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Efficiency of medical and physical rehabilitation in patients who suffered from cerebral ischemic stroke

O. A. Koziolkin^{A,C,E,F}, S. O. Miedvedkova^{*B-D}, L. O. Shevchenko^{A-C}, I. M. Liakhova^{A-C},
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Objective. The purpose is to increase the efficiency of medical and physical rehabilitation in patients who suffered from cerebral ischemic stroke (CIS) with the help of differentiated use of rehabilitation measures depending on the severity of neurological disorders and comorbid states.

Materials and methods. In the clinic of nerve diseases of Zaporizhzhia State Medical University we observed 305 patients (213 men and 92 women, average age is 57.93 ± 0.43 years old) in the recovery period of CIS. All patients were clinically and neurologically examined according to a specially designed protocol using modern scales – NIHSS, mRS on the 10th, 30th, 90th and 180th day of the disease and differentiated treatment in accordance with standards and protocols for the assistance to patients who suffer from stroke. Patients with CIS were divided into four groups. The first group included 111 patients (36.4 %) with CIS, among whom the severity of post-stroke disorders was mild (state on NIHSS ≤ 7 points), without comorbid conditions. The second group consisted of 120 patients (39.3 %) also with a mild degree of post-stroke disorders (state on NIHSS ≤ 7 points) and the comorbidity (heart pathology, diabetes mellitus, chronic obstructive pulmonary disease of the IInd stage). The third group included 36 patients (11.8 %) with CIS, among whom the severity of post-stroke disorders was moderate and obvious (state on NIHSS > 7 points), without comorbidity. The fourth group consisted of 38 patients (12.5 %) with moderate and severe post-stroke disorders (state on NIHSS > 7 points) and comorbid pathology. Statistical analysis was carried out using descriptive statistics methods. The interrelation between qualitative features was evaluated according to the criterion of the Pearson's chi-square test.

Results. As a result of the treatment among the patients in group I, 97 patients (87.4 %) (index mRS 0–2) had a favorable outcome, relatively favourable one (index mRS ≥ 3 points) – only 14 (12.6 %); in group II, 104 patients (86.7 %) achieved favorable treatment, relatively favorable one – 16 (13.3 %); in group III – a favorable outcome was recorded in 13 patients (36.1 %), relatively favorable – in 23 (63.9 %), and in group IV – a favorable outcome was revealed in 13 patients (34.2 %), relatively favorable one – in 25 (65.8 %).

Conclusions. The differentiated application of medical and physical rehabilitation in patients with CIS in different groups, taking into account the individual prognosis of the recovery period and selection of methods and ways of treatment, has improved significantly the effectiveness of rehabilitation measures.

Ключові слова:
інсульт, реабілітація
інсульту.

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Ефективність медичної та фізичної реабілітації у хворих, які перенесли мозковий ішемічний інсульт

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Мета роботи – підвищити ефективність медичної та фізичної реабілітації у хворих, які перенесли мозковий ішемічний інсульт (МІІ), шляхом диференційованого застосування реабілітаційних заходів залежно від тяжкості неврологічних розладів і наявності коморбідних станів.

Матеріали та методи. У клініці нервових хвороб Запорізького державного медичного університету під нашим спостереженням перебували 305 хворих (213 чоловіків і 92 жінки, середній вік – 57.93 ± 0.43 року) у відновному періоді МІІ. Усім хворим виконали клініко-неврологічне дослідження за спеціально розробленим протоколом, використовуючи сучасні шкали (NIHSS, mRS) на 10, 30, 90 і 180 добу захворювання, а також диференційоване лікування за стандартами та протоколами надання допомоги хворим на інсульт. Пацієнтів із МІІ поділили на 4 групи. У I групу ввійшли 111 (36,4 %) пацієнтів із МІІ, в яких був легкий ступінь вираженості післяінсультних розладів (стан за NIHSS ≤ 7 балів), без коморбідних станів. II групу становили 120 (39,3 %) пацієнтів із легким ступенем післяінсультних розладів (стан за NIHSS ≤ 7 балів) і наявністю коморбідної патології (патологія серця, цукровий діабет, хронічне обструктивне захворювання легень II стадії). У III групу ввійшли 36 (11,8 %) хворих на МІІ, в яких ступінь вираженості післяінсультних розладів був помірним і вираженим (стан за NIHSS > 7 балів), без коморбідної патології. IV група – 38 (12,5 %) хворих із помірними та вираженими післяінсультними розладами (стан за NIHSS > 7 балів) і коморбідною патологією. Статистичний аналіз виконали, використовуючи методи описової статистики. Наявність взаємозв'язку між якісними ознаками оцінювали за критерієм χ^2 Пірсона.

Результати. У результаті лікування хворих I групи сприятливий результат (значення mRS 0–2 бали) мали 97 (87,4 %) пацієнтів, відносно сприятливий (значення mRS ≥ 3 бали) – тільки 14 (12,6 %); у II групі сприятливий наслідок визначили у 104 (86,7 %) пацієнтів, відносно сприятливий – у 16 (13,3 %); у III групі сприятливий результат зафіксували у

13 (36,1 %) пацієнтів, відносно сприятливий – у 23 (63,9 %); у IV групі сприятливий наслідок встановили у 13 (34,2 %) пацієнтів, відносно сприятливий – у 25 (65,8 %).

Висновки. Диференційоване застосування медичної та фізичної реабілітації у хворих на МІІ у різних групах з урахуванням індивідуального прогнозу результату відновного періоду та підбором методів і способів лікування дали змогу суттєво підвищити ефективність реабілітаційних заходів.

Эффективность медицинской и физической реабилитации у больных, перенесших мозговой ишемический инсульт

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Цель работы – повысить эффективность медицинской и физической реабилитации у больных, перенесших мозговой ишемический инсульт (МИИ), путем дифференцированного применения реабилитационных мероприятий в зависимости от тяжести неврологических расстройств и наличия коморбидных состояний.

Материалы и методы. В клинике нервных болезней Запорожского государственного медицинского университета под наблюдением находились 305 больных (213 мужчин и 92 женщины, средний возраст – $57,93 \pm 0,43$ года) в восстановительном периоде МИИ. Всем больным проводили клиничко-неврологическое исследование по специально разработанному протоколу с использованием современных шкал (NIHSS, mRS) на 10, 30, 90 и 180 сутки заболевания и дифференцированное лечение согласно стандартов и протоколов оказания помощи больным инсультом. Пациенты с МИИ разделены на 4 группы. В I группу вошли 111 (36,4 %) пациентов с МИИ, у которых степень выраженности постинсультных расстройств была легкой (состояние по NIHSS ≤ 7 баллов), без коморбидных состояний. II группа состояла с 120 (39,3 %) пациентов, также с легкой степенью постинсультных расстройств (состояние по NIHSS ≤ 7 баллов) и наличием коморбидной патологии (патология сердца, сахарный диабет, хроническое обструктивное заболевание легких II стадии). В III группу вошли 36 (11,8 %) больных с МИИ, у которых степень выраженности постинсультных расстройств была умеренная и выраженная (состояние по NIHSS >7 баллов), без коморбидной патологии. IV группу составили 38 (12,5 %) больных с умеренными и выраженными постинсультными расстройствами (состояние по NIHSS >7 баллов) и коморбидной патологией. Статистический анализ проведен с использованием методов описательной статистики. Наличие взаимосвязи между качественными признаками оценивали по критерию хи-квадрат Пирсона.

Результаты. В результате лечения больных I группы благоприятный исход (значение mRS 0–2 балла) имели 97 (87,4 %) пациентов, относительно благоприятный (значение mRS ≥ 3 балла) – только 14 (12,6 %); во II группе благоприятный исход был у 104 (86,7 %) пациентов, относительно благоприятный – у 16 (13,3 %); в III группе благоприятный исход зафиксирован у 13 (36,1 %) пациентов, относительно благоприятный – у 23 (63,9 %), а в IV группе благоприятный исход отмечен у 13 (34,2 %) пациентов, относительно благоприятный – у 25 (65,8 %).

Выводы. Дифференцированное применение медицинской и физической реабилитации у больных МИИ в разных группах с учетом индивидуального прогноза выхода восстановительного периода и подбором методов, способов лечения позволило значительно повысить эффективность реабилитационных мероприятий.

Ключевые слова:
инсульт,
реабилитация
инсульта.

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Introduction

Cerebrovascular diseases and their acute forms – cerebral strokes – are one of the important problems of clinical neurology [1,5]. In Ukraine, about 100,000 brain strokes are registered annually and, unfortunately, mortality rates from them are much higher than in developed European countries [2]. Most patients who have suffered from a stroke have become persons with disability, and only 10–15 percent restore their working ability. Therefore, this problem has got not only medical, but a great socio-economic significance as well [3–5]. Unfortunately, in Ukraine the system of rehabilitation institutions is poorly developed; there are few highly skilled rehabilitation specialists, who would improve the consequences of rehabilitation.

Apart from this, rehabilitation should be carried out starting from the acute period of the disease within the limits of passive kinesiotherapy, but the largest amount of rehabilitation measures concerns the recovery period of the disease [5–10]. Therefore, the development of differentiated rehabilitation complexes with the wide use of methods and ways of medical and physical rehabilitation is timely and relevant.

Aim

In this regard, we set the objective of work: to increase the efficiency of complex treatment of patients who have suffered from cerebral ischemic stroke (CIS) by differentiated application of methods of medical and physical rehabilitation, depending on the severity of neurological disorders and the availability of comorbid states.

Material and methods

In the clinic of nerve diseases of Zaporizhzhia State Medical University 305 patients (213 men and 92 women, average age is 57.93 ± 0.43 years old) were under our observation in the recovery period of the CIS. All patients were clinically and neurologically examined according to a specially designed protocol using modern scales – NIHSS, mRS on the 10th, 30th, 90th and 180th day of the disease and differentiated treatment in accordance with standards and protocols for the assistance to stroke patients (The Order of the Ministry of Health of Ukraine No. 602 of 03.JUL.2012).

The diagnosis of CIS was based on a complex clinical-neurological and computed tomographic study of the brain (using a computer tomograph “Siemens So-

matom Spirit", Germany) on the first day of the disease. The degree of stroke severity was assessed on the stroke scale of National Institute of Health (NIHSS), the degree of functional recovery and disability was assessed on the modified Rankin scale (mRS) in the dynamics of the recovery period of the disease on the 10th, 30th, 90th, 180th day.

As a favorable outcome of the restorative period of CIS, the index of mRS 0-2 was considered, as a relatively favorable outcome – the index of mRS \geq 3 points.

The statistical analysis was carried out in the Statistica 13.0 (StatSoft Inc., № JPZ804I382130ARCN10-J) using descriptive statistics methods. The interrelation between qualitative features was evaluated according to the criterion of the Pearson's chi-square test. The interrelation was considered reliable at the level of significance $P < 0.05$.

Results

In the course of complex treatment, we were guided by the basic principles of medical and physical rehabilitation:

- early start of rehabilitation measures;
- the complexity of using all available and necessary rehabilitation measures;
- individuality of the rehabilitation program;
- the stage of rehabilitation;
- regularity and continuity throughout all stages of rehabilitation;
- social orientation of rehabilitation measures;
- use of methods to control the adequacy of loads and the effectiveness of rehabilitation.

Developing the rehabilitation program, we took into account the age, sex and profession of the patient, his motor potential, the nature and the level of the pathological process and the functional abilities of the patient. Peculiar conditions were created for the conscious active participation of the patient himself in the rehabilitation process, a positive psycho-emotional background and a psychological attitude to increase the effectiveness of the applied rehabilitation measures. The increase in physical activity was carried out gradually concerning volume, intensity, number of exercises, the number of their repetitions and the complexity of the exercises, daily and throughout the whole rehabilitation process. In a specialized department during the first year after a stroke we carried out 2–3 rehabilitation courses. We systematically used various rehabilitation methods to ensure sufficient, optimal for each patient action, allowing to improve the functional state of the patient's body.

Physical exercises were carried out in the mode of alternation of work and rest with novelty and variety of tasks. Physical activity was moderate and dosed in time, depending on the severity of the patient's condition and the comorbid pathology.

We conducted the division of all patients with CIS into 4 groups in accordance with the criteria developed by us, based on the degree of severity of poststroke disorders and the availability or absence of comorbidity. On this basis, we identified 4 groups of patients. The division of patients into groups gave us the opportunity to apply differentially various methods and ways of medical and physical rehabilitation.

Medical and physical rehabilitation for all patients with CIS was conducted according to a specially developed scheme (made by us) on all its stages, beginning from the acute period of the disease and during the recovery period for patients in four groups. So, the 1st–14th days of CIS (I–IV groups) – conducting standard medical therapy, passive kinesiotherapy, psychotherapy, speech therapist consultation in the department of acute cerebrovascular disorder (60 beds); the 15th–60th days (I–III groups) – continuation of medication therapy, active kinesiotherapy, classes with speech therapist, electrostimulation, physiotherapy, laser therapy, psychotherapy in the neuro-rehabilitation department (the 21st–28th days) and in the sanatorium with the direction of treatment of cerebrovascular diseases (24 days); the 3rd–12th months of the disease – medical and physical rehabilitation in the department of neurorehabilitation of the angioneurological center – the clinical base of the Department of Nervous Diseases of the ZSMU (the 21st–28th days) at least 2–3 courses for the I–III groups and rehabilitation clinic for the IV group.

We also developed criteria for the medical and physical rehabilitation of patients who have undergone the CIS: favorable outcome with indexes of mRS 0–2; relatively favorable outcome – mRS \geq 3 points.

We also developed the criteria of the restoration period of CIS: favorable outcome – with indexes of mRS 0–2; relatively favorable outcome – mRS \geq 3 points.

The I group included 111 patients (36.4 %) with CIS, among whom the severity of post stroke disorders was mild (statue on NIHSS \leq 7 points), without comorbid states. Patients in this group had absolute indications for in-patient treatment in the rehabilitation department.

The tasks for the patients of the first group were – complete restoration of broken functions, training of the cardiovascular system, increased tolerance to general physical activity, complete restoration of domestic and social activity and work efficiency.

Methods of rehabilitation for patients of the I group were:

Rehabilitation complexes for patients of group I:

1. Medical rehabilitation included – drug treatment (neurometabolic, vascular, anticholinesterase drugs, as for indications – sedatives and antidepressants); physiotherapy – procedures of general influence on the neck-collar zone in order to improve cerebral circulation (alternating or permanent magnetic field, electrophoresis of vessels) and others; massage of segmental zones and paretic limbs; acupuncture, laser therapy; electrostimulation of paretic muscles; classes with a speech therapist – an aphasiologist in case of aphasic disorders; psychotherapy – individual or group classes.

2. Physical rehabilitation of patients was carried out step by step. In the acute period, the emphasis was done on passive movements and gradual verticalization. After this, gradually active movements by the healthy limb firstly were added, then by paretic one (with external help) or exercises with the sending of impulses by the patient himself in the absence of active movements.

Active exercises were repeated mostly passively and were carried out either with out-of-the-way help, or under lightened conditions. Then it was recommended to include

into work the muscles of the paretic limbs in various operating modes (overcoming, static, inferior, as well as with different degree of muscle tension). Exercises directed to the increasing of the muscle strength of the paretic muscles were used. In the presence of spasticity in the paretic limbs, exercises with multiple repetition of movements with resistance overcoming (postisometric muscle relaxation – PIMR) were prescribed in different planes and directions in two or more joints. With the appearance of signs concerning the increased tone in spastic muscle groups, the number of repetitions of exercises and the degree of muscle tension was decreasing. Initially, exercises for increasing muscle strength were carried out in the range of small amplitudes, and then the amplitude increased up to full, physiological one. After that, stretching exercises were used with an increase as for the physiological length of the muscles. When performing combined movements in two or more joints, we were watching that synergies would not occur.

During the implementation of the rehabilitation program, adaptive and compensatory processes were stimulated, the volitional activity of patients was increased. Psychotherapeutic correction was aimed at alleviating and eliminating neurotic disorders existing in the majority of post-stroke patients, which complicate the implementation of rehabilitation measures. Apart from creating a psychotherapeutic environment, we conducted group exercises on therapeutic physical culture (exercise therapy), including individual and individual group classes in combination with acupressure, autogenic training, aimed at active relaxation and local stimulating effect on isolated muscle groups of paretic limbs. In the timetable, multiple physical exercises were provided: morning hygienic gymnastics, therapeutic gymnastics, independent exercise done by the patient himself. As the patient's physical activity increased, we included self-care skills training and elements of ergotherapy.

The expansion of the motor regime of patients was carried out due to various forms and methods of exercise therapy. Dosed walking and climbing stairs were one of these measures. With sufficient adaptation of the patient to physical exercises and under the supervision of the exercise therapy instructor, patients gradually increased the distance and speed of movement during dosed walking, height and speed of climbing the stairs. The rate of increase of the load as for climbing the stairs was set for each patient individually, depending on his reaction to this type of load. Also, the patients were given mechanotherapy using swivel and block simulators in a specially equipped room in the department.

The results of treatment for patients in group I were following: favorable treatment – in 97 patients (87.4 %), relatively favorable – only in 14 (12.6 %).

The second group consisted of 120 patients (39.3 %) also with mild post-stroke disorders (state on NIHSS ≤ 7 points) and comorbidity (one of the following diseases or their combination – ischemic heart disease (IHD), chronic coronary insufficiency of I–II degree, insufficiency of circulation I–A degree, normocardic or bradycardic form of permanent atrial fibrillation, unitary extrasystole, atrioventricular blockade not higher than I degree, history of myocardial infarction (over 1 year ago), COPD of II

degree, compensated or subcompensated diabetes, type II. More severe forms of concomitant diseases were not considered, since their presence was a contraindication as for the referral to the rehabilitation of patients in specialized rehabilitation departments.

The tasks of rehabilitation for patients in group II were – full or partial restoration of impaired functions, training of the cardiovascular system, increased tolerance to general physical activity, stabilization of the course of the main vascular disease; complete restoration of domestic and social activity and, if possible, capacity for work.

Rehabilitation complexes for patients of group II:

1. Medical rehabilitation: medical therapy (pathogenetic drugs – hypertensive, cardioprotective, antiarrhythmic, antidiabetic, etc.), as well as neurometabolic, vascular, anticholinesterase drugs, following the indications – sedatives, antidepressants and others; physiotherapy: hardware physiotherapy (only after patient adaptation and stabilization of his condition) – electrophoresis of the vascular on the neck-collar zone in order to improve the cerebral circulation, etc.; dosed electrostimulation of paretic muscles; massage of segmental zones and paretic limbs; acupuncture, laser puncture; classes with a speech therapist, an aphasiologist, in case of speech disorders; psychotherapy: autogenous training, for indications – group or individual classes.

2. Physical rehabilitation: physical therapy – group exercises with limitation of intensity of physical exercises (dosed physical loads is possible to add into the complex only after a 1–2-week period of adaptation of the patient and a careful bicycle ergometry examination); mechanotherapy using pendulum simulators; limited active and passive kinesiotherapy, dosed auto-mobilization, therapeutic physical training of paretic limbs.

The results of rehabilitation of patients in group II were following: favorable outcome – in 104 patients (86.7 %), relatively favorable one – in 16 (13.3 %).

36 patients (11.8 %) with CIS were included in group III. The severity of post-stroke disorders was moderate and severe (state on NIHSS >7 points), without comorbidity. Treatment in the rehabilitation department was also recommended to these patients.

The tasks of rehabilitation for patients of group III were – reduction of the severity of motor and other post-stroke disorders in the early recovery period of the disease, psychotherapeutic correction and complete restoration of household activity.

Rehabilitation complexes for patients of group III:

1. Medical rehabilitation: medical therapy, such as neurometabolic, vascular, anticholinesterase medicine, according to indications – muscle relaxants, analgesics, sedatives and antidepressants; physiotherapy: procedures of general influence on the neck-collar zone in order to improve the cerebral circulation, the effect of alternating or permanent magnetic field, vascular electrophoresis, differentiated arrangement of local physiotherapy on the paretic limbs, taking into account muscle tone (with its real increasing – warm procedures, with moderate – combining them with a selective electrostimulation; massaging of segmental zones, selective and point massage of paretic limbs; acupuncture, laser puncture; classes with a speech therapist – an aphasiologist in case

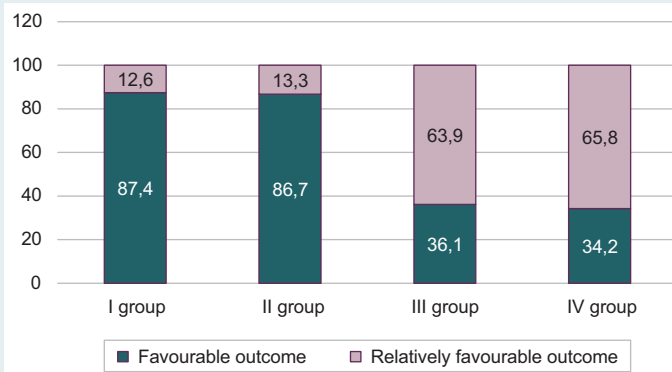


Fig. 1. Results of medical and physical rehabilitation of patients with CIS in four groups in the recovery period.

of aphasic disorders; psychotherapy: individual or group (communicative discussion) classes, autogenous training, psychogymnastics.

2. Physical rehabilitation: medical physical training – position treatment, individual exercises, training of proper walking, mechanotherapy with the use of table simulators for hands and fingers, special devices for reducing muscle tone, swing training simulators; passive kinesiotherapy and limited auto-mobilization.

The results of rehabilitation of patients in group III were following: favorable treatment – in 13 patients (34.2 %), relatively favorable – in 23 (63.9 %).

The fourth group consisted of 38 patients (12.5 %) with moderate and severe post-stroke disorders (state on NIHSS >7 points) with subcompensated and compensated comorbidity (one of the diseases – ischemic heart disease, chronic coronary insufficiency of the I-II degree, insufficiency of blood circulation I-A degree, normocardic or bradycardic form of permanent atrial fibrillation, unitary extrasystole, atrioventricular blockade not higher than I degree, history of myocardial infarction (over 1 year ago), COPD of the II degree, compensated or subcompensated diabetes, type II or their combination; indications on frequent transient ischemic attacks were mentioned in the history. This group of patients has relative indications for in-patient treatment in the department of rehabilitation.

The tasks of rehabilitation for patients of the group IV where – stabilization of the course of the main vascular disease, adaptation to everyday household loads, reduction of the severity of motor and other post-stroke disorders, psychotherapeutic correction, complete restoration of household activity.

Rehabilitation complexes for patients of group IV:

1. Medical rehabilitation: medical therapy – pathogenetic drugs (antihypertensive drugs, cardioprotectors, antiarrhythmic, antidiabetic, etc.), neuro-metabolic, vascular, anticholinesterases / symptomatic medicine (muscle relaxants, analgesics, sedatives and antidepressants); physiotherapy: hardware physiotherapy (only after patient adaptation and stabilization of his condition) – electrophoresis of the vessels on the neck-collar zone in order to improve cerebral blood flow, warm on the paretic limb with increased muscle tone, local anesthetic procedures in cases of arthralgia; electrostimulation in minimal phys-

iotherapeutic doses only after consultation with the cardiologist and physiotherapist; massaging of segmental zones, selective and point massage of paretic limbs; acupuncture; speech therapy classes; psychotherapy – individual or group (communicative discussion) classes, autogenous training, psychogymnastics.

2. Physical rehabilitation: medical physical training – position treatment, individual exercises, training of proper walking; mechanotherapy using table simulators for hands and fingers, special devices for reducing muscle tone.

The results of rehabilitation of patients in group IV were following: favorable treatment – in 13 patients (34.2 %), relatively favorable – in 25 (65.8 %).

Data on the results of medical and physical rehabilitation of patients with CIS in four groups are presented in Fig. 1.

Thus, in the I and II group, probability of the favorable outcome of the early recovery period of the CIS is significantly higher than in the III and IV groups (chi-square = 79.3; $P < 0.01$).

As a result of medical and physical rehabilitation measures out of 305 patients who suffered from CIS – 140 patients (45.9 %) were discharged to work: out of 111 patients in group I – 63 patients (56.8 %), out of 120 patients in group II – 66 (55.0 %), out of 36 patients in group III – 7 (19.4 %), out of 38 patients in group IV – 4 (10.5 %).

Discussion

Our research has shown the importance of the inspected problem of the rehabilitation of patients with CIS starting with organizational arrangements and differential usage of various methods and approaches of restorative treatment. These data are congruent with the point of view of W. J. Powers et al. (2018) and T. S. Mishchenko (2017) [1,2].

We also consider complex rehabilitation to be very important, it is made by a multidisciplinary team of specialists including rehabilitation physicians, specialists in remedial gymnastics, kinesiologists, physiotherapists and others. The nearest relatives of the patient should become active participants of the rehabilitation in order to create friendly psychological climate and optimistic mood by the patient, who aims at rehabilitation. It's necessary to coordinate the actions of all specialists according to the fact, how bad the case is and what psychological condition the patient has. These data are congruent to the point of view of C. J. Winstein et al., 2018 [5].

During the rehabilitation measures, we have noticed the positive influence on the movement rehabilitation of patients, which was evaluated in dynamics using NIHSS and mRS. This is in accord with the data of M. Morreale et al. (2016) [8].

We believe, that complex physical exercises are an important component of rehabilitation measures, the exercises are chosen for every patient individually, according to the degree of severity of kinetic deficit. This contributes to active participating of the patient in his rehabilitation and to his aiming to the positive result. Physical exercises are organized both for groups and individually under the control of instructors of remedial gymnastics. We

think, that physical exercises influence on the processes of brain plasticity, what is proven by positive dynamics of neural disorders. These data are congruent to the results of Caroline Pin-Barre, Jérôme Laurin (2015) [7].

Lately, there has been a discussion among scientists about the terms of the beginning of rehabilitation, maybe early (starting with the first 24-hour period of the disease), and also its duration [1, 10]. To our mind, the rehabilitation as passive kinesiotherapy and psychotherapy should be organized starting with the first 24-hour period of the stock, but the rehabilitation in the early recovery period, like it was mentioned in our thesis before, is more effective.

Also, we have shown, that comorbid conditions influence the results of the rehabilitation in negative way, they don't allow making active rehabilitation to the full extent. That's why the division of the patients to the groups with the identifying of the group of patients with comorbid conditions (groups II and IV) is absolutely necessary. The rehabilitation of patients who have suffered from CIS with comorbid conditions must be complex, with limitation of active methods of treatment. Our data are congruent to the results of Nelson MLA et al. (2017) [4].

The division of post-stroke patients to groups allows not only to differentially use various methods of treatment, but also to predict the disease outcome and also disablement of the patients. In Ukraine, not more than 10–15 % of patients come back to work after a stroke [4]. As a result of the complex treatment and rehabilitation measures, which were made by us, 140 patients who have suffered from CIS (45.9 %) were dismissed to come back to work, this index is much higher, than the average index in Ukraine. These data show the positive result of the research and its perspective.

Conclusions

1. In the complex of therapeutic measures in patients who have suffered from CIS, it is necessary to apply methods of medical and physical rehabilitation differentially, depending on the degree of severity of neurological disorders and the comorbid diseases.

2. Restore therapy for patients who have suffered from CIS should be conducted in a specialized rehabilitation department with trained specialists in the multidisciplinary team and equipped with the necessary equipment.

3. The results of rehabilitation of patients who suffered from CIS were better in the first and second groups, where 129 patients (55.8 %) recovered and returned to work.

4. The division of patients into groups depending on the degree of severity of post-stroke disorders and the availability or absence of comorbid conditions allows to form the volume, intensity and duration of complex rehabilitation measures differentially, taking into account the individual prognosis of the outcome of the recovery period of the CIS.

Prospects for further research. We believe that it is efficient to continue this research with the study of processes of brain plasticity, their influence on the rehabilitation of movement functions and usage of biomarkers for predicting the efficiency of the rehabilitation.

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