 DOI: 10.18231/2455-8451.2017.0015

Cognitive communicative deficits in adults with stroke

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Abstract

Aim: To compare the cognitive communicative performance of Stroke subjects with that of normal subjects and to compare the cognitive communicative performance across stroke subgroups of cortical lesion and subcortical lesion.

Materials and Method: A total of 30 subjects participated in this study. Among 30 subjects, 15 subjects with stroke (experimental group) and 15 subjects with age matched normal adults (control group) were taken. Among experimental group, 7 had cortical and 8 had subcortical lesion. Scale of Cognitive and Communicative Ability for Neurorehabilitation (SCCAN) test was administered to all the subjects.

Results: The stroke subject as a group performed significantly poorer when compared to that of normal aging adults. The performance of subjects with stroke was more impaired on memory scale compared to other scales of SCCAN. The performance of subjects within the stroke showed that subjects with subcortical stroke performed poorer when compared to the subjects with cortical stroke.

Conclusion: This study highlights on nature of cognitive communicative deficits in stroke individuals.

Keywords: Stroke, Cognition, Cortical lesion, Subcortical lesion.

Introduction

Stroke is defined as brain injury due to insufficient glucose and oxygen delivery to meet the needs of the involved brain tissue.(1) Stroke can be caused by a clot obstructing the flow of blood to the brain, a blood vessel rupturing and preventing blood flow to the brain. Stroke is the third leading cause of death in many countries. The risk factors that increase the probability of having stroke are hypertension, age, cardiac disease, diabetes, obesity and smoking. Two major types of strokes are occlusive (ischemic) and hemorrhagic.(2) Stroke can also be categorized into cortical stroke and subcortical stroke. Cortical stroke affects cortical regions of the cerebral cortex, which includes frontal, parietal, temporal and occipital lobes. Cortical strokes are large vessel strokes involving the major branches of Middle cerebral artery, Anterior cerebral artery and Posterior cerebral artery. Subcortical stroke affects the structures subcortically, below the cortex, including the internal capsule, thalamus, basal ganglia, brainstem and cerebellum. Subcortical strokes are small vessel strokes, affect the deep penetrating vessels in the basal ganglia, thalamus, internal capsule and brainstem.(3)

Cognition comprises of a large number of mental structures and processes. The various cognitive processes are attention, pattern recognition, memory, organization of knowledge, language, reasoning, problem solving, classification, concepts and organization. After stroke, the incidence of cognitive deficit increases threefold. The chance of acquiring cognitive deficit increases after stroke. Stroke patients are frequently incapable to manage daily life activities due to cognitive deficits, but some individuals retrieve entirely from physical disability following stroke. Current global trends of population ageing and decline in stroke mortality result in increased incidence of cognitive impairment after stroke. Hence considerably the health care expenditure also increases. After investigating the potential mechanisms of cognitive impairment after stroke, Tatemichi et al have emphasized that stroke location, volume and number of lesions as important factors and the stroke location is a significant factor for cognitive level.(4) Cognitive deficits may follow a cortical or subcortical stroke. After stroke there is a high chance of acquiring memory problem. When compare to all other cognitive abilities, the memory deficit is reported upto 30% of all individuals with stroke.(5) There is a need for further investigation of cognitive deficits in individuals with stroke for effective rehabilitation planning. Aim of the present study is to compare the cognitive communicative performance of Stroke subjects with that of normal subjects and to compare the cognitive communicative performance across stroke subgroups of cortical damage and subcortical damage.

Materials and Method

15 subjects with stroke were taken as experimental group between the age ranges of 37-75 years. All the subjects had a minimum of primary schooling. They were from rural areas, around Chennai city and had Tamil as their native language. Stroke subjects with lesion in cortical and subcortical regions were considered for the study. Among 15, 7 had cortical lesion and 8 had subcortical lesion. All the subjects included for the study were right handed. Both adult males and

females were included for the study (10 males and 5 females). Stroke subjects were evaluated by neurologist and speech language pathologist. Subjects were tested in the post stroke period from 1 month to 16 months. Equal number of controls matched for age, gender, handedness and educational level were taken. They had history devoid of any psychological, cognitive, peripheral, sensory deficit. Scale of Cognitive and Communicative Ability for Neurorehabilitation (SCCAN) was used for assessing cognitive communicative abilities of all subjects. The SCCAN contains eight scales which include oral expression, orientation, memory, speech comprehension, reading comprehension, writing, attention and problem solving.

Demographic data of stroke subjects

Cortical stroke subjects

S. No	Stroke subjects	Age/ gender	MRI/CT findings
1	A1	55/F	Subacute infarct in left frontal lobe, corona radiate
2	A2	75/M	Acute infarct in left perisylvian and high parietal lobe
3	A3	68/M	Subacute infarct in right frontoparietal region
4	A4	40/M	Subacute infarct left fronto parietal region with hemosiderin deposition due to hemorrhage
5	A5	55/M	Gliotic changes in left fronto-parietal region
6	A6	55/F	Acute chronic infarct in left parieto occipital region
7	A7	48/M	Chronic infarct with gliotic changes and surrounding cortical laminar necrosis noted in the left temporo parietal lobes

Subcortical stroke subjects

S. No	Stroke subjects	Age/ gender	MRI/CT findings
1	A1	37/M	Multiple chronic lacunar infarct in right corona radiata and right ganglio capsular region
2	A2	60/F	Subacute infarct with hemorrhagic transformation in left ganlio capsular region with diffusion restriction
6	A6	60/F	Subacute focal hemorrhagic infarct involving left capsuloganglionic region
7	A7	65/M	Acute infarct in right ganglio capsular region
9	A9	56/M	Lacunar infarct in bilateral basal ganglia and corona radiata
10	A10	63/M	Small acute infarct in left posterior capsulo ganglion and corona radiate
12	A12	48/M	Chronic hemorrhage in bilateral globus pallidus
13	A13	40/F	Chronic lacunar infarct in bilateral ganglio capsular region, bilateral thalamus

Results and Discussion

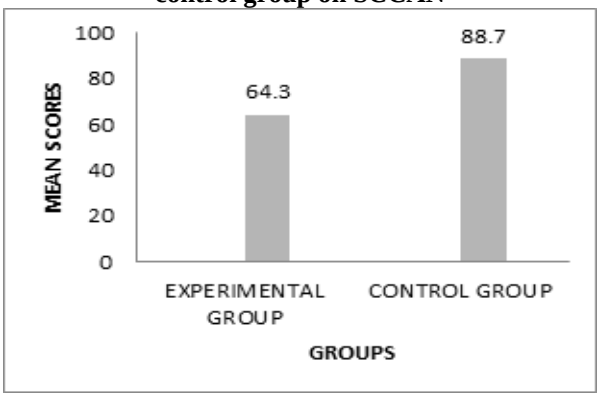
The primary objective of the study was to compare the cognitive communicative performance of stroke subjects (experimental group) with that of normal subjects (control group) and also to compare the cognitive communicative performance across stroke subgroups of cortical damage and subcortical damage. The SCCAN scores were analyzed statistically to arrive at mean and standard deviation for each group independently.

Comparison of overall performance of experimental group and control group

Table 1: Mean and standard deviation of experimental and control group for total raw score in SCCAN assessment

Group	Total raw score in SCCAN assessment	
	Mean	Standard deviation
Experimental group	64.3	10.3
Control group	88.7	1.43

Table 2: Overall performance of experimental and control group on SCCAN



As from Table 1, 2, control group (88.7) has higher mean score than that of experimental group (64.3). Deviation was however more for the experimental group (10.3) than that of the control group (1.43). Thus, there was a significant difference in overall performance of experimental group compared to control group for all scales of SCCAN.

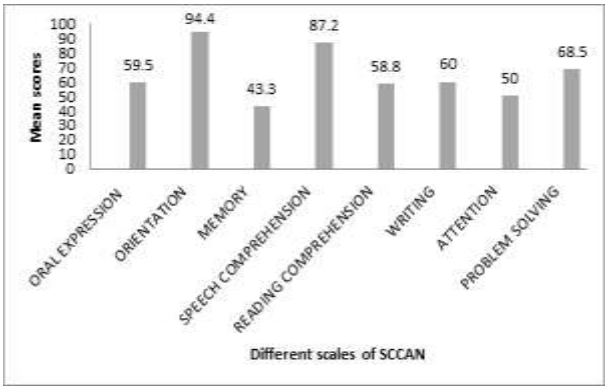
For stroke group the average time taken for a few timed tasks was more. Subjects with stroke required more repetition of instruction and more time to begin and finish a task. Self corrections were seen in most of the stroke subjects in the form of rephrasing the answer or repetition of the answer. Also, to establish the response stroke subjects needed cues. Cognitive deficits occur often after stroke, as reported in the literature by Tatemichi TK, Desmond DW, Stern Y, et al. (1994).[6] Thus, findings of the present study correlate with findings of earlier studies which report cognitive deficits in individual with stroke.

Comparison of performance across stroke subjects on various scales of SCCAN

Table 3: Mean, standard deviation of subjects with stroke on different scales of SCCAN

Different scales of SCCAN	Mean	Standard deviation
Oral expression	59.5	24.6
Orientation	94.4	7.3
Memory	43.3	18.5
Speech comprehension	87.2	8.2
Reading comprehension	58.8	12.7
Writing	60	15.1
Attention	50	13
Problem solving	68.5	15.1

Table 4: Performance of subjects with stroke on different scales of SCCAN



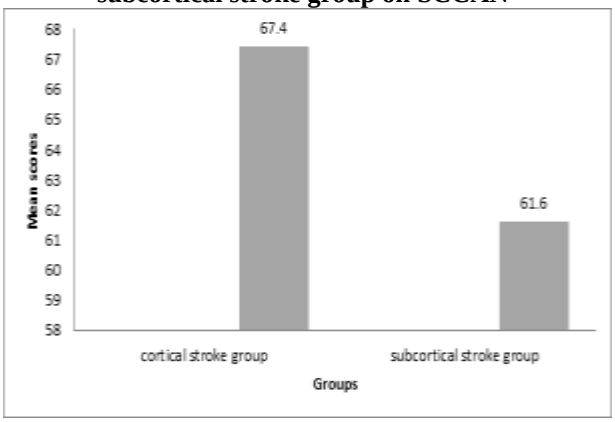
As seen from Table 3, 4, the mean score of stroke subjects for memory scale of SCCAN is lowest followed by attention scale when compared to other scales of SCCAN. The incidence and risk factors for disturbance in memory caused by stroke are common. Upto 30% of all stroke individual have memory disturbance, as reported in literature by J. P. Mohr, James C. Grotta, Philip A. Wolf, Michael A., (1986)[5]. Thus, findings of the present study revealed that the performance of subjects with stroke were more impaired on memory scale followed by attention scale when compared to other scales of SCCAN.

Comparison of performance across stroke subgroups of cortical and subcortical stroke

Table 5: Mean, Standard deviation of groups with cortical and subcortical stroke for total raw score in SCCAN assessment

Group	Total raw score in SCCAN assessment	
	Mean	Standard deviation
Cortical stroke group	67.4	8.56
Subcortical stroke group	61.6	11.01

Table 6: Performance of cortical stroke and subcortical stroke group on SCCAN



As from Table 5, 6, cortical stroke group (67.4) has higher mean score than that of subcortical stroke group (61.6). Deviation was however more for subcortical stroke (11.01) group than that of cortical stroke group (8.56).Patients with stroke in subcortical region may have even worse cognitive skills than patients with stroke in cortical region, as reported by K. E. A. Turunen, T. V. Kauranen, S. P. K. Laari, S. M. Mustanoja, T. Tatlisumak, E. T. Poutiainen, (2012).[7] Thus, for total raw score of SCCAN, mean score of subjects with subcortical stroke was lesser when compared to the subjects with cortical stroke.

Finally, results of the present study revealed that the stroke subject as a group performed significantly poorer when compared to that of normal aging adults. The performance of subjects with stroke was more impaired on memory scale followed by attention scale when compared to other scales of SCCAN. The performance of subjects within the stroke showed that subjects with subcortical stroke performed poorer when compared to the subjects with cortical stroke.

Conclusion

This study highlights on nature of cognitive communicative deficits in individual with stroke. It also gives information regarding which type of lesion would probably lead to more problems in cognitive functioning of stroke patients. The finding of this study will help in setting appropriate rehabilitative strategies in individuals with stroke.

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