinating polyneuropathy, peripheral nerves, peripheral nervous system.*

Introduction

Acute inflammatory demyelinating polyneuropathy (AIDP) is the most common pathology of the peripheral nervous system, the frequency of which in children is up to 1.7-2.0 per 100 000 of the child population. The degree and prevalence of the demyelinating process in OVDP determines the severity of flaccid paresis and impaired sensitivity, as a result of impaired neural conduction [1,4].

Aim. To study the clinical and neurological manifestations of acute demyelinating polyneuropathy in children.

Materials and research methods. The work was carried out in the department of pediatric neurology and the intensive care unit of the 1st clinic of SamMI. In total, 46 children from 7 to 17 years old with a diagnosis of AID and 25 children of the comparison group were examined. The comparison group consisted of 25 children from 7 to 17 years old with complete physical health.

The diagnosis of AFDP in children was established in accordance with the WHO criteria (1993) and the neurophysiological criteria of R. Hadden (1998). The criterion for the average severity of AIDP corresponded to from 1 to 3 points, for severe severity - from 3 to 7 points according to the functional status index.

All children with AIDP received basic therapy, which is indicated for any polyneuropathies, pathogenetic treatment, treatment of complications and rehabilitation therapy. In severe cases with the development of respiratory failure - ventilation of the lungs. All children with a severe course underwent programmed plasmapheresis in the first days of the disease in the amount of 35-40 ml of plasma / kg of body weight per procedure daily, and during sessions every other day - replacement of 40-50 ml / kg. During the course, 3-4 transfusions were carried out (up to 200 ml / kg). Rehabilitation therapy in patients with AIDP began from the first days of the disease. Its main tasks in the early stage of the disease were to prevent the development of stiffness, contractures, pathological postures of the extremities, through active and passive movements in all joints with light muscle massage. Prevention of the development of pressure ulcers, deep vein thrombosis and other complications associated with immobility of patients (posture treatment, passive exercises, breathing exercises, massage). After the end of the period of increasing paresis and stabilization of the condition, children with AIDP underwent more active rehabilitation treatment: physiotherapy exercises, robotic mechanotherapy on a device with positive feedback and functional electrical stimulation Motion Maker (Switzerland) for about 10 sessions, anticholinesterase agents, vitamins. Comprehensive clinical and neurological examination of all children with AIDP All children with AIDP underwent a general clinical examination according to the standard method with an assessment of cranial innervation, superficial and deep sensitivity, deep and superficial reflexes, pathological reflexes, assessment of the muscle strength of the extremities on a 5-point scale.

Research results. In the course of the study of the peculiarities of clinical manifestations in 46 children with AIDP, it was found that the most common manifestation during the manifestation of AIDP was muscle weakness (95.6%) in the extremities with paresis in the arms and legs of various degrees (Table 1). Numbness and paresthesias (83.4%) of the polyneuropathic type were the most common type of sensory disorders. Among sensory disorders, symptoms of irritation in the form of neuropathic pain and symptoms of tension in nerve trunks were observed in half of the cases. Vegetative disorders were observed in 72.7% of cases in the form of arterial hypotension, acrocyanosis, and hyperhidrosis. The defeat of the cranial nerves manifested itself in the form of neuropathy of the facial nerve in 11% of cases and bulbar disorders in the form of impaired swallowing and phonation as manifestations of glossopharyngeal nerve neuropathy were observed in 2% of cases.

When analyzing anamnestic data, it was revealed that 1 month before the onset of the disease, upper respiratory tract infections were observed in 84.3% of cases, gastroenteritis was observed in 10.2% of cases, and in 5.5% of cases there were no previous infections.

In all cases of AIDP, the sequence of development of neurological disorders was characteristic, with the appearance, first of all, of autonomic disorders, then of sensory disorders, and then of motor disorders, which is due to varying degrees of myelination of nerve conductors, the least pronounced in autonomic and sensory fibers, and most in motor ones. Moreover, the earlier the vegetative symptoms

were determined and the shorter the period before the subsequent development of motor disorders, the more severe the course of the disease was in the future.

Table 1.

The frequency of clinical symptoms in children with AID at different periods of the disease, depending on the severity (n /%).

Clinical symptoms	Moderate severity (п=24)	Severe severity (п=22)
Acute period (1-14 days from the onset of the disease)		
Muscle weakness	24/100	22/100
Sensory impairment	20/83	22/100
Symptoms of the tension of the nerve trunks	12/50	20/91
Cranial nerve damage	0/0	6/13
Vegetative disorders	15/63	22/100
Ventilation support	0/0	3/14
Functional status index (score)	2 ±0,8	5±2,5
The period of early convalescence (15-30 days from the onset of the disease)		
Muscle weakness	20/83	22/100
Impaired sensitivity	18/75	22/100
Symptoms of the tension of the nerve trunks	5/21	18/88
Cranial nerve damage	0/0	6/13
Vegetative disorders	13/54	22/100
Ventilation support	0/0	0/0
Functional status index (score)	1±1,2	4±1,5
Length of hospital stay (days)	28±5Д	45±8,4

From the peculiarities of the clinical picture of AIDP in all children, it can be noted that the first signs of the disease were paresthesias in the area of the toes and soles in the form of sensations of numbness, constriction, cold snap. Simultaneously with paresthesias in 36% of cases, there was a weakness in the movements of the fingers and toes. In 63% of cases, these disorders were more pronounced on the one hand, and subsequently these small differences persisted. By 2-3 days, paresthesias were accompanied by a decrease in sensitivity, primarily painful and propriceptive, and the border of sensory disorders spread along an ascending type, capturing both feet and spreading to the legs. With the spread of disorders to the upper thirds of the legs and knee joints, disorders of the sensitivity of the hands appeared in the form of paresthesias and numbness of the ends of the fingers. In the next 1–2 days, all children with AIDP developed weakness of the muscles of the feet and legs, weakness of the proximal muscles of the legs and muscles of the hands. From the peculiarities of the clinical picture of AIDP in all children, it can be noted that the first signs of the disease were paresthesias in the area of the toes and soles in the form of sensations of numbness, constriction, cold

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Thus, the clinical picture of AIDP in children had signs of subacute polyneuropathic syndrome with initial sensory and autonomic disorders and further development of motor disorders. In the acute period of AIDP with moderate severity, the functional status index averaged 2 ± 0.8 points, with severe severity 5 ± 2.5 points. With severe severity, in 45% of cases, there was a prolonged recovery period for independent walking, more than 1 month. Analysis of the dynamics of neural conduction for acute 10-minute ischemia in 25 healthy children showed that short-term local ischemia causes a regular U-shaped form of the dynamics of the SPI along the motor fibers of the ulnar nerve on the forearm. Already at the 2nd minute of ischemia, a significant decrease in SPI was observed, which increased and became maximum at the 10th minute of ischemia. After the release of compression, in all groups, there was a rapid reliable increase in the SPI already by 1 minute.

The background values of STI for the motor fibers of the ulnar nerve in children of primary school age averaged 59.4 ± 2.9 m / s. In children of senior school age, the SPI did not differ from the younger age group and averaged 60.7 ± 3.6 m / s. Slightly reduced values of STI in children of primary school age may be due to the still incomplete process of myelination of nerve fibers. STI on the motor fibers of the ulnar nerve in boys (n = 10) and girls (n = 10) aged 7 to 17 years does not have significant background differences and at 10 minutes of ischemia. The background STI in boys 60.2 ± 3.6 m / s, in girls 59.1 ± 3.1 m / s, STI at 10 minutes of ischemia in boys 54.6 ± 3.2 m / s, in girls 53, 9 ± 2.7 m / s.

The reactivity of neural conduction at 10 minutes of ischemia in healthy children has the same value as in adults: in children from 7 to 17 years old, according to our data, it is 8.6 ± 1.9%, in adults over 20 years old - 8.7%.

An analysis of variance of the RNP of the motor fibers of the ulnar nerve for short-term local ischemia by age showed no significant differences in RNP between the group of primary school age and the group of senior school age ($p > 0.05$)

An analysis of variance of the RNP of the motor fibers of the ulnar nerve for short-term local ischemia by gender showed no significant differences in the RNP between the group of girls and the group of boys ($p > 0.05$). 2.2%, in girls - 8.6 ± 2.6%. All children during the tourniquet test at 1-2

minutes of ischemia in the compression area described slight discomfort and paresthesia at the forearm-hand level, which persisted throughout the test. Immediately after the release of compression in the area of the hand, paresthesias appeared in the form of tingling, which disappeared 3-5 minutes after the appearance. Thus, the RNP of the motor fibers of the ulnar nerve at the 10th minute of ischemia in children aged 7 to 17 years does not have age and gender differences. A significant decrease in the STI for compression of the nerve on the forearm in children normally occurs already at 2 minutes of ischemia, but a more reliable decrease occurs at 10 minutes. It is unreasonable to use ischemia of a longer time, as it requires a longer study time, prolonged stimulation of the nerve and causes severe painful sensations.

The analysis of the dynamics of RNP for ischemia demonstrates that the study of neural conduction using short-term local ischemia is a reliable standardized test for assessing the conductive properties and reserve capacities of motor fibers of peripheral nerves in healthy children.

Conclusion. Thus, the clinical picture of AIDP in children had signs of subacute polyneuropathic syndrome with initial sensory and autonomic disorders and further development of motor disorders. In the acute period of AIDP with moderate severity, the functional status index averaged 2 ± 0.8 points, with severe severity 5 ± 2.5 points. With severe severity, in 45% of cases, there was a prolonged recovery period for independent walking, more than 1 month.

The analysis of the dynamics of the neural conduction reactivity to ischemia demonstrates that the study of neural conduction using short-term local ischemia is a reliable standardized test for assessing the conductive properties and reserve capacities of motor fibers of peripheral nerves in healthy children.

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