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Strategies for the recovery of patients with post stroke sequelae in the context of the COVID-19 pandemic

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Abstract

Introduction. The performance areas of post-stroke mention negatively correlated determinants in doing daily activities. The intrinsic motor recovery depends on the primary motor deficit. The functional recovery of patients with post-stroke sequelae is not only based on the remission of the functional deficit, but it also depends on the ability to develop adapted motor strategies.**The objective of the study** was to point out, for the patients with post-stroke sequelae, the sensitive, motor and cognitive changes in the context of the COVID-19 pandemic. **Material and method.** The study included a number of 18 patients diagnosed with post-stroke sequelae and was conducted for a period of 5 months in an outpatient department. The recovery treatment included sessions of kinetotherapy and occupational therapy. The evaluation of the patients was made in the beginning of the treatment, at its end and at the control after 6 weeks. Scales were used to assess pain, the static and dynamic balance, the gait and the cognitive function. **Results.** The obtained results were statistically significant for the patients in the group. The values that were obtained by applying the tests and evaluation scales are consistent with the clinical evolution of the patients in the study group. **Conclusions.** Given the pandemic period we are going through, it is still necessary to carefully evaluate not only the sensory-motor functions of patients with post-stroke sequelae, but also the cognitive functions that are known to influence in some situations the recovery of these patients.

Keywords: *post-stroke sequelae, functional recovery, kinetic therapy,*

Introduction

The performance areas of post-stroke mention negatively correlated determinants in doing daily activities. Among the negative changes of the sensory components, we mention deficiencies in the processing of perception (kinesthesia, body scheme, spatial positioning) (1), vertebral balance disorders and changes in the cognitive component (2,3) and even depression in some situations (4).

Some symptoms of the stroke (for example, balance disorders) may be similar to the symptoms of the glioma-type tumors (they also have cognitive, sensory-motor dysfunctions) (5); they are also similar to the symptoms of Alzheimer's disease (the reduction of daily activities, the presence of cognitive dysfunctions) (6).

The intrinsic motor recovery depends on the primary motor deficit. This is why the spontaneous motor recovery is reflected over time in the improvement of motor skills. Thus, at the level of the hemiparetic limbs, in the first 10 weeks post stroke, about 80% of the upper limb and gait skills are functionally improved (7,8). Six months after stroke (4) there may be static and dynamic balance disorders (1) or urinary incontinence (4,9).

The functional recovery of patients with post-stroke sequelae is not only based on the remission of the functional deficit, but it also depends on the ability to develop adapted motor strategies.

Learning to compensate for motor functions that were lost through a substitution of function is a process that can take more than 3 months after stroke. The recovery of motor ability depends on the interaction between the restitution and the substitution of the function. If the recovery is limited in terms of motor functions, the patient should rely on learning adaptive motor strategies. In case the prognosis is favorable, the patient can take advantage of the restitution of the affected functions.

The mechanisms of the post-stroke functional recovery are not fully known (10,11). For patients with post-stroke sequelae, it is also important to gain lateral stability, which is useful for gait, when the gravity center and the support base must always be adapted to ensure posture and balance (12). For the recovery of patients with stroke, it is important to recover their postural control and also their static and dynamic balance that could ensure the functional independence of the patient diagnosed with stroke (13).

Recovery involves restoring the balance between the agonist muscles and the antagonist ones, having an impact on coordination, posture and balance (14).

There are studies which show that certain daily activities (getting dressed, personal care) recover faster in comparison to complex activities such as gait. In the functional recovery after 6 months, it is important to see

the improvement of the daily activities, which is noticed ever since the first weeks after the stroke (15,16).
If patients with post-stroke sequelae also have cognitive disorders such as depression or even dementia, it is necessary to use sensors in order to assess the risk of falling and the physical performance of these patients (17).
Elderly patients may experience changes in dynamic stability, this is why age and body mass index are two important factors (18).
Especially in the elderly, it is important to recover walking both in a straight line and to make turns, and if the patient is also diagnosed with stroke sequelae, their adaptive adjustment is all the more necessary in order to enable their recovery, even monitoring recovery by using sensors (19).
The periods of quarantine, emergency and alert imposed by the COVID-19 pandemic have worsened cognitive changes and depression in these patients. For elderly patients with associated comorbidities, the lack of physical exertion and isolation induced the worsening of cognitive and emotional disorders (20).
The objective of the study was to point out, for the patients with post-stroke sequelae, the sensitive, motor and cognitive changes in the context of the COVID-19 pandemic.

Material and method

The study included a number of 18 patients (44.46% male and 55.56% female), diagnosed with post-stroke sequelae and was conducted for a period of 5 months (May-September 2020) in an outpatient department. The recovery treatment included sessions of kinetotherapy and occupational therapy, lasting 1 hour a day for 15 days. The objectives of the recovery program were: to reduce pain, to increase muscle strength, to re-educate grip, gait, balance, postural control and stability, to increase quality of life. The elements of physiotherapy were represented by passive and active exercises but also by balance, gait and transfer exercises.
The inclusion criteria were: the age of 45-70, patients with clinical diagnosis and imaging of stroke, patients with motor deficit in a hemibody, without any other comorbidities without any neuropsychiatric or language disorders, patients who resumed control and who agreed to participate in the study.
The exclusion criteria were: patients with the age under 45 and over 75, who had decompensated diseases (cardiovascular, respiratory or renal), patients with neuropsychiatric, language or cognitive disorders the ones who did not give their consent to participate in the study.
This study respects the ethical and deontological norms according to the legislation in force whereas the patients gave their consent to participate in the study.
The evaluation of the patients was made in the beginning of the treatment (M1), at its end (M2) and at the control (M3) after 6 weeks. Scales were used to assess pain, the static and dynamic balance, the gait and the cognitive function.
Thus, for pain was applied the visual analog scale (0 = no pain, 10 = maximum pain), BERG scale for balance (it is a scale considered reliable and sensitive, benchmark (20,21) in the assessment of balance (with 14 items, values between 0 = unable to execute and 56 = executes without any difficulty), Barthel Index (22) for functional independence (minimum value = 0-maximum disability, maximum value = 20-no disability), QOL scale for assessing the quality of life (16 items, minimum value = 16, maximum value = 112), test "Get up and Go" (useful for the assessment of the static and dynamic balance). For depressive disorders, was used the Depressive, Anxiety and Stress Scale (DASS-21), 21 items comprising a set of three self-reporting scales designed to assess negative emotional states in depression, anxiety and stress. This questionnaire is valid in research but also in clinical activity; it mainly assesses the condition of the individual, not necessarily the features. DASS-21 is based on a dimensional conception rather than on a categorical conception of psychological disorder. The minimum value of the questionnaire is 0 and corresponds to the lack of manifestations of anxiety, depression or stress. The maximum value is 63 and involves negative emotional states with increased intensity.
The objectives of the recovery program were: to reduce pain, to increase muscle strength, to re-educate of grip, to re-educate postural control and implicitly balance, to re-educate stability, gait, to reduce anxiety and/or depression, to increase quality of life.
The demographic data for the study group can be found in Table no. 1.

Table no. 1. Distribution of the group according to the age/gender

Age group/gender	45-54 years	55-64 years	65-74 years
Female	2	5	3
Male	3	3	2

It is found that there is a large number of patients 8 (44.45%) in the age group 55-64 years, followed by the age groups 45-54 and 65-74 years with 5 patients each.
It is also found that there is a higher number of patients, namely 10, who were diagnosed with stroke.

Statistical analysis

All the data obtained after the initial, final and control evaluations were statistically processed by using Microsoft Excel 10. The median and the standard deviation were calculated, then the t-student test was applied for the initial-final and final-control moments in order to verify the work hypothesis. The chosen level of statistical signification was 5% , namely its value to be $p<0.05$.

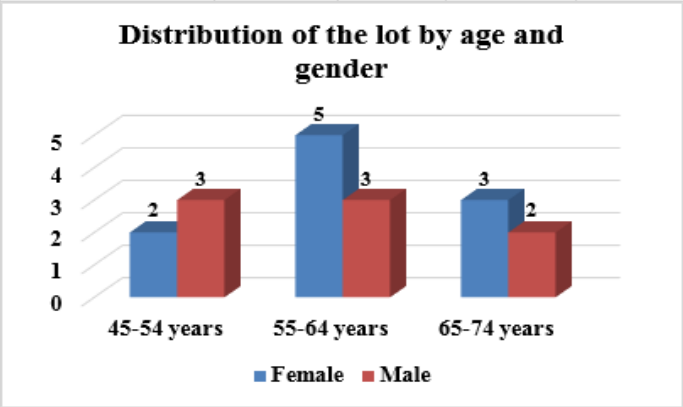

Fig. 1. Distribution of the study group according to the age and gender

Results

While evaluating the pain by applying the Visual Analog Scale, there was a reduction of the pain syndrome at the end of the treatment by 38.46% and at the control by 25 %. (Tabel 2)

Table no. 2. Evolution of the pain by VAS scale

SCALE	VAS		
Statistical/moment	M1	M2	M3
median/std dev	6.5±0.51	4±0.43	3±0.49

In order to assess the evolution of static and dynamic balance, the "Get up and go" test was used and the Berg scale was applied. Thus, at the "Get up and go" test, there was an increase by 23.52% at the end of the treatment and by 15.38% at the control, which explains the increase in these patients' ability to transfer and to walk, and the adaptation to the current functional status. The patients also improved their movements, which was evaluated with the help of the Berg scale, by 25.56% at the end of the treatment and by 10% at the control. (Table no. 3)

Table no. 3. Evolution of the parameters walk and balance

SCALE	UP and GO			BERG		
Statistical/moment	M1	M2	M3	M1	M2	M3
median/std dev	17±1.82	13±0.92	11±0.78	33.5±3.11	45±2.75	50±1.49

The results obtained in the evaluation of patients are shown in Figure no. 2.

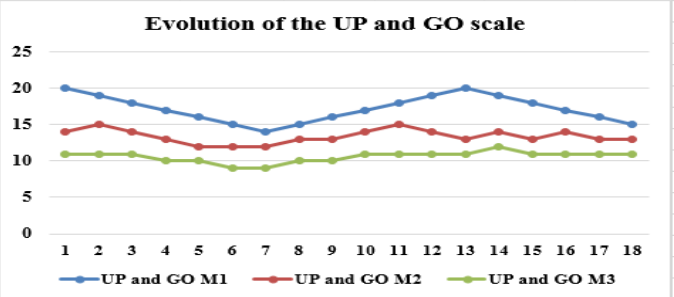

Fig. no. 2. Evolution of patients after the "Get up and walk" test

It is easy to see significant improvement in transfers and postural stability in almost all patients. There are also patients (7,13,14, 15,17) for whom the recovery will be longer. On the other hand, there is a better evolution during the application of the treatment.

As for the BERG scale, there is a significant improvement in movement and balance in the 18 patients. There are exceptions, namely patients 10,12,13,14,16,17 for whom the evolution between the final period of the treatment and control is relatively insignificant. As for the BERG scale, the improvement of movements and balance is statistically significant in all patients.

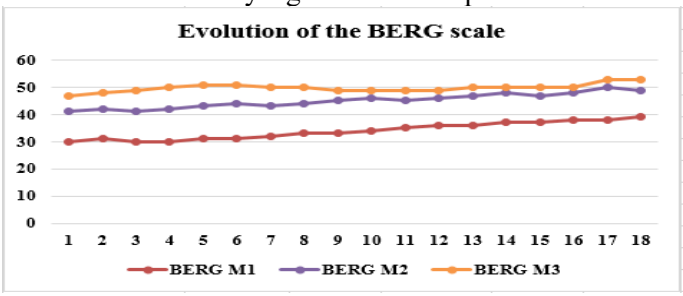

Fig. no. 3. Evolution of patients by using the BERG scale

The functional independence was assessed by using the Barthel index of daily activities. It improved by 9.09% at the end of the treatment and by 12% at the control. (Fig. no. 4)

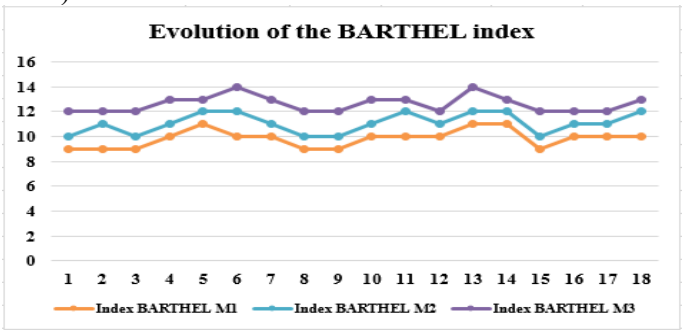

Fig. no. 4. Evolution of the Barthel index

There is a statistically significant evolution for the patients of the group, except for the patients no. 5,12,14,16,17 for whom the recovery seems to be long-lasting.

The quality of life was assessed by using the QOL scale. The results obtained in the evaluation in the 3 moments were statistically significant. The quality of life was assessed by using the QOL scale. The results obtained in the evaluation in the 3 moments were statistically significant. The patients' quality of life was increased by 10.34% at the end of the treatment and by 17.65% at the control. (Table no. 4)

Table no. 4. Evolution of quality of life by using the QOL scale

SCALE	QOL		
Statistical/moment	M1	M2	M3
Median/SD	78±1.77	87±2.36	93.5±14.96

Taking into account the fact that we are in the pandemic period determined by COVID-19, the patients who came to recovery showed anxiety and depression, fear of illness, symptoms determined by the fact that they had been isolated for several days. This is why we used the DASS-21 scale and to evaluate the affection degree of the depression-type in these patients and understand why the therapeutic evolution had significant results or not. These depressive manifestations that involve negative emotional states which could influence the medical recovery treatment were reduced by 32.65% at the end of the treatment and by 27.27% at the control. (Fig. 5)

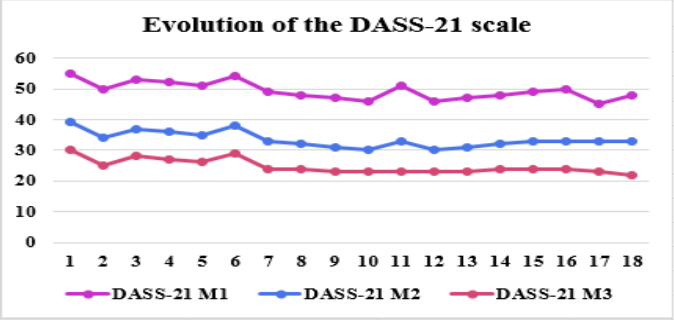

Fig. no. 5. Evolution of DASS-21 scale

The obtained results were statistically significant for the patients in the group, less for the patients 5,7,10,12,17. The latter showed depressive emotional states (in the context of the COVID-19 pandemic) that were added to the sensory-motor changes that had been previously evaluated.

Table no. 5. Statistical evolution of DASS-21 scale

SCALE	DASS-21		
Statistical/moment	M1	M2	M3
Median/SD	49±2.85	33±2.59	24±2.32

Discussions

Following the application of the scales for pain (VAS) and for functional independence (Barthel Index), the results are statistically significant, with values of $p < 0.05$ for the VAS scale and extremely statistically significant with $p < 0.005$ for the Barthel Index. (Table no. 6)

Table no. 6. Values of the T-student test for VAS scale and Barthel index

SCALE	VAS		Index Barthel	
Moment	M2-M1	M3-M2	M2-M1	M3-M2
test t-student	0.0311	0.0131	0.0013	0.0037

As for the transfers, balance and gait evaluated by the BERG scale and the "Up and Go" Test, the results are statistically significant for both scales at M2-M1 moments and extremely statistically significant with $p < 0.005$ for the evaluation between the control moment (M3) and the end of the treatment (M2).

Table no. 7. Values of the T-student test for BERG scale and "Up and Go" tests

SCALE	BERG		UP and GO	
Moment	M2-M1	M3-M2	M2-M1	M3-M2
test t-student	0.0121	0.0016	0.011	0.0039

As for the quality of life (QOL scale), the results are extremely statistically significant for the evaluation moments with $p < 0.05$, and for depressive disorders (DASS-21) the results are statistically significant, $p<0.05$, as it can be seen in the following table:

Table no. 8. Values of the t-student test for QOL scale and DASS-21 scale

SCALE	QOL		DASS-21	
Moment	M2-M1	M3-M2	M2-M1	M3-M2
test t-student	0.0016	0.0037	0.0205	0.0143

The values that were obtained by applying the tests and evaluation scales are consistent with the clinical evolution of the patients in the study group.

After the application of the recovery treatment that included sessions of kinetotherapy and occupational therapy, lasting 1 hour a day for 15 days, it is shown that the proposed objectives have been achieved:

-the pain improved and the results were statistically significant;

-stability and balance have been improved, and transfers have been made, thus preparing the recovery of gait whereas the results were statistically significant;

-the patients improved their functional ability and achieved functional independence, with statistically significant results;

- the quality of life of the patients with post-stroke sequelae has also improved, with extremely statistically significant results;

-the patients registered a decrease in their depressive conditions whereas the results were statistically significant;

For the patients who presented an interruption in their evolution, it is necessary to re-evaluate the recovery program and to apply relaxation techniques in order to reduce negative emotional manifestations.

Some patients (13,14,16,17) need a longer recovery period, therefore kinetotherapy applied at home would be useful.

Conclusions

The purpose of the recovery treatment for the patients with post-stroke sequelae is their successful reintegration into the family, society and professional activity.

The recovery treatment in this uncertainty period caused by the COVID-19 pandemic has somehow influenced the addressability of patients to the recovery medical practices.

In this context, there was also a slowdown in the recovery of static and dynamic balance, due to the impossibility of doing kinetotherapy exercises under the supervision of a physiotherapist, with consequences in the motor recovery process.

Given the pandemic period we are going through, it is still necessary to carefully evaluate not only the sensory-motor functions of patients with post-stroke sequelae, but also the cognitive functions that are known to influence in some situations the recovery of these patients.

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References:

1. Verheyden G, Nieuwboer A, Wit LD, Thijs V, et. al. Time cours or trunk,arm leg and functional recovery after ischemic stroke. Neurorehabil Neural Repair.2008 Mar-Apr;22(2):173-9
2. Saxena SK, Ng TP, Koh G, Yong D, Fong NP. Is improvement in impaired cognition and depressive symptoms in post-stroke patients associated with recovery in activities of daily living?, Acta Neurol Scand.2007 May;115(5):339-46
3. Patel MD, Coshal C, Rudd AG, Wolfe CD. Cognitive impairment after stroke: clinical determinants and its associations with long-term stroke outcomes. J Am Geriatr Soc. 2002 Apr;50(4):700-6
4. Meijer R, van Limbeek J, Peusens G, Rulkens M, et al. The stroke Unit Discharge Guideline, a prognostic framework for the discharge outcome from the hospital stroke unit. A prospectice cohort study. Clin Rehabil.2005 Oct;19(7):770-8
5. Grosu F, Ungureanu A, Bianchi E, Moscu B, Coldea L, Stupariu AL, Pirici I, Roman-Filip C. Multifocal and multicentric low-grade oligoastrocytoma in a young patient. Rom J Morphol Embryol 2017, 58(1):207–210
6. Birlutiu V, Stef L, Cernusca Mitariu SI, Roman Filip C, Duica L, et al. The Biochemical Biomarkers Determination in Alzheimer Dementia. Rev.Chim. (Bucharest) 2018;69(11)
7. Kwakkel G., Kollen B, Twisk J. Impact of time on improvement of outcome after stroke. Stroke.2006 A Sep:37(9):2348-53
8. Kollen B, van de Port I, Lindeman E, Twisk J, Kwakkel G. Predicting improvement in gait after stroke: a longitudinal prospective study.Stroke.2005 Dec:36(12):2676-80
9. van Kuijk AA, van der Linde H, van Limbeek J. Urinary incontinence in stroke patients after admission to a rehabilitation centre for a post-acute inpatient rehabilitation program, Arch Rehab Med, 2001;82:1407-11
10. Heddings AA, Friel KM, Plautz EJ, et al. Factors contributing to motor impairment and recovery after stroke.Neurorehabil Neural Repair, 2000;14(4):301-10
11. Dobkin BH. Confounders in rehabilitation trials of task-oriented training: Lessons of designs of EXCITE and SCILT multicenter trials. Neurorehab Neura Repair.2007;21:3-13
12. Conradsson D, Paquette C, Franzén E. Medio-lateral stability during walking turns in older adults, PLoS One, 2018 Jun 5;13(6))
13. 13.Silişteanu SC, Antonescu E, Duică L. The importance of balance and postural control in the recovery of stroke patients, Balneo Research Journal , Vol.11, No.3, September 2020 p: 372–378
14. Danelciuc FT, Danail S, et al. A trial regarding the baropodometric indexes for patients who had a cerebrovascular accident, Balneo Research Journal, Vol.8, No.3, September 2017
15. Verheyden G, Nieuwboer A, Wit LD, Thijs V, Devos H, et al. Time cours or trunk,arm leg and functional recovery after ischemic stroke. Neurorehabil Neural Repair.2008 Mar-Apr;22(2):173-9
16. Formisano R, Pantano P, Buzzi MG, Vinicola V, Penta F, et al.Late motor recovery is influenced by muscle tone changes after stroke.Arch Phys Med Rehabil.2005 Feb;86 (2):308-11
17. Williams JM, Nyman SR. Age Moderates Differences in Performance on the Instrumented Timed Up and Go Test Between People With Dementia and Their Informal Caregivers, J Geriatr Phys Ther. 2020 Mar 12.
18. Herssens N, van Criekinge T, Saeys W, et al. An investigation of the spatio-temporal parameters of gait and margins of stability throughout adulthood, J R Soc Interface, 2020 May;17(166): 194
19. Mangano GRA, Valle MS, Casabona A, et al. Age-Related Changes in Mobility Evaluated by the Timed Up and Go Test Instrumented through a Single Sensor, Sensors (Basel). 2020 Jan 28;20(3):719
20. Stam HJ, Buyruk HM, Melvin JL, Stucki G, Burggraaf IB. Recuperarea medicala de faza acuta, Editura Universitara „Carol Davila" Bucuresti, 2018, ISBN:978-973-708-879-6
21. Stevenson TJ. Detecting change in patients with stroke using the Berg Balance Scale. Aust J Physiother. 2001;47:29–38
22. Kwakkel G, Veerbeek JM, Harmeling-van der Wel BC, et al. Prediction of functional outcome after stroke (EPOS) investigators. Diagnostic accuracy of the Barthel Index for measuring activities of daily living outcome after ischemic hemispheric stroke:does early postrstroke timing of assessments matter? Stroke.2011 Feb;42(2):342-6