STROKE SCALE SCORE AND EARLY PREDICTION OF OUTCOME AFTER STROKE

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ABSTRACT

Objective: To evaluate the baseline National Institute of Health Stroke Scale (NIHSS) score as a predictor of functional outcome after ischemic stroke.

Design: A cross-sectional study.

Place and Duration of Study: The study was carried out between September 2001 and May 2002 at the Department of Medicine, Civil Hospital, Karachi.

Subjects and Methods: The study included 50 patients who presented to Civil Hospital, Karachi, during the study period with acute stroke and were evaluated with CT scan of brain. Only those patients were enrolled in the study that had acute ischemic stroke. The enrolled subjects were then evaluated for the neurological impairment using National Institute of Health Stroke Scale (NIHSS). The subjects were followed-up and their functional outcome was assessed using Barthel index (BI) on the 7th day of their admission.

Results: Of the fifty patients enrolled in the study, 31(62%) were males and 19 (38%) were females, with age ranging from 45 years to 95 years and a mean age of 59.9 years. Neurological impairment at presentation was assessed by NIHSS. The score ranged between 2 and 28. The functional outcome was evaluated on the 7th day using Barthel index (BI), which ranged from 0 to 80. NIHSS score was found to be a good predictor of functional outcome in patients with ischemic stroke ($p<0.001$). Other factors like gender, hypertension and heart disease did not affect the functional recovery in such patients. Various factors were found to be significant for early prediction of stroke recovery. The NIHSS score was the strongest predictor of outcome after ischemic stroke. Age at the time of the event was also found to be an important predictor for stroke recovery.

Conclusion: The NIHSS score is a good predictor of patient's recovery after stroke. Assessing the patient's neurological impairment at first presentation of ischemic stroke can guide the physician regarding the prognosis and management plan.

KEY WORDS: *Stroke scale score. Barthel index. Stroke. CAT scan.*

INTRODUCTION

Stroke is a leading cause of death after cardiac diseases and cancers.[1] It is also a major cause of mortality and morbidity around the world.

Patients of stroke with initial similar clinical deficits can improve dramatically or worsen during the first 48 to 72 hrs.[2] It is often not clear for some days after stroke as to, how patients are likely to fare as various ongoing pathophysiologic processes affect the final functional outcome of the patient.[3]

The need for early and accurate outcome assessment is of paramount relevance in the current climate of financial constraint. There are calls to improve the efficacy of care while maintaining quality. It is also essential for evaluation, treatment planning, guidance of patient and relatives and eventually also in the search for new therapeutic strategies.[4] It also seems likely that new but possibly risky stroke therapies will need to be administered within the first few hours after stroke. That decision based upon the relative risks and benefits of treatment could be aided by knowing the likely outlook of the patient.

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Received May 21, 2003 ; accepted April 16, 2004.

Stroke can be a devastating illness causing a lot of distress to the patients and their families, so the personal and social consequences of any residual disability after stroke can be considerable. Early prediction of stroke outcome might be improved by developing clinical criteria.[5]

Several scales have been developed to quantify neurologic impairments following ischemic stroke.[6] In previous studies NIHSS was found to have excellent specificity, sensitivity and accuracy in forecasting outcomes.[7-10] The object of this study was to analyze the predictive value of baseline NIHSS score in predicting outcomes at 7 days after stroke.

PATIENTS AND METHODS

This study included 50 patients who presented and were admitted to the Medical Wards of Civil Hospital, Karachi with the diagnosis of acute ischemic stroke from September 2001 to May 2002. Patients with transient ischemic attack (TIA) were excluded. All the patients of ischemic stroke were identified by computed tomography (CT) of brain performed within 48 hours of onset of symptoms. All the patients included in the study were those who had presented within 24 hours of symptoms, were confirmed to have ischemic stroke of the on the basis of CT of brain. The stroke patients who were excluded

from the study were those who had non- ischemic stroke pathology, TIA, posterior circulation stroke, multiple stroke, CT scan performed after 48 hours, history of cranialsurgery, severe head trauma and cerebral vascular malformation.

Clinical factors such as age, gender, history of treated hypertension, and history of heart disease were noted. Neurological impairment was quantified at presentation using NIHSS score and patients' functional outcome on day 7 was measured on Barthel index recorded through a predesigned performa.

NIHSS score is used to provide a measure of the severity of neurological dysfunction at the patients' first hospital visit. This score has undergone extensive validation and reliability assessment and consists of 11 graded items measuring multiple aspects of the neurological examination.[11] A score of >25 denotes very severe neurological impairment, a score between 16 and 25 severe impairment, a score between 5 and 15- moderately severe impairment and a score of less than 5 as mild impairment.

Barthel index provides a functional assessment of ten activities of daily living.[12] The maximum score of 100 indicates full independence, a score of 90 and above indicates patients who have near full functional independence and at most need assistance with one or two daily activities. Patients who died were given a score of zero. This is a simple index of independence to score the ability of a patient with a neuromuscular disorder for self care.[13,14]

The maximum linear measurement of the infarct was measured. Regression analysis was performed using linear and log regression models of the infarct size on CT with the NIHSS score on admission and Barthel index on the 7th day, using SPSS version 10.01 software. The predictive value of NIHSS and Barthel index was calculated.

Statistical significance of continuous variables was done using Students 't' test. The significance level was set to <0.05.

Results

The study was conducted in Civil Hospital, Karachi, over a period of eight months. Fifty patients fulfilling the selection criteria were included in the study. Characteristics of the studied subjects are listed in Table I. Among the enrolled patients 31(62%) were males and 19 (38%) were females with ages ranging from 45 years to 95 years and a mean age of 59.9 years. Thirty patients (60%) had left sided ischemic injury in the territory of anterior circulation and twenty patients (40%) had right-sided ischemic injury. The mean NIHSS score at presentation was 15.28, which ranged from 2 to 28. Patients' functional outcome was measured using Barthel index on the 7th day, with a score of '0' assigned to those patients who died and a score of '100' to the patients with full recovery. In this study, Barthel index on the 7th day ranged from 0 to 80 with a mean of 27.9. Patients with hypertension and heart disease were also identified. Twenty-three (46%) patients were found to be hypertensive and 12 (24%) had cardiac disease.

In regression model, NIHSS score at presentation was significantly associated with good stroke recovery after 1 week which was quantified using Barthel index ($p<0.001$, Figure 1, Table II and III).

Table I: Patients' characterstics.

Gender	
Male	31(62%)
Female	19(38%)
Age	
Min	45years
Max	95 years
Mean	59.9 years
Hypertensives	23(46%)
History of heart disease	12(24%)
Side	
Left sided	30(60%)
Right sided	20(40%)

Table II: NIHSS score at baseline.

NIHSS score at presentation	No. of patients(%)
> 25	7(14)
16-25	12(24)
5-15	28(58)
< 5	2(4)

Table III: Barthel index on 7th day

Barthel index	No. of patients(%)
00	3(6)
1-10	24(48)
11-20	4(8)
21-30	2(4)
31-40	2(4)
41-50	1(2)
51-60	2(4)
61-70	8(16)
71-80	4(8)

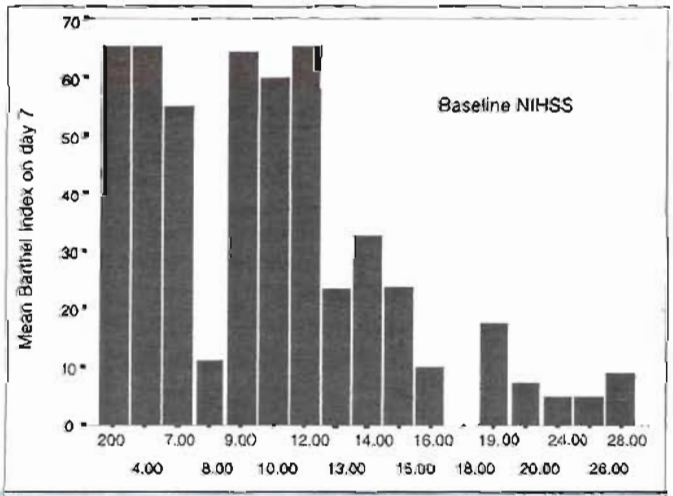

Figure 1: Histogram showing correlation between baseline NIHSS score and Barthel index on day 7.

Age factor was also found to have a significant affect on functional outcome in patients with ischemic stroke ($p=0.021$). Factors like gender of the patient, presence of hypertension, heart disease and the side of the brain affected were not found to have significant effect on the functional outcome.

Discussion

Stroke is one of the commonest diseases of CNS and is a major cause of morbidity and mortality.[1] Many of the patients are left with variable degree of permanent neurological impairment. This requires long-term care of such patients to prevent further complications. There are many risk factors that have

been identified which may predispose a subject to a catastrophic event like stroke. The patients with acute event may show dramatic improvement or worsening of their functional status over a period of time. The functional outcome is influenced by various factors present at the time of stroke.

The need of early prediction regarding what the patient's functional outcome will be, is of increasing importance for improving the quality of life. The early assessment is also essential for evaluation, treatment planning as well as guidance of patients and relatives.

This study was designed to evaluate the clinical scale NIHSS that would help early prediction of stroke recovery as accurate assessment of prognosis in the first hours of stroke is desirable for best patient management.

The data of the study shows that the baseline NIHSS score is a good predictor of outcome after stroke. The changes in the NIHSS score were most powerful than any other factor in predicting an excellent outcome after stroke. The NIHSS score provides prognostic information that could be useful to physicians, patients and families; this has also been described in previous studies.[16] This can also have an influence on decisions about emergent management as well as on inclusion and exclusion of the patients for enrollment in trials for testing new treatments for stroke.

Patients with low baseline NIHSS score do well and their functional outcome is better than those with high scores

Data collection from a single academic hospital setting was a study limitation and therefore, may not be generalized to other settings. The other limitation was that the functional outcome was recorded on day 7 after the ischemic event, though disability of stroke patients can change over a longer period. However, results from previous studies suggest that baseline NIHSS score is highly predictive of 3 months outcome determined by any neurological impairment scale.[17]

Clinicians and researchers recognize the shortcomings of the neurologic examination and related scales in forecasting prognosis. Other ways are needed to improve the ability to predict outcomes and to monitor responses to treatment. Compared to expensive imaging techniques available, the rating scales are a cost effective means.

Potential uses for the results deduced from the study include early decision making on aggressiveness of care, discharge planning and rehabilitation, which is of particular relevance in the current health care climate where there are extreme pressures to shorten length of stay, limit the number of tests and commence discharge planning soon after the patient's admission.

As described in few past studies,[18] age factor at the time of stroke has also been found to have an influence on predicting the functional outcome in stroke patients. The study also shows that age at the time of stroke is also influences the functional outcome in stroke patients. Other factors like side of the brain involved, hypertension and heart disease were not important in predicting outcome.

Conclusion

Stroke is a common condition encountered in the medical emergency. Thus leaves the patients with variable degree of neurological impairment. NIHSS score is a valuable and inexpensive method of predicting the functional outcome in stroke patient after the acute event. Early prediction of prognosis and the extent of recovery may help the physician not only counseling the family members but also in planning the management of such patients

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