

## **295. A comparison of comprehensive rehabilitation and comprehensive rehabilitation with feed-back balance training for acute stroke patients**

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**Abstract.** 60% of stroke survivors become disabled due to motor and cognitive disorders that have an effect on the person's quality of life. Early comprehensive rehabilitation after acute stroke is very important, because it affects the course of the disease, functional independence level and conditions the better quality of life. Most important factors affecting on the patient's functional independence is a level of balance disorders in patients after stroke. Therefore the influence of different factors on the results of comprehensive rehabilitation in early period of stroke and the relation between the balance disorders and functional independence, the relation between balance tests and various factors that can influence the results of balance alteration has been presented in this paper. In the paper are described different influences of comprehensive rehabilitation and comprehensive rehabilitation with feed-back balance training on balance improvement in patients groups after stroke. It was formed some conclusions: comprehensive rehabilitation program increase balance and functional independence of the stroke patients; correlation between functional independence tests, routine balance tests and „MTD-balance“ system indications tests ( $p < 0.01$ ) was determined, comprehensive rehabilitation program with feed-back balance training (using „MTD-balance“ system) improve balance and functional independence of stroke patients better than comprehensive rehabilitation program only.

**Keywords:** stroke, early comprehensive rehabilitation, functional independence, balance disorders, feed-back balance training

### **Introduction**

About 60% of stroke survivors become disabled due to motor and cognitive disorders that have an effect on the person's quality of life [1]. According to the publications, use of comprehensive rehabilitation helps the person to gain back lost biosocial functions or compensate them, thus the patient becomes functionally more independent and is able to come back to normal life style [2, 3]. Some authors, studying the quality of life, determined that it depends on patient's functional independence [4]. Therefore, the early rehabilitation after acute stroke is very important, because it affects the course of the disease, functional independence level and conditions the better quality of life [1, 5]. During rehabilitation the patients after stroke get comprehensive rehabilitation: physiotherapy, occupational therapy, psychotherapy, speech therapy, social worker's consultations, muscle electro stimulation, classical therapeutic massage, orthoses adaptation, patient's and his family education, drug treatment [6, 7, 8]. There are few studies which analyses patient's gender, age, stroke type and cognitive functions effect on rehabilitation effectiveness and the need of repeated course of rehabilitation [8].

One of the most important factors affecting on the patient's functional independence is level of balance disorders in patients after stroke [4, 6, 9]. Therefore, it is very important to evaluate the influence of different factors on the results of rehabilitation in early period of stroke and to determine: the relation between the balance disorders and functional independence, the relation between balance tests and various factors, that can influence the results of balance alteration.

The aim of this study was to evaluate the effect of comprehensive rehabilitation and comprehensive rehabilitation with feed-back balance training on functional independence and balance improvement in patients groups after stroke.

### **Analysed material and applied methods**

220 patients after stroke, who underwent rehabilitation in the Centre of Rehabilitation, Physical and Sport Medicine of Vilnius University Hospitals "Santariškių klinikos" in 2000 – 2007 was analysed. . The mean age of rehabilitated patients was  $63.3 \pm 12.5$  years. 53.8% of them were male and 46.2% - female patients. The patients were referred to rehabilitation according the Ministry of Health direction No. 444, which

regulates the indications for further rehabilitation (i.e. BI 0-80 points, MMSE 11-30 points, if MMSE was impossible because of aphasia a person had to understand ordinary commands and to perform them, had to be able to take an active part in rehabilitation). The patients were examined within first 3 days after admission and on discharge.

190 patients balance was trained using comprehensive rehabilitation program. 30 patients balance was trained using comprehensive rehabilitation program with feed-back training ("MTD-balance" system). In the both groups period of the balance training was the same. To evaluate the effectiveness of rehabilitation, we used the change of functional independence after the rehabilitation course was complete (i.e. BI on discharge); to evaluate the level of functional independence improvement we used the difference between BI on discharge and admission.

The effectiveness of rehabilitation was valued by the changes of functional independence and cognition's level during the rehabilitation course. In accordance with the American Heart Association stroke outcomes assessment recommendations to evaluate functional independence three tests are used: Barthel index (BI), functional independence measurement (FIM) and activities of daily living (ADLs), to evaluate cognitive functions the Mini Mental State Examination (MMSE) is used. Statistical analysis of retrospective study data was performed using programs package „SPSS 13“, graphics were performed using „Excel 2000“ program. Student's independent samples T test was used analysing the effectiveness of rehabilitation. Age, pre-rehabilitation period, duration of rehabilitation, functional independence tests (BI, FIM, ADLs), cognitive functions (MMSE), motivation for rehabilitation, attention, memory, level of anxiety and depression, temper, mental (psychic) activity, self – assessment, deep and superficial sensation, muscles tone and strength, balance (Fugl-Meyer, Berg, Tinetti scales and „MTD balance“ – balance measurement, training and documentation feed-back platform) were assessed in prospective study. Analysing this group data, Student's independent samples T test and Student's paired samples T test were used to compare independent samples, logistic regression stepwise method – to determine different factors influence. Using platform patients'balance was trained in standing position with its correction with visual control. The criteria for „MTD balance“ system evaluation were: the difference in patient's pressure on platform with left and right leg. The correlative analysis of „MTD balance“ system and classical balance tests was performed.

All patients were applied comprehensive rehabilitation program: physiotherapy 3 times per day (2,0–2,5 h/day), occupational therapy 2–3 times per day (1,5–2,0 h/d), massage, muscle electrostimulation, psychotherapy, compensatory aids adaptation, speech therapy, social worker's consultation. To evaluate muscle strength we used Lowett scale; A p-value of less than 0,05 was regarded as statistically significant.

## Results and Discussion

After evaluating balance for patients from prospective group, we observed that all patients lost their balance: the mean scores of Fugl-Meyer test were 8,9, Berg Balance Scale – 25,4, Tinetti test – 11,6, the difference of weight distribution in sitting position – 7,7 kilogram, in standing – 20,7. Analysis of functional independence tests, classical balance tests and classical tests correlation showed that data of all balance tests correlate with functional independence tests ( $p < 0,001$ ), (but the smallest correlation is with Fugl-Meyer test). It was showed high correlation between classical balance tests ( $p < 0,01$ ) (Table1).

**Table 1.** Correlation between functional independence tests and classical balance tests

	BI	FIM
Berg	0,84	0,80
Tinetti	0,74	0,73
„MTD-balance“ in sitting position	-0,31	-0,35
„MTD-balance“ in standing position	-0,44	-0,45

\*\*  $p < 0,01$

Analyzing data of platform for balance evaluation in standing position was found it's high correlation with classical balance tests ( $p < 0,01$ ), except with Fugl-Meyer test. (Table 2).

**Table 2.** Correlation between classical balance tests and "MTD-balance" system indications

	Berg	Tinetti
„MTD-balance“ in sitting position	-0,48	-0,47
„MTD-balance“ in standing position	-0,55	-0,53

$p < 0,01$

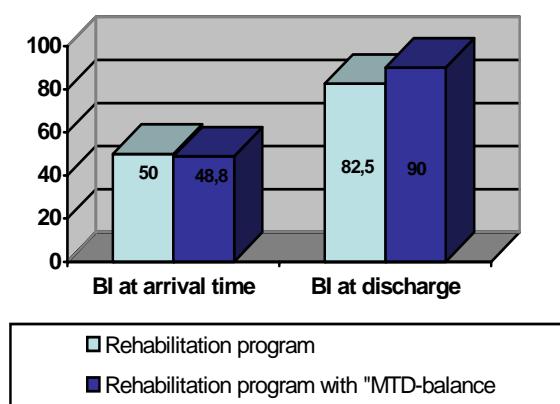
Analysis of correlation between different factors (muscle tone, superficial and deep sensation, and coordination, muscle strength of affected and unaffected legs, attention, motivation, mood, perception, diplopia, and head dizziness) and "MTD balance", classical tests stated that their data correlates with some of these factors like results of classical tests. Data of balance test in sitting position (evaluated on balance platform) correlates only with patient's cognitive functions. Completely these functions improving the differences of body weight distribution become less. Data of platform research in standing position like classical tests correlates with muscle tone, deep senses, affected leg hip and knee extensors strength (Table 3).

**Table 3.** Correlation between “MTD-balance” system indications and different factors

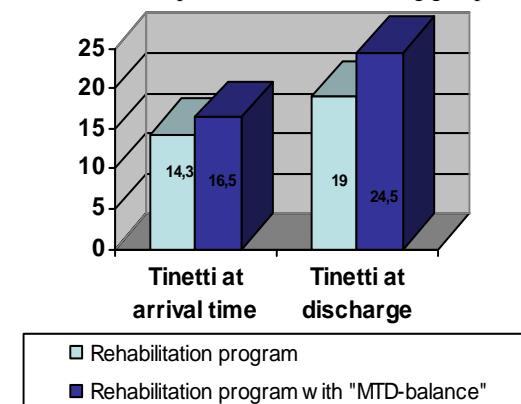
Factors	„MTD-balance“ in standing position
Muscle tonus	-0,48
Deep senses	-0,55
Hip extensors of unimpaired leg	-
Hip extensors of impaired leg	-0,40
Knee extensors of impaired leg	-0,45

p < 0,01

The functional independence and balance of the stroke patients has been improved during comprehensive rehabilitation evaluating them with Tinetti and Barthel tests (picture 1, 2). On admission in both groups, the indices of functional independence and balance indices were the same, but after comprehensive rehabilitation with feed back training of the balance differed ( $p < 0.05$ ). Functional independence and balance indices were higher in this group of patients ( $p < 0.05$ ).



**Fig. 1.** Changes of functional independence (using BI) in rehabilitation period in different training groups



**Fig. 2.** Changes in Tinetti scale in rehabilitation period

In studies by other scientists [4, 6, 8] active rehabilitation means (physiotherapy, occupational therapy and psychotherapy) are considered very useful in cases of stroke patients. The results of our study have indicated the same.

## Conclusions

1. Comprehensive rehabilitation program increase balance and functional independence of the stroke patients.
2. Correlation between functional independence tests, routine balance tests and “MTD-balance” system indications tests ( $p < 0.01$ ) was determined.
3. Comprehensive rehabilitation program with feed-back balance training (using “MTD-balance” system) improve balance and functional independence of stroke patients better than comprehensive rehabilitation program only.

## References

- [1] Kaste M, Skyroj Olsen T, Orgogozo J-M, Bogousslavsky J, Hacke W, European stroke initiative recommendations for stroke management. 2001. [www.eusi-stroke.com](http://www.eusi-stroke.com)
- [2] Dobkin B. H., Rehabilitation after Stroke. The New England Journal of Medicine 2005; 352:1677-65.
- [3] Davies J. Neurodevelopmental treatment of adult hemiplegia: the Bobath approach. London, Mosby, 1996;435-50.
- [4] Geiger R. A., Jeffery B. A., O’Keefe J. Balance and mobility following stroke: effects of physical therapy intervention with and without biofeedback/forceplate training. Physical therapy 2001; 4.
- [5] Kaufman S. R. Towards a phenomenology of boundaries in medicine: chronic illness experience in the case of stroke. Med Anthropol Q 1988; 2:338-54.
- [6] Gold S. J. Getting well: impression management as stroke rehabilitation. Qual Sociol 1983; 6:238-254.
- [7] Juocevičius A., Kesienė J. Galvos smegenų kraujotakos sutrikimų diagnostikos, gydymo ir profilaktikos algoritmas. Neurologijos seminarai 1999,3(7): 28-9.
- [8] Janonienė D., Juocevičius A., Zigmantavičiūtė Lir kt. Sergančių galvos smegenų insultu kompleksinės reabilitacijos veiksmingumas. Neurologijos seminarai, 2006, 10, 2(28):82-87.
- [9] Lai S-M, Studenski S., Duncan P. W., Perea S. Persisting consequences of stroke measured by the Stroke Impact Scale. Stroke 2002; 33:1840-4. Disabil Rehabil, 2004 Jul 22-Aug 5;26(14-15):875-81.