Ischemic Stroke: Motor Impairment And Disability With Relation To Age And Lesion Location

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Citation

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Abstract

Objectives: To describe the association between motor impairment and disability and to establish the relation to age, and hemisphere of stroke in ischemic stroke.

Methods: A total of 100 patients with ischemic stroke were assessed at Erciyes University Neurology Department. The Rivermead Motor Assessment (RMA) was used to measure motor impairment and the Functional Independence Measure (FIM) was used to measure disability. The assessments were made poststroke in 7-10 days and 3 months.

Results: RMA correlated significantly with FIM for both 7-10 days and 3 months. Motor impairment and disability were not related with age and istatistically between both hemispheres there was no significant difference in either motor impairment or disability.

Conclusions: Stroke-related motor impairment and disability are significantly correlated with each other. Despite some inconsistencies in existing literature, our study showed that age and lesion location had no effect in motor impairment and disability assessments.

INTRODUCTION

Although stroke often results in some degree of long-term impairment and disability, most patients experience some natural recovery of neurologic functioning and improvement in ability to perform activities of daily living ([1,2,3,4,5]). Impairment, manifested by deficits in primary neurologic functions, results in disability, which is manifested by the reduced ability to perform functional activities such as dressing, walking and elimination ([6]). However, the nature of the relation between motor impairment and disability among individuals who undergo stroke rehabilitation remains unclear. Much of the lack of empirical evidence for the relation between stroke motor impairment and disability can be attributed to the difficulty in quantifying neurologic functioning and severity of disability. Some authors have shown that increased age predicts poor outcome after stroke ([7, 8]) , whereas other researchers maintain that age is an independent predictor of functional outcome ([9]).

In addition to age, the side of lesion also appears strongly related to functional outcomes. Patients with severe functional impairment on admission following right hemisphere lesions appear to demonstrate less improvement than those with left hemisphere lesions ([7, 10]). Although these findings are not unique ([1]) some researchers have not found a difference in outcome related to lesion location ([8]) and recent literature reviews suggest that hemisphere of stroke does not predict outcome ([10, 11]).

There were purposes of the present investigation. Firstly, the study was designed to describe the assosciation between motor neurologic functioning and ability to perform activities of daily living, and secondly to describe the assosciation between patient's age and lesion location (left vs right) because of the findings on the effects of age and lesion location on outcome are in conflict.

METHODS

SUBJECTS

The participants were 100 individuals who sustained an eligible stroke and were the recruited for the this study. Case ascertainment for our study started in October 2001 and

ended in March 2004. 100 patients (60 men and 40 women; mean SE age, 61.73 1.10 years, range 42-74 years) were enrolled consecutivly. Fifty patients had right hemispheric lesions and fifty had left hemispheric lesions.

Stroke was defined according to World Health Organization critera of acute onset of neurological deficit lasting>24 hours, with no apparent cause other than cerebrovascular accident ([12]). The diagnosis of stroke was based on clinical assessment supported by CT scanning or MRI. Patients with a hemispheric stroke due to focal brain ischemia in the middle cerebral arter territory were considerd for inclusion.

All patients with moderate and severe disability received physical therapy.

PROCEDURE

The patients were evaluated by standardized assessments 7 to 10 days and 3 months after stroke by health care professionals who were physical therapists. Assessments included baseline demographics and stroke characteristics.

All patients were evaluated for type of motor impairment using the Rivermead Motor Score (RMA). The RMA is a well-validated instrument used to assess motor impairment in 38 functions frequently affected by stroke ([13, 14]). The RMA was found to be suitable to evaluate gross functions, lower limb and trunk and upper limb movements. A two-point ordinal scale (0, can not perform; 1 perform fully) was applied to each function.

Each patient was also evaluated for level of disability, using the Functional Independence Measure (FIM). This ordinal scale is a well-validated functional assessment tool used to rate patient performance on each of the 18 activities of daily living on 7 levels of independence (a score of 7 means complete independence and a score of 1 means complete dependence) ([15,16,17,18,19]). Two subscales of the FIM instrument have been distinguished, and were used in this study the motor FIM subscale, which includes ratings of 13 functional activities (self-care, mobility, locomotion, and sphincter control), and the cognitive subscale, which includes ratings of 5 cognitive-communicative skills ([19]).

DATA ANALYSIS

All analyses were conducted using the Statistical Package for Social Sciences (SPSS). Statistics presented in this paper are means SE.

Pearson correlation analyses were performed to determine the associations between total RMA (tRMA) and total FIM (tFIM), tRMA and motor FIM (mFIM), tRMA and cognitive FIM (cFIM), gross RMA (gRMA) and tFIM, gRMA and mFIM, gRMA and cFIM, leg RMA (lRMA) and total FIM, lRMA and mFIM, lRMA and cFIM,arm RMA (aRMA) and tFIM, aRMA and mFIM, armRMA and cFIM at 7-10 days and 3 months after stroke.

Independent t test was used to examine the effect of lesion side.

Regression analyses were performed to determine the associations between age and tRMA, age and gRMA, age and lRMA, age and aRMA, age and tFIM, age and mFIM, age and cFIM, at 7-10 days and 3 months. The level of significance was set at $p<.05$.

RESULTS

Subject demographics and associated stroke characteristics are listed in table 1. Motor impairment and ratings for the entire sample are provided in table 2. Correlations between motor impairment and disability measures are shown in table 3 and 4. These analyses revealed significant correlations between RMA and mFIM measurements for both time periods. However, the correlation between the cFIM and assessment measures were revealed poor relation. The level of association was also lower in relation to arm movement. In general, relations between impairment and motor disability at both 7-10 days and at 3 months were stronger than were the relationships between impairment and cognitive disability. In general, the correlations at 3 months were similar to at 7-10 days.

Figure 1

Table 1: Patient Demographics and stroke Characteristics

Age, mean±SE	**61.73±1.10yrs**
Gender	
Men	60 (60%)
Women	40 (40%)
Stroke location	
Right (%)	50 (50%)
Left (%)	50 (50%)
Depth of stroke	
Cortical	66 (66%)
Subcortical	34 (34%)

Figure 2

Table 2: Motor Impairment and Disability Ratings 100 Stroke Patients

		7-10 days		3 month
tRMA		13.75±1.22		21.30±1.20
gRMA		4.29±0.41		7.51±0.42
lRMA		4.43±0.38		6.60±0.35
aRMA		5.01±0.47		7.23±0.52
tFIM		63.35±3.28		84.18±3.52
mFIM		41.63±2.51		58.57±2.71
cFIM		22.16±1.40		25.97±1.42

Figure 3

Table 3: Correlation Analyses of RMA Measures and FIM Measures of Stroke Patients at 7-10 days

	tFIM	mFIM	CFIM
tRMA	0.87	0.90	0.46
gRMA	0.87	0.91	0.45
lRMA	0.83	0.87	0.42
aRMA	0.80	0.82	0.45

P<.05 for all correlations

Figure 4

Table 4 : Correlation Analyses of RMA Measures and FIM Measures of Stroke Patients at 3 Months

	tFIM	mFIM	CFIM
tRMA	0.88	0.89	0.52
gRMA	0.86	0.89	0.48
lRMA	0.81	0.82	0.47
aRMA	0.76	0.75	0.47

P<.05 for all correlations

Regression analyses between age and FIM and RMA measurements at 7-10 days and 3 months were not significant (p>.05). The regression analyses between age and FIM, RMA measurements were also insignificant in the difference between 7-10 days and 3 months following the stroke. Independent t test revealed no significant differences between the left hemisphere and right hemisphere groups on the RMA and FIM (p>.05). However, only cognitive FIM revealed a significant difference between both hemispheres (p<.05). The left hemisphere measurements in cognitive FIM were higher than the in right hemisphere (Table 5).

Figure 5

Table 5 : Independent t tests on RMA and FIM by Hemisphere

	right hemisphere N=50	left hemisphere N=50	t	P
7-10 days				
tRMA	13.44±1.77	14.06±1.69	0.25	>.05
gRMA	4.32±0.60	4.26±0.57	0.07	>.05
lRMA	4.22±0.56	4.64±0.51	0.54	>.05
aRMA	4.86±0.66	5.16±0.69	0.31	>.05
tFIM	62.02±4.74	64.68±4.59	0.40	>.05
mFIM	41.96±3.61	41.30±3.53	0.13	>.05
cFIM	18.54±1.35	26.78±2.42	2.18	<.05
3 month				
tRMA	20.84±1.78	21.76±1.62	0.38	>.05
gRMA	7.34±0.62	7.68±0.57	0.39	>.05
lRMA	6.50±0.51	6.70±0.49	0.28	>.05
aRMA	7.08±0.77	7.38±0.73	0.28	>.05
tFIM	81.80±5.33	86.56±4.63	0.67	>.05
mFIM	57.60±4.13	59.54±3.55	0.35	>.05
cFIM	23.52±1.48	30.42±2.39	2.43	<.05

DISCUSSION

Although many reports have described changes in disability levels during stroke rehabilitation ([1,2,3,4, 20, 21]), there has been relatively little examination of the severity of stroke-induced motor impairment at rehabilitation admission and discharge. Clinical observation and a few emprical studies have suggested the motor impairment and disability in stroke survivors are related to in subtle and complex ways ([3, 22, 23]). The purpose of this investigation was to describe these relationships by using different from literature on motor impairment and disability measures only in ischemic stroke group, particularly because of different views in literature which have researched the effect of age and lesion location on impairment and disability in this limited group.

Several prior studies have examined the relationships between ordinal measurements of impairment and disability. Wood-Dauphinee and colleagues ([24]) found that two measures of neurologic status (including the Fugl-Meyer scale) significantly correlated with the Barthel index. Two studies ([5, 25]) used a measure of impairment, the National Institutes of Health Stroke Scale (NIHSS), to demonstrate a correlation between impairment and disability after stroke. Generally these studies were limited by a small sample size, and the ischemic and hemorrhagic group, which can also appear different from progression of recovery in stroke, were taken together ([5, 24, 25, 27]).

There are several advantages to using the RMA to measure impairment. RMA measures functional motor assessment. While motor impairment of patient with stroke was evaluated to assess over all make RMA much more preferenc?able an assessment method. RMA is considered a highly reliable and valid measure of stroke-related impairment, and is easy to administer ([13, 14]). This is an assessment method which is objective and can make stability measure in itself, and can also show the level of RMA impairment, to determine the effect of the rehabilitation program which is to be chosen and to measure the recovery quantity. Furthermore, FIM is similar to RMA, has been used extensively in rehabilitation. It too, possesses evidence of high reliability and validity, although the FIM instrument measures disability rather than impairment ([15, 19]).

In this study, a large cohort of consecutively admitted stroke patients who underwent a comprehensive rehabilitation program were consistently evaluated using the RMA and the FIM at both 7-10 days and 3 months after stroke. This afforded the opportunity to determine the relationship between impairment and disability. There were statistically significant associations between impairment and disability in both subscale and total scores at both the 7-10 days and 3 months after stroke. Especially, our study also showed that gross and leg movement contribute more to high activities of daily living (ADL) scores than upper limb function.

The finding that there was more improvement in motor function (33%) than in cognitive function (18%) is consistent with the common clinical observation that motor recovery tends to occur earlier and to a greater extent than does cognitive recovery ([22, 27]).

It was found that there is istatistically a poor relation between cognitive FIM and impairment in this study. Wood-Dauphinee and colleagues also found a relation between the motor performance and cognitive subscale of level of rehabilitation scale ([24]).

The following are the views of some researchers about how the effects of age factor on functional capasity and prognose in patients with a stroke. Alexander ([7]) found initial severity of stroke and age to be the most powerful predictors of functional recovery. Similarly, Kotila's group ([22]) showed that age patients of over 65 yrs had a significant negative impact on discharge from hospital, adequate performance of

ADL and return to work. Other researchers have found survival to decrease in each successive age group ([28]). Ferrucci and colleagues found that the extent of improvement in functional status was independent of age ([29]).

In our study it was found that age is an independent parametre in patients with stroke. Its connection with age is not a factor which effects the impairment and disability level by itself. Differences in association between age and outcome across studies might be due to the correlation of age with comorbidities such as medical, psychosocial, and psychiatric disorders which may not emerge as independent predictors of outcome ([7, 30]).

Despite the fact that reviews found poorer functional outcomes in patients with nondominant (right hemisphere) strokes ([1, 7]), our study supports findings obtained by other researchers who found no differences in outcome between dominant and nondominanat cerebral lesions ([11, 30]).

Mills and DiGenio found no significant difference in recovery of mobility and ADL performance, except in language between patients with left or right hemispheric lesions ([31]).

Gardarsdottir and colleagues ([11]) only scores on 3 of the 18 ADL items observed on the disability discriminated between participants in the left and right hemispheric groups (shave/make-up, comprehension, and speech).

In our study cognitive FIM items also showed a significant difference in right and left hemispheric groups ($p<.05$).

The inability of scores on the other FIM items on disability to discriminate between the two groups could indicate that both hemispheres contribute important and necessary functions to behavior at the disability level. These findings agree with Arnadottir ([32, 33]) that although certain functions can be assigned to specific cortical lobes, several functional areas in different lobes may contribute to a particular function and, therefore, a variety of cortical areas may be responsible for processing particular functions.

CONCLUSION

Using the RMA to measure motor impairment and the FIM to measure disability in 100 patients, stroke-related motor impairment and disability were found to be significantly correlated with each other. The extent of improvement in impairment and disability was found to be independent of age.

In 100 patients with ischemic stroke seperated into two groups, left and rigth hemisphere lessions, no statistically significant differences were found between the groups in assessments made at 7-10 days and 3 months, except in cognitive function istatistically.

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