

Study of Stroke Due to Intracranial Atherosclerosis in Population of Bihar

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Abstract

Background: Ischemic stroke is quite heterogeneous in its pathophysiological mechanism associated with atherosclerosis. Little is known about measures for the prevention of the disease apart from latest technologies and medications.

Method: One hundred patients of different age groups were studied with magnetic resonance angiography, to rule out occlusion or lesion; tropical distribution of infarction, clinical manifestations, and recurrence after treatment was also noted.

Results: Clinical manifestations included 33% of alcoholic, 21% of homocystine, 80% of hyper tension (HTN), 54% of diabetes mellitus (DM), 30% of hyperlipidemia, 35% of smoking, 48% of HTN + DM, 17% of HTN + DM +hyperlipidemia, 7% of HTN + DM + hyperlipidemia, and + smoking + alcohol. Highest occlusion was observed 51 (39.9%) in middle cerebral artery followed by 20 (14.4%) internal carotid artery, 23 (16.6%) basilar artery (BA), 18 (13.04%) vertebral artery (VA), and least was 2 (1.4%) in VA + BA. Highest tropical distribution of infarction was 28% cortical followed by 24% subcortical and cortical, 23% cortical, 11% cerebellum, and 8% brainstem and recurrence was observed in 19% patients.

Conclusion: The present pragmatic study will help for efficient management and risk control for neurophysician and neurosurgeon because risk factor control remains the best strategy for preventing recurrence, because the recurrence of the stroke worsen the physical and mental conditions of the patients.

Key words: Magnetic resonance angiography, Hypertension, Diabetes mellitus, Homocystine, Recurrence

INTRODUCTION

Intracranial atherosclerosis of major arteries is most common proximate mechanism of ischemic stroke worldwide. Intracranial atherosclerosis (IATH) has been recognized as a serious cause of stroke. It is reported that IATH is present in 7–10% of patients with cerebrovascular disease.^[1] In general, the risk factors are thought to be the same as for non-intracranial vascular disease and include hypertension (HTN), hypercholesteremia, tobacco chewing and smoking, and diabetes mellitus (DM), in addition, possibly to genetic factor and race-ethnicity.^[2] It is also noted that, metabolic syndrome, cluster of risk factors that are linked to insulin resistance and increased

risk of coronary heart disease, is involved in stroke with atherosclerosis.^[3,4]

Hence, to evaluate, the various etiologies of the stroke associated with atherosclerosis of major arteries of the brain in different age groups and both sexes were studied with help of magnetic resonance angiography (MRA).

OBSERVATION AND RESULTS

Table 1 shows clinical manifestations of stroke patients – 33 (33%) of alcoholic, 21 (21%) of homocysteine, 80 (80%) of HTN, 54 (54%) of DM, 30 (30%) of hyperlipidemia, 35 (35%) of smoking, 48 (48%) of HTN + DM, 17 (17%) of HTN + DM + hyperlipidemia, and 7 (7%) HTN + DM + hyperlipidemia + alcohol.

Table 2 shows distribution of atherosclerotic lesions (occlusion) in variables arterial 51 (36.9%) middle cerebral artery (MCA), 20 (14.4%) internal carotid artery (ICA), 6 (4.3%) anterior cerebral artery (ACA), 18% (13.04%) vertebral artery (VA), 6 (4.3%) basilar

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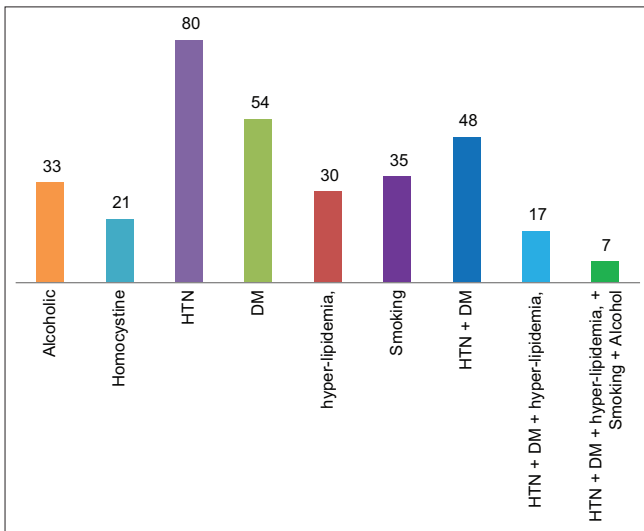
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Table 1: Clinical manifestations of stroke patients due to atherosclerosis

| Sl No | Clinical manifestations | No. of patients (100) % |
|-------|---|-------------------------|
| 1 | Alcoholic | 33 (33%) |
| 2 | Homocystine | 21 (21%) |
| 3 | HTN | 80 (80%) |
| 4 | DM | 54 (54%) |
| 5 | hyperlipidemia, | 30 (30%) |
| 6 | Smoking | 35 (35%) |
| 7 | HTN+DM | 48 (48%) |
| 8 | HTN+DM+hyperlipidemia, | 17 (17%) |
| 9 | HTN+DM+hyperlipidemia, +smoking+alcohol | 7 (7%) |



artery (BA), 23 (16.6%) PCA, 4 (2.89%) MCA + ICA, 4 (2.89%) ICA + MCA + ACA, 4 (2.89%) BA + PCA, and 2 (1.4%) VA + BA.

Table 3 shows tropical distribution of infarction – 28 (28%) of cortical, 23 (23%) of subcortical, 24 (24%) of cortical and subcortical, 8 (8%) of brain stem, 11 (11%) of cerebellum, and 6 (6%) of others.

Table 4 shows study of recurrence in un-controlled risk factors .The total number of patients were 19 – 6 (31.5%) of drug compliance to anti-platelets, 3 (15.7%) of drug (anti-platelets), 2 (10.52%) of single anti plate, 3 (15.7%) of statins, 2% of HTN controlled, 2 (10.52%) of DM controlled, and 1 (5.2%) hyperlipidemia controlled.

MATERIALS AND METHODS

One hundred patients aged between 25 and 60 years admitted at the Neurosurgery Department of Shri Krishna Medical College and Hospital Muzaffarpur-842001, Bihar were studied.

Table 2: Distribution of atherosclerotic lesions (occlusion) in various arteries

| Name of the artery | Frequency of lesion | Percentage of distribution of lesions |
|--------------------|---------------------|---------------------------------------|
| MCA | 51 | 36.9 |
| ICA | 20 | 14.4 |
| ACA | 6 | 4.3 |
| VA | 18 | 13.04 |
| BA | 6 | 4.3 |
| PCA | 23 | 16.6 |
| MCA+ICA | 4 | 2.89 |
| TCA+MCA+ACA | 4 | 2.89 |
| BA+PCA | 4 | 2.89 |
| VA+A | 2 | 1.4 |

MCA: Middle cerebral artery, ICA: Internal carotid artery, ACA: Anterior Cerebral artery, VA: Vertebral artery, BA: Basilar artery, and PCA: Posterior cerebral artery

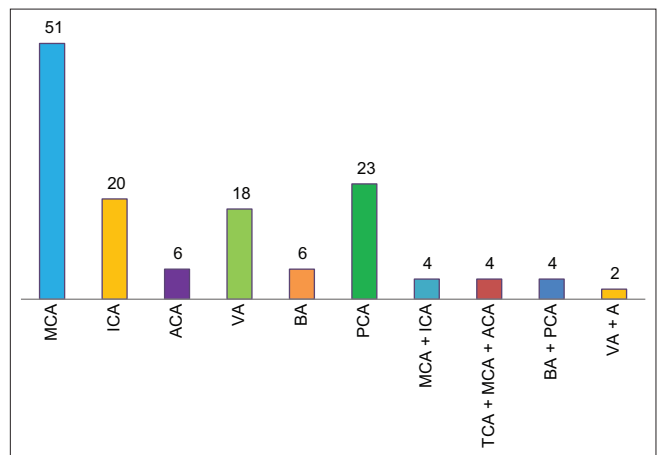


Table 3: Tropical distribution of Infarction

| | |
|--------------------------|----|
| Cortical | 28 |
| Subcortical | 23 |
| Cortical and subcortical | 24 |
| Brain stem | 8 |
| Cerebellum | 11 |
| Others | 6 |

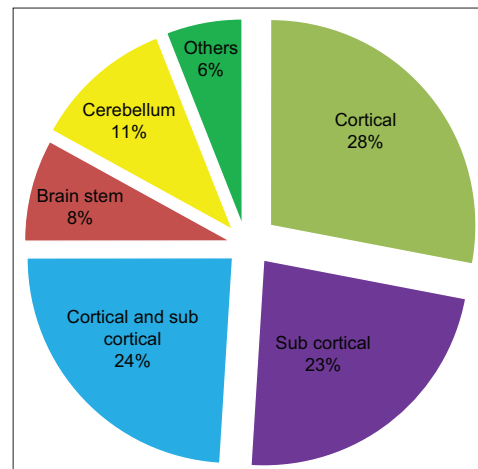
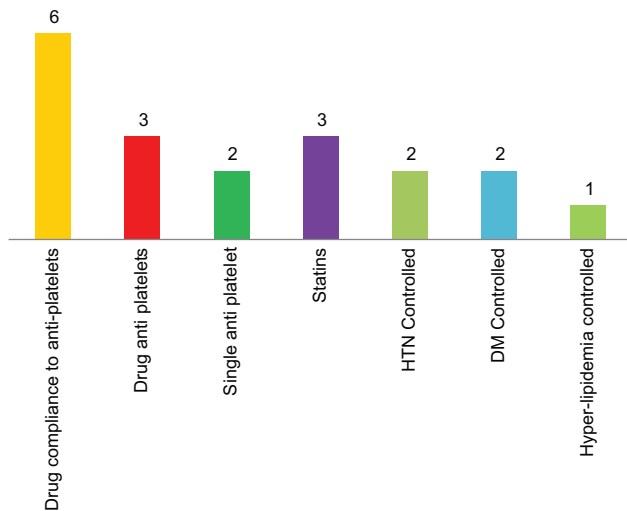


Table 4: Study of recurrence in un-controlled risk factors (No. of patients: 19)

| Parameters | Recurrence Number |
|-----------------------------------|-------------------|
| Drug compliance to anti-platelets | 6 |
| Drug anti-platelets | 3 |
| Single anti-platelet | 2 |
| Statins | 3 |
| HTN controlled | 2 |
| DM controlled | 2 |
| Hyperlipidemia controlled | 1 |



Inclusive Criteria

Diagnosis of ischemic stroke due to large IATH was selected for the study.

Exclusion Criteria

Patients with organic mental disorders, arterial fibrillation, acute anterior wall ST elevation myocardial infarction <30 days, mitral stenosis, intracardiac thrombus or vegetations, intracranial tumors, arteriovenous malformations, Moyamoya disease, and arteritis were excluded from the study.

Method

The diagnosis of ischemic stroke due to large artery intracranial atherosclerosis was made as per the TOAST (trial of ORG 10172 in acute stroke treatment) classification. Physical and neurological examination was done disease duration laboratory findings, any complications and treatment received were noted. The data were noted in pre-designed case record forms.

MRA (GE systems 1.5 T) was done in all patients. Stenosis (segmental flow gap or luminal stenosis or occlusion) was assessed in proximal MCA, ICA VAS, and BA. The distribution of stenosis and occlusive lesions was noted. Patients were put on treatment with anti-platelet, drugs in addition to other required medications.

History of HTN in the past, systolic blood pressure (SBP) ≤ 140 mm/Hg and or diastolic blood pressure ≤ 90 mm/Hg, diabetes mellitus (DM) – history or DM fasting blood glucose ≥ 126 mg/dl, or 2-h post prandial blood glucose ≥ 200 mg/dl. HbA1C ≥ 6.5 Hyper homocysteinemia – elevated levels of serum homocysteine more than 20μ moles/L. HbA1C > 6.5 Hyper homocysteinemia – elevated levels of serum homocysteine more than 20μ moles/L. Hyperlipidemia – history of dyslipidemia cholesterol, cholesterol ≥ 200 mg/dL, and LDL (Low-density lipoprotein) ≥ 100 m/dl or triglyceride ≥ 150 mg/dl. Smoking history, history of alcoholism was also noted.

The duration of the study was January 2020–July 2021.

Statistical analysis

Various findings of clinical manifestations, distributions of atherosclerotic lesions, and tropical distributions recurrence of strokes were classified with percentage. The statistical analysis was performed in SPSS software. The ratio of male and female was 3:1.

DISCUSSION

Present study of stroke due to intracranial atherosclerosis in Bihar population. The clinical manifestations were 33% of alcoholic, 21% of homocysteine, 80% of HTN, 54% of DM, 30% of hyperlipidemia, 35% of smoking, 48% of HTN + DM, 17% of HTN+DM+ hyperlipidemia, 7% of HTN + DM + hyperlipidemia, and + smoking + alcohol [Table 1]. In the distribution atherosclerosis lesions (occlusions) in various arteries, 5 (36.9%) MCA was highly involved followed by 23 (16.6%) BA, 20 (14.4%) ICA, 18 (13.04%) ACA, and least was 2 (1.4%) in VA + A [Table 2]. In tropical distribution of infarction, highest was 28% cortical followed by 24% of cortical and subcortical, 23% of subcortical, 11% of cerebellum, 8% of brainstem, and 6% of others [Table 3]. The total recurrence in the study was 19%, drug compliance to anti-platelet was 6%, anti-platelet drugs – 3%, single anti-platelets – 2%, statins – 3%, HTN controlled 2%, DM controlled 2%, and hyperlipidemia controlled 1% [Table 4 and Figures 1-3]. These findings are more or less in agreement with the previous studies.^[5-7]

Concurrent atherosclerosis extracranial and intracranial arteries were also studied HTN emerged as the strongest risk factor for concurrent lesion or occlusion followed by DM, coronary artery, and smoking. Occlusion of large branches of the circle Willis can lead to stroke by hypoperfusion or by artery to artery embolism.^[8] It is also noted that stroke is one of the leading causes of death in India. Stroke was the cause of the death in 13% which was similar to death due to coronary artery disease 14% in Andhra Pradesh.^[9]

Apart from atherosclerosis gene, disorders do leads to stroke in young individual without known risk factors and

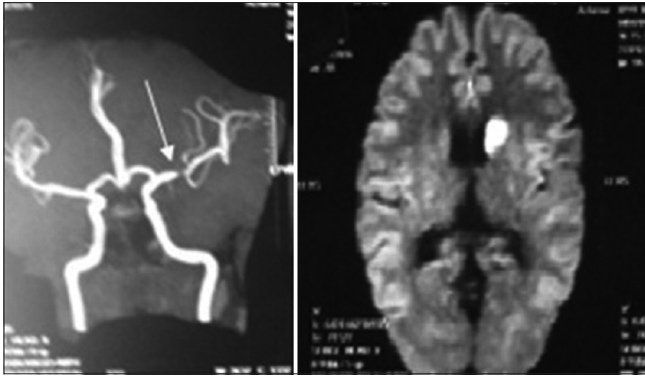


Figure 1: The left middle cerebral artery stenosis with diffusion-weighted imaging showing subcortical infarct

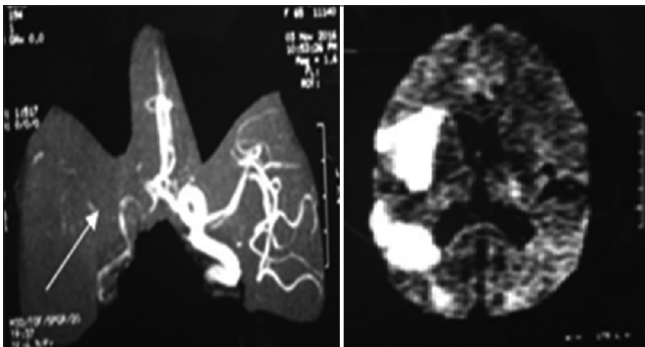


Figure 2: The right middle cerebral artery/internal carotid artery occlusion with diffusion-weighted imaging showing corresponding infarct

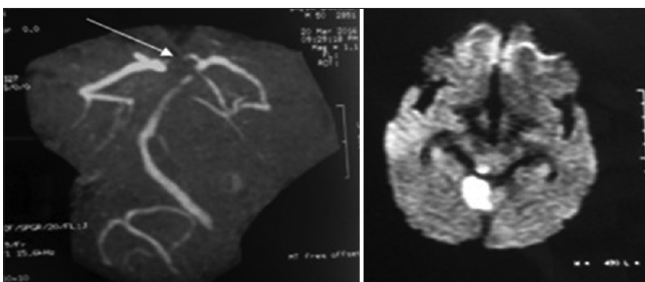


Figure 3: Basilar artery stenosis, right superior cerebellar, and right posterior cerebral artery not visualized with diffusion-weighted imaging showing infarct in the midbrain and occipital cortex

they include cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy, Fabry's disease, and sickle cell disease.^[10] Hence, genetic contribution to stroke is polygenic. It was also observed that apolipoprotein E gene (gene involved with lipid metabolism) was evaluated in stroke patients.

It is accepted globally that as tea is the commonest beverage after water. It is shown beneficial effect that tea consumption of 450 ml or more than or equal to three cups per day was associated with reduction of the incidence of

recurrent ischemic stroke, significant decrement of systolic blood pressure, better control of fasting hyperglycemia, and lowering down of the level of total cholesterol and LDL level in the subject with hypercholesterolemia.^[11]

SUMMARY AND CONCLUSION

The present study of strokes due to atherosclerosis has multiple etiologies such as HTN, DM, smoking, and dyslipidemia as they are not being adequately controlled; hence, there is challenge of high stroke incidence. Apart from public awareness, it needs more inventional studies to find out the efficacy of preventive agents such as antihypertensive and anti-platelets, because exact pathogenesis of stroke is still unclear.

- This research paper is approved by the Ethical Committee of Shri Krishna Medical College and Hospital, Muzaffarpur-842001, Bihar.

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