

Functional Results of Physiotherapy Programme On Patients With Aneurysmal Subarachnoid Hemorrhage

ABSTRACT:

OBJECTIVE: The purpose is to evaluate the functional recoveries obtained through the physiotherapy program started in the early postoperative period with the patients with SAH, and then advanced after being discharged.

MATERIAL AND METHODS: Home Exercise (HE) (n=54) was Group I, and the Regular Supervised Exercise (RSE) (n=18) group by the physiotherapist was determined to be Group II. The patients in both groups were treated as outpatients for six months after being discharged. The functional independent measure was used. The measurement were done at the beginning, on the day of discharge, and on the first and sixth months.

RESULTS: In the FIM measurements taken on the first and the sixth months, there is a significant difference in the groups doing the RSE compared to the group doing the home exercises ($p < 0.05$).

CONCLUSION: The exercises done regularly and under observation for the patients with aneurysmal SAH is important from the viewpoint of obtaining functional recoveries during both the early and late periods.

KEY WORDS: Aneurysm, Subarachnoid hemorrhage, Physiotherapy.

INTRODUCTION

Primary or spontaneous subarachnoid hemorrhage (SAH) is usually caused by arterial bleeding into the subarachnoid space surrounding the brain, and it often extends into the brain itself, and into the ventricle (23,18). The source of SAH is virtually always arterial and because of that, symptoms are usually abrupt at the onset. SAH's symptoms consist of sudden headache, vomiting, double vision, loss of consciousness, neck stiffness, convulsions, confusion, dizziness, dropping of eyelids, loss of vision, motor and sensory loss (29).

Age, hypertension, smoking, alcohol abuse, and poor nutritional habits are some of the risk factors associated with hemorrhagic cerebrovascular disease (30). Age, sex and preoperative neurological status are believed to contribute to the severity of physical deficits that occur after SAH. Thus, these factors also contribute to resulting physical dependence in mobility, and in performing activities of daily living (5). The intensity of the actual rehabilitative program depends on the degree of disability (28).

Virtually all initial rehabilitation is designed to deal with motor deficits rather than with visual or somatosensory perception deficits.

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Programs directed toward dealing with motor deficits are designed to manage the problem of immobility, which produces significant changes in joint and muscle functions (7). In an effective rehabilitation program, all aspects of the patient's disability must be examined and carefully assessed, because such consideration as the degree of weakness, intellectual impairment, sensory loss, visual loss and depression, as well as the magnitude of problems facing the patient such as finances, returning to social activities and work, living at home, sexual function, and the need for care tend to influence the outcome of the rehabilitation program (2,13,22).

The aim of our study is to evaluate the functional recoveries obtained in the early and late periods through two different physiotherapy methods carried out either as regular supervised exercise (RSE), or home based exercise (HE) on the patients with aneurysmal SAH during the period after the operation.

METHOD

Patients

Our study was carried out in the Neurosurgery Department of University Hospital, on patients who were operated on for aneurysmal SAH between 1998 and 2003. 72 patients, whose ages ranged from 24 to 74 were included in the study.

Inclusion Criteria

- Those who underwent surgery due to SAH
- Those who had neurologic deficits
- Those whose WFNS scores were II,III,IV
- Those whose medical conditions were unchanging

Exclusion criteria

- Those older than 75
- Those who have brain tumors
- Those who have extracranial hemorrhage

Sex, ages, Body Mass Index (BMI : kg/m²), complications of SAH (hydrocephalus, ventriculo-peritoneal shunt, vasospasm, seizures) acute hospital Length Of Stay (LOS), the side and locations of the ruptured cerebral arteriovenous malformation, and motor deficits were recorded.

Intervention

During the years of 1998 and 2003 out of every four patients admitted to our hospital's

neurosurgery department with the diagnosis of aneurysmal SAH, the first three of them, according to the admission order, were put under treatment as the home exercise group, and the fourth one as RSE group. During those years, 72 patients were included in our study, and out of whom, 54 patients (Group I) completed the treatment being in the home exercise group, and 18 of them (Group II) being in the RSE group. Those patients who were taken to the RSE group were put under treatment as outpatients three days a week, at least two hours a day, during six month-period.

For the remaining 54 patients, the exercise programs, given at the time of discharge, were modified at the end of the first and the third months of the control visits, and home exercise program similar to that of the group, that was exercising regularly, was assigned. In home exercise group the exercises were started with ten repetitions, three times a day, and progressed with twenty repetitions. The patients were encouraged through regular telephone calls.

Treatment (Design)

Neurophysiological approach used for the treatment of hemiplegics was applied two times a day for the patients. Scapula mobilization, bilateral upper extremity exercises, hip/ knee flexion at the bedside, balance training in sitting and standing positions, weight shifting, ankle dorsal flexion training in sitting and standing, and walking training were given as Todd - Davies therapy program. In order to reduce spasticity and to improve gait function, orthotic supports were provided for ankles and wrists.

Programs to be followed at home were supplied to patients at discharge, and they were also provided with consultancy as related to their daily living activities. Of all the patients, eighteen who had motor deficits at the time of discharge were included in the program voluntarily and they were accepted in our neurological rehabilitation unit as outpatients for 6 months, three days a week, and at least two hours a day. Their program was conducted by a physiotherapist. The therapy program was progressed with walking, climbing exercises, and wrist-hand exercises.

Ethical Committee: Patients were informed as required and their consents were obtained for assessments. During our study, required

explanations were given to our patients and to their family, and required approval was obtained from them for the evaluations and participation into the study.

Assessment of Functional Outcome

In evaluating the functional results, the Functional Independent Measure (FIM) score was used. The FIM score was developed as a measure of a person's disability and of the progress made in the rehabilitation program. Total FIM scores were found to be the best predictor of rehabilitation outcome (2,11). The FIM was found to be appropriate for use in patients with intracranial hemorrhage as well as those with ischemic stroke (4).

Functional status was measured by the patients' scores on the motor and cognitive components of the FIM, which was prospectively obtained at the time of admission and discharge for all patients. The FIM is an 18-item scale, which measures independence in task involved in feeding, grooming, dressing, toileting, mobility, and cognition. Patients are scored from 7 (totally independent) to 1 (totally dependent or not testable) on each item, with a score of 126 indicating total functional independence. The FIM assesses an individual's functional status regarding their basic activities of daily living. The FIM has proven the content and construct validity, that is responsive to small increments in functional status after stroke, and correlates highly with measures of neurologic impairment after stroke. The FIM is recognized as an appropriate functional scale for the evaluation of the physical needs of people with neurological conditions (8,12,17,20,31).

Primary outcome measures were the patients' Δ FIM total score and total discharge FIM score. Secondary outcome measures were FIM efficiency (Δ FIM divided by rehabilitation length of stay (LOS), motor and cognitive subscores of FIM total score).

The FIM measurements were done on the postoperative discharge day, and repeated at the end of the first and sixth months.

Statistical Analysis

Descriptive statistics include frequency distribution variables and means, medians ranges and standart deviations (SDS) for continuous variables. The analyses of demographic and clinical data were used for the chi-square test for categoric variables (deficits, sex, WFNS). In comparing the

FIM scores which Group I and II received, Mann – Whitney U test was performed. In comparing the FIM efficiency, and the motor and cognitive values in the Groups at the time of discharge, the Sperman's correlation tests was performed. The relationships between location of cerebral lesion, LOS, and starting of rehabilitation were calculated using the Pearson correlation coefficients. The statistical analysis was performed using the statistical package for social sciences (SPSS), version 11.0.

RESULTS

Sample Characteristics

A total of 72 patients with aneurysmal SAH were identified. A large proportion of the patients had experienced rupture of an anterior communicating artery (ACoA) (61.1%), and all the patients had experienced a surgical intervention (Table I). There is no significant difference between the Group I and Group II in terms of neurologic deficits ($P>0.05$)

Sixty-four percent had right-sided lesions and 36 % left- sided lesions (Table I). Between the Groups, there appeared no significant difference in terms of age, sex, BMI, and WFNS scores.

Complications of SAH had an inconsistent relationship to functional outcome. The presence of hydrocephalus (%34) or a VP shunt (%28) did not appear to have a detrimental impact on functional gain. Patients with vasospazm (%22) and seizures (%16) showed lower mean discharge day FIM scores on the day of discharge.

Functional Outcome

While, in the beginning, there existed no significant difference in the total admission FIM values in the patient groups, a significant difference was found in favor of Group II, in the discharged total FIM values on the day of discharge ($p<0.05$). When the FIM was valued separately as motor and cognitive, the motor FIM scores were found to be significant in favor of Group II in the measurements of the beginning, on the day of discharge, and in the first and sixth months ($p<0.05$). On the patients who were orderly and regularly taken into the exercise program, there is a significant increase in the motor FIM values. However, while cognitive FIM scores presented no significant difference statistically between the groups during admission, and on the day of discharge, a significant difference was noticed in the measurements of the fist and the sixth months (Table II).

Table I: Clinical features of patients (n: 72)

Neurological status	Grup I n:54		Grup II n:18	
Right				
Hemiplegia	15	27.8	5	27.8
Hemiparesis	22	40.0	4	22.2
Left				
Hemiplegia	8	14.8	6	33.3
Hemiparesis	9	16.7	3	16.7
Location of cerebral lesion				
AcoA	24	61.1	6	33.3
PCO	7	-	3	16.7
MCA	11	22.2	3	16.7
BAS	3	5.6	1	5.6
ACA	-	-	1	5.6
ICA	9	11.1	4	22.2

AcoA: Anterior communican artery, PCO: Posterior cerebral artery, MCA: Middle cerbral artery, BAS: Basillar artery, ACA: Anterior cerebral artery, ICA: Intra cerebral artery.

Length of stay

While there was a significant difference between the groups in terms of starting the rehabilitation and the length of stay in the hospital (LOS) ($p < 0.05$). There appeared no difference statistically between the groups in terms of rehabilitation length ($p > 0.05$).

DISCUSSION

Because of cognitive and neurologic deficits which form along with SAH, it is an ailment whose treatment length and treatment success is of rather changing nature. In literature, although there is a lot of publication concerning the physiotherapy practices during the rehabilitation has been found concerning various practice of physiotherapy programs.

Most of the outcome studies appear in the neurusurgical literature and take into account only broad categories of impairment. Psychosocial factors were not considered in the early literature on aneurysmal SAH; however, information has appeared recently on the emotional, behavioral, social, and cognitive sequel that occur after aneurysmal SAH. These outcome studies usually do not integrate physical and cognitive impairments as

outcome predictors. In an effective rehabilitation program, all aspects of the patient's disability must be examined (5, 26).

Our study was planned for the purpose of pointing out the effectiveness on the functional results of the physiotherapy program which is the same in content, but practised differently. The patients were regularly controlled for six months after being discharged.

It has been estimated that 3% to 28% of the patients require nursing home care for a period of one year after aneurysmal SAH. The present study suggests a much better return to home rate. Although a majority of subjects required some degree of supervision, most were able to return to their home environment. A trend suggested that motor impairment and functional status at admission can play an important role on the need for supervision at discharge (1,3,25). We are not able to give definite results due to the fact that only a six-month follow-up of the patients is carried out. This difference from previous reports may, in fact, reflect the impact of comprehensive rehabilitation on overall outcome. On the basis of these observations, we believe inpatient rehabilitation represents an

Table II. The Demographic Data and FIM Measurement of Patients

	Grup I (n:54)	Grup II (n:18)	Mann Whitney U Test
Gender (%) Female - Male	35-65	39-61	Chi-Square Tests X ² : 0.080, df=1, 0.777
LOS (day)	21.50±5.72	25.61±6.20	0.018*
Rehabilitation time (day)	13.57±5.27	14.11±4.28	0.629
Age (years) X± SD	48.24±11.58	43.50±9.82	0.146
BMI (kg/ m2) X± SD	26.59±3.97	25.59±3.33	0.168
WFNS (%) 2 – 3 - 4	46 – 37 – 17	60 – 23 – 17	Chi-Square Tests X ² :1.481, df= 2, 0.477
Total admission FIM	39.22±8.79	43.27±11.02	0.199
Total discharge FIM	50.79±13.68	60.94±14.48	0.010*
MOTOR FIM X± SD			
Admission	21.14±6.63	26.88±6.15	0.003*
Discharged	27.94±10.93	38.50±9.64	0.000*
1st month	31.77±9.60	50.44±13.82	0.000*
6 th month	35.12±8.91	59.16±17.10	0.000*
COGNITIVE FIM			
Admission	18.12±4.36	16.38± 5.48	0.374
Discharged	22.85±4.34	22.44±5.69	0.686
1 st month	24.16±4.21	26.27±5.04	0.039*
6 th month	25.14±3.99	29.61±3.64	0.000*
FIM EFFICIENCY	0.58±0.44	0.74±0.32	0.018*

* Statistically different from value of before treatment (p<0.05)

appropriate option in selected patients for care after aneurysm surgery. Kassel et al. found that the higher the admission motor response, the better the patient outcome would be (14). In our study, the values of admission motor FIM were higher, and as Kassel et al. pointed out, the results of the first and the sixth months were found to be higher compared to the other group. Although, when cognitive FIM values were taken into consideration. There were significant difference in the admission and discharge values between the groups, the obtaining of high FIM scores of the patients admitted into the RSE group can, at the same time, be attributed to the high scores of motor FIM at the beginning.

The range of the age at the onset of SAH is quite wide in infants as young as four months, and in patients older than 90. It was believed to be most common in the 3rd and 4th decades of life. The mean age of the cases of our study is 47.05 ± 11.29 years and the range is from 24 to 74. Neurosurgical studies have shown a strong negative correlation between the FIM outcome and the advancing age (5)

Cognitive impairment, as manifested by low scores in mental status questionnaires, has been correlated with limited functional gains and poor rehabilitation outcome in elderly patients (25). This result, associated with older age, may be secondary to a general loss of cognitive functioning in the elderly (10,21). For this reason, patients older than 75 were not included in this study.

SAH is common to both sexes with no significant preponderance in either sex. Functional gains by gender were virtually identical (23,29). The percentages of the male and female patients of our study are 63.9% and 36.1% respectively.

Consistent with Dombovy et al. and Clinchot et al., aneurysm location had little impact on functional gain, although these data were limited with small cell sizes (5,6).

The most common arterial location for aneurysms has been reported to be the middle cerebral artery, followed by the anterior cerebral artery, and the internal carotid artery (19,24,27).

30 of our patients (47.22%) had anterior communicating artery aneurysm, 14 (19.4 %) middle cerebral artery, and 13 (16.66%) intra cerebral artery. No significant correlation was found between the scores of cerebral lesion and the FIM scores ($p > 0.05$).

Saveland et al. reports 'very few patients, if any, will have a full recovery with no signs or symptoms of a psychosocial or cognitive disturbance after a major aneurysmal SAH (15). Deficits after SAH have been found to occur primarily in the areas of information processing, behaviour, emotional control, intellectual and social interactions (27). Ljunggren et al. found that abnormalities on standardized neuropsychological tests occurred in 97.5% of the patients; 53% of these had evident deficits (21). Persons who have neurological sequel after their SAH are more likely to have associated personality impairment. Patients with mild-moderate neurological impairment after their SAH are often described as more restless, anxious, aggressive, and disinhibited (10).

In the patient groups we admitted for study, mostly increases were obtained in motor FIM values. In the patients admitted to Group II, while there was no significant difference at the beginning comparing with Group I, higher scores were seen on the measurements of motor FIM scores on the day of discharge, and in the first and the sixth months. And, while there was no significant difference at the cognitive FIM values on the patients admitted to the regular exercise group, the fact that there was a significant increase in the first and the sixth months compared with the other group, the physiotherapy program regularly practised by the physiotherapist which exist during the rehabilitation process indicates the positive increases which take place on the functionality of the patients with SAH during the early and late periods. Although there were no difference in the age, sex, BMI, and neurologic deficit, and no difference between the groups in terms of the rehabilitation period practised at the hospital, and the content of the physiotherapy program practised was the same, our patients whom we admitted to the exercise program regularly, compared with the patients given home program, had functionally more significant recoveries.

Most authorities have stressed the importance of early initiation of treatment because delay allows complications, particularly contractures, to develop. But early treatment also provides stimulation that minimizes intellectual regression, emotional withdrawal, and depression (27,28). Our physiotherapy programme was started in the earliest period soon after the stabilization of the medical status of the post SAH patients, and progressed in accordance with the patients' situation.

Limitation of our study

Our present certain limitations in which we had some difficulties to perform, because of the number of the patients being little, may have contributed to the lack of statistically significant differences in the same analyses. In our study, the FIM may not have been sensitive enough to detect more subtle differences between the groups (particularly if the differences were primarily depressive in nature). The HE group was called for controls more frequently due to some difficulties such as transportation. We were able to give only six-month results of our study due to the lack of patients attending the programme regularly. More efforts should be given in our studies with a view to determining the long-term effects of the physiotherapy programme.

In our study, the patients were included in the programme primarily according to their neurological deficits, however sensory losses and cognitive deficits were found to be of secondary importance. Because it was a very early period, neurophysiologic tests, which would bring the cognitive dysfunction, couldn't be performed. These should be taken into consideration in the rehabilitation programme and a multidisciplinary programme ought to be implemented.

The physiotherapy programme is to be started from the most convenient earliest time onwards and progressed in SAH, which causes personality changes as well as cognitive, sensory and motor deficits. The physiotherapy programs started from the early period, and practised as regular supervised, and which is advanced after being discharged from the hospital, become more effective in improving the patients' functional results.

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