

# A Prospective Study of Correlatio of Magnetic Resonance Imaging of Brain Including MR Angiogram and Carotid Vertebral Arterial Doppler Study with the Clinical Features in Ischemic Stroke

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## ABSTRACT

**Introduction:** Stroke is a global health problem. In this study we evaluated the risk factors, clinical features and their correlation with Magnetic Resonance Imaging (MRI) brain including Magnetic Resonance Angiogram (MRA) and Carotid Vertebral (CV) Doppler findings in patients presenting with acute ischemic stroke.

**Material and methods:** Seventy five patients of the age group 20 to 80 years admitted with acute ischemic stroke were enrolled for the study. A detailed history, clinical examination and blood investigations were done. MRI, MRA and CV Doppler were done in all patients. Serum Homocysteine levels and Anti-nuclear antibody assay (ANA) by Immunofluorescence (IF) were done in selected patients. Statistical analysis was done using SSPS version 16.0 for microsoft windows.

**Results:** In this study, there were more males than females. The mean age was 59 years. Young stroke population (<40 years) was 5%. Anterior circulation was predominantly involved than posterior circulation. Right Middle Cerebral Artery was the most common artery involved. There was positive correlation for clinical presentation and area of infarct and for areas of infarct and the vessels involved. Most common clinical presentations were weakness and slurring of speech. There were 3% intracranial anomalies. 56% had significantly elevated levels of homocysteine. 24% had ANA- IF positivity. Recurrence of stroke was seen in 17%; National Institute of Health Stroke Scale (NIHSS) score was higher in patients with recurrent stroke and right hemisphere infarcts.

**Conclusion:** There was positive correlation for clinical presentation and area of infarct and for areas of infarct and the vessels involved.

**Keywords:** Stroke, Anterior Circulation, Clinical co-relation, MRI, MRA Brain, Homocysteine, Area of Infarct.

disability.<sup>5</sup> Stroke is a life-changing event both financially and physically.

Stroke is caused by acute interruption of blood supply to the brain region it supplies, usually because of the blockade of a cerebral artery by a thrombus or emboli or by rupture of a vessel. This cuts off the supply of vital oxygen and nutrients to the brain, accumulation of free radicals causing damage to the brain tissue. An acute total occlusion of the vessels to the brain can cause death of the brain tissue within four to ten minutes. WHO clinically defines stroke as the rapid development of clinical signs and symptoms of a focal neurological disturbance lasting more than 24 hours or leading to death with no apparent cause other than vascular origin.<sup>6</sup> Among CVA, ischemic stroke constitutes 50%–85%<sup>6,7</sup> Hemorrhagic strokes - Subarachnoid hemorrhage and intra-cerebral hemorrhage, account for 1%-7% and 7%-27% respectively of all strokes worldwide.<sup>8,9</sup> In a study done, hemorrhagic stroke has significantly higher mortality when compared with ischemic stroke.

This study was conducted to evaluate various parameters like the risk factors of stroke, areas of brain involvement including the vessels involved and their clinical correlation in patients with acute ischemic stroke.

## MATERIAL AND METHODS

This is a prospective observational study conducted in a tertiary hospital at Coimbatore between June 2015 and June 2016. A total of 75 patients in the age group of 20 to

## INTRODUCTION

Stroke is a worldwide concern. Approximately two hundred lakh people every year suffer from stroke and of these fifty lakh do not survive.<sup>1,2</sup> In the developed nations, stroke is the leading cause for disability, second cause of dementia and third cause of death. Stroke is the second common cause of death and fourth leading cause of disability globally.<sup>3</sup> Stroke is an important cause for epilepsy, falls and depression in developed nations.<sup>4</sup> It is the leading cause of functional impairments, with 20% of survivors required hospital and nursing care for a prolonged period of more than 3 months duration and 15% - 30% of patient develop permanent

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80 years admitted with acute ischemic stroke to the medical and neurology wards were enrolled in the study. The study was initiated after obtaining clearance from the Institutional Ethical Committee. After obtaining informed consent, a detailed history attributable to the risk factors of stroke was obtained. A detailed clinical examination including baseline NIHSS score was obtained.

Investigations like complete hemogram, urine analysis, blood sugar, serum electrolytes, serum creatinine, blood urea, chest X-ray, fasting lipid profile, echocardiogram, electrocardiogram, MRI brain with MRA intracranium, CV Doppler were done in all patients. HbA1C was done if patient was found to be Diabetic based on random blood sugars. Investigations like ANA- IF and serum Homocysteine were done in selected patients.

### STATISTICAL ANALYSIS

The data was reported as the mean +/- SD or the median, depending on their distribution. Frequencies were reported in percentages. The differences in quantitative variables between groups were assessed by means of the unpaired t test. Non parametric test Wilcoxon signed test was used to assess the qualitative variables. To assess the difference in categorical variables between groups chi square test was used. Two tailed test was considered significant for all statistical tests when  $P$  value is  $<0.05$ . All data were analysed with a statistical software package (SSPS version 16.0 for microsoft windows).

Symptoms	Number of patients
Headache	6
Slurring of speech	33
Gait	16
Giddiness	17
Deviation of mouth	33
Weakness	51
Vomiting	8
Urinary incontinence	1
Decreased sensation	12
Total loss of speech	4
Double vision	5
Hiccups	1
Blurring of vision	1
Altered sensorium	1
Seizures	3
Pin prick sensation	1
Pain	1
Dysphagia	1
Loc	

**Table-1: Clinical Presentation**

	Mean	SD	95% CI of mean		Minimum	Maximum	Sig
			Lower	Upper			
Right	5.5	2.9	4.5	6.5	1	11	<0.05
Left	5.2	2.3	4.4	6.0	1	10	
Bilateral	4.8	3.3	2.0	7.5	2	12	
Total	5.3	2.7	4.7	5.9	1	12	

**Table-2: Mean NIHSS score with Laterality**

### RESULTS

Among the study population of 75 patients, 62 (83%) were males and 13 (17%) were females. 77% of total patients were aged more than 50 years. The mean age in the study population was 59 years. The young stroke population ( $<40$  years) in this study was 5%.

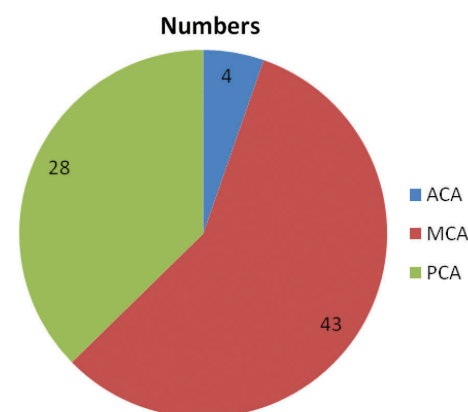
The percentage of smokers, alcoholics and both was 17%, 5% and 24% respectively. In the study population the percentage of Type 2 Diabetes mellitus, Systemic hypertension, Dyslipidemia and combined was 11%, 9%, 35% and 41% respectively.

The most common symptoms were weakness, slurring of speech, deviation of angle of mouth as listed in Table 1.

In the study population, 47 patients (63%) had anterior circulation stroke and rest twenty eight patients (37%) had posterior circulation involvement. The most commonly involved arteries in the present study were Middle Cerebral Artery (MCA). Forty three out of seventy five patients (57%) had MCA involvement. Among the 43 patients with MCA involvement, right MCA was involved in 24 patients and 19 patients had diseased left MCA. Anterior cerebral artery (ACA) was involved in 4 patients. Posterior cerebral artery (PCA) was involved in twenty eight patients (Figure 1)

31% of the patients had intracranial obstruction due to atherothrombotic process which was classically seen in MRA intracraium. 11% of the patients had only extracranial occlusion which was seen in CV doppler studies. Twenty one percentage of the study population had both intracranial and extracranial lesions and 37% had normal IC & EC studies, probably related to small vessel ischemia.

Forty five patients (60%) had positive correlation of location of the infarct in the brain with either MRA or CV Doppler findings  $P <0.001$ . 37% had normal MRA & CV Doppler findings. Only in 3% of the study population there was no



**Figure-1: Most commonly involved arteries**

correlation of the same.

The clinical presentation was correlating with infarct in MRI in seventy patients (93%)  $P < 0.05$ . There was no correlation in 7% of the study population due to bilateral involvement. In this study population, recurrent CVA was seen in thirteen patients (17%). The mean age of recurrent CVA was 62 yrs and average NIHSS was 6.5 which were significantly higher than patients who had CVA for the first time. NIHSS was more in those with right hemisphere involvement when compared with left and bilateral involvement. The average NIHSS for right, left, bilateral involvement was 5.5, 5.2, and 4.8 respectively (Table 2). The maximum NIHSS in this study population was 12 which were noted with bi-hemisphere involvement.

Fasting serum Homocysteine levels and ANA –IF was done in 46 patients. Elevated homocysteine and ANA –IF positivity was noted in 56% and 24% respectively. Serum homocysteine was elevated in 36% of the alcoholics and 64% of non alcoholics. The highest value was 160 against  $< 12$  of the normal reference range.

In the study population, 2 (3%) had congenital anomalies. They were Frontal arteriovenous malformation and fetal PCA. None of the patients in the study population underwent thrombolysis.

## DISCUSSION

Stroke among adults is rapidly increasing in the recent times. A systematic approach with good clinical history and examination, evaluation of risk factors, investigations and proper management of stroke is the need of the hour for acute ischemic stroke (AIS) patients.

In this study, males were more when compared with females. The male: female sex ratio among affected individuals is 7:1 in India. Among the females high risk groups are those taking oral contraceptives and pregnancy.<sup>10,11</sup>

The mean age was 59 years. In our study young stroke population ( $< 40$  years) was 5%. In a study at All India Institute of Medical Sciences (AIIMS), out of the 2,634 patients admitted with AIS, 440 patients (16.7%) were in the age group of 18–45 years and majority (83.4%) were male.<sup>12</sup> Smoking, alcoholism and dyslipidemia have been found to be significantly associated with stroke and its recurrence. Poor control of Diabetes Mellitus and systemic hypertension were associated with stroke recurrence.

Anterior circulation was predominantly involved than posterior circulation. Right MCA was the most common artery involved. There was positive correlation for clinical presentation and area of infarct and for areas of infarct and the vessels involved. Most common clinical presentation was weakness and slurring of speech. There were 3% intracranial anomalies

Eleven percent of patients had only extracranial occlusion. Extracranial occlusion that is carotid artery disease constitutes 10–20% of the strokes; stroke risk is directly proportional to the degree of occlusion. Carotid endarterectomy should be considered within 2 weeks if carotid stenosis of more than 70% involvement. There is less benefit of end carotidectomy

and carotid stenting in patients with stenosis of carotids 50 to 69% and in asymptomatic patients, and there is literally no benefit in patients with stenosis of less than 50%

Hyperhomo-cysteinemia emerged as an important independent risk factor for ischemic stroke.<sup>13</sup> 56% had significantly elevated levels of homocysteine. The levels ideally have to be assessed 6 weeks later, for ideally diagnosing hyperhomocystinemia. Vitamins such as B12, B6 and folate play a vital role in the Homocysteine - methionine cycle<sup>14</sup>, thus alcoholics are at risk of developing lower levels of folate and hence the increased Homocysteine levels. In contrary the proportion of elevated levels of Homocysteine was more in the non alcoholics when compared with alcoholics. There is correlation made in few studies that higher the Homocysteine values higher the mortality and recurrence of stroke.

24% had ANA- IF positivity but none of them had history of connective tissue disease. Incidental ANA- IF positivity in 24% of the study population raises concern whether it should be done routinely in all stroke patients and the same should be repeated to confirm the autoimmune etiology 6 weeks later.

Recurrence of stroke though was seen in 17%, but no mortality was observed among these patients. Relapse of alcohol, hard to kickoff smoking, poor adherence of medications was prime important in the stroke recurrence. NIHSS score was comparatively higher in these patients than in patients who had stroke for the first time. Similarly Right sided infarcts had higher NIHSS

None of the patients was thrombolysed due to varied reasons like exclusion criteria, after explaining the risks involved and mainly the time lapse in reaching the hospital. None of the patients was treated surgically.

## CONCLUSION

There was positive correlation for the clinical presentation with area of infarct and for areas of infarct with the vessels involved. Elevated serum homocysteine levels and incidental positivity of ANA-IF noted in the present study raises concern; further studies are needed which will throw light in this area and indicate their significance in patients with acute ischemic stroke.

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