

# THE IMPACT OF HYDROKINETOTHERAPY IN THE POST STROKE REHABILITATION

\*F.MARCU<sup>1</sup>, L. LAZĂR<sup>1</sup>, GABRIELA MUȚIU<sup>2</sup>

*University of Oradea, Medicine and Pharmacy Faculty, Department of Psycho-Neurosciences<sup>1</sup>,  
Department of Morphological Sciences<sup>2</sup>,*

**ABSTRACT.** The strokes or cerebrovascular accidents - CVA represent a public health issue, being one of the major mortality causes worldwide, due to collateral complications generating long term disabilities and to high social and economic costs they involve. Hemiplegia, characterized by the presence of the motor and sensitive deficit in the hemibody opposed to the place of the lesion, is the most characteristic and frequent symptom of a CVA. Hydrokinetotherapy, the method comprising kinetic exercises in water at 36-37°C, is, in the case of patients diagnosed with hemiplegia, one of the most important ways of rehabilitation. In order to point out the therapeutic advantage of hydrokinetotherapy, we have conducted a comparative study on 2 groups of patients diagnosed with post CVA hemiplegia, at the Recovery Hospital Băile Felix. The assessment of the therapeutic efficiency of hydrokinetotherapy was carried out by using standardized scales before and after the recovery treatment. The therapeutic efficiency of the recovery program was superior in the study group who also undertook hydrokinetotherapy during the rehabilitation, as compared to the witness group, who did not undertake hydrokinetotherapy along with the other recovery methods. Overall, in the case of hemiplegic patients, hydrokinetotherapy works as positive factor in what regards the patients' neuromotor impairment, thus being recommended in cases compatible with the hydrokinetotherapeutic treatment.

**KEY WORDS:** stroke or cerebrovascular accident, hemiplegia, hydrokinetotherapy

## INTRODUCTION

Stroke or cerebrovascular accident - CVA, from a pathophysiological point of view represents a sudden interruption of the oxygen supply of a certain area of the brain, followed, in a few minutes, by the damage and afterwards, if it persists for a longer period of time, even the destruction of the brain cells of that area of the brain. The consequence of these functional disorders is that the part of the body that is controlled by the damaged area of the brain no longer functions properly. The stroke is a major neurological disease due to its severe repercussions, thus a forth of those who have suffered of a stroke die, and half of the survivors present long term disabilities ( Asbury A.K. et al., 1992 ). These can influence all functions of the person: motor, sensory, cognitive and/or the autonomic nervous system, which generates persistent symptoms as: equilibrium deficiencies,

perception deficiencies, aphasia, hemiplegia, depression and other impairment of the cognitive function.

The stroke represents a suffering that has a major social impact, mainly due to the multiple social connections it determines, the patient and her/his family and the multidisciplinary team that participates to the treatment of these patients ( Goldstein L.B., Adams R. et al., 2001 ). Another argument, which highlights the importance of this suffering, is represented by the extremely high expenses caused by the intensive treatment starting from the acute, sub-acute phase and the extended period of the rehabilitation treatment.

Hemiplegia is the most frequent characteristic manifestation of a stroke, which appears at the level of the hemicorpus opposite to the location of the cerebral lesion and it is mainly

characterized by the existence of a variable degree of the motor and sensory deficit. Specific for the hemiplegic patients is the incapacity to move, which constitutes a major long term disability; thus, for these patients the recovery of the motor function is considered the most important in the rehabilitation process (Cash Joan, 1997).

The treatment for stroke will include medication, surgical and rehabilitation treatment. The rehabilitation treatment must be immediately started, after the cerebral lesion was stabilized, after 24-48 hours in case of ischemic stroke and after 2-3 weeks in case of hemorrhagic stroke, when the danger of cerebral hemorrhage is considered to be gone (Lennon S., 2003). Hydrokinetotherapy- HKT, the method of kinetic exercises in water, in case of patients who have suffered a stroke, consists in the immersion of the entire body in individual or collective pools.

The prescription and recommendation of the hydrokinetotherapy is based on two proven and accepted phenomena: the floatation of the body, sustained by Archimedes' principle and the resistance opposed by the aquatic environment for some movements. Thus, HKT involves a smaller physical effort for moving and maintaining verticality in water, due to the weight unload of the body and facilitating up and down movements. At the same time, this therapy, performed for a period of approximately 20 minutes, allows increasing muscle force and resistance of the patient for side or up and down movements.

## **MATERIAL AND METHODS**

During June 2009- January 2012 at the Rehabilitation Clinical Hospital from Băile Felix, in order to assess the therapeutic efficiency of HKT we have performed a comparative study on two groups of patients, who were diagnosed with post-stroke hemiplegia and who have performed at least one rehabilitation treatment for a period of 14 days. All 200 patients within our study have followed a conservatory specialist treatment non-surgical, which included: medication, rehabilitation or balneal and physical therapy and respecting a life style that would reduce the risk of stroke relapse.

The balneo-physical therapy included the following means of rehabilitation: kinetotherapy, positively respected also at patient's home, electrotherapy, thermotherapy, massage therapy, psychotherapy, Lokomat robotic orthosis and occupational therapy.

The first group - the study group included 100 patients who have performed HKT during the

rehabilitation program, and the second group - witness group also included 100 patients, but who have not performed HKT. The selection of the witness group was made based on subjective criteria of medical discipline, as well as on objective ones due to some existing contraindications:

- the existence of some dermatoses;
- cerebrovascular and cardiac pathology with destabilization or aggravation risk, when performing a physical effort in thermal water at 36°C;
- acute developing flare-ups of inflammatory rheumatisms.

The exclusion criteria of this research were:

- the existence of some complications: history or diagnosis of neoplasms of any kind, invalidating comorbidities or mental illnesses;
- stroke older than 5 years;
- speech disorders, which prevent the possibility to assess the subject.

We intended for the groups subjected to the study to be homogeneous in respect to patient's gender, age, and background. The studied group included 57 women and 43 men, 52 came from the rural area and the others were from the city. As regards the distribution of the subjects on age groups, 59 of them were between 55 - 70 years old, 24 were over 70 years old, 13 subjects were between 40 and 55 years old and 4 subjects were younger than 40.

The witness group included 58 women and 42 men, half of them were from the urban environment. Most patients, 61, were between 55 and 70 years. 11 subjects of the witness group were between 40 - 55 years old and 5 of them were younger than 40 years old. The rest of the subjects, 23, were over 70 years old.

Furthermore, there were not any significant statistical differences between the 2 groups considering the types of stroke, ischemic or hemorrhagic and of the period since the stroke occurred until the beginning of the rehabilitation, but not longer than 5 years.

During this research, we decided to monitor as study variables the following parameters:

- the pain was self-assessed by the patient partially with the visual analogue scale - VAS, the interval of the results is from 0 - lack of pain, to 10 - maximum pain;
- muscle tone, the spasticity level is appreciated with the Ashworth scale, the score is from 0 - normal muscle tone, to 4 - hemicorpus affected by hypertonicity and with limbs fixed in flexion or extension;

- the functional independence appreciated with the FIM scale - Functional Independence Measure, this standardized tool for assessing patients with stroke or spinal cord injury - SCI, includes 13 motor items and 5 cognitive ones, which are scored from 1 - total dependence to 7 - complete independence; the minimum score is 18 and the maximum is 126, the higher the assessment result is the greater the functional independence of the subject is.

The assessment of the 2 groups considered in the research was performed before the starting of the rehabilitation treatment, in the first hospitalization day and at the end of the specialist treatment, respectively in the last day of the treatment.

### RESULTS AND DISCUSSIONS

In order to compare the subjects from the hydrokinotherapy group to those from the group without kinetotherapy, we considered the initial values, before the beginning of the treatment and the

final values, after treatment, of the following parameters:

- pain;
- muscle tone;
- functional independence.

Assessing the initial values of the two studied groups, we have established that before starting the treatment, there have been some differences between the two groups, respectively if the two groups have been or not homogeneous for each studied variable.

Regarding the initial values analysis of the studied variables, we have determined, which of the two treatment methods have had a stronger effect, namely the combination: the life style that lowers the risk of stroke relapse associated with medication and the rehabilitation treatment including or not HKT.

The pain assessment using VAS scale was performed individually in the two moments of the assessment, after which the average for each studied group was calculated.

*Table 1 - The result of the pain assessment using VAS scale*

Assessment time	Studied group	Witness group
Before starting the treatment	6,6	6,4
After finishing the treatment	3,1	4,3

Analyzing the two groups considering VAS scale results, scale used for pain assessment, we have noticed that when the study started there were no significant differences between the studied groups, these being homogeneous in respect to pain perception.

The final results of the VAS scale highlight the fact that the subjects who perform HKT during the rehabilitation treatment have a lower perception of pain, from 6,6 to 3,1 with a difference of 3,5

between assessments compared to the subjects of the witness group who do not perform HKT, from 6,4 and 4,3 and that have a difference of only 2,1 between assessments.

The assessment of the muscle tone, of spasticity using Ashworth scale, was individually performed before starting the study and after finishing it, after which the average was calculated for each studied group.

*Table 2 - The result of the spasticity assessment using Ashworth scale*

Assessment time	Studied group	Witness group
Before starting the treatment	2,7	2,6
After finishing the treatment	1,7	2,2

From the above presented table, we notice that at the beginning of the study, before starting the treatment, the studied groups were homogeneous considering muscle spasticity. Thus, the initial values average of the spasticity level for the study group was 2,7 and for the witness group was 2,6.

The final results obtained, after finishing the treatment, proved that the muscle tone of the subjects present in the studied group significantly diminished, more than twice, compared to those of the subjects of the witness group. Specifically, the group that performs HKT during the rehabilitation treatment, the

spasticity level decreases from 2,7 at 1,7 and for the rehabilitation without HKT group the spasticity level decreases from 2,6 to 2,3.

The possibility of the studied subjects to fulfill ADL, meaning activities of daily living, was

measured using FIM scale. The assessment of the functional independence, as for the other variables considered in the study, was made using average of the values for each group, at the start and end time of the study.

*Table 3 - The result of the functional independence assessment using FIM scale*

Assessment time	Studied group	Witness group
Before starting the treatment	87.6	89
After finishing the treatment	98.7	94.5

At the end of the study, we can notice that the functional independence index of the patients, who perform HKT during the rehabilitation treatment, increases two times more in comparison to that of the patients who do not perform HKT during the rehabilitation treatment. The difference between assessments for the witness group is of 5.5, while for the studied group is of 11.1.

These results were extremely significant considering the effect of HKT in facilitating the performance of ADL, because the initial values of the FIM scale highlight the unity of the studied groups regarding functional independence: 87.6 for the studied group and 89 for the witness group.

On one hand, the final results of the parameters followed during our study highlight the fact that HKT performed in thermal water at 36-37°C from Băile Felix has obvious therapeutic effects, easy to highlight, and on the other hand it confirms other scientific researches ( Carr J.H, Shepherd R.B, 2002 and Hoenig H., Duncan P.W., Horner R.D., et al, 2002 ). Thus, for the subjects of the witness group, who have respected HKT during rehabilitation, we notice pain reduction, spasticity reduction and the increase of functional independence.

## CONCLUSIONS

Hydrokinetotherapy obviously facilitates the favorable evolution of the neuromotor deficit of the hemiplegic patient, the therapeutic benefit of this rehabilitation method being supported by the combined actions of the physico - chemical characteristics of the thermal water with the benefits of the kinetic program performed under circumstances that alleviate movement, generated by the aquatic environment. Hydrokinetotherapy is not singly used as unique therapeutic method, but it is part of a complex therapeutic program to which besides a multidisciplinary team works along the

patient her/himself and her/his family ( Dauch W.A., 2000 ).

Noteworthy is that the rehabilitation of the patient with post-stroke neuromotor deficit must be performed lifelong, specific for each case and in successive stages depending on her/his evolution.

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*\*Correspondence address: assist. univ. Florin Marcu  
 Faculty of Medicine and Pharmacy, University of Oradea, Romania  
 Mobile Telefon: 0745\883047  
 e-mail. mfmihai27@yahoo.com*