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The Measure Of Balance In Sitting In Patients At Post - Stroke Rehabilitation

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SUMMARY

Functional recovery is a key determinant of post-stroke rehabilitation. The aim of the paper was to show the importance of sitting balance measuring in post-stroke rehabilitation. Prospective cohort study involved 25 (9 men and 16 women) patients who suffered from the first stroke. The study was conducted in the Clinic for Physical Medicine and Rehabilitation in Niš, from March 1st till June 30th 2009. Functional status was assessed by using Barthel Index at the admission to the Clinic, one month and three months after the stroke. Four-point scale was used for sitting balance measuring: 4-normal balance, 3-good, 2-fair, 1-poor. To determine the etiology of the stroke computerised tomography was used. Of all 25 patients, 18 (72.0%, 6 men and 12 women) had left haemiparesis and seven (28.0%, 3 men and four women) had right haemiparesis. Twenty-one (84.0%) patients had thromboembolic stroke and 4 (16.0%) had hemorrhage. The mean age of patients was 68.07±9.3 years. A strong positive correlation was found between Barthel Index score and each weekly sitting balance score. At first measuring, the correlation between Barthel Index and sitting balance was r=0.699; (p<0.001), at second r=0.933 (p<0.001) and at trird, r=0.839 (p<0.01).

Multiple evaluations over time identified those patients whose sitting balance improved during rehabilitation in our unit; after grouping the patients into those with normal, improved, and poor sitting balance, we found a significant difference in the Barthel Index scores among these three groups.

The group of patients whose sitting balance improved had higher Barthel Index scores than the group whose sitting balance did not improve.

***Key words*: sitting balance, rehabilitation, stroke**

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INTRODUCTION

Stroke is the third most common cause of death both in men and women worldwide (1). 70% of strokes are due to cerebral infarction, or disruption of blood vessels in the brain, and 20% are due to hemorrage, bleeding in the brain, and 10% are unspecified (1, 2). Many studies have correlated patient's characteristics present at the initial examination with long-term functional improvement (3,4). Other studies have been unable to document a sufficiently high correlation to precisely predict outcome (5).

Anderson et al. (6) showed that perceptual loss, low motivation, confused and disoriented thinking, withdrawn and apathetic behavior, an extended time since stroke onset, previous stroke, low blood pressure, and an extended period of unconsciousness at the time of the stroke are important variables related to improvement. Lehmann et al. (7) showed that family income and family involvement supporting the patient predicted discharge disposition. There is a paucity of data concerning the value of specific, ongoing functional assessment techniques in identifying those stroke victims who will do well in inpatient rehabilitation units.

The objective of the paper was to show that patients with initially good sitting balance or those who develop good sitting balance during the rehabilitation have better Bathel-index based on functional assessment outcomes.

METHOD

A prospective cohort study was performed. Twenty-five patients who had stroke were admitted to the Clinic for Rehabilitation and Physical Medicine in Niš, from March 1st to June 30th, 2009.

The same physiatrist obtained an informed consent from each patient or a family member, tested the patient's sitting balance, and assessed the patient's Barthel Index score.

Sitting balance was tested using the standard technique for evaluating static and dynamic sitting balance (8). The patient sat on the side of a hospital bed, feet on the floor, back unsupported, and hands on the lap. If the patient could hold this position without assistance for 15 seconds, he was nudged by the physiatrist interiorly, posteriorly, and laterally using approximately 5-10 foot-pounds of force. The physiatrist guarded the patient from falling with his free hand.

The patient's sitting balance was scored as 4 - normal: able to perform the above testing without any physical assistance; 3 - good: able to maintain a static position without difficulty but requiring assistance in righting from the hemiplegic side; 2 - fair: able to maintain a static position without difficulty but requiring assistance in all righting tasks; or 1 - poor: unable to maintain a static position. Sitting balance was evaluated on admission to the rehabilitation unit and every week while the patient was in hospital (9).

The Barthel Index (10), as an ordinal scale that comprises scores for feeding, mobility, personal care, ambulation or wheelchair skills, bowel and bladder abilities, and dressing skills, was used to assess each patient's rehabilitation outcome. The Barthel Index was selected because of its ease of administration, its proven reliability, and its good track record in the functional evaluation of patients with stroke (11,12).

The percentage of the cohort with given demographic and clinical characteristics was calculated. The mean standard deviation (SD) was calculated for the time variables: age, time from stroke onset to admission to Clinic for Rehabilitation, time to initial sitting balance evaluation, and time in rehabilitation.

The correlation coefficient (r) for sitting balance score versus Barthel Index score was calculated and evaluated using the two-tailed t-test. The mean ±SD Barthel Index scores for defined groups of patients were calculated and compared using the two-tailed t test.

RESULTS

Of 25 patients, 18 (72.0%, six men and 12 women) had left haemiparesis and seven (28.0%, three men and four women) had right haemiparesis; 21 (84.0%) strokes were thromboembolic and four (16.0%) had hemorrhage that resulted in left haemiparesis. This was the first stroke in all the examined patients. The mean±SD age of 25 patients was 68.07±9.3 years.

These 25 patients were admitted to the Clinic for Rehabilitation on average 14.0 (SD=11.83) days after stroke. Sitting balance was initially evaluated on average as 3.5 (SD=2.9) days after admission to the Clinic for Rehabilitation. The Barthel Index score averaged 75 (SD=17).

Of 25 patients, 18 (72%) were discharged to home with help, including stand-by assistance, and one (4.2%) was discharged to independent home care. Two patients (8.3%) were discharged to extended-care facilities and one (4.2%) to a retirement home.

Correlation analysis of the Barthel Index score and the first sitting balance scores yielded r=0.699; ($p<0.001$). Similar correlation analyses of Barthel Index score and the second and third sitting balance scores gave r=0.933 ($p<0.001$) and r=0.839 ($p<0.01$), respectively.

There was no significant difference in Barthel Index scores between 19 patients discharged home (mean±SD score 77±16) and five patients discharged to retirement or nursing homes or to the acute-care hospital (mean±SD score 65±21).

Table 1 gives the frequency distributions of the sitting balance scores for each evaluation.

We grouped the patients by their sitting balance scores at each evaluation; the normal group comprised the patients with normal balance sitting.

Comparing the Barthel Index scores of the two groups revealed a significant difference. As shown in Figure 1, mean Barthel Index score at the first sitting balance evaluation was 85 for the normal group and 68 for the less-than-normal group ($p<0.01$). At the second evaluation the means were 87 and 55, respectively $p<0.001$, and at the third they were 82 and 53, respectively ($p<0.02$).

For additional analysis the patients were divided into three groups. First group involved patients with sitting balance scores of 4 or 3 at the first evaluation and at discharge.

The second group consisted of patients with sitting balance scores of 2 or 1 at the first evaluation, who improved by at least two points so that their sitting balance score at discharge was 4 or 3.

The third group included patients with sitting balance scores of 2 or 1 at the initial evaluation who failed to improve at least two points, or those whose sitting balance scores declined while on the rehabilitation unit and were discharged with sitting balance scores of 2 or 1.

The mean±SD Barthel Index score was 85±9 for the first group, 69±14 for the second group, and 48±8 for the third group. There was a significant difference in mean Barthel Index score between the first and the second group ($p<0.01$), between second and the third ($p<0.05$) group, and between the first group and the third group ($p<0.001$).

The rehabilitation stay averaged 17.5 (SD=7.5) days. Mean±SD length of stay for the first, the second and the third group was 16.7+6.3, 20.8±7.0, and 17.4±12.0 days, respectively. There was no significant difference among them.

Table 1. *Assessment of sitting balance in 25 patients*

		Sitting balance score							
		1 (poor)		**2 (fair)**		**3 (good)**		**4 (normal)**	
Assessment	N	n	%	n	%	n	%	n	%
I	25	7	28.0	2	8.0	5	20.0	11	44.0
II	20	6	30.0	0	0	2	10	12	60.0
III	10	2	20.0	1	10	2	20.0	5	50.0
IV	2	0	0	1	50	0	0	1	50.0

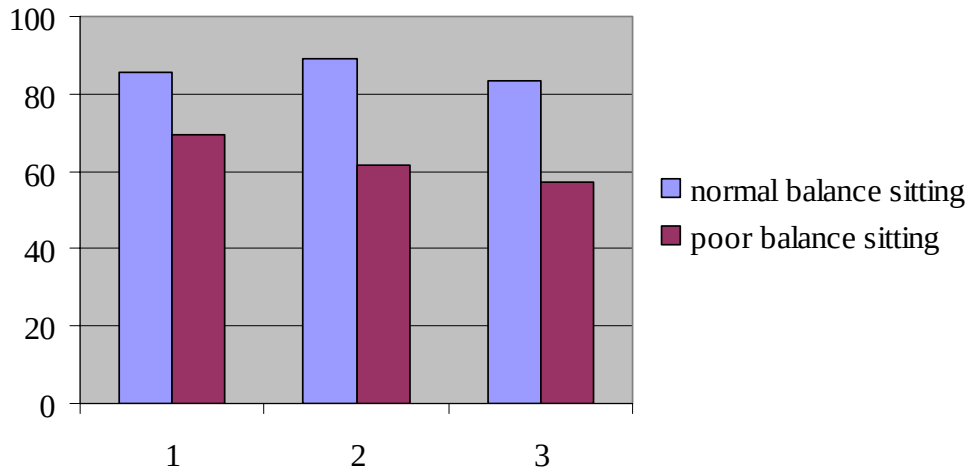

Figure 1. *Barthel Index score for stroke patients with normal sitting balance and in patients with poor sitting balance*

DISCUSSION

Early sitting balance is a well-known predictor of functional outcome after stroke. It is still unknown which aspects of normal upright sitting balance are most sensitive to subsequent recovery (13, 14).

As patients come to rehabilitation at various periods after sustaining a stroke, the onset of the stroke rather than admission to the rehabilitation was used as time t=0. It was agreed that Barthel Index assessment should be performed four weeks after the stroke. Given an average of 17 days from stroke onset to rehabilitation admission and an average rehabilitation stay of 17.5 days, the Barthel Index scores represent the patient functional status one week before discharge. This time frame seems to be clinically relevant since discharge planning frequently begins approximately one week before discharge. A strong correlation between Barthel Index score and any weekly sitting balance score is not surprising.

The Barthel Index is weighed heavily toward activities (dressing, bowel and bladder abilities, and wheelchair skills) that require good sitting and transfer skills. Wade et al. (8) dentified sitting balance along with age, hemianopsia, urinary incontinence, and arm motor deficit as variables that related to 6-month Barthel Index score in a study of 83 patients with stroke. Additional information about this cohort is derived from our serial evaluation of sitting balance.

Our stroke patient's sitting balance scores improved between the first and the second evaluations, but then the rate of improvement leveled off. Most likely, sitting balance improved from the first to the second evaluations because of neurological and functional recovery in the cohort, but there also may have been some practice effect. It is of particular interest that there was a significant difference in Barthel Index score among the three groups of patients.

Certainly patients with good sitting balance are expected to do well on the Barthel Index. There was also a group of patients with initially poor sitting balance whose scores improved while on the Clinic for Rehabilitation. We found no significant variables (such as age or length of rehabilitation stay) that differed between those patients whose sitting balance scores improved and those whose scores remained poor or fair.

CONCLUSION

Only serial sitting balance evaluations identified those patients whose sitting balance scores improved and in turn had higher Barthel Index scores. Additional work needs to be done to identify other serially evaluable functional tasks that may indicate which patients will do well during stroke rehabilitation.

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MERENJE BALANSA U POZICIJI SEDENJA KOD BOLESNIKA NA REHABILITACIJI POSLE CEREBROVASKULARNOG INSULTA

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Sažetak

Određivanje funkcionalnog statusa bolesnika posle cerebrovaskularnog insulta (CVI) jedan je od glavnih pokazatelja uspeha rehabilitacije.

Cilj rada bio je da prikaže značaj određivanja balansa u poziciji sedenja kod bolesnika posle CVI, kao prediktora uspešnog funkcionalnog oporavka.

Prospektivnom studijom obuhvaćeno je 25 (9 muškaraca i 16 žena) bolesnika koji su doživeli prvi CVI. Istraživanje je sprovedeno na Klinici za fizikalnu medicinu i rehabilitaciju Kliničkog centra u Nišu, od 1. marta do 30. juna 2009. godine. Funkcionalni status procenjivan je Barthelovim indeksom i to pri prijemu na Kliniku, mesec dana i tri meseca posle CVI. Procena balansa u poziciji sedenja vršena je primenom četvorostepene skale i to: 4-normalan balans, 3-dobar, 2-narušen, 1-slab. Za utvrđivanje etiologije CVI korišćena je nuklearna magnetna rezonanca.

Od 25 bolesnika, 18 (72.0%, 6 muškaraca i 12 žena) je imalo levostranu, a sedam (28.0%, 3 muškarca i četiri žene) je imalo desnostranu hemiparezu. Kod 21 (84.0%) bolesnika utvrđen je tromboembolijski CVI a 4 (16.0%) je imalo hemoragiju. Prosečna starost bila je 68.07±9.3 godina. Utvrđeno je postojanje jake pozitivne korelacije između Barthelovog indeksa i balansa u poziciji sedenja i to u sva tri merenja. Na prvom merenju dobijena je korelacija između Barthelovog indeksa i balansa u poziciji sedenja $r=0.699$; ($p<0.001$), na drugom $r=0.933$ ($p<0.001$) i na trećem $r=0.839$ ($p<0.01$). Ponovljene procene balansa svake nedelje tokom rehabilitacije, kod grupe bolesnika koji su popravili balans, kod onih sa normalnim balansom sedenja i sa lošim balansom, pokazuju postojanje značajne razlike između grupa bolesnika i vrednosti Barthelovog indeksa. Grupa koja je popravila balans u poziciji sedenja imala je značajno veći Barthelov indeks nego grupa kod koje nije došlo do poboljšanja balansa.

Bolesnici koji su imali bolji balans u poziciji sedenja pre početka rehabilitacije, kao i oni koji su popravili balans sedenja tokom rehabilitacije, imali su veći Barthelov indeks, a time i veće šanse za bolji funkcionalni oporavak.

Ključne reči: **balans u poziciji sedenja, rehabilitacija, cerebrovaskularni insult**