

신경근 재교육이 편마비 환자의 인지와 기능에 미치는 효과

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The Effect of Neuromuscular Reeducation on the Cognitive and Functional Assessment for Hemiplegic Patients

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- ABSTRACT -

편마비 환자의 인지 기능과 운동 및 신체적 기능에 관련된 변인을 분석하고자 하였다.

본 연구는 인지 기능이 편마비 환자에게 미치는 영향과 인지 영역의 손상이 편마비 환자의 독립적 기능 및 수준 향상의 예언 인자로서의 고려해야 할 개념을 검사나 평가 척도로 비교, 분석 하였다.

연구 대상은 전라북도에 소재한 한방병원에 입원 및 통원하고 있는 52-73세의 연령 범위에 있는 편마비 환자 20명 이다.

편마비 환자의 기능적 능력, 운동 회복, 신체적 기능 그리고 인지적 상태를 평가하기 위해 편마비 환자를 위한 임상적 결과 변인 척도, 운동 평가 척도와 바텔 척도 그리고 기능적 독립성 측정 척도를 평가도구로 사용하였다.

편마비 환자의 신체적, 운동 그리고 기능적 능력 상태를 평가도구에 의해 측정된 결과를 분석한 바 운동,

신체적 그리고 인지적인 영역과 기능적 독립 측정 척도 및 바텔 척도 와 관련성이 있음을 보여주고 있다. 편마비 환자의 신체적, 인지적 결함이나 손상 부위, 손상의 본질에 따른 대상의 선정과 운동 조절 형태에 관한 지식 그리고 인지와 신경학적 결함 정도를 심도있게 다루어 기능적 능력 향상의 임상적 효과를 높이고자 하는데 연구의 의의가 있다.

key word : Hemiplegia; Neuromuscular Reeducation ; Cognition

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INTRODUCTION

Cerebrovascular disease is a major cause of cognitive and physical impairment in the old age(Barnes et al.,1981; Novack et al.,1987). hemiplegic patients survivors often face a long physical therapy process to regain a normal life(Calvanto et al.,1993). physical therapist must assess the probable outcome of their patients physical therapy programs, and their ability to accurately estimate a patients level of independence at the end of a physical therapy program and specify the patients needs is extremely important(Dejong et al.,1982; Shah et al., 1991).

some study have been designed to assess the severity and outcome of hemiplegic patient(Cote et al.,1986; Dehaan et al.,1993). hemiplegia impairment scales provide valuable information about the neurological and physical impairment of patients, but offer little information concerning patients disabilities(Dodds et al.,1993). most health care professionals have focused on patients impairment while physical therapy specialists, elderly, and some others have focused on disabilities(Hochstenbach et al.,1996). also functional scales were developed to quantity a patients level of independence(Granger et al.,1979; Keith,1984). functional scales generally focus

on basic daily life activities that healthy adults are required to perform, such as self care, sphincter control, ambulation((Mahoney et al.,1965; Krefting et al.,1992). The Barthel Index and the functional Independence Measure are two of the most commonly used scales(Shah et al,1991; Heinemann et al.,1993). many studies have shown that these scales meet base in psychometric quality are reliable and valid instruments with internal consistency, and are good predictors of physical therapy outcome (Oczkowski et al.,1993; Shah.,1989).

There is a importance whether functional scales appropriately assess cognitive impairment(Cote et al.,1986; Oczkowski et al.,1993; Wilson et al.,1991). also especially crucial in the physical therapy fields of hemiplegic patients, many studies have demonstrated that a high percentage of hemiplegic patients are cognitively impaired.(Oczkowski et al.,1993; Morr et al.,1994). this impairment is rather specific and limited to one or several cognitive functions, some studies have observed that the functional level of patients, as reflected by their scores on functional scales, can not be reliably predicted by their result on an array of cognitive tests. third leading cause of death and the major cause of adult disability in the united states. It is estimated that more than 60% of all stroke patients will have some functionally limiting disability as a result of the neurologic event(Gresham et

al,1995; Kojima et al,1990; Sacco et al,1982). Neurologic and functional recovery is most rapid within the first 3 months, but some patients continue to progress beyond that time(Anderson et al,1974; Andrews et al,1981; Dombovy et al,1987; Skilb다 etal,1985). The natural history of recovery from stroke after 3 months is mixed, with some patients improving, some remaining stable, and some demonstrating functional decline(Davidoff et al,1991; Ferrucci et al,1993).

Neuromuscular reeducation approach have been advocated as more effective than Traditional treatment program approach in physical therapy after cerebrovascular accident(Bobath,1950; Bobath, 1960 ; Brunnstrom,1970). However, when first developed, these techniques were not subjected to clinical trials to demonstrate their efficacy and later trials revealed no outcome differences between two groups at time of hospital discharge(Logigian et al,1983; Quin,1971; Srem et al,1970).

Stern(1970) in a study of 62 patients found no significant difference at discharge in improvement of mobility, leg strength or functional status between neurodevelopmental treatment and traditional approach groups. He also noted that neurodevelopmental treatment patients had longer average hospital stays than the traditional approach patient, although he did not determine whether this difference was statistically significant. Quin(1971) found no obvious improvement in upper extremity dexterity and only small strength improvements after a one-month course of daily proprioceptive neurofacilitation treatment in four patients. Logigian(1983) found no significant difference in Barthel index ratings and manual muscle testing in two groups of patients consist of 21 in each group, one receiving neurofacilitation the other receiving traditional therapy to the involved upper

extremity.

In these three studies, Specifically, it addresses functional abilities carried over into the home environment, involving both upper and lower extremities. We believe this paper is the first to report such long term comparisons. The purpose of this study is to demonstrate the effectiveness of intensive patient physical therapy of the hemiplegia survivor to increase functional status.

This study investigated whether existent functional scales properly assess both the physical and cognitive disabilities of hemiplegic patients. study results on functional scales were statistically related to results on scales emphasizing the assessment neurological impairment.

METHOD

This study was carried out in one general oriental hospital. the study included all hemiplegic patients admitted to the physical therapy room during the one year study. they were selected in the sequence of their admission if they agreed to participate in the study, and they had sufficient oral korea skills. twenty hemiplegic subjects(6 female) participated in this study and hemipepic patients are consist of 12 right side(4 female) and 8 left side(2 female) hemiplegia stroke patients. The hemiplegic subjects ages ranged from 52 to 73(mean age, 62.; standard deviation,8.25)years. Foury-five percent had a infarction stroke, 40% were ICH, and 5% had brain tumor. before their current admission to a hospital, one patient had a history of stroke. and Description of 20 subjects who participated in the study is summarized in table 1.

Table 1. General Characteristics

region/sex	male	female
Rt	8	4
Lt	6	2
Average age(yrs)	62	68
Infarction	7	2
ICH	5	3
Brain Tumor	2	1

Study patients were selected by retrospective review of medical records. Length of time between cerebrovascular accident and follow-up date ranged during one year.

Patient selection was designed to identify post cerebrovascular accident patients suffered from a hemispheric stroke. Criteria for inclusion in the study, therefore included presence of hemiplegia secondary to cerebrovascular disease. Criteria for exclusion included previous ambulation limitations, independent ambulation, ability of Korean language.

Three categories of assessment tests were used and compared in this study, functional, physical, cognitive. Physical test category is usually used by physical therapist to assess physical disabilities and impairment. These tests were selected because they are part of the standard assessment in the hemiplegic patients.

Two functional tests were used, the Barthel Index, the functional independence measure(FIM). The Barthel Index measures independence in 10 activities of daily living and has a maximum score of 100. The FIM is similar to the Barthel Index but also includes items that assess the cognitive functional level. It contains items that measure self care, mobility, locomotion, communication and social cognition. Score range from 18 to 126. The reliability and validity of the Barthel, FIM have been

previously demonstrated.(Table. 2)

Table 2. Relations Between the Barthel and FIM

	Barthel	FIM
Barthel	-	
FIM	.76	-

Physical test were used, the Clinical Outcome Variable Scale, it is a functional scale that focuses on the physical domain and 13 items that quantify functional mobility(Gowland et al.,1993).

Cognitive tests that focus on the assessment of cognitive functions, either specially or globally, were used. The Stroke Unit Mental Status Examination (SUMSE) is a test that was designed to screen cognitive impairment in hemiplegic patients, based on 29 questions, the test evaluates the following functions: orientation, concentration, judgement and reasoning, praxis, language, and immediate and remote memory(Seaby et al.,1989). With a minimum of training, the physical test can be administered by health care professionals who have little expertise in cognitive assessment.

Most of the tests were administered by the physical therapist of the physical therapy room. Patients were assessed during 3 weeks after hemiplegic patients.

Two types of analysis were performed, Pearson and Spearman correlation coefficients were computed to examine the strength of the relationships within each of the three test categories. The correlation coefficients also provided valuable insights regarding the relationship between the three assessment categories, a factor analysis using the principle component method of extraction was done to determine, and is a statistical technique used to summarize relationships among many variables in a

concise manner.

The important property of factors is that they are independent even though the original variable may be related.

The functional items reflect the same skills as those measured in the initial physical therapy evaluation, as well as ambulation skills and a more general assessment of upper extremity function. To permit direct comparisons of initial versus outcome functional abilities of daily living status, patients were asked to rate each skill on a one to six and one to three scale equivalent to that initially used by the physical therapist. Patients were also asked about functional ambulation capability on the same one to four scale.

As an overall functional measure, a self-care score was calculated for each patient in the same manner as for the initial physical therapy evaluations. The mean change in self-care score was then compared as a measure of overall effectiveness of the rehabilitation program.

RESULTS

As a first step, the strength of the statistical relationship within each test category was examined using Spearman or Pearson correlation coefficients.

The correlation coefficient between the two functional tests ranged .76 and were all statistically significant.(Table 2)

The physical scale of physical tests were also highly correlated($r=.78$). In addition to the overall correlation coefficient between the two physical scales, also lists the four correlation coefficients for the four partial scores provided by the stage of motor recovery scale. The average score of the 4 partial scores should only be interpreted as indicative of the overall

physical impairment of a patients. The highest correlations between the Clinical Outcome Variable Scale(COVS) and the stage of motor recovery scale were between the assessment of the upper extremities. The correlations between the clinical outcome variable scale and the stage of motor recovery scale for the lower extremities were lower but still highly significant.(Table 3).

The variation between the value of correlation coefficients was the highest in the Cognitive test category. The results of the physical disability and impairment tests were all significantly related to the results of the functional tests(Table 3).

Table 3. Relation between the Physical tests

Function	Cognitive	Physical	Physical Test			
	SUMSE	COVS	Hand	Arm	Foot	Leg
Barthel	.67*	.72*	.62*	.51+	.47*	.46*
FIM	.82*	.83*	.74*	.62*	.52+	.56+

* P<.001 + P<.01

The analysis revealed that the result of most of the cognitive tests were not significantly related to the results of the functional tests used in the study. The total FIM score is based on a higher proportion of physically oriented items and may not properly reflect the patients cognitive disability, a subscale analysis of the cognitive items was conducted. As expected the resulting correlation coefficients did reach significance. The cognitive subscale was moderately correlated with the SUMSE. A factor analysis was done to establish whether the results of the various tests used in the this study could be summarized. To reduce the number of variables and considering the relatively small number of patients. The principal component technique was used as the factor extraction method. The three factors that explained

more than 10% of the total variance are given in table 4

Table 4. Factor for Each variable

Test Name	Factor1	Factor2	Factor3
FIM	.86*	.14+	.11+
Barthel	.75*	.22+	.29+
COVS	.84*	.35+	.06+
SUMSE	.34+	.79*	.08+
Explain(%)	57.6	28.7	14.7

+ Factor loading higher than 0.5

The first factor explained 57.6% of the total variance, the second factor is 28.7% and the third factor was 14.7% of the variance. factor loadings higher or equal to 0.5 were considered. in the following interpretation, factors was mainly based on factor loadings. On the 1st factor, all the noncognitive tests have a factor load higher than 0.5. On the 2nd factor, cognitive tests have a loading over 0.5 and 3rd factor, has a loading higher than 0.5.

As a further outcome measure, average lengths of stay for each group were analyzed. Cognitive problem patients spent significantly longer on the rehabilitation ward than Physical or motor problem patients.

DISCUSSION

Cerebrovascular disease is a major cause of cognitive and physical impairment in the elderly(Barnes & Raskind,1981; Tatemichi et al,1994). Stroke survivors often face a long physical therapy process to regain a normal or near normal life((Calvanto et al,1993). physical therapist must assess the probable outcome of their patients physical therapy programs. consequently, their ability to accurately estimate a patient's level of independence

at the end of a physical therapy program and to specify the patient's needs is extremely important(Dejong & Branch, 1982; Shah et al,1991).

The purpose of this study was to examine the validity of functional assessments of hemiplegic patients in terms of the sensitivity of these assessments to physical and cognitive disabilities. it was expected that the functional scales would correlate highly with physical scales because they emphasize the assessment of physical impairment (Gowland et al.,1993; Shin et al.,2000). the relation between functional scales and cognitive scale was expected to be low, if at all significant. the result demonstrate that hemiplegic patients scores on the functional tests were highly related to their results on physical disability scales and, to a lesser degree, also the correlations between the results of the functional tests and the cognitive tests were small and reflected little overlap between the two types of assessment.

The 1st result concerns the similarity and magnitude of the correlation coefficients between the three functional scales. the coefficient of .76 between the Barthel and FIM confirms that the Barthel and the FIM are similar tests. the fact that correlation coefficients between the FIM and Barthel were .72 and .83, respectively, indicates the dominant influence of functional independence((Dodds et al.,1993; Heinemann et al.,1993; Roth et al.,1990).

As previously shown in the literature, our finding that use of an intensive neuromuscular reeducation approach to stroke rehabilitation did not influence long term functional status is in agreement with previous studies(Shin et al.,2000; Logigian et al,1983; Quin,1971; Stern et al,1970).

This study differed from previous studies in two respects. First, this study evaluated both upper and lower extremity functions in patient groups large

enough for statistical analysis, Second, this study evaluates physical therapy outcome as long-term function within a home environment. All previous studies have considered "physical therapy outcome" at time of discharge, which ignores the all-important question of skill carry over post discharge.

Several study design items deserve comment. Initial matching was performed to assure that differential outcomes represented intervention effects rather than differences in initial patient groups, however, accurate early predictors of ultimate post-cerebrovascular accident functional ability have not been identified, although a number of investigator (Bobath,1959; Feigenson et al,1997; Logigian, et al,1983) have identified prognostic "clusters." Items selected for initial matching were selected retrospectively, uniform medical and neurologic information was not available.

Therefore, only the number of medical risk factor score. This may have introduced an observation bias into the matching procedure. The initial self-care score was taken from each patient's initial physical therapy evaluation form. It reflects overall severity of neurologic insult and has been identified as a significant stroke outcome indicator(Britton et al,1980; Feigenson et al,1997; Logigian et al,1983).

One major finding was the significantly different interval between tests and admission to the physical therapy room. This difference represented a problem because several studies have identified prolonged hemiplegia to physical therapy interval as a negative factor in functional outcome(Anderson et al,1974; Boureston,1967; Feigenson et al,1997; Novack et al,1984). In all of these studies, however, it was found that hemiplegia to physical therapy interval was a contributing variable only when considered along with other prognostic factor. Furthermore,

interval presumed to cause significant outcome differences ranged from one month to several years(Feigenson et al,1997; Novack et al, 1984). To test the effect of prolonged hemiplegia to physical therapy interval in our study, a subgroup consisting only of patients who were admitted to physical therapy within three weeks months of their cerebrovascular the high correlation between the two cognitive scales confirms their resemblance and respective validity((Cote et al.,1986; Dehaan et al., 1993; Hantson et al.,1994).

The same conclusion can be drawn for the COVS and Motor, although one test focuses on physical disability and impairment, the two tests are highly related, the high correlations of functional scales with neurological scales and the low correlations of functional scales with cognitive scales indicate that functional scales are based towards the assessment of physical disability. It makes sense that the results of the FIM and the cognitive tests are related, also the functional level of a hemiplegic patients should be directly associated with a hemiplegic patients cognitive impairment, the fact that the physical tests, Barthel and FIM are related is a reflection of the FIMs content.

There has been recent interest in the concept of brain plasticity. It has been demonstrated in animal model that the central nervous system can respond to neural damage with collateral sprouting of the remaining intact nervous in the fringe zones(Wall,1980).

The neurophysiology of recovery after stroke is often attributed to the resolution of local factors such as resorption of edema and necrotic tissue and the development of adequate collateral circulation to the surrounding area of ischemia(Dombovy & Bachyrita,1988). There is suggestive evidence that

physiologic function and behavioral evidence of recovery after brain damage may depend on repetitive functional demand or training in specific activities(Bachyrita & Balliet,1986; Chow & Steward,1972).

Most of the functional items on the FIM are concerned with the physical autonomy of the patient. A patient who is severely physically disabled will score very poorly on a functional assessment tool such as the FIM, even if cognition is unimpaired. high correlations between the other functional tests and the physical and neurological tests were also obtained. It is important to stress that this finding strongly supports the ability of the functional scales to assess the physical level of independence.

Another aspect of hemiplegic patients physical therapy is the quality of life of the hemiplegic survivor. There have been several studies that have documented a deterioration in the perceived quality of life after a stroke(Silliman et al,1987).

In conclusion, a controversy exists in respect to the value of physical therapy services in the hemiplegic patients. This study suggests that physical tests can be translated into increased functional gains that are clinically relevant. The gains were primarily in the area of Barthel Index, FIM, Physical and Motor Assessment Scale.

CONCLUSION

The cognitive assessment if hemiplegic patients is a lengthy and process, cognitive screening devices are available and may help to identify the need for thorough cognitive evaluation. In physical therapy settings where in depth cognitive assessments are available and cognitive assessments should be combined with functional assessment.

The sensitivity of studies of hemiplegic patient and physical therapy outcome can be enhanced through the use of a functional abilities score, physical tests obtained, feedback from the speech and occupational therapist, coupled with easily administered cognitive evaluations, may provide some indication regarding the cognitive functional level of hemiplegic patients. The total score provided by functional scales can not be considered as indicative of both the physical and the cognitive functional level of brain injured patients, and thus should be interpreted with caution. functional scales that do not include even a rudimentary assessment of cognitive functions should not be used to assess total disability level of brain injured patients.

More in depth knowledge may be acquired about the distribution of physical and motor control patterns with respect to the degree of cognitive and neurologic deficit for the enhancement of residual motor control function in hemiplegia. There are limitations to this study, the sample size was relatively small, and the findings may not generalizable to other physical therapy settings.

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