

Effectiveness of Comprehensive Medical Rehabilitation in Children with Various Diseases of the Peripheral Nervous System

Zakhidjon Ismailov N.^{1,2}, Mirdjuraev Elbek M.²

¹Republic Children's Rehabilitation Center with Diseases of Bearing Movable System, Tashkent, Uzbekistan

²Department of Neurorehabilitation, Center for the Development of Professional Qualification of Medical Workers, Tashkent, Uzbekistan

Abstract To describe the condition of pediatric patients after rehabilitation therapy using pharmaco-physio-mechanotherapy. **Purpose of the study.** To describe the effectiveness of complex rehabilitation with the use of medicinal product Ipigrix® in children with various diseases of the peripheral nervous system. **Materials and methods of research.** 100 children aged 3 to 18 years with damage of the peripheral nervous system who were treated in the neurological rehabilitation department were selected. 80 were children with neuropathy that occurred after injections, 10 were children with neuropathy caused by long-term use of orthopedic products, 10 were patients with neuropathy of various etiologies. Duration of treatment is 45-50 days. The scope of the study included: medical history, somatic and neurological examination, balance assessment (Standing Balance R, Bohannon Scale), assessment of impairment of quality of life on the Rankin scale, assessment of physical capabilities on the Rand scale, assessment of pain due to disease, assessment of pain using a visual analogue scale (VAS), assessment of the severity of asthenia (according to L.R. Krupp) [1]. **Research results.** According to the main group, after using the developed complex of rehabilitation measures with the drug Ipigrix, the following changes occurred: motor disorders in children decreased to 85.6±3.4% on average ($p<0.05$); in the main group, the ability to climb stairs to the first and second floors without the use of additional support (barrier, belt) increased by 25.7±6.0% ($p<0.05$); lack of exercise tolerance was noted in 68.3±3.8% in the main group and 21.8±4.5% in the control group. In the main group, a statistically significant improvement was achieved in the form of pain reduction by 73.2±6.4% ($p<0.05$), and dependence on NSAIDs decreased from 45.4±3.7% to 4.2±1.6% ($p<0.05$). According to a neurological examination, as a result of using the drug Ipigrix, statistically significant results were achieved: leg tremor stopped in 57.3±4.0% of children ($p<0.05$); In the main group, the number of children without limitation of leg function was 61.6±5.8% compared to the control group. (21.8 ± 3.4%, $p\leq 0.05$). **Conclusions:** As a result of a comprehensive clinical assessment of patients in the early recovery period after lesions of peripheral nerves, it was revealed that spasticity is a factor that reduces the range of active movements in the ankle joint, reduces the rate of recovery, the ability to move independently, and social activity, preventing the achievement of individual rehabilitation goals.

Keywords Peripheral nervous system, Tardieu scale, Electroneuromyography, Children

1. Relevance

In children with diseases of the peripheral nervous system, paresthesia, loss of mobility in the legs, pain in the direction of the affected nerve, loss of mobility (53.1%) and pain in the heel of the leg (42.2%), pain in the legs (31.5%) were observed. Among children aged 7-11 years, the number of children with the above complaints decreased significantly ($p = 0.05$) from 41.6% to 32.8%, pain due to damage to the nerve of the leg was 23.4%. One of the actual problems remains the prolongation of treatment, the persistence of complaints, and the insufficient effect of rehabilitation measures [2].

As the child's age increases, the number of complaints of pain in the joints of the legs, as well as hypoesthesia in the legs, increases. In the acute stage of the disease, 71.2% of patients experienced spontaneous pain in the area of compression. The irradiation of pain along the damaged nerves is less than local pain in the area of compression - by 40%. In 68.8% of our observations, pain of the damaged nerve fiber was observed upon palpation. The pain syndrome manifested itself as a burning, pressing, sometimes sharp shooting character [3]. The intensity of pain is greatest with neuropraxia of the nerve trunks. The pain syndrome in the residual period was less than in the acute period, but was more stable and usually had a focal nature. In this clinical study observed in 67.5% of cases. In this case, radiating pain is often encountered - in 41.8% of cases. On palpation, pain in the damaged nerve

fiber was observed in 47.9% of cases. The pain syndrome was burning, stabbing and twisting [4]. Almost all patients with peripheral neuropathy experienced damage to the sensory field.

2. Purpose of the Study

To describe the effectiveness of complex rehabilitation using Ipigrix® in children with various diseases of the peripheral nervous system.

3. Materials and Methods of Research

We took 100 children aged 3 to 18 years with damage to the peripheral nervous system who were treated in the neurological rehabilitation department. Duration of treatment is 45-50 days. The scope of the study included: medical history, somatic and neurological examination, balance assessment (Standing Balance R, Bohannon Scale [5]), assessment of impairment of quality of life on the Rankin scale, assessment of physical capabilities on the Rand scale, assessment of pain due to the disease, assessment of pain using a visual analogue scale (VAS), assessment of the severity of asthenia (according to L.R. Krupp), assessment of motivators of perceived obstacles to maintaining physical activity, further improvement of post-treatment rehabilitation measures [6], use of the drug Ipigrix®. All patients underwent clinical-neurological, anthropometric, methods of studying the sensor fibers n.peroneus superficialis and n.suralis, as well as electrophysiological tests [7]. Patients were divided into groups as follows.

Table 1. Dividing children into groups

Children's age	Main group	Control group
3-7 years	26 (26%)	15 (15%)
7-11 years	20 (20%)	13 (13%)
11-18 years	18 (18%)	8 (8%)

Among patients with mononeuropathy of the legs, neuropathy of the peroneal nerve was observed in 30 (37.5%) cases, neuropathy of the large sural nerve was observed in 13 (16.25%) cases, and neuropathy of the small sural nerve was observed in 37 (46.25%) cases. Most patients suffer from injection (iatrogenic): 65 children (81.25%) after the use of anti-inflammatory drugs, 15 (18.75%) after the use of antibiotics. All patients were divided into groups depending on treatment methods. The study used observational, prospective and cohort methods. When assessing the severity of the disease, it was found that 27 (27%) had mild muscle paresis, 33 (33%) had moderate paresis, 30 (30%) had moderate and severe paresis. Diagnosis is based on the 10th International Classification of Diseases.

4. Research Results

According to the main group, after using the developed

complex of rehabilitation measures with the drug Ipigrix, the following changes occurred: motor disorders in children decreased to $85.6 \pm 3.4\%$ on average ($p < 0.05$); in the main group, the ability to climb stairs to the first and second floors without the use of additional support (barrier, belt) increased by $25.7 \pm 6.0\%$ ($p < 0.05$); lack of exercise tolerance was noted in $68.3 \pm 3.8\%$ in the main group and $21.8 \pm 4.5\%$ in the control group. In the main group, a statistically significant improvement was achieved in the form of pain reduction by $73.2 \pm 6.4\%$ ($p < 0.05$), and dependence on NSAIDs decreased from $45.4 \pm 3.7\%$ to $4.2 \pm 1.6\%$ ($p < 0.05$). According to a neurological examination, as a result of using the drug Ipigrix, statistically significant results were achieved: leg tremor stopped in $57.3 \pm 4.0\%$ of children ($p < 0.05$); In the main group, the number of children without limitations in the functioning of the legs was $61.6 \pm 5.8\%$ compared to the control group ($21.8 \pm 3.4\%$, $p < 0.05$). In the main group, the severity of muscle wasting (heel, calf) decreased by $68.5 \pm 7.2\%$ ($24.3 \pm 3.8\%$, $p < 0.05$). Independent motor function increased by $73.2 \pm 8.6\%$ in the main group and by $42.3 \pm 4.4\%$ in the control group ($p < 0.05$). The frequency of acute disorders increased from $67.3 \pm 4.5\%$ to $13.8 \pm 2.4\%$ in the main group ($p < 0.05$) and to $44.6 \pm 3.7\%$ in the control group ($p < 0.05$). $65.7 \pm 7.6\%$ returned to normal ($p < 0.05$) in the control group ($34.4 \pm 4.7\%$, $p < 0.05$) compared to standing on toes (comparison group). The ability to walk on the heel was $55.2 \pm 6.4\%$ in the main group and $29.6 \pm 4.7\%$ in the control group, $p < 0.05$. The intensity of steps decreased from $45.8 \pm 4.9\%$ to $10.3 \pm 2.4\%$ in the main group and $21.6 \pm 4.3\%$ in the control group ($p \leq 0.05$).

If 21 children had iatrogenic causes (monopodiosis as a result of an incorrectly performed intramuscular injection) with a diagnosis of equinus on the foot before treatment, after rehabilitation measures and the use of the drug Ipigrix, we noted that almost all children had a normal foot condition [8]. After the entire rehabilitation (rehabilitation course of 45 days), scoliosis in children before treatment decreased, 90% of children returned to normal, which shows the high effectiveness of our proposed combined use of the drug Ipigrix in the rehabilitation process. At the same time, to assess the effectiveness of rehabilitation in groups, restoration of musculoskeletal system functions was better, despite the severity of the pathology in group I. All patients had stepwise, varus, and recurvature deformities before treatment [9]. After rehabilitation measures with the use Ipigrix, a splint bandage was installed to improve the functional state of the joint. Also, the damaged legs were corrected into the correct position using orthoses and orthotics [10]. Orthopedic mode is installed. After rehabilitation measures in children of the main group, varus deformity of the foot, sprain, and recurvature decreased by $89.4 \pm 5.6\%$, and in the control group they were ($56.7 \pm 4.3\%$, $r < 0.05$). Statistically significant backward bending in the ankle joints [11] was observed in $67.3 \pm 4.6\%$ in the main group and $35.5 \pm 3.7\%$ in the comparison group ($r < 0.05$). The increase in muscle strength of the plantar flexors and extensors [12] was $93.6 \pm 5.4\%$ in the main group and $65.2 \pm 4.3\%$ ($r < 0.05$) in the comparison group. In the main group, the strength of the extensor muscles of 1 finger

increased (in points from 0 to 5) and during the rehabilitation period reached 5 points, which amounted to $83.5 \pm 4.4\%$ in the main group and $67.8 \pm 3.2\%$ in the control group. In the proximal sections, a greater increase in muscle strength was observed than in the distal sections, and the muscle strength of the legs was better restored, which is probably due to more pronounced pathological changes in the floor muscle groups of the legs [13]. Patillary reflexes were restored on both sides (from $6.8 \pm 3.7\%$ to $75.6 \pm 7.3\%$ in the main group compared to $54.3 \pm 5.6\%$ in the control group, $r < 0.05$); In the main group, plantar reflexes ranged from $6.8 \pm 3.7\%$ to $80.4 \pm 8.2\%$, compared with the control group - $49.8 \pm 4.3\%$ ($r < 0.05$); The Achilles reflex ranged from 0.0% to $80.4 \pm 8.2\%$ in the main group and $56.7 \pm 5.1\%$ in the control group ($r < 0.05$). Soreness of the joint muscles in the main group increased by $57.8 \pm 7.1\%$ compared to $24.5 \pm 3.7\%$ in the control group. These indicators are explained by the complete or partial restoration of afferent pathways under the influence of physical rehabilitation. As a result, the degree of dependence on the walking level of children in the main group decreased from $23.5 \pm 4.6\%$ to $4.2 \pm 1.7\%$ in the main group and $6.7 \pm 2.1\%$ in the comparison group ($p \leq 0.05$).

5. Conclusions

In the process of using drug Ipigrix in rehabilitation activities, improvement in the main group was determined after 2-3 days, which revealed a decrease in swelling of the right side of the body (by $34.8 \pm 5.6\%$) in cerebral neuropathy [14]. The results obtained make it possible to reduce childhood disability as a socio-economic factor and improve the quality of life of children. Also, the widespread use of the drug Ipigrix in the implementation of complex rehabilitation measures after illness can further reduce the incidence of the disease in children and allows them to return to a normal lifestyle in a short time.

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