

A STUDY ON INTRACRANIAL STENOSIS IN ACUTE ISCHEMIC STROKE

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ABSTRACT: BACKGROUND: Acute ischemic stroke is very common cause of significant morbidity and mortality throughout the world. The causes of acute ischemic stroke could be intracranial or extra cranial. Prevention of the acute episode could be decreased by surgically treating extra-cranial vascular disease but the prevention of intracranial cause is only medical. Various risk factors are also associated with development of ischemic stroke. However, the association between these and the pattern of vascular involvement is not clear.

AIM: The aim of the study was to 1. Identify the location of the vessel involved in different cases of ischemic stroke 2. To study the various risk factors associated with the development of ischemic stroke.

MATERIALS AND METHODS: This was a prospective study conducted between the years 2010 and 2012. All adult patients with acute ischemic stroke which was confirmed by MRI and less than two weeks duration were included in the study. Parameters recorded were presence of pre-existing comorbid conditions, neurological examination findings, Cardiovascular system examination findings, Blood pressures, blood sugar levels and pattern of vascular involvement. This was assessed using MR angiography or four vessel Doppler. Statistical analysis was done using the SPSS software.

RESULTS: Two hundred patients were enrolled in the study. Pure extracranial stenosis was present in 21.5%, extracranial with intracranial stenosis in 34%, and pure intracranial stenosis in 44.5%, which was predominant and resembled other Indian studies. 15.5% of patients had significant carotid stenosis based on Doppler study and were suitable candidates for carotid endarterectomy. Middle cerebral artery was commonly involved (55%). Hypertension (63.5%), diabetes mellitus (48%), alcoholism (20.5%) and smoking (18.5%) were the common risk factors. Prevalence of these risk factors was more in those with intracranial stenosis in our study, elevated total cholesterol, LDL, triglyceride and low HDL showed no relation to the incidence of ischemic stroke.

CONCLUSION: The vascular and demographic patterns in ischemic stroke help us to identify modifiable risk factors which can prevent the development of acute stroke.

KEYWORDS: Ischemic stroke, Intracranial stenosis, Acute stroke.

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INTRODUCTION: Although stroke being the second commonest cause of mortality after ischemic heart disease, it is the most common cause of morbidity. In the Indian scenario, the prevalence rate of stroke is 545 per 100,000.⁽¹⁾ In comparison with the western registries, predominance of intracranial stenosis is seen among Indian population, with middle cerebral artery being the most common site.^(2,3) Unlike extracranial stenosis, where endarterectomy is a treatment option, intracranial largely depends on the control of the risk factors, hence highlighting the need for the recognition of modifiable risk factors. Atherosclerotic disease is most frequent etiology. Hypertension, diabetes, smoking and alcohol were the common risk factors. The aim of the present study was to

study the pattern of vascular lesion in our population and identify risk factors for development of ischemic stroke.

MATERIALS AND METHODS: An ethics committee approval was obtained for the conduct of the study. The study was done on a prospective basis between the years 2010 and 2012. All patients with ischemic stroke who were above the age of 18 years were included in the study. The presence of ischemia was confirmed by MRI. Patients who had stroke of more than two weeks duration, stroke due to other causes were excluded from the study.

All patients underwent a clinical examination which included detailed history and recording of all vital signs. Past history of smoking, Diabetes, Hypertension, family history of stroke were noted. Examination of the cardiovascular system for underlying murmurs was done. The peripheral pulses including the Carotid were palpated for bruit etc. Investigations which were carried out were blood sugar measurements, complete haemogram and fasting lipid profile. Vascular lesion was analyzed using MR angiogram or Doppler study.

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RESULTS: Two hundred patients were included in the study. Age distribution in our study showed that maximum number of patients was in the age group between 61 and 70 years (34.5%). Sex distribution in our study showed general male preponderance in stroke. Males constituted 73% of the total and females 27%. Intracranial stenosis was predominantly involved in this study (44.5%). Middle cerebral artery was commonly involved (55%). Internal carotid artery was mostly affected in the extra cranial group (44%). Hypertension (63.5%), diabetes mellitus (48%) and alcoholism (20.5%) were the predominant risk factors. 108 patients had diabetes mellitus (54%). 96 patients were known diabetic (48%). 32 of them had uncontrolled sugar levels. 28 patients were newly detected diabetic (14%). Intracranial arteries were predominantly involved in known diabetic (37.5%). 136 patients had hypertension (68%). 127 patients were known hypertensive (63.5%). 60 of them had uncontrolled blood pressure levels. 9 patients were newly detected hypertensive. Intracranial arteries were commonly involved in known hypertensive. 21 patients had history of coronary heart disease (10.5%). 5 patients had atrial fibrillation (2.5%). Intracranial arteries were only involved in those with atrial fibrillation. 37 patients were smokers (18.5%). Intracranial arteries were mostly involved (40.5%). 41 patients were alcoholic (20.5%). Intracranial arteries were mostly involved (48.8%). It was the commonest clinical presentation and was seen in 148 patients (74%) in this study. Right hemiparesis was found in 67 patients (33.5%) and Left hemiparesis in 81 patients (40.5%). It was seen in 78 patients among the 148 patients who had hemiparesis. Right UMN facial paresis was found in 34 cases (17%) and Left UMN facial paresis in 44 cases (22%). 4 patients had facio brachial monoparesis, of which 3 were right sided and 1 left sided. 1 patient had isolated UMN facial paresis. 45 patients had aphasia (22.5%), of which 23 were Global (11.5%), 10 in Broca's and Wernicke's aphasia each (5%). 80 patients had dysarthria (40%). 25 patients had sensory involvement (12.5%). Unilateral hemi sensory loss was present in 20 patients (10%), and crossed hemisensory loss in 3 patients (1.5%). 14 patients had left sided (7%) and 5 patients had right sided involvement (2.5%). Low hemoglobin was seen in 28 patients (14%). HbA1c was done in 100 patients (50%). It was statistically significant in intracranial, extracranial, and both intracranial and extracranial groups ($p=0.015$). Carotid and Vertebral Doppler was done in 155(77.5%) and 157(78.5%) patients respectively. Grade 2 carotid stenosis was present in 120 patients, which were the most common. Only 31 patients (15.5%) had significant carotid stenosis. It was noticed that the infarct and stenosis on MR angiography did not correlate in 79 patients (39.5%). 8 patients' MRI revealed embolism. 3 had intracranial stenosis. Associated small vessel disease was present in 66 patients.

DISCUSSION: In our study, MCA was affected in 55% of total patients, followed by PCA in 20.5%, ACA in 12% and PICA in 0.5% of total patients. Basilar artery was involved in 11%. In the extracranial involvement, ICA was affected in 44%, CCA in 2%, ECA and SCA in 0.5% of the total patients. Vertebral artery was involved in 17.5% of patients. According to Barcelona stroke registry,⁽⁴⁾ MCA

was the most common vascular territory affected by infarction in 66.5% followed by PCA in 6.6% and ACA in 2.8% of patients.¹⁴⁶ Louis Caplan and Mohr et al⁽⁵⁾ documented that MCA was involved in 75% followed by PCA in 11%, ACA in 3% and basilar artery in 5% of cases.¹⁵⁴ Our study shows almost similar results to this series. In Bogousslasky et al⁽⁶⁾ series of stroke patients, 96% of Internal Carotid territory infarcts involved MCA followed by ACA in 3% of patients. 48% of posterior circulation infarcts involved basilar and PICA whereas PCA was affected in 36% of patients.

Echocardiography showed LVH with normal EF in 37.8% of patients. LV systolic dysfunction was seen in 4.5% of patients. Rheumatic heart disease was found in 1.3% of patients. ECHO was normal in 27% of patients. LA clot was seen in 0.6% of patients. According to Lausanne stroke registry,⁽⁶⁾ LVH was found in 26.3%, left ventricular dysfunction was seen in 17.08%, and ECHO was normal in 41%. Tribolet et al reported that out of the 853 patients admitted with ischemic stroke, dilated cardiomyopathy was seen in 19.1%, previous anterior wall myocardial infarction in 6.2%, left ventricular systolic dysfunction in 3.7%, mitral valve stenosis with enlarged left atria in 1.6%, intracardiac masses in 0.5% and valvular prosthesis in 0.2%.⁽⁷⁾ In our study, out of 200 patients, intracranial arteries were affected in 89(44.5%), extracranial in 43(21.5%) and both intracranial and extracranial in 68(34%). Middle cerebral artery was most commonly involved (55%). In extracranial involvement, Internal carotid artery was predominant (44%). Only 31 patients (15.5%) had significant carotid stenosis when Doppler study was done for assessing prevalence of extracranial stenosis and suitability for carotid endarterectomy.

In the study conducted by Gyanendra Kumar et al, from North India, in 151 patients, intracranial magnetic resonance angiographic abnormality was seen in 63.3% and extracranial in 56.3%. Internal carotid artery was most the common site. Abnormality correlated positively with hypertension and diabetes, and negatively with alcohol consumption.⁽⁸⁾ A study from Nizam's Institute of Medical Sciences, Hyderabad, by Kaul S et al, predominance of intracranial large artery atherosclerosis was also noted. Of 392 patients, 160(41%) had large artery atherosclerosis (133 intracranial and 27 extracranial). Hypertension, diabetes and smoking were the common risk factors.⁽⁹⁾ As noted by Padma et al, in contrast to the results reported from western countries where the likelihood of a surgically correctable extracranial carotid arterial lesion being present was 60-70%, she found only 11% of operable lesions. Intracranial atherosclerotic disease causing strokes is probably more common in India. Therefore although carotid endarterectomy is the only accepted surgical procedure for secondary prophylaxis of stroke, there is a need to find an alternative surgical intervention for the predominantly intracranial pathology found in the Indian population.

CONCLUSIONS: In our study, pure extracranial stenosis was present in 21.5%, extracranial with intracranial stenosis in 34%, and pure intracranial stenosis in 44.5%, which was predominant and resembled other Indian studies. 15.5% of patients had significant carotid stenosis

based on Doppler study and were suitable candidates for carotid endarterectomy. Such a small proportion highlights the emphasis of aggressive medical treatment even in those with extracranial stenosis. Middle cerebral artery was commonly involved (55%). Hypertension (63.5%), diabetes mellitus (48%), alcoholism (20.5%) and smoking (18.5%) were the common risk factors. Prevalence of these risk factors was more in those with intracranial stenosis. Modification of lifestyle and proper management of these modifiable risk factors might play a major role in the primary and secondary prevention of ischemic stroke. In our study, elevated total cholesterol, LDL, triglyceride and low HDL showed no relation to the incidence of ischemic stroke.

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