

# CASE REPORT

Effects of early rehabilitation on the outcome of cerebro-vascular insult rehabilitation in women over 65 in correlation with initial neurological deficit gravity

Efeitos da reabilitação precoce no desfecho da reabilitação pós-acidente vascular encefálico (AVE) em mulheres com mais de 65 anos e sua correlação com a gravidade do deficit neurológico inicial

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## ABSTRACT

This study aims at verifying the effects of short- and long-term rehabilitation on the outcome of encephalic vascular accident (EVA) in women older than 65 years; establishing the correlation between the impact of the neurological deficit severity on the prediction of the rehabilitation treatment outcome as well as investigating the possibility of the follow-up of individual parameters at the Functional Independence Measure (FIM) when predicting the EVA rehabilitation outcome. The EVA is currently the third major cause of death in the world's population, as well as the main cause of permanent disability. In the present scenario, cardiovascular and cerebrovascular diseases, which used to be observed almost exclusively in the male population, now affect the female population as well. On the other hand, we observe a linear correlation between aging and the occurrence of these diseases. We conclude that the implementation of early rehabilitation leads to a significant acceleration in the treatment and recovery process post-EVA in women older than 65 years. We also conclude that certain FIM parameters can be used to predict the patient's overall recovery, as they present the same evolution pattern.

## KEYWORDS

cerebrovascular accident, aged, women, rehabilitation

## RESUMO

Este trabalho visa examinar os efeitos da reabilitação precoce, a curto e longo prazo, no desfecho do acidente vascular encefálico (AVE) em mulheres com mais de 65 anos; estabelecer a correlação entre o impacto da gravidade do déficit neurológico na predição dos resultados do tratamento de Reabilitação e, ainda, investigar a possibilidade do acompanhamento de parâmetros individuais da Medição de Independência Funcional (MIF) na predição do desfecho da reabilitação do AVE. Atualmente, o AVE é a terceira maior causa de mortalidade na população mundial, bem como a maior causa de invalidez permanente. No cenário atual, as doenças cardiovasculares e cerebrovasculares - que antes eram tidas como exclusivas da população masculina - têm afetado também as mulheres. Por outro lado, observamos uma correlação linear entre o envelhecimento e a ocorrência destas doenças. Concluímos que a implantação do método de reabilitação precoce conduz a uma aceleração significativa do processo de tratamento e recuperação após o AVE em mulheres com mais de 65 anos. Concluímos também que certos parâmetros da MIF, por apresentarem o mesmo padrão de evolução, podem ser utilizados na predição da recuperação global do paciente.

## PALAVRAS-CHAVE

acidente cerebrovascular, idoso, mulheres, reabilitação

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## INTRODUCTION

Stroke is the third on the list of causes of death in modern population, but the first on the list of causes of lasting invalidity. The data from the Framingham Study show that the frequency of stroke in the USA is approx. 5,000/year, resulting in significant morbidity, mortality, and invalidity, particularly in persons over 65 years of age.<sup>1</sup> According to the data of the Monika Study (WHO MONIKA), the frequency of stroke in Serbia related to the total number of population is 2.36% with 42.2% mortality.<sup>2</sup>

Cardio-vascular/cerebro-vascular diseases have been deemed as “masculine diseases” for long. Modern lifestyle changes the relationship to great extent. Men still die more from cardio-vascular diseases, but women become affected far more frequently. Also, there is much higher percentage of re-insult within the first year in women related to men of the same age. The change of woman’s lifestyle contributes to far more frequent appearance of all factors of risk – hypertension, smoking, hyper-lipidaemia, the lack of movement, obesity, sugar disease. The frequency of cardio-vascular diseases in women increases in the period of menopause, i.e. post-menopause, which is in direct relation with more frequent appearance of hypertension and hyper-lipidaemia.<sup>3,4</sup>

On the other hand, cerebro-vascular diseases are exclusively specific for old age because their frequency shows the trend of linear correlation with age. The reason primarily lies in degenerative and involuntary changes of the central nervous system, accompanied by the decrease of brain activity and changes in brain circulation, which are the cause of occurrence of hypo-perfusion of these structures. All the changes occur and may be observed even before the age of 65. In the older age they develop progressively, faster or slower, depending on the entire line of factors, increasingly disrupting the brain functions. Since women live longer than men (in average 80.4 years against 75.2 in men), all degenerative changes, factors of risk, as well as accompanying diseases are far more frequent in older women.<sup>4,5</sup>

Rehabilitation, defined as qualification of the incapacitated for the greatest possible physical, mental, social, professional, and economic benefit he/she is up to, is a complex process including many disciplines – medical and non-medical, as well as various techniques with cooperation of a number of persons with the aim of achieving as best results as possible. The lifestyle of a modern woman poses new requirements to rehabilitation. Older generations were bound to home and family. The generation of women born during forties of the past century represents a transitional generation in which the traditional role of woman as a housewife diminishes. An increasing number of women are sometimes engaged in more difficult jobs but still retain the role of a housewife. Because of that, the role of rehabilitation is to qualify the woman for both housework and many other intellectual and physical activities.<sup>6</sup>

## OBJECTIVE

1. To examine short-term and long-term effects of early rehabilitation on the outcome of stroke in women over 65 years of age.

2. To establish correlation/impact of neurological deficit gravity on the outcome of rehabilitation.

3. To investigate the possibility of follow-up of individual parameters of FIM test as a predictor of the outcome of stroke rehabilitation.

## WORKING HYPOTHESIS

1. Implementation of the method of early rehabilitation leads to significant improvement and acceleration of recovery in patients over 65 years of age following the stroke.

2. Graver initial neurological deficit causes poorer results of rehabilitation – recovery.

3. The score of the TOTAL FIM test has the greatest significance in the follow-up and prediction of the rehabilitation results.

## METHOD

The total number of 200 women over 65 years of age, treated in the Special Hospital for Prevention and Cure of Cerebro-Vascular Diseases “Saint Sava” in Belgrade, Serbia, have been monitored through a prospective study. The study was performed during the year 2006, in which period over 3,000 patients were treated under the picture of acute cerebro-vascular insult. The study included female patients who fulfilled the criteria of age and diagnose, and had no counter-indications to the conduct of rehabilitation treatment. The data used were those obtained through routine clinical examinations by standard medical procedures.

Following the neurological examination and admission, all patients were subjected to intern/cardio examination, full-scale bio-chemical blood and urine analysis, Roentgenogram of the heart and the lungs, Doppler of the main blood vessels in the neck and trans-cranial Doppler, neuro-ophthalmological examination, and CT of endocranium. Also, FIM test was made immediately upon the admission, and the TOTAL FIM score.

Depending on the neurological deficit gravity, the patients were divided into two equal groups: Group A with graver neurological deficit and Group B with lighter neurological deficit.

Early rehabilitation, in addition to individual approach, commenced 24 hours following the admission. After a 14-day treatment the first control FIM TOTAL score was assessed by an independent examiner, not acquainted with the results of the TOTAL FIM score at admission.

Following the release from hospital, the patients were directed to continuation of the rehabilitation treatment in the regional rehabilitation centre. The neurological control examination and the second assessment of the TOTAL FIM score were made 3 months after the event of insult.

When processing the data, the FIM test parameters were processed separately – walk, the bladder sphincter control, and the colon control, as possible individual predictors of the total score.

The obtained data were processed by standard statistical methods – the Student’s T test, Hi square test, correlation test, by the statistic expert not acquainted with the objective of the study.

## RESULTS

Immediately after the admission (during the first 72 hours) 34 patients passed away (17% of the total number included in the study). The examination continued in 166 patients – 86 in Group A and 80 in Group B. The groups are comparable by age: 69.8±4 years in Group A and 67.8±5 years in Group B.

Hypertension is found in the total number of 142 patients (68 in Group A and 74 in Group B) lasting for 8 years in average. In all patients there is a period of 1 – 4 years without hypertension being treated with medicaments (the basic reason is the refusal of medicine or self-initiated irregular application of prescribed therapy). The most frequent therapy is mono-therapy with ACE inhibitors, then the combination of ACE inhibitors and diuretics. Only 20 patients are under a regular trilateral therapy with ACE inhibitors, diuretics, and calcium canals blockers, and 8 patients with therapy also including beta-blocker. Also, satisfactorily regulated tension during the year prior to the insult is found in only 54 patients. Average values are within the range of 1st degree hypertension (JNC VII), i.e. 150-155/85-90 mmHg.

Hyperlipidemia is present in 118 patients out of which number only 38 of them were treated with statins during the past 2 years. Satisfactorily regulated values of the total cholesterol and HDL/LDL cholesterol relation have not been found in any of the patients.

Sugar disease has been registered in 74 patients, 8 of whom are insulin-dependent. Prior therapy has not resulted in satisfactory gluco-regulation in 16 patients. 19 out of 166 patients are non-smokers. In average, it is the issue of 20 cigarettes/day in the duration of 25 years.

Out of the total number, no any factor of risk has been found in 7 patients, and 107 of them have had 3 factors of risk combined (most often hypertension, hyper-lipidemia, and smoking).

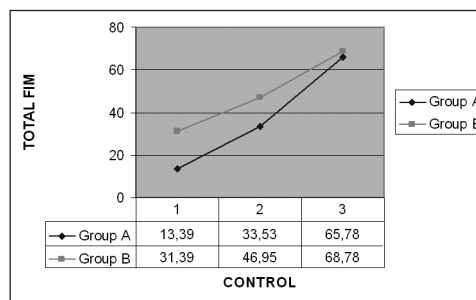
All patients suffered ischemic insult. The distribution of CT findings and neurological deficit is the following:

1. Infarct in temporal,
2. Infarct in temporo-parietal, and
3. Infarct in occipital region.

At admission, the average TOTAL FIM score value in Group A is 13.39, while it is 31.39 in Group B and is significantly higher ( $p < 0.01$ ) related to Group A. At the first check-up after 14 days, the TOTAL FIM score in Group A increases to 33.53, while it is 46.95 in Group B. Both groups witness statistically significant growth in overall score, whereas a significant difference is maintained between the groups. After 90 days from the occurrence of insult, the value of the TOTAL FIM score in Group A is 65.78, while it is 68.78 in Group B, with no statistically significant difference.

The same trend as for the FIM test parameter TOTAL may be observed amongst separately monitored parameters.

The average assessment of the WALK parameter in Group A is 2.15, while it is 4.91 in Group B and it is statistically significantly higher related to Group A. After 14 days, the average assessment in Group A increases to 3.60 (statistically significantly higher  $p < 0.01$  related to that at admission), while it is 5.90 in Group B - as well

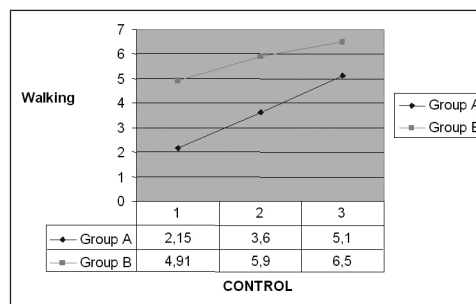


The chart 1  
Displays average values of the TOTAL FIM score at admission and check-ups after 14 and 90 days.

Table 1  
Shows the analysis of outcome of the treatment – relation of the FIM parameter TOTAL measured in 3 instances. Statistical processing for each pair of variables is based upon all patients with data valid for that pair. There is statistically significant relation between scores obtained at admission and after 14 days, as well as between those obtained following the 14th and 90th day.

	Admission	14 days	90 days
Admission		0,518(**)	0,399(**)
14 days	0,518(**)		0,502(**)
90 days	0,399(**)	0,502(**)	

statistically significantly higher related to that at admission but also related to Group A. At the second check-up after 90 days, the average value of WALK parameter in Group A is 5.1, while it is 6.5 in Group B.

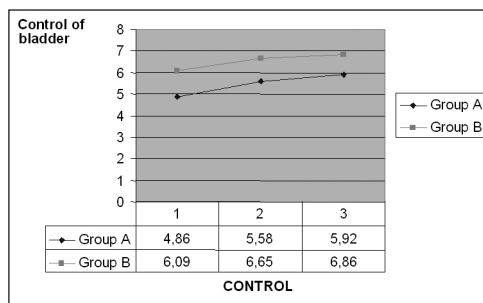


The chart 2  
Displays average values of the FIM parameter WALK at admission and check-ups after 14 and 90 days.

Table 2  
Shows the analysis of outcome of the treatment – relation of the sum of FIM parameter WALK measured in 3 instances. Statistical processing for each pair of variables is based upon all patients with data valid for that pair. There is statistically highly significant relation between scores obtained at admission and those after 14 days, as well as between those obtained following the 14th and 90th day.

	Admission	14 days	90 days
Admission		0,393(**)	0,324(**)
14 days	0,393(**)		0,485(**)
90 days	0,324(**)	0,485(**)	

The average value of the assessment of FIM test parameter BLADDER CONTROL at admission is 2.87 (in Group A), 5.45 in Group B (statistically significantly higher  $p < 0.01$  related to Group A). After 14 days, the average assessment in Group A increases to 4.22 and in Group B to 5.94. In both groups statistically significant leap may be noticed related to the values registered at admission. At the second check-up, the average value of the parameter assessment in Group A is 4.93, while it is 6.61 in Group B.



The chart 3

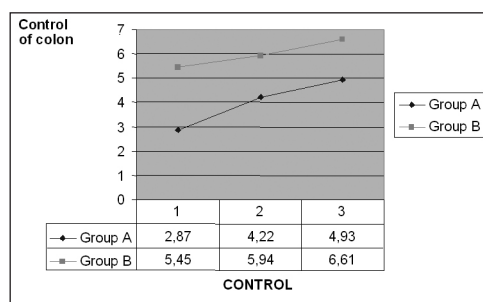
Displays average values of the FIM parameter BLADDER CONTROL at admission and check-ups after 14 and 90 days.

Table 3

Shows the analysis of outcome of the treatment – relation of the sum of FIM parameter BLADDER CONTROL measured in 3 instances. Statistical processing for each pair of variables is based upon all patients with data valid for that pair. There is statistically significant relation between scores obtained at admission and those after 14 days, as well as between those obtained following the 14th and 90th day.

	Admission	14 days	90 days
Admission		0,553(**)	0,367(**)
14 days	0,553(**)		0,421(**)
90 days	0,367(**)	0,421(**)	

The average value of the assessment of the FIM test parameter CONTROL OF THE COLON at admission is 4.86 in Group A and 6.09 in Group B and is statistically significantly higher  $p < 0.01$  related to Group A. After 14 days, it increases to 5.58 in Group A and in Group B to 6.65. There is statistically significant growth in both groups. After 90 days, the average assessment of the parameter in Group A is 5.92, while it is 6.86 in Group B.



The chart 4

Displays average values of the FIM parameter CONTROL OF THE COLON at admission and check-ups after 14 and 90 days.

Table 4

Shows the analysis of outcome of the treatment – relation of the sum of FIM parameter CONTROL OF THE COLON measured in 3 instances. Statistical processing for each pair of variables is based upon all patients with data valid for that pair. There is statistically significant relation between scores obtained at admission and those after 14 days, as well as between those obtained following the 14th and 90th day.

	Admission	14 days	90 days
Admission		0,530(**)	0,383(**)
14 days	0,530(**)		0,387(**)
90 days	0,383(**)	0,387(**)	

## DISCUSSION

At admission, there is statistically significant difference between the groups in neurological deficit gravity according to the TOTAL FIM score. After 14 days of treatment and early rehabilitation, statistically significant growth in the TOTAL FIM score, i.e. the improvement in neurological status, may be observed in both groups, whereas significant difference between the groups is maintained. At the second check-up, 90 days after the occurrence of the insult, there is significant growth of the TOTAL FIM score related to the values at admission but also related to the values obtained after 14 days of treatment. It is noticeable that there is no statistically significant difference between the groups, i.e. almost identical neurological deficit gravity is found in patients of both groups.

Separate parameters of the FIM test also display the same trend of growth and difference between the groups in 3 instances – walk, bladder control and control of the colon. There are significant differences at admission. After 14 days a significant growth occurs in average assessment in both groups with maintained difference between them. After 90 days, a significant growth of the average assessment is noticeable related to that at admission and after 14 days of treatment, whereas there is no statistically significant difference between the groups.

The implementation of modern methods of treatment (thrombolytic and anti-hypertensive therapy, in the first place) has significantly contributed to the reduction in thromboembolic complications and re-insult and enabled implementation of the method of early rehabilitation in an increasingly larger number of patients. There is almost no disease that encompasses in one place and with the same extent of significance the prevention, and early detection, and treatment and rehabilitation, as is the case with the stroke. The application of the method of early rehabilitation additionally reduces the risk of occurrence of thromboembolic complications, thus considerably reducing mortality following the insult.

The specific feature of early rehabilitation is in preventing the occurrence of muscular atrophy, contractures, and joint deformities, developing as a consequence of prolonged bed rest. This results in significant reduction of invalidity, which is not directly caused by neurological deficit, i.e. by patho-anatomic substrate of the stroke.<sup>7</sup>

An early mobilization of the patient reduces the possibility of occurrence of bedsores lesions, urinary infections, constipation,

which contributes to easier training for self-care at bed and room level. This also reduces the possibility of deterioration of other – accompanying diseases of loco-motoric system, primarily lumbar and cervical syndromes as well as changes in root joints such as the hip, which are particularly excessive in women after 65 years of age.<sup>4</sup>

On the other hand, there is also great psychological moment that has favourable effect on the overall outcome of the treatment. The patient is no longer a “thing” left to motionlessly lie in bed and receive the therapy. An early activation creates in the patient additional motivation as an active participant in the process of treatment. This is, perhaps, where we may find the essential reason of monitored parameters performance in selected groups. Amongst patients in our country, names such as “small stroke”, which does not represent a particular problem and requires no greater attention and engagement, have become habitual. On the other hand a “big stroke” is a condition the survival of which is in the domain of science fiction. This prejudice is in most cases an additional motive for greater engagement of both the patient and his/her family in rehabilitation and achievement of best possible results.<sup>8,9</sup>

There is also a certain, possibly dangerous, game of figures. In relation to a lighter initial deficit it is very difficult to achieve some spectacular progress in patients of Group B. The gravity of neurological deficit in patients of Group A creates conditions in which their progress may be noticed on daily basis. Therefore, their much faster recovery and almost identical neurological deficit gravity after 90 days are of no surprise. This particularly refers to rough motoric functions such as walk but also autonomously controlled functions such as bladder and colon discharge. The occurrence of this trend is also affected by the fact that the aging process causes primary cessation of many motoric functions.<sup>10,11,12</sup> Already at the age of 35, reflexive mechanisms become slowed-down, fine coordination of moves, rough muscular strength, as well as mobility in general are reduced, and the static is disturbed. The global concept of changes related to the aging process of the central nervous system consists of degenerative processes of brain nerve cells and circulation changes of brain blood stream to different extent and different combination of these two processes. The organic substrate of the mentioned processes also consists of structural and functional changes of brain cells and blood vessels, which significantly alter the functioning conditions of nerve cells because they lead to hypo-perfusion of brain tissue to different extent. Changes in brain nerve cells and blood vessels are not always in mutual connection and correlation. There may be encountered extremely different cases of combination of these processes and their different variations. Thus, for example, there may be found clinical pictures of extensive motoric and cognitive disorders with relatively preserved circulation, and vice-versa. Nevertheless, these two processes develop jointly, advance progressively, disrupting brain functions and causing the clinical picture known as – cerebro-vascular insufficiency. In graver cases, insufficiency at acutization may lead to the development of cerebro-vascular insult, an incident which rapidly and greatly damages the brain activity. In such situation, the task of early rehabilitation is to re-establish forgotten but

not definitely lost patterns of motoric and autonomous functions, which may also explain the obtained results.

## CONCLUSION

The implementation of the method of early rehabilitation leads to significant acceleration of the process of treatment and recovery of female patients over 65 years of age following the stroke. Gravity of the initial neurological deficit has no effect on the extent of recovery and rehabilitation success.

The FIM score represents a simple, practice-applicable test in monitoring the effects of rehabilitation. Of the greatest significance – the key-parameter is the TOTAL score of the FIM test, which reflects the effects of rehabilitation as a whole. Because certain parameters of the FIM test, such as walk, control of bladder and colon discharge, show the same trend of growth, they may be used as predictors of the patient’s overall recovery.

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