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Evaluation of Short Term Outcome of Acute Ischemic Stroke by Modified Rankin Scale

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Abstract **Original Research Article**

Background: Stroke is the most common cause of morbidity and mortality worldwide. There are two types of stroke, ischaemic stroke and haemorrhagic stroke. The most important diagnostic tool of acute stroke is CT scan of brain. In acute ischaemic stroke, there are diverse CT scan findings especially in respect of anatomic location of ischaemic change or character. After the event of acute ischaemic stroke the patient may become completely stable or may develop complications or may die within a few days. ***Objective****:* This study is designed to access short term outcome of Modified Rankin Scale of acute ischaemic stroke**.** ***Methodology****:* This is a prospective observational study done in Rangpur Medical College Hospital during the period of July, 2015 to June, 2017. Total 60 cases were enrolled from the admitted patients in Medicine and Neuromedicine department of Rangpur Medical College Hospital, in this study by purposive consecutive sampling technique fulfilling the inclusion and exclusion criteria. CT scan of brain was done for each patient after taking informed consent. Radiological evidence of acute ischaemic stroke was ascertained by radiologist. Data were collected from each patient and/or attendants by taking meticulous history, clinical examination and relevant investigations. Clinical status and afterwards outcome after 7 days of admission was measured by Modified Rankin Scale. All data were collected in individual predetermined case record form and analysed by SPSS version 17.0. ***Results****:* Total number of patients was 60. Male female ratio was 1.2:1. During study period 22% (N=13) died out of 60 patients. Thirty six(60%) patients had infarction due to proximal occlusion of artery mostly middle cerebral artery and 24(40%) patients had lacunar infarcts.Morbidity was measured by modified Rankin scale at the time of admission and during follow up after 7 days. Morbidity was found to be significantly increased in proximal occlusion stroke than lcunar sroke (P value <0.05). Mortaliy was also significantly higher in proximal occlusion stroke than lacunar stroke (P value 0.04). ***Conclusion:*** In this study it is found that CT scan findings can predict the short term outcome of acute ischaemic stroke. This will provide insight about better understanding in predicting accuracy of CT scan of brain.

Keywords: Ischemic stroke, CT scan, Modified Rankin Scale, Ischemic infarction of brain.

INTRODUCTION

Stroke is the second leading cause of death worldwide [1]. Patients who have experienced a stroke will most likely be taken to a nearby hospital. Upon arriving at the hospital, medical staff will attempt to treat the patient, considering the clinical presentation together with information obtained from an emergency non-contrast computed tomography (CT) scan of the patient's brain [2]. Eligibility for stroke treatment depends not only upon time from stroke onset, but also on the extent of ischemic damage on CT scans. Changes on the CT scan denote predominately irreversibly infracted tissue that appears hypodense, representing the infarct core. In the first 6 hours following stroke onset, stroke detection is challenging and requires significant expertise, as only subtle signs of cerebral ischemia are present on CT. Early computed tomographic (CT) signs of cerebral infarction seen within 6 hours after onset of symptoms of stroke may be predictive of poor functional outcome [3]. Neurologic symptoms caused by focal brain ischemia do not necessarily represent irreversible brain damage. The critical perfusion level

for functional disturbance is at 15–25 mL/100 g per minute and above the critical perfusion level for tissue death (10–15 mL/100g per minute). Neuronal tissue can survive with cerebral blood flow values higher than 12 mL/100 g per minute in a state of dysfunction for an undefined period. This difference in critical blood flow levels for reversible dysfunction and irreversible tissue damage allows spontaneous or treatment-induced recovery.

The focal degree of ischemia determines the delay between the onset of symptoms and induction of irreversible brain damage. Information on whether the ischemic brain has a chance to survive or is already dead is important to assess the effect of treatment. Because of time constraints, a reliable method of cerebral blood flow measurement that could clearly facilitate the prediction, from cerebral blood flow values, of which brain regions will die and which will survive is not routinely applicable. Even with histologic staining, identification of irreversible damage is difficult in experimental animals within the first hours after arterial occlusion [4-8]. One of the most sensitive indicators of acute middle cerebral artery (MCA) ischaemia is loss of the insular ribbon [9-11]. The hyperdense MCA sign has also been reported as a sign of acute ischemia, in which high attenuation blood clot is identified within the MCA as it traverses the sylvian fissure.

This sign, however, has limited value, especially with modern CT scanners, with which the MCA frequently appears bright, even in normal patients [12]. Other indicators of acute stroke include loss of gray-white differentiation, especially in the region of the basal ganglia and internal capsule [13]. Sulcal effacement can result from cortical swelling, which decreases the size of the CSF spaces surrounding affected gyri [14]. These signs can be confidently identified by a neuro-radiologist [15]. Treatment of acute ischemic stroke is aimed at salvaging potentially viable ischemic brain. Final infarct size is reduced and functional outcomes are better if this is achieved rapidly. CT scanning has demonstrated a possible role as a prognostic and triage test. The observation of early infarct signs involving extensive areas of the middle cerebral artery territory has been implicated in poor outcome [16-18]. The primary outcome measure of stroke is poor clinical outcome assessed by the mRS. A score of 0–2 represents good outcome, and a score of 3–6 represents poor outcome [19].

OBJECTIVE

General objective

1. To find out short term outcome of Modified Rankin Scale of acute ischaemic stroke.

Specific objective

2. Association of CT Scan Findings with Short Term Outcome of Acute Ischaemic Stroke
3. To find out the association of CT scan findings with Modified Rankin Scale of acute ischaemic stroke
4. To find out short term outcome of Modified Rankin Scale of acute ischaemic stroke.

METHODOLOGY

Type of study	**It was a Prospective observational study.**
Place of study	Department of Medicine and Neuromedicine, Rangpur Medical College Hospital, Rongpur
Study period	24 months (July 2015 to June 2017)
Study population	All ischemic stroke patients admitted in the department of Medicine and Neuromedicine, Rangpur Medical College Hospital, Rangpur.
Sampling technique	Purposive sampling method

SELECTION CRITERIA

Inclusion criteria

1. All ischemic stroke patients irrespective of age and sex

Exclusion criteria

2. Stroke with other systemic disease.eg. DM, IHD, CKD
3. Stroke with pregnancy.
4. H/O previous stroke

Procedure of data collection

Data was collected and recorded from standard pre-designed data collection form.

Statistical Analysis

All data generated was statistically analyzed using the computer based SPSS (Statistical Package for Social Science) in 17.0 version of windows. Levels of significance were calculated at a confidence interval of 95% ($P<0.05$) by using t test.

RESULTS

During the study period from July 2015 to June 2017, a total 60 patients of ischaemic stroke were enrolled in this study to see the association of CT scan findings with their short term outcome. Short term outcome was measured by modified Rankin Scale during the time of hospital admission and upto 7 days of in hospital follow up.

Age distribution of patients in this study was ranging from 29 to 83 years. Occurance of ischaemic strokes were more in middle and advanced aged people. Of the total 60 patients, most of the patients 18(30%) patients were in the age group 61-70 years.

Both male and female patients were included in this study by purposive sampling method. Among them 33(55%) were males and remaining 27(45%) patients were females in the enrollment.

Majority of the patients were poor and came from low socio-economic condition status. The low, middle and high socio-economic status of patients were respectively 58.33%, 31.67% and 10% of total patients. In proximal occlusion stroke patients of low socio-economic status was 30.2% and in lacunar stroke was 28.13%. In statistical analysis it is found that p value is 1.39 that indicates there was no significant difference. Like this regarding middle and high socio-economic status there was no statistically significant difference in between proximal occlusion stroke and lacunar stroke (P value 0.95 in middle class and 0.52 in high class).

About half of the patients (51.67%) were current smokers, 20% of them were ex-smoker and remaining 28.33% were nonsmoker. In both proximal occlusion and lacunar stroke had statistically insignificant p-value of smoking status.

Family history was found to be positive only in 18.33% of patients. Both positive and negative family history had no statistically significant difference in between proximal occlusion stroke and lacunar stroke.

Among female patients 22.22% had the history of OCP intake. In proximal occlusion stroke, history of OCP intake was significantly higher than that of lacunar stroke. P-value was 0.03 that was statistically significant.

Of the total patients 36(60%) patients had infarction due to proximal occlusion of artery and mostly of middle cerebral artery and 24(40%) patients had lacunar infarcts. Mean modified Rankin scale score of proximal occlusion stroke patients was 2.5 with standard deviation of 0.58 after 7 days follow up and of lacunar stroke was 2.2 with standard deviation of 0.42. During follow up after 7 days the morbidity of the patients of proximal occlusion stroke was more than that of lacunar stroke. The morbidity was measured by modified Rankin scale score system. During statistical analysis student's t-test was done and P-value was <0.05, that was statistically significant.

Regarding mortality proximal occlusion stroke was associated with increased mortality rate than that of lacunar stroke. During study period mortality rate was found 22% (N=13). Among them in proximal occlusion stroke mortality was 69% (N=10 out of 36) and lacunar stroke was 31% (N=3 out of 24) of total mortality. Chi-Square test was done and it is found that proximal oclusion stroke is associated with significantly increased mortality (P value-0.04).

Age distribution of the patients (n=60)

Table-I: Showing age distribution of patients. Most patients are in the group of age 61-70 years (30%)

Age in years	Frequency	Percentage (%)
<31	1	1.7
31-40	2	3.3
41-50	11	18.3
51-60	14	23.3
61-70	18	30.0
71-80	12	20.0
>80	2	3.3

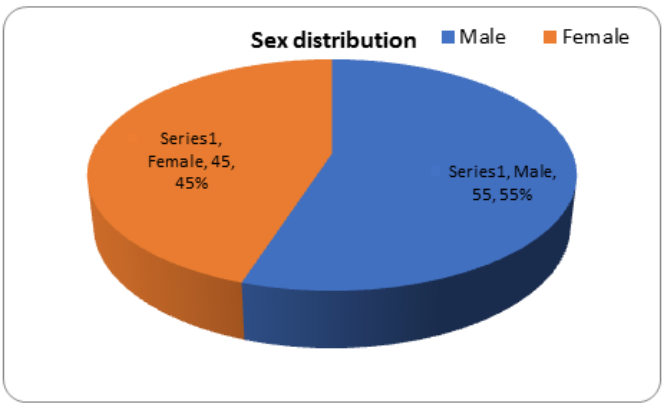

Fig-1: Sex distribution

Among 60 patients, 33(55%) were male and 27(45%) were female. Male female ratio was 1.2:1

Socio-economic status of patients

Table-II: Most of the patients came from rural area in both proximal occlusion and lacunar stroke.

Socioe-economic status	Prox.occl. stroke (%)	Lacunar stroke (%)	P value
Low	30.2	28.13	1.39
Middle	16	15.67	0.95
High	6	4	0.52

Distribution of patients according to family history of stroke

Table-III: showing most patients have negative family history in both proximal and lacunar stroke

Family history	Prox.Occl.stroke(%)	Lacunar stroke (%)	P-value
Positive	10.12	8.21	0.65
Negative	36.32	45.35	0.31

Smoking status of the patients

Table-IV: shows most of the stroke patients are current smoker

Smoking status	Prox.Occl.stroke (%)	Lacunar stroke (%)	P-value
Smoker	30.11	21.56	0.23
Nonsmoker	16.12	12.21	0.46
Ex smoker	12.23	7.77	0.32

Distribution of female patients with history of OCP use

Table-V: Among OCP user Incidence of proximal occlusion stroke is significantly higher than that of lacunar stroke

OCP user	Prox.Occl. stroke (%)	Lacunar stroke (%)	P-value
Yes	16.11	6.11	0.03
No	40.45	37.33	0.72

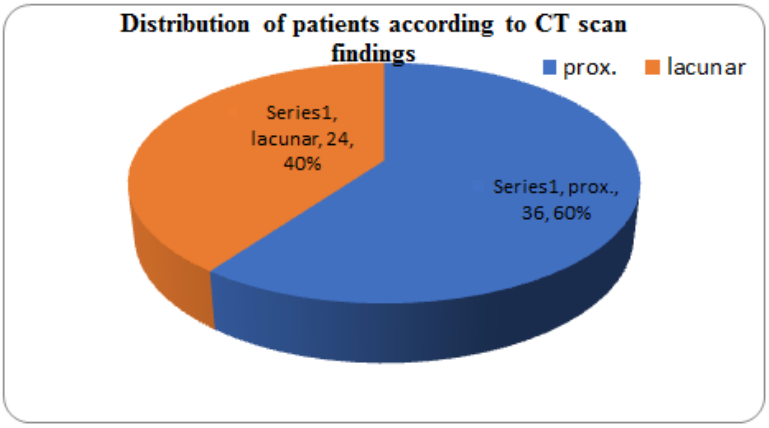

Fig-II: Distribution of patients according to proximal artery and lacunar infarction

Mobidity of patients based on MRS according to CT scan findings

Table-VI: Showing higher mean MRS on admission and after 7 days follow up.

Mean MRS	Proximal occlusion stroke	Launar stroke
On admission	2.5	2.2
After 7 days follow up	3.2	2.5

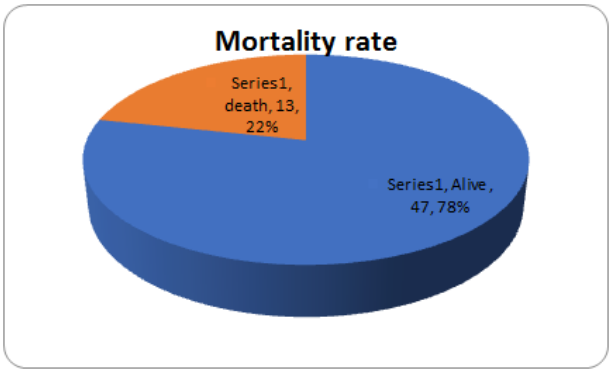

Fig-III: Among 60 patients 13(22%) patients died

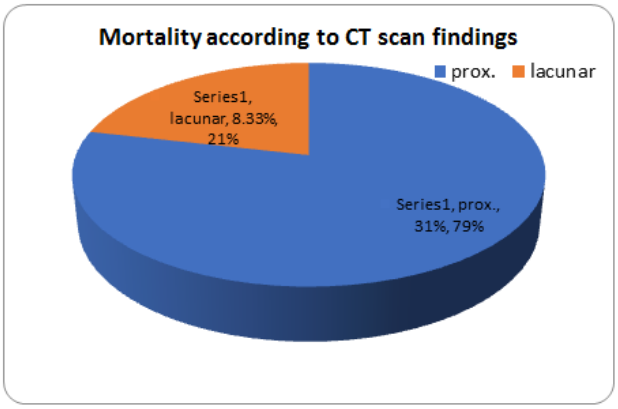

Fig-IV: Among 13 dead patiens 11(79%) was due to proximal artery infarction

DISCUSSION

CT scan findings were observed as the involvement of large arterial territories and lacunar stroke. The age group of the patients was ranged from 20 to over 80. Among them most patients was of 50 to 80 years. Collins *et al*. grouped their patients with ischaemic stroke into five categories; under 45 years (2.4%), 45-54 years (10.3%), 55-64 years (21.9%), 65-74years (39.1%), and 75 years and older (26.3%) [20]. In this study, most patients are of advanced age ranging from 50 to 90 years that is near about similar to previous results.

Regarding sex distribution 55% was male and 45% was female. 60% patients were affected in large arterial territory and 40% patients were affected as lacunar stroke. In this study it is found that proximal oclusion stroke is associated with significantly higher morbidity. Morbidity was measured by disability assessment tool, Modified Rankin Scale (MRS) scoring system. Mean MRS was significantly higher in proximal occlusion stroke than that of lacunar stroke both on hospital admission and during the time of follow up after 7 days. In previous study, neurological deterioration which reflects worsening of neurological symptoms is relatively common in acute pontine infarction cases and ranges from 14 to 35% according to different reports [21-24]. Pontine stroke is included in proximal oclusion stroke. So this study result is similar to previous study report. Moreover proximal occlusion includes other part of brain. So in this study the prevalence of proximal occlusion stroke is higher, that is 40%. Corticospinal tract in the midbrain are located in the middle of the cerebral peduncle compact bundles. In the upper pons, these tracts run along the corticopontine fibers in a loosely dispersed manner within abundant and heavily traversing non pyramidal fibers [25]. The corticospinal tracts are situated in the dorsolateral part of the pontine base at the level of the upper pons and converge into the anteromedial surface of the upper medulla to form compact bundles [26, 27]. So in acute ischaemic stroke, the involvement of large aterial territoty may be associated with larger damage of motor fibers in comparison with smaller damage in lacunar involvement.

Bamford *et al*. recently reported that outcomes and likelihood of recurrent stroke differed markedly by stroke subtype; large hemispheric infarcts, usually resulting from occlusion of the internal carotid artery or proximal middle cerebral artery, had the worst prognosis [28].

Despite significant achievement in the acute management and treatment of stroke, it remains the third leading cause of death in industrialized countries. Nowadays, upto 10% of patients with an acute ischamc stroke die within 30 days of the ictus [29]. Rothwell *et al*. reported a 17.2% case fatality due to initial stroke in the Oxford Community Stroke Project and 17.8% in the Oxford Vascular Study [30]. In this study the overall mortaliy was found 22% that is near about to previous results.

In this study, it has been found that proximal arterial occlusion stroke is associated with statistically significant increased mortality in comparison with lacunar infants. So the study results regarding mortality of acute ischaemic stroke on the basis of CT scan findings is similar to previous study results.

Limitation of The Study

All lacunar stroke patients in our country usually do not get admitted into hospital. This study was done in a tertiary level hospital. All costly investigations were not possible in all cases due to financial constrain.

CONCLUSION

The outcomes of acute ischaemic stroke patients can be predicted by the seeing the radiological area of brain involvements and appropriate measure can be taken immediately. Hence for management of acute ischaemic patients CT scan fndings is a reliable tool for assessing the prognosis of the patients affected by acute ischemic stroke.

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