Lipid Profile And Carotid Artery Plaque In Ischaemic Stroke Patients

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Abstract

Stroke patients have significant lipid abnormality and it is associated with formation of carotid artery plaque. This is an observational study conducted at the department of Medicine, Rajshahi Medical College Hospital, Rajshahi, to observe the frequency of carotid artery plaque in ischaemic stroke patients and its correlation with dyslipidaemia. Fifty patients of stroke with cerebral infarction confirmed by CT scan of brain were included. The frequency of significant carotid artery plaque was on right side 52%, on left side 40% and on both side 34%. Both left and right internal carotid artery showed positive correlation with serum total cholesterol, LDL cholesterol and HDL cholesterol but it was not statistically significant (r<0.05).

Introduction

Stroke is the third most common cause of death and is the main cause of neurological disability today. Among the risk factors of stroke, dyslipidaemia particularly low-density lipoprotein (LDL) cholesterol is important. Dyslipidaemia and atherosclerosis have got important associations between them. Aging is associated with progressive accumulation of atherosclerotic lesions in carotid arteries and it’s bifurcation point is a favored site for the development of atherosclerotic plaque. The extent of these carotid lesions is directly related to the presence of clinically manifested stroke and transient ischaemic attack. This echolucent carotid artery plaques are associated with increased levels of triglyceride in the fasting and postprandial state. Presence of stenotic atherosclerotic carotid plaque is a well-established risk factor for ischaemic stroke. Recent trials have shown that the incidence of stroke can be reduced by using cholesterol lowering drugs which reduce carotid artery intima-media thickness. In Bangladesh, the exact situation regarding carotid atheroma is not known. Therefore, this study was performed among Bangladeshi patients with ischaemic stroke to observe the frequency of carotid artery plaque in ischaemic stroke patients and its correlation with dyslipidaemia.

Material and Methods

This descriptive cross sectional study was carried out on 50 consecutive admitted patients, age between 40 to 90 years, presented within 48 hour of symptom onset of stroke. Stroke was defined according to WHO criteria. Ischaemic stroke was confirmed by clinical examination and CT scan of brain. Fasting (at least 12 hours) blood sample was taken from each patient for lipid profile, blood sugar and other relevant investigations. Carotid duplex ultrasound scanning was done in all patients using a Siemens ACUSON CV-70 ultrasound scanner with a 7.5 MHz transducer. Doppler spectral analysis showed three categories

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of stenosis: mild (<30%), moderate (31-69%) and severe (≥70%) on the basis of reduction of lumen diameter. Four ultrasonographic plaque characteristics were defined: echolucent, echogenic, mixed pattern and isoechoic. Dyslipidaemia was assessed by raised fasting serum cholesterol >200 mg/dl, LDL>130 mg/d, TG >150 mg/dl and HDL <40 mg/dl (NCEP-2001).9

Results
Among fifty (50) patients of cerebral infarcts, forty (80%) patients were male and ten (20%) were female. Male female ratio was 4:1. Doppler study showed RICA plaque in twenty six (52%) cases and LICA plaque in twenty (40%) cases respectively. Both sided carotid plaque were observed in seventeen (34%) patients (Table -I). Thirteen (26%) plaques were echolucent and thirty three (66%) were echogenic (including mixed and isoechoic). The right internal carotid artery was commonly associated with plaque formation than left (56% vs 40%). Mean intima-media thickness of right internal carotid artery was 1.20 ± 0.8 mm and left internal carotid artery was 1.46 ± 0.8 mm. Left internal carotid artery showed maximum intima-media thickness than right (1.46 vs 1.29 mm).

Seventeen (34%) patients showed mild, ten (20%) patients showed moderate and four (8%) patients showed severe carotid stenosis in RICA and seventeen (34%) patients showed mild, nine (18%) patients showed moderate and three (6%) patients showed severe carotid stenosis in LICA (Table II). Twenty four (48%) cases showed hypercholesterolemia, twenty (40%) cases showed abnormal TG-cholesterol, thirty nine (78%) cases showed high LDL-cholesterol and thirteen (26%) cases showed low HDL-cholesterol (Table-III).

Among the patients of hypercholesterolemia, sixteen (66.6%) had carotid plaque and eight (33.3%) had no plaque. Surprisingly, thirteen (26%) cases had carotid plaque despite of normal cholesterol level. Among the patients of hypertryglyceridemia, eleven (56%) patients showed carotid plaque and nine (45%) patients had no plaque. Patients with abnormal LDL-cholesterol, twenty two (56.4%) cases showed plaque and seventeen (43.5%) showed no plaque. Seven (53.8%) cases showed plaque and six (46.1%) cases showed no plaque in patients with abnormal HDL cholesterol (Table-IV). Left internal carotid artery showed positive correlation with serum cholesterol, LDL cholesterol and HDL cholesterol but it is not statistically significant (r=<0.05). Right internal carotid artery showed positive correlation with LDL and HDL cholesterol and it is also statistically not significant (r=<0.05) (Table-V).

Discussion
This is an observational study and was carried out to find out the correlation between carotid artery plaque and serum lipid profile of ischaemic stroke patients. The risk of stroke increases with age10 and the majority of the subjects in this study were in between sixth and seventh decade of life and their mean age 61.72±11.32 years. Iqbal et al11 and Victor and Ropper12 also showed similar age statistics (mean age 60.8±13 yrs.) in their study patients. This difference is possibility because of poor awareness and poor control of risk factors of cerebral infarction in Bangladeshi as compared to western countries.

Dyslipidaemia and atherosclerosis have got important associations between them.1-3 Several authors had tried to establish a correlation between dyslipidaemia and altherosclerosis but results were conflicting. Saloner et al13 showed positive association of carotid plaque formation with serum cholesterol and TG level. Adem et al14 showed an increase frequency of cortical stroke in low HDL cholesterol patients. But Framingham study failed to establish a significant association between carotid plaque and lipid states. We also found a positive correlation of serum cholesterol, LDL cholesterol and HDL cholesterol with left and right internal carotid artery plaque formation. But unexpectedly this result is statistically not significant. However a large scale study would establish a significant statistical result in future.

Conclusion:
Dyslipidemia is more associated with carotid artery plaque formation. Left internal carotid artery showed positive correlation with serum total
cholesterol, LDL cholesterol and HDL cholesterol. Right internal carotid artery also showed positive correlation with LDL and HDL cholesterol. So it can be concluded that dyslipidaemia has an important role in the formation of carotid plaque.

**Tables**

**Table I:** Detection of carotid artery plaque of patients

| Involvement of carotid artery | No. of patient | Percentage |
|-------------------------------|----------------|------------|
| LICA                          | 20             | 40%        |
| RICA                          | 26             | 52%        |
| Both Rt. & LICA               | 17             | 34%        |
| No plaque both side          | 21             | 42%        |

**Table II:** Grading of stenosis

| RICA            | No. of patient | Percentage |
|-----------------|----------------|------------|
| Mild ≤30%       | 17             | 34%        |
| Moderate 31-69% | 10             | 20%        |
| Severe >70%     | 4              | 8%         |
| **L ICA**       |                |            |
| Mild ≤30%       | 17             | 34%        |
| Moderate 31-69% | 9              | 18%        |
| Severe >70%     | 3              | 6%         |

**Table III:** Lipid profile of stroke patients

| Lipid profile        | No. of patients | Percent (%) |
|----------------------|-----------------|-------------|
| Total cholesterol (≥200 mg/dl) | 24             | 48%         |
| Triglyceride (≥150 mg/dl)       | 20             | 40%         |
| LDL-cholesterol (≥130 mg/dl)    | 39             | 26%         |
| HDL-cholesterol (<40 mg/dl)     | 13             | 26%         |

Total no of patients 50, Total cholesterol- Normal (<200 mg/dl), Triglyceride- Normal (<150 mg/dl), LDL-cholesterol- Normal (<130 mg/dl), HDL-cholesterol- Normal (≥40 mg/dl).

**Table IV:** Dyslipidaemia in patients with carotid artery plaque

| Lipid profile (Abnormal) | Plaque (positive) | Plaque (negative) | Total |
|--------------------------|-------------------|-------------------|-------|
| Hypercholesterolemia     | 16 (66.66%)       | 8 (33.34%)        | 24    |
| TG-c abnormal            | 11 (55.00%)       | 9 (45.00%)        | 20    |
| LDL-c abnormal           | 22 (56.41%)       | 17 (43.59%)       | 39    |
| HDL-c abnormal           | 7 (53.84%)        | 6 (46.16%)        | 13    |

**Table V:** Correlation of carotid artery plaque with dyslipidaemia.
(Correlation ‘r’ value)

| Carotid artery plaque          | Serum cholesterol | Triglyceride | LDL  | HDL  |
|--------------------------------|-------------------|--------------|------|------|
| Left Internal Carotid          | 0.81              | -0.066       | 0.109| 0.083|
| Right Internal Carotid         | -0.038            | -0.085       | 0.094| 0.047|

Interpretation: Correlation is significant at the level of 0.05 levels (2-tailed).

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