

To study the clinico-labrotary correlation of stroke due to intracranial extracranial and combined vascular lesions

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Abstract

Introduction: Although dyslipidemia is a well established risk factor for coronary artery disease, its relationship to ischemic cerebrovascular disease has remained unclear, perhaps because of the heterogeneous nature of stroke. **Aims and Objectives:** To study the clinico-laboratory correlation of stroke due to intracranial, extracranial and combined vascular lesions. **Material and Method:** in the present study 104 cases of ischemic stroke were included in the study. All these patients were studied clinically and radiologically to study the nature of lesion (intracranial or extracranial vascular lesion). Neuroimaging- MRI-Brain or CT-Brain was done in each patient to see site of infarct. Routine laboratory evaluation- blood sugar, renal function tests, haemogram, lipid profile and serum vitamin B12 and homocysteine levels are calculated in all patients. **Results:** 49.04% of patients included in our study were having vitamin B12 deficiency. Raised serum homocysteine levels were seen in 61.54% patients. Hypertension was found in 76.92% of total patients whereas 41.35% of patients were having diabetes mellitus. 30.77% of patients with ischaemic stroke were having hypercholesterolaemia. It was observed that 33.65% patients of ischaemic stroke were having raised serum triglyceride levels and 52.88% patients were having raised LDL levels. Patients having low HDL cholesterol levels were 67.30%. **Conclusion:** Thus we conclude that raised homocysteine levels, hypercholesterolaemia, hypertriglyceridaemia and raised LDL levels are found to be important risk factors for ischaemic strokes due to extracranial vascular lesion. HDL appears to have protective influence on extracranial vascular lesion.

Keywords: intracranial extracranial, vascular lesions.

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INTRODUCTION

Although dyslipidemia is a well established risk factor for coronary artery disease, its relationship to ischemic cerebrovascular disease has remained unclear, perhaps because of the heterogeneous nature of stroke. Among all the neurologic diseases of adult life, the stroke clearly rank first in frequency and importance accounting upto

20% of all central nervous system disorders, in the urban sectors of India. Stroke is defined as an abrupt neurologic deficit that is attributable to focal vascular cause. Risk factors for stroke include hypertension, carotid stenosis, atrial myxomas, smoking, hyperlipidemia, diabetes, myocardial infarction and atrial fibrillation. Nikolai Anichkov first proposed a link between cholesterol and atherosclerosis in 1912. Decades later observational studies have incontrovertibly established hyperlipidemia as an independent risk factor for coronary artery disease. The link between hyperlipidemia and stroke was more difficult to establish. The difficulty arose in part because of the heterogeneous nature of stroke. To investigate a possible etiologic relationship between hyperlipidemia and stroke, it became essential to distinguish ischemic from hemorrhagic stroke. It now appears likely that hyperlipidemia is an independent risk factor for ischemic stroke. Atherosclerosis of arteries, extracranial and intracranial is the most prominent cause of stroke and

hyperlipidemia is a major risk factor for atherosclerosis. Most of the evidence specifically implicates hypercholesterolemia and to a lesser extent hypertriglyceridemia in the causation of atherosclerosis. The mechanisms by which hyperlipidemia contributes to atherogenesis are many.¹ The atherosclerotic plaques in the arterial walls contain large amounts of cholesterol. The higher the level of LDL cholesterol, the greater is the risk of atherosclerotic heart disease; conversely, the higher the HDL cholesterol, the lower is the risk of CHD. The effect of HDL cholesterol is greater in women, whereas the effects of total and LDL cholesterol are comparatively smaller and of these relationships diminish with age.² The size of the LDL molecule also influences atherogenesis; at the same LDL concentrations, individuals with large numbers of smaller particles appear to be at higher risk for CHD.^{3,4} The relationship of VLDL cholesterol to atherogenesis is less clear. The number, size, or subtype and the total amount in serum of VLDL particles may be important. In addition, HDL and VLDL levels are inversely related. Patients with a high VLDL level are at increased risk for CHD as they are likely to have a low HDL level.^{5,6}

AIMS AND OBJECTIVES

To study the clinico-laboratory correlation of stroke due to intracranial, extracranial and combined vascular lesions.

MATERIAL AND METHOD

The present cross sectional study was conducted at Ruby Hall Clinic, Pune to study the clinico laboratory profile of ischemic stroke patients. Following inclusion and exclusion criteria was used to select the study subjects.

Inclusion criteria

All the patients admitted to Ruby Hall Clinic, Pune with sudden onset neurological deficit and diagnosed to have TIA, ischaemic stroke or leukoaraiosis are included in this study.

Exclusion criteria

All cases suggestive of cardio-embolic stroke and haemorrhagic stroke are excluded from this study. By using the above mentioned inclusion and exclusion criteria total 104 patients were enrolled in the study in one year. Detailed case history was taken for each patient regarding history of current illness, past history of similar events, treatments, transient ischaemic attacks and history suggestive of risk factors like hypertension, Diabetes mellitus, ischaemic heart disease, old stroke, smoking history was noted. General examination and systemic examination was performed on each patient. Detailed neurological examination was done to localise site of lesion. Cardiovascular examination was done to rule out any cardiac disease leading to embolisation and stroke. Routine laboratory evaluation- blood sugar, renal function tests, haemogram, lipid profile and serum vitamin B12 and homocysteine levels are studied. All the patients were studied clinically and radiologically to study the nature of lesion (intracranial or extracranial vascular lesion). Neuroimaging- MRI-Brain or CT-Brain was done in each patient to see site of infarct. Patients with haemorrhagic stroke and venous sinus thrombosis are excluded. Subsequently CT-angiogram, MR-angiogram or Digital subtraction Angiography was done to study site of occlusion in vessels. Lesion which is not causing any symptoms or signs is considered as normal. Accordingly clinical and radiological correlation of strokes due to intracranial and extracranial vascular lesion and associated risk factors like hypertension, Diabetes mellitus, vitamin B12 and homocysteine levels, dyslipidaemia, hyperhomocysteinaemia were studied.

RESULTS

Table 1: Clinico-laboratory risk factors associated with ischaemic stroke

Risk factors		Intracranial vascular lesions	Extracranial vascular lesions	Combined vascular lesions	Normal angiogram	Total
vitamin B12	B12 deficiency	15 (50%)	18 (54.55%)	4 (50%)	14 (42.42%)	51 (49.04%)
	Normal B12	15 (50%)	15 (45.45%)	4 (50%)	19 (57.58%)	53 (50.96%)
homocysteine levels	Hyperhomocysteinaemia	18 (60%)	24 (72.73%)	5 (62.50%)	17 (51.52%)	64 (61.54%)
	Normal homocysteine	12 (40%)	9 (27.27%)	3 (37.50%)	16 (48.48%)	40 (38.46%)
Hypertension	HTN	25 (83.33%)	25 (75.76%)	7 (87.50%)	23 (69.70%)	80 (76.92%)
	Non-HTN	5 (16.67%)	8 (24.24%)	1 (12.50%)	10 (30.30%)	24 (23.08%)
Diabetes	DM	15 (50.00%)	15 (45.45%)	1 (12.50%)	12 (36.36%)	43 (41.35%)
	Non-DM	15 (50.00%)	18 (54.55%)	7 (87.50%)	21 (63.64%)	61 (58.65%)

Vitamin B12 deficiency appears to be an important risk factor for stroke. 49.04% of patients included in our study were having vitamin B12 deficiency. 50% of stroke

patients with intracranial vascular lesion were having vit.B12 deficiency, 54.55% with extracranial vascular lesion were having vit.B12 deficiency, 50% of patients

with combined lesion were having vit.B12 deficiency and 42.42% of patients with normal angiogram were having vit.B12 deficiency. 61.54% of total patients were having raised serum homocysteine levels, out of which 60% patients were with intracranial vascular lesion, 72.73% patients with extracranial vascular lesion, 62.5% patients with combined vascular lesion and 51.52% patients were with normal angiographic study. Hypertension appears to be an important risk factor for stroke. Hypertension was found in 76.92% (80 out of 104) of total patients. 83.33% of stroke patients in our study with intracranial vascular lesion were having hypertension, 75.76% patients with extracranial vascular lesion were having hypertension, 87.5% patients with combined intracranial and

extracranial vascular lesions were having hypertension and 69.7% of stroke patients with normal angiogram were having hypertension. HTN has positive correlation with intracranial vascular lesions as compared to extracranial vascular lesions, but difference is not statistically significant ($p=0.53$). 41.35% of patients in our study were having diabetes mellitus. 50% of patients with intracranial vascular lesion were diabetic, 45.45% patients with extracranial vascular lesion were diabetic, 12.5% patients with combined lesion were diabetic and 36.36% of stroke patients with normal angiogram were diabetic. 33.65% of stroke patients in our study were having past history of ischaemic heart disease. 14.42% of patients in our study were having history of prior stroke.

Table 2: Association of lipid profile with ischaemic stroke

Lipid profile		Intracranial vascular lesions	Extracranial vascular lesions	Combined vascular lesions	Normal angiogram	Total
Total cholesterol	High	9 (30.00%)	12 (36.36%)	2 (25.00%)	9 (27.27%)	32 (30.77%)
	Normal	21 (70.00%)	21 (63.64%)	6 (75.00%)	24 (72.73%)	72 (69.23%)
Triglyceride	Hypertriglyceridaemia	7 (23.33%)	16 (48.48%)	2 (25.00%)	10 (30.30%)	35 (33.65%)
	Normal TG	23 (76.67%)	17 (51.52%)	6 (75.00%)	23 (69.70%)	69 (66.35%)
LDL levels	High LDL	16 (53.33%)	21 (63.64%)	4 (50.00%)	14 (42.42%)	55 (52.88%)
	Normal LDL	14 (46.67%)	12 (36.36%)	4 (50.00%)	19 (57.58%)	49 (47.12%)
HDL	Low HDL	19 (63.33%)	24 (72.73%)	5 (62.50%)	22 (66.67%)	70 (67.31%)
	Normal HDL	11 (36.67%)	9 (27.27%)	3 (37.50%)	11 (33.33%)	34 (32.69%)

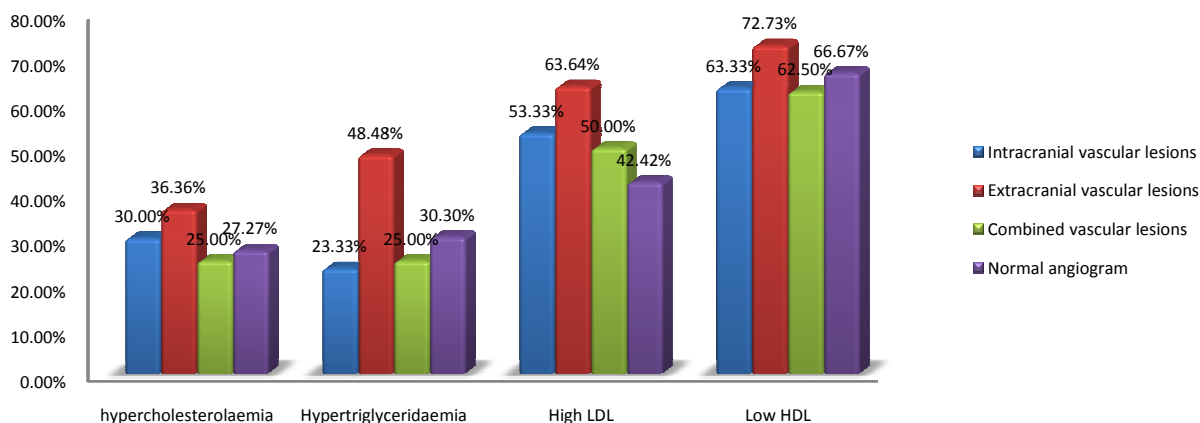


Figure 1: Association of lipid profile with ischaemic stroke

In our study, 30.77% of patients with ischaemic stroke were having hypercholesterolaemia. 30% patients with intracranial vascular lesion, 36.36% patients with extracranial vascular lesion, 25% patients with combined lesion, 27.27% stroke patients with normal angiogram were having high serum cholesterol levels. It was observed that 33.65% patients of ischaemic stroke were having raised serum triglyceride levels. 23.33% patients with intracranial vascular lesion, 48.48% patients with extracranial vascular lesion, 25% patients with combined

lesion and 30.30% patients with normal angiographic studies were having raised serum triglyceride levels. 52.88% patients were having raised LDL levels. 53.33% patients with intracranial vascular lesion, 63.64% patients with extracranial vascular lesion and 50% patients with combined lesion whereas 42.42% patients with normal angiographic findings were having high LDL levels. Patients having low HDL cholesterol levels were 67.30%. It was seen that 63.33% patients were with intracranial vascular lesion, 72.72% patients with extracranial

vascular lesion, 62.5% patients with combined vascular lesion and 66.66% patients with normal angiographic findings were having low HDL cholesterol levels.

DISCUSSION

The Present study was conducted at Ruby Hall Clinic, Pune on patients admitted with sudden onset neurological deficit and diagnosed to have ischaemic stroke to study the clinico-labrotary correlation. It was observed that 49.04% of our patients were having vitamin B12 deficiency. In Indian patients vitamin B12 deficiency is an important risk factor for ischaemic stroke, it was also observed by wadia *et al*⁷. Robertson *et al*⁸ also found association of vitamin B12 deficiency with ischaemic strokes. In our study, 54.55% of ischaemic stroke patients with extracranial vascular lesion were having vitamin B12 deficiency. Suwanwela *et al*⁹ also showed association of vitamin B12 deficiency with extracranial strokes.

When association of hyperhomocysteinaemia with ischaemic stroke was studied it was observed that 61.54% of stroke patients were having raised plasma homocysteine levels. Similar observations were also reported by Yoo JH *et al*¹⁰. 72.73% patients with extracranial vascular lesions were having raised plasma homocysteine levels. Suwanwela *et al*⁹ has also showed raised plasma homocysteine levels as an important risk factor for extracranial vascular lesion. Hypertension was found in 76.92% of total stroke patients. According Yip PK *et al*¹¹ hypertension was present in 69% cases of stroke. Shrivastava *et al*¹² also observed 67% of stroke patients were having hypertension. In our study, 83.33% patients with intracranial vascular lesion were having hypertension. Berne *et al*¹³ also states that hypertension is an independent risk factor for intracranial stenosis. It was observed that 41.35% patients were having diabetes mellitus. Ralph *et al*¹⁴ also observed diabetes as an independent risk factor for ischaemic stroke. It was also observed that 50% patients with intracranial strokes have diabetes. Similar observations were also reported by Rincon F¹⁴. Hypercholesterolaemia was observed in 30.77% of patients of ischaemic stroke. National Cholesterol Education Programme also suggested hypercholesterolaemia as an important risk factor for ischaemic stroke¹⁵. Navi BB¹⁶ also states association of hypercholesterolaemia and ischaemic stroke. 36.36% patients with ischaemic strokes due to extracranial vascular lesion were having raised serum total cholesterol levels. Heiss G *et al*¹⁷ also found positive relationship between raised total cholesterol levels and stroke extracranial vascular lesion. It was seen that serum triglyceride levels were increased in 33.65% of patients with ischaemic stroke. Bonaventure *et al*¹⁸ also

mentioned increased risk of ischaemic stroke with increased serum triglyceride levels. 48.48% patients with extracranial vascular lesion were having raised serum triglyceride levels. Christopher *et al*¹⁹ also found raised triglycerides as a risk factor for ischaemic stroke. When association of raised LDL levels with ischaemic stroke was studied it was observed that 52.88% patients were having raised levels of low density lipoprotein (LDL). Zhao Cx *et al*²⁰ in their study also observed high LDL levels as an independent risk factor for ischaemic strokes. 63.64% patients with extracranial vascular lesion in our study were having raised LDL levels. Heiss G *et al*¹⁵ have also mentioned about positive correlation of raised LDL levels with extracranial strokes. It was observed that 67.31% patients with ischaemic stroke were having low levels of high density lipoproteins (HDL). In a study carried out by Uddin MJ *et al*²¹, low HDL levels was found to be a risk factor for ischaemic stroke. It was also observed that 72.73% patients with extracranial vascular lesion were having low HDL levels. Heiss G *et al*¹⁵ also states protective influence of HDL in extracranial vascular lesions leading to stroke in their study.

CONCLUSION

Thus we conclude that raised homocysteine levels, hypercholesterolaemia, hypertriglyceridaemia and raised LDL levels are found to be important risk factors for ischaemic strokes due to extracranial vascular lesion. HDL appears to have protective influence on extracranial vascular lesion.

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