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Rehabilitation of patients after stroke

Stroke, which is the reason of high mortality, lameness, disability, dementia, is one of the most important medical as well as economic problems due to big costs of medical care, treatment and rehabilitation (1). Stroke incidence is 1.5 in 1,000 people, and mortality – 25% (2, 3). It makes 9% of all death causes in the world and is the second death cause, just after cardiac infarction (4). Stroke is a vascular disease of the central nervous system, characterizing in focal or general disorder of brain function. Because of decreased blood flow through brain vessels or their complete obstruction, there comes to anoxia and neurons death in the stroke area. A factor narrowing blood vessel lumen might be an atheromatous plaque (5, 6).

Health state of a patient after past stroke and his efficiency are determined by the quality of nursing care and rehabilitation during first days of staying in hospital. Early rehabilitation increases a possibility of recovery, dysfunction compensation; decreases stroke results and has influence on further patient's history (5, 7–9).

Rehabilitation of patients after stroke is based on regulations of the Expert Team Report of National Stroke Prevention and Treatment Programme, so-called: the Helsinborg Declaration. According to it, the basis is rehabilitation care 'without previous selection'. A rehabilitation team looking after patient after stroke consists of: a doctor, nurse, physiotherapist, ergotherapist, psychologist, speech therapist, occupational therapist and social worker. The most crucial rules of procedure towards those patients derive from the Polish rehabilitation idea, which emphasizes that it should be general, early, complex and permanent (2, 7).

The rehabilitation according to Kwolk's algorithm (2) comprises physiotherapy, kinesitherapy, occupational therapy, speech therapy exercises, psychotherapy, family education and orthopedic equipment supply. Rehabilitation takes place in the early stage of disease, namely during first days of staying in stroke ward and hospitalization period in neurology or rehabilitation department lasting about 4–8 weeks. Then there is rehabilitation during compensation period (one year after stroke) and continuation of rehabilitation for the next many years (2, 7).

PATIENT STATE EVALUATION

Before undertaking action it is necessary to estimate a patient's physical state and his functioning abilities – it is called clinimetric assessment (and it is performed by a rehabilitation team). Thinking about post-stroke patients, many point scales have been worked out but specificity of this disease and its effects do not allow to create an ideal scale. For this purpose proper general assessment scales are used such as Rankin's, Glasgow, stroke scales like Mathew, Canadian Neurologic Scale, Scandinavian Stroke Scale, National Institute of Health Stroke Scale (NIHSS), European Stroke Scale (ESS), classification of body motor activity – MOC or assessment scale of mental state according

to J.A.Yesavage. *The Rankin's scale* determines a self-service ability. According to this scale it is possible to classify the patient as slightly or heavily unfit requiring constant care. *The Mathew's scale* assesses consciousness, orientation, speech, some skull nerves, muscle power of limbs, reflexes, sensation and disability grade. There are many more other scales for general assessment of the patient after stroke but because of comprehensiveness and time-consuming aspect they are seldom used, e.g. *the Orgogozo's scale, the Copenhagen's, the Toronto's scale.* Ability assessment for independent existence is carried out by *the Barthel scale, Katza, Kenny* and The Functional Indepedence Measure (FIM). *The Barthel scale* is the most popular one assessing performance of everyday activities, especially in Europe. It evaluates the patient's ability to consume meals, get dressed, make toilet, control bowel emptying and bladder, take a bath, walk, move from place to place and ascend stairs (2, 3, 6, 8, 10, 11).

It is also necessary to mention here the so-called instrumental scales assessing both self-service efficiency and life quality. It is the Franchay Functional Index, the Rosser's pathologic state Classification, Extended Everyday Activity Index of Nottingham (*Nottingham Extender ADL* Index) defining mobility, self-service activities, dealing with kitchen activities, housework and organizing leisure time and learning ability. During motor rehabilitation their effectiveness is estimated. For this purpose there are used scales assessing motor functions such as Brunnström, Fugl-Meyer, Rivermead or Södring. They evaluate the ability of turning on side in bed, sitting, getting up and walking (11, 12). Brola and Czernicki (10) write that neurological scales are necessary and helpful during treatment and rehabilitation but they do not take into account all important aspects and do not present the patient's full image.

EARLY REHABILITATION

After assessment stage there starts an individually scheduled (for each patient) early rehabilitation. If patient's state is unstable (respiratory and circulatory failure, hydrous- electrolyte and endocrinological disorders) and there occur: extensive decubites ulcers, active inflammatory processes, infectious diseases, pains, unstable coronary heart disease, arrhythmia, aneurysm dissecting aortas, arterial hypertension not reacting to pharmacological treatment, anxiety states, aggressiveness, apathy, dementia or when the patient does not have any motivation to do exercises, starting the rehabilitation is not recommended. After regression of some of these states having a transient character, the rehabilitation can be started (7, 13, 14).

The result of the past stroke is the complete loss of ability to perform involuntary dyskinesia with abolition or weakness of tendinous reflex. The muscular tone decreases pathologically. Activation of tendinous reflexes of affected side takes place within 48 hrs after the stroke. At the same time there increases extension resistance occupying bigger muscle groups mainly of adductors and shoulder joint flexors and adductors and hip joint extensors. Growing spasticity of paretic limbs is the result of damaging an upper motor neuron, so the structures and functions near cerebral cortex, subcortical areas, brain stem and spinal cord. Spasticity is a big problem, making the rehabilitation procedure difficult or even impossible. It also often causes strong and difficult-to-control pains, which become chronic and might predispose for decubitus ulcer and disturb the nursing care process (15–17).

The most important therapeutic problems of the patient just after stroke are first of all movement disorders, consciousness disorders, bigger activity disorders, swallowing difficulties. The first elements of early rehabilitation, which begin an improvement process, include a suitable laying down patient to bed, considering particularly paresis. Paretic upper limb should be led in shoulder joint 60–90°, bent in elbow joint 90–120°. Forearm should be placed in a slight inversion, wrist in a slight dorsal flexure, roller should be put into hand, fingers ought to be bent slightly and thumb secured with roller. Paretic lower limb should be placed in extensory position, abducted hip joint by

10°, bent in knee joint by 5–10°, foot should be placed, bent in tarsal joint by about 90° in intermediate position and secure the limb with rollers, wedges. The patient should lie on anti-decubital mattress (6, 7, 18).

An effective form of rehabilitation of patients after stroke is physiotherapy, consisting of kinesitherapy, physical therapy and massage. Physiotherapy contributes to decreasing death rate and reduces risk of the second stroke. In order to decrease the muscular tone and at the same time reconstruct or compensate lost motor functions (position change, walking and other more complex motor functions), kinesitherapy is used. Traditional methods are active and passive exercises. Active bedside exercises need to be done six times a day for about 10–15 minutes. The same rule applies to passive exercises performed in unconscious patients or with no contact and supported by massage, patting or brushing dermatomes of spasticity muscles. More advanced techniques of kinesitherapy are facilitation of movements and functions, manual resistance, gravitation in exercises and mass function repetition. Moreover, there are used some special methods such as NDT-Bobath, Rood, Priopriocceptive Neuromuscular Facilitation (PNF) and relaxation methods, biofeedback and instrumental methods. The NDT-Bobath is one of crucial rehabilitation methods used in Western Europe by trained specialists. Due to suitable exercises the muscular tone is normalized, proper reflexes are stimulated, reflex connected with posture is integrated and pathologic reflexes are inhibited. The main principle of this method is patient rehabilitation in order to achieve as big self-reliance in everyday life as possible, at the same time requiring as little help from the others as possible (2, 3, 6, 14, 19, 20).

A popular rehabilitation method is the Kabat method (PNF) – also called 'the pattern method', based on the rule of complex motor patterns. This method is unique because of movement facilitation of head, neck, upper and lower limbs by extension, intensification, pressure, resistance and relaxation techniques. During training it is important to carry out motor patterns and emphasize rotation in oblique plane. During rehabilitation a therapist uses direct resistance, cyclical stabilization and changes in movement direction to opposite (21).

Realization of kinesitherapy is facilitated due to physiotherapy. Procedures with using light, heat, water, ultrasounds and electromagnetic field might have influence on the whole organism. Local cryotherapy is very popular in spasticity treatment, especially of upper limb. Cold reveals beneficial reaction to pathologic muscular tone. It penetrates body covers, cools muscles and nerves, excludes exteroceptors and reduces neuromuscular conduction in sensory and vegetative nerves. Low temperature might affect brain motor control, and as a result – control of muscular tone. Also positive effects are achieved by tonolysis – two-channel electric stimulation of wrist muscles and fingers (17, 22). Pasternak-Miądzka et al. (16) have showed an improvement in skills of paretic hand after having used both tonolysis and cryotherapy. Even little bending and extension in elbow joint and dealing with grabbing subjects increases patient's self-reliance and self-service efficiency (16).

Limited mobility and shrinkage of soft tissues within joint, particularly hip and hand joints, causes pain and discourages from rehabilitation. At that moment pharmacotherapy plays an important role. Non-steroidal Anti-Inflammatory Drugs or muscle relaxants control pain and contribute to a quicker process of improvement. Also other medicines have a positive effect on the rehabilitation process. These are monoamines, precursors and agonists of monoamine receptors and drugs increasing their concentration. Research has proved a positive action of dopaminergic receptors' agonists, levodopas and derivatives of amphetamine and piracetams in patients with lingual function disorders. There are also medicines hindering rehabilitation such as: neuroleptics, benzodiazepines and some antiepileptic drugs (6, 22, 23).

In his work Krawczyk has presented the Constraint-Induced Movement Therapy (CIT) method of rehabilitation of patients after stroke. The method is also useful in case of rehabilitation of paretic

upper limb. CIT is "a family of therapeutic reactions, whose common element is provoking the patient after stroke to more intensive using a weaker upper limb" (24). Through immobilization of a healthy limb with the use of triangular bandage, elastic bandage or sling, the patient is forced to use a paretic limb. The therapy lasts 2–3 weeks for 4–9 hrs a day during which the patient does exercises with elements of proprioceptive facilitation and adjustment, movement shaping and using bad limb in everyday activities. The method of forced movement, as the name suggests, contains an element of compulsion. Therefore, it is important to obtain patient's permission, independent and stable gait and a good mental contact. This method is modern, still under examination and controlled as regards effectiveness. It is helpful during rehabilitation with the methods: PNF and NDT-Bobath (21, 24).

Rehabilitation cannot proceed without occupational therapy. Its goal is to reconstruct practical functions – i.e. learning everyday activities. Through exercises a therapist teaches the patient how to master basic self-service activities like getting dressed, making toilet, preparing meals, eating. This therapy also includes the following actions: taking medicines, communicating with the environment, running household, ability of finance management. If restoring lost functions is not possible, occupational therapy helps in carrying out substitute functions (2, 14, 22).

Research by Petruševičienė and Kriščiūnas conducted in patients after stroke and dependent on other people have showed that early rehabilitation of these patients made a big progress. The patients had memory problems, weak ability to solve problems and social communication disorders. Due to providing the patients with early rehabilitation, at first the progress was made in skills of eating, making toilet, getting dressed an upper part of the body and moving from a bed to wheelchair. In the end, ability of getting dressed lower parts of the body on their own came back as well as of taking a bath and using the toilet. Progress depended on the kind of stroke, scale of damages and patient's age but picture advantages from the earliest rehabilitation (8).

NEUROPSYCHOLOGICAL REHABILITATION

Simultaneously patients should be subject to neuropsychological rehabilitation. Brain injury as a result of stroke often leads to cognitive ability disorders such as attention, perception, memory, learning, and thinking disorders. It might also lead to changes of personality trait, self-esteem, self-assessment and disorders of behaviour standards in performed social roles. Because of both inappropriate functioning of brain structures responsible for emotions and reaction to disease and sudden change of lifestyle, there might occur emotional disorders – depression, anxiety, irritability, aggressivity, apathy, indifference, emotional lability, negativism. Action against these cognitive, emotional and social disorders and at the same time restoring complex natural behaviour in everyday situations is the main goal of neuropsychological rehabilitation. Different effects has a cognitive rehabilitation defined as "the system of functionally oriented therapeutical strategies which are based on a proper diagnostic assessment and understanding cognitive deficiencies being the consequence of acquired, non-progressive brain damage". Patient's qualification to neuropsychological rehabilitation follows on the basis of neuropsychologist's assessment of his general condition, not occurring consciousness disorders, dementia, diagnosed partial skill of learning and patient's agreement for cooperation in rehabilitation. Stages of neuropsychological rehabilitation consist of: making diagnosis, prognosis, setting therapy goals, picking therapeutical methods, executing therapy and its assessment. During therapy the following disorders are examined: of lingual functions (aphasia), attention (neglecting symptoms), reception of visual, hearing and sensory stimuli (agnosia), memory (amnesia), space and structure functions (apraxia) and also executive functions, loss of writing skill (agraphia) and disability of understanding written words (alexia) (14, 25–29).

Neuropsychological rehabilitation starts from making contact with the patient, motivating him to cooperate, stimulating, minimizing emotional reactions caused by disease. It is necessary to proceed

in a professional way, not to expose patient to next psychic trauma. After preparing the patient for therapy it is time to start a programme of restoring correct speech. The exercises cover stimulating auditory speech reception, inhibiting expressive speech side and stimulating speech transmission. If disorders are of neurodynamic character, they are subject to regression; if not – they are a proof of irreversible brain injury. In the next stage the patient is more carefully examined and detailed neuropsychological diagnosis is made, after which there are selected techniques and exercises adjusted individually to the patient and sort of his speech disorders. Speech therapy duration depends on the extent and place of injury, patient's age, his personality, kind of treatment and its intensity. At the same time, when speech therapy is conducted, functions of writing, reading and counting are improved as well (27).

Psychotherapy has to cause and keep in patient a good mood, soothe tension and anxiety, help in controlling emotional reactions and self-acceptance, overcoming difficulties, accepting disease and building up hope for skill improvement. It is also significant in fighting depression, which has a negative influence on cognitive functioning, eliminates effort put into rehabilitation and worsens existing neurological symptoms. Magoń et al. (30) prove that depression lessens patient's motivation for rehabilitation procedure and inhibits improvement of the patient's condition. According to Korner-Bitensky et al. (31), compared to healthy individuals of advanced age, people after stroke are characterized by a higher risk of depression and worse life quality. The biggest risk of depression is within first three months since the episode of stroke (22, 27, 32, 33).

LATE REHABILITATION

In the next stage of rehabilitation – the phase of compensation, when there are still motor and motion disorders present as well as manipulation and higher actions, time and intensity of exercises prolong and patient is prepared for self-care. Self-service efficiency determines patient's life quality, therefore the next step is to focus on preparing the patient to deal with everyday activities on his own. Training of paretic limbs, active relieving exercises and breathing practice are continued. Manipulative exercises, hand prehensive and ergotherapy are started. Through this kind of procedure, the aim is to optimize psychophysical ability, adapt to new life conditions and simultaneously to life quality improvement. At the moment of patient's adaptation to a vertical position, gait education is introduced. Varied exercises improving the skill of walking after stroke have been worked out. They focus on damage associated with the walking ability such as balance, leg muscle power, circulatory-respiratory efficiency. The patient starts learning this action with flinging up his paretic limb forward, which makes proprioreception possible and resembles proper gait. Keeping balance on one foot, balancing with the centre of gravity and stimulating along with loading a paretic limb is conducive to the gait reaction (6, 7, 34, 35).

Elements which make moving and the whole rehabilitation process easier are orthopedic equipment and facilities. Among the equipment the most useful are crutches, walking sticks, walking assistants, 4-leg crutches, walkers, wheelchairs. The facilities include uncomplicated devices which help a disabled person to function such as rails, handles, wall bars, suitable cutlery, orthopedic shoes. All these things make performing daily activities easier and make self-service possible (6, 36).

In the period between one year after stroke to death, if there have not been fixed deficiencies and their secondary sequels such as contractures or osteoporosis, ambulatory rehabilitation is carried out. The goal of such rehabilitation provided by rehabilitation clinics and sanatorium is to accept someone's state, improve general feeling and struggle to obtain motor skills as far as possible. The rehabilitation effects, to a large extent, depend on the patient's age (7, 37).

CONCLUSIONS

Because of stroke and its effects like movement dysfunctions, self-care, understanding, behaviour and communication, a high percentage of patients remains disabled. They need care and become dependent on other people. Immediate transport of patient to hospital just after diagnosing initial stroke symptoms, treatment and rehabilitation are the bases for good prognosis for patient (38). World Health Organization defines rehabilitation as a complex use of methods and medical means in order to improve patients with damaged organism efficiency possibly to the highest level (22). Rehabilitation of patients after stroke is the adaptation to their own environment and return to independence from the period before disease. Researchers prove that a professionally organized rehabilitation, conducted by a therapeutical team of specialists, reduces the stroke death rate and necessity to stay in foster homes; improves functioning and patient's life quality and increases the percentage of patients returning to partial or complete self-reliance (26). However, there are still too few neurological and rehabilitation departments which run early and fully complex post-stroke rehabilitation. There is a shortage of well-trained staff as well (28).

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SUMMARY

Patient's return to health and efficiency after past stroke is determined by early, complex and continuous rehabilitation. Implementation of physiotherapy including kinesitherapy, physical therapy and massage counteracts the stroke's effects, gives a chance to the return of lost functions or learning how to compensate dysfunctions. Rehabilitation should be conducted by a specialized rehabilitation group which task is to estimate a patient's general condition according to established scales, functional assessment and mental state. The stroke's results in the form of cognitive ability disorders require a neuropsychological rehabilitation. The rehabilitation procedure ought to start as soon as possible in a post-stroke department, continue in a rehabilitation department and after leaving hospital. Only this determines the effects in the form of acquiring self-service ability by patients.

Rehabilitacja chorych po udarze mózgu

Powrót do zdrowia i sprawności pacjenta po przebytym udarze mózgu uwarunkowany jest wczesną, kompleksową i ciągłą rehabilitacją. Wdrożenie fizjoterapii obejmującej kinezyterapię, fizykoterapię i masaż przeciwdziała skutkom udaru, daje szansę na powrót utraconych funkcji lub nauczenie kompensowania dysfunkcji. Rehabilitacja powinna być prowadzona przez wyspecjalizowany zespół rehabilitacyjny, którego zadaniem jest dokonanie oceny stanu ogólnego pacjenta według przyjętych skal, oceny funkcjonalnej oraz stanu psychicznego. Skutki udaru w postaci zaburzeń zdolności poznawczych wymagają rehabilitacji neuropsychologicznej. Postępowanie rehabilitacyjne powinno rozpocząć się najszybciej, jak to jest możliwe w oddziale poudarowym, być kontynuowane w oddziale rehabilitacyjnym, a także po wypisaniu pacjenta ze szpitala. Tylko takie postępowanie warunkuje efekty w postaci nabywania przez pacjenta zdolności samoobsługowej i poprawy jakości jego życia.