Functional Outcome of Stroke in the Young Patients Undergoing Rehabilitation at the Philippine General Hospital

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ABSTRACT

Objectives. Because of the growing concern for stroke in the young, this study was done to determine functional outcome among patients seen at the out-patient clinic of the Department of Rehabilitation Medicine, Philippine General Hospital.

Methods. Twenty-two patients diagnosed to have stroke in the young, who were referred for comprehensive rehabilitation and satisfied the inclusion criteria participated in this prospective study. The patients were evaluated using the Institute of Rehabilitation and Restorative Care–Long Range Evaluation System. The scores were analyzed using paired t-test, repeated measures ANOVA and linear regression at 95% confidence level.

Results. Significant changes across time in all variables tested: communication, motor function of the affected extremity, the unaffected extremity, proficiency in self-care activities, family cluster, social cluster, resources, outlook in life and work status. Significant changes were also noted between the first and second, and between the second and third evaluation periods. Family cluster, resources and the motor function of the affected extremity significantly affected the functional outcome of the patients.

Conclusion. The present study suggests that it is not the improvement in motor recovery alone but also increased psychosocial support that determine functional outcome for stroke in young patients.

Key Words: stroke in the young, functional outcome, rehabilitation

Introduction

Stroke, the overt manifestation of cerebrovascular disease, is a leading cause of mortality and morbidity in the Philippines and in many parts of the world.[1] Primary and secondary prevention, and rehabilitation measures have resulted in the improvement of the patient's outcome as evidenced by the decrease in the mortality.[2] However, there is a certain population of stroke patients, those who suffer stroke at a young age, which is a growing concern for healthcare providers. By definition, these patients are those in the 15 to 45 year old age group, very much in their productive years. Their demographic profiles, risk factors and etiology are common targets of research to facilitate clinicians in managing stroke in the young. Functional outcome studies, however, are limited.

Being in their productive years, this group of patients poses a challenge to general practitioners and specialists who are tasked to help these patients gain their optimum function despite their impairments.

Review of Related Literature

Stroke in young adults, aged 15 to 45 years, has been a relatively neglected area of study despite its prevalence in practice. The recorded incidence in various studies cited range from 10.4 to 47 per 100,000 per year.[3] Worthy of note from the different studies, the incidence is increased among males, and infarction is more common than hemorrhagic strokes in this age group. These findings are similar to the profile of the general stroke population.[4] Functional outcome studies on stroke in young adults have also been limited. A Philippine study by Mojica et al. showed general improvement of functional outcome in the general stroke population using Barthel Index scoring.[5] In general, 75% to 85% of stroke patients are discharged after formal, in-patient, acute rehabilitation. The Copenhagen Stroke Study (1991–93), a prospective study of 1,197 acute stroke patients, used the Barthel Index to evaluate basic activities of daily living (ADLs) which were affected including dressing skills, transfer skills and ambulation.[6] About 50% of patients were initially rated with severe disability. After rehabilitation, there was reduction to 25% while those patients with mild and moderate disability increased from 50% to 75% of the study population. Functional recovery in these patients was generally noted to be completed within three months of the stroke.

An earlier study, the Framingham Heart Study (1948–52) reported that from 148 general stroke patients, 78% of the

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survivors were fully independent after four years of observation; 68% of them were independent in mobility and self-care. However, it was also noted that 59% of stroke survivors had decreased vocational function.[7] This study was one of the first to describe the psychosocial aspects of recovery in stroke other than the motor or neurological recovery. These studies, however, were based on the general stroke population.

Previous studies have described good functional recovery in stroke among young adults since at least 50% become independent and return to work.[8,9] In contrast, Leys et al. reported that although young patients who experience ischemic strokes have a low risk of stroke recurrence, some patients do not regain independence. In this three-year follow-up study, the annual stroke recurrence was 1%; 4% of patients lost their jobs despite mild disability and only 22% gave up smoking.[10] Also, early detection and treatment of depression are recommended to improve quality of life among stroke patients.[11,12] In the Philippines, the authors are not aware of any published studies on functional outcome of stroke in young adults.

Objectives

This study was undertaken with the following objectives:

1. To describe the functional profile of stroke in the young patients seen at the Out-Patient Stroke Clinic, Department of Rehabilitation Medicine (DRM), Philippine General Hospital (PGH).
2. To compare the functional outcome of stroke in young patients within the first month of the stroke, and the third and sixth months post-stroke.
3. To determine which variable(s) in the Long Range Evaluation System (communication, affected upper extremity [UE], affected lower extremity [LE], unaffected extremity, self-care, environment, social cluster, family cluster, resources, outlook and work status) affect(s) the functional outcome of stroke in young patients.

Methods

Study design. This is a prospective cohort study.

Subjects. The patients included in the study were selected consecutively between January to June 1999 according to the following inclusion criteria: 1) patients diagnosed with stroke for the first time, within the first month of onset; 2) patients between 15 to 45 years of age; and 3) patients seen at the Out-Patient Stroke Clinic, Department of Rehabilitation Medicine, PGH. Patients with the following conditions were excluded: repeat strokes, central nervous system tumor or infection, traumatic brain injury, and demyelinating disease.

Methods. All patients underwent computed tomography (CT) of the head for confirmation and documentation of their stroke. Consent for the study was taken from all the patients. After baseline evaluation, all the patients underwent a comprehensive Stroke Rehabilitation Program consisting of physical therapy, occupational therapy, speech therapy and psychology services as needed, and were re-evaluated after the third and sixth month of rehabilitation.

The patients were evaluated by the investigators using the Institute for Rehabilitation and Restorative Care–Long Range Evaluation System.[13] This questionnaire assesses the patient's functional status, proficiency in doing activities of daily living, motor, function, communication skills, environment, resources, social and family support, outlook in life, and work or vocational status. The system uses a four-point scale for each item, with a score of 1 as the highest level of independence and 4 as the highest level of dependence. The questionnaire was self-administered with the investigator on hand for clarification. Repeat evaluation with the same questionnaire was done on the third and sixth month post-stroke. The average score was then taken per variable for each patient. These were multiplied by a factor to make a total of 100%. A perfect score of 100% signifies full independence while a low score of 25% signifies full dependence on a caregiver. Recovery was defined by an increase in the score or percentage of their variables.

The scores were plotted per time interval and the differences were analyzed for significance using the paired T-test and repeated measures ANOVA. Linear regression was applied to determine which among the variables affected the outcome of the patients. The level of significance for all the analyses was set at $p \leq 0.05$.

Results

A total of 29 subjects were included in the study. However, 7 patients were lost to follow-up; 22 patients completed the study.

There were 14 males and 8 females with the mean age upon onset of stroke at 39.6 ± 4.2 years. The most common type of stroke encountered was infarction. Common risk factors in these patients were hypertension (59.10%), hypercholesterolemia (32.80%), heart disease (27.28%) and smoking (27.70%). One patient was noted to have a five-year history of metamphetamine and marijuana intake. It was also noted that nine of the patients (40.91%) had more than one risk factor. Anti-phospholipid antibody screening and VDRL testing were not done in all of the patients.

From the questionnaire, the scores were tallied from the different variables per patient. The total functional outcome score values which are >50% and an increase from initial scores imply functional recovery. During the initial visit, scores ranged from 49% to 85%; on the third month post-stroke, it ranged from 54% to 98% while on the sixth month post-stroke, it ranged from 69% to 100%.

Paired T-test analysis showed significant change between the initial and sixth-month post-stroke scores ($p< 0.05$) for all the variables (Table 1). Using the repeated measures ANOVA, significant change in all time intervals was noted for all variables ($p< 0.05$) (Table 2).

Using linear regression (Force method) analysis, family cluster, resources, and the motor function of the affected lower extremity variables were noted to affect the final functional outcome scores of this group of patients ($p<0.05$) (Table 3).

Table 1. Analysis of the difference between the initial scores and scores at 6th month post-stroke using the T-test at 95% confidence level

Parameters	SD	t	Significance
Communication	1.9436	-6.488	.000
Affected UE*	2.8155	-6.857	.000
Self-Care	1.9510	-8.752	.000
Environment	3.1365	-3.727	.001
Affected LE*	2.9860	-7.231	.000
Unaffected Extremity	4.8403	-3.052	.006
Social Cluster	2.2708	-2.646	.015
Family Cluster	3.1407	-4.084	.001
Resources	5.8813	-2.181	.041
Outlook	3.8735	-4.107	.001
Work Status	5.0150	-4.305	.000
Functional Outcome	1.8650	-8.426	.000

**UE – upper extremity, LE – lower extremity*

Table 2. Analysis of difference between scores across time intervals using the repeated measures ANOVA at 95% confidence level

Parameters	Sum of Squares	df	Mean of Squares	f	Significance
Communication	1772.120	2	886.060	29.955	.000
Affected UE*	4482.956	2	2241.478	31.288	.000
Affected LE*	5170.455	2	2585.227	30.333	.000
Unaffected extremity	1382.576	2	691.288	12.264	.000
Social Cluster	404.926	2	202.463	4.965	.012
Family Cluster	1817.517	2	908.758	11.865	.000
Self-Care	3381.753	2	1690.876	60.049	.000
Environment	1357.532	2	678.766	8.744	.001
Resources	1817.517	2	908.758	3.524	.038
Outlook	2803.030	2	1401.515	12.532	.000
Work	5132.576	2	2566.288	13.847	.000
Functional Outcome	2722.458	2	1361.229	57.482	.000

**UE – upper extremity, LE – lower extremity*

Discussion

Stroke is a common condition seen in tertiary hospitals, especially those with specialized stroke units or clinics. At the DRM-PGH Out-Patient Department, at least 600 stroke patients per year are seen at different stages of their condition.[14]

The incidence rates of stroke in the young in this study are similar to previous studies: 29 cases of stroke in the young out of 331 general stroke patients during the period of recruitment (8.7%). The risk factors of the patients studied

Table 3. Analysis of variables as to contribution to the final outcome of stroke in young patients using linear regression, Force method, with 95% confidence level

Variables	Unstandardized Coefficient		Standardized Coefficient	t	Significance
	B	Std Error	(β)		
Communication	.206	2.838	.215	1.638	.130
Affected UE*, motor	-.162	.143	-.245	-1.133	.281
Self-Care activities	-.356	.122	-.372	-2.910	.014
Affected LE*, motor	.256	.122	.409	2.098	.040
Unaffected Extremities	8.185	.044	.212	1.853	.091
Social Cluster	-6.627	.115	-.081	-.578	.575
Family Cluster	.345	.101	.581	3.428	.006
Resources	.139	.053	.440	2.621	.024
Outlook	.170	.063	.353	2.711	.050
Work status	4.142	.052	.111	.793	.445

**UE – upper extremity, LE – lower extremity*

are also similar to the general stroke population. Illicit drug use is a known risk factor in young adults and was found in one of the patients. Adrenergic stimulants, like cocaine and amphetamines, are known to cause vasoconstriction, causing ischemic infarcts. Illicit drugs are implicated in the rising incidence of infarction among young adults.[15] In the general stroke population, Wade et al. noted the following predictors of function after six months of stroke: urinary incontinence, sitting balance, age, functional ability and motor deficit in the arm.[16]

Although studies have shown that there are several predictors of outcome, clinically, the multiplicity of variables in one individual makes it difficult to point out the factors that contribute to general functional outcome. However, there is general agreement that the greatest recovery is noted during the first three months after the stroke, which remains significant until sixth month post-stroke. In the general stroke population, the lower limb usually achieves more recovery than the upper limb since the middle cerebral artery territory is more commonly affected in stroke. Most stroke survivors also show significant functional recovery aside from neurological recovery.[8,9] Indeed, in a 12-year follow-up of 272 cases of stroke in young adults, Varona et al. showed that 90% of patients became independent and 53% returned to work.[17]

The pattern of recovery of our patients was similar to the general stroke population, with motor recovery fastest within the first six months post-stroke. At the end of six months, the average score of 79.76% from all variables implies mild impairment or disability of these patients. Significant recovery was noted in the lower extremity within three months, as evidenced by the onset of ambulation with cane in 75% of these patients on their third month post-stroke. This is in contrast to the recovery of the upper

extremity, which was observed only at six months post-stroke. In addition to the motor ability of these patients, there are other factors which are commonly underestimated but equally contributory to functional outcome. These are difficult to quantify. Berk and Schall state that financial resources and family support have a major impact on discharge outcome.[18] A decrease in ADL function was noted in the patients upon discharge because of these factors. Similarly in this study, the variables Family Support (under Family Cluster) and Resources are the factors which greatly affect the functional outcome based on the linear regression analysis. Considering that the study participants are out-patient referrals, more family interaction is expected, which could have affected the patient's outcome. It also shows the importance of the patient's family support as part of the stroke patient's recovery.

It is usually surmised that the upper extremity is more important than the lower extremity in terms of function, vis-a-vis the performance of ADLs. However, in this study, recovery of the lower extremity showed more effect on the final outcome of the patients than the recovery of their upper extremities. This could be attributed to two factors. One is that patients learned to use the unaffected hand to compensate for the loss of the other. The unaffected extremity of our group of patients was strong and functional even on initial evaluation. So, a right-handed patient who lost the function of that hand eventually learns to use the left hand in his or her daily activities. On the other hand, when one ambulates or transfers from bed to chair, some strength is needed in both legs.

It should be noted, however, that this study has its limitations. One is the small population and the other is the short duration of the study. Also, the CT scan findings were not correlated with the functional outcome.

Conclusion and Recommendations

From the study, the population of stroke in young adults in an out-patient setting of a tertiary hospital is comparable to the patient population cited in foreign literature. More males are affected with an average age of onset of 39.6 years with infarctions occurring more often than the hemorrhagic type of stroke. Risk factors noted in descending order of frequency are: hypertension, hypercholesterolemia and smoking.

The functional outcome scores of patients showed statistically significant changes across time. The variables which greatly affected the final outcome of this group of patients were family cluster and resources, and were affected by the lower extremity recovery. This study showed that psychosocial factors are as important as motor strength in the eventual recovery of stroke in young patients.

It is recommended that further studies be done on a larger group of patients for this population. Philippine studies are very limited, especially in the field of functional outcome and quality of life. A prospective study on their functional outcome could be done to determine if significant recovery continues beyond six months post-stroke as observed in the general stroke population. Studies on the differences in in-patient and out-patient rehabilitation management outcomes can also be done. Correlation between CT scan or magnetic resonance imaging (MRI) findings and functional outcome is also recommended.

Both primary and secondary prevention are the keys to a comprehensive rehabilitation program for stroke patients. However, rehabilitation is perceived to have a greater impact on the young adult group, as these patients are still in their productive years.

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