

Risk factor in patients of cerebrovascular accident

RANJIT PATIL¹ and UPLABDHI RAGHUWANSHI²

¹Medical Biochemistry Department, Dr. Ulhas Patil Medical College, Jalgaon (India).

²Maharashtra University of Health Sciences, Nashik B.J. Medical College, Pune, (India).

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ABSTRACT

The present study aims at-(1) The effect of derangement of lipid patterns in CVA patients; and (2) The effect of CVA on derangement of lipid patterns; both on 1st and 7th day. The study included 25 patients of CVA (stroke) whose 12-14 hr fasting samples were obtained, within 24 hours of admission, i.e. on 1st and 7th day. The measured lipid levels (TC, HDL-c, & RF [TC: HDL-c]) were compared to the normal range (130 to 250 mgs/dL, 30 to 70 mgs/dL, & < 4:1, respectively). It was found that measured mean value of serum TC was 190.24 mgs/dL, HDL-c = 38.68 mgs/dL, & RF = 5: 1, with corresponding normal values on 1st day, which on 7th day showed decrease for 158.16 mgs/dL, 35.68 mgs/dL, & 4.5: 1 correspondingly. The measured lipid parameters showed a considerable decrease on 7th day, as the stroke severity decreased, it could be proportionally linked with the severity of stroke. Thus stroke causes a significant derangement in lipids. Individuals with low HDL-c should be considered a group at high risk of stroke, whereas direct relationship has been observed with levels of TC & RF (comparing 1st day with control).

Key words: Cerebrovascular Accident; Total Cholesterol; High-density lipoprotein cholesterol; Risk factor.

Abbreviations: CHE = Cholesteryl ester hydrolase; CHO = Cholesterol oxidase
POD = Peroxidase; RF = Risk factor.

INTRODUCTION

Stroke is a syndrome characterized by acute onset of neurologic deficit that persists for at least 24 hours, reflects focal involvement of the CNS. Amongst the leading neurologic disorder stroke is the 3rd most cause of death, disability, and health-care expenditure⁶.

Strong correlations between plasma lipids concentrations & risk of stroke have never been clearly established. The present study attempts to associate this; specifically showing the derangement caused in TC, HDL-c, & RF in CVA patients & also the effect of stroke on this derangement (on the 1st day, i.e. of admission after an acute onset & on 7th day of stroke). The present study establishes the role of lipids as a factor in stroke risk. Chief role of

cholesterol in pathologic processes is a factor in the genesis of atherosclerosis of vital arteries, causing cerebrovascular, coronary, & peripheral vascular disease. There is also an established inverse relationship between HDL-c concentrations & coronary heart diseases including strokes, which is consistent with the function of HDL in reverse cholesterol transport. Many studies have been done which aims at derangement of lipids in stroke patients but not sufficient data is available for establishing the relationship between derangement of lipid patterns, especially showing the effect of risk factor, in CVA patients & also on the effect of stroke on this significant derangement particularly on the 1st day of admission after an acute onset of the disease and on the 7th day of stroke. The present study attempts to do so.

MATERIAL AND METHODS

Clinical material

The present work on, "Risk factor in patients of cerebrovascular accident", was done in the Department of Medical Biochemistry, Gandhi Medical College, in association with the Department of Medicine, Hamidia Hospital, Bhopal, Madhya Pradesh. The clinical material for the present study comprised of 25 patients of CVA (20 males & 05 females), which were randomly selected from the emergency wards of medicine department, & 25 healthy subjects (15 males & 10 females), during the year 2004-05. All were in the age group 30-55 years and 56 & above years.

Inclusion criteria

Cerebrovascular accident (CVA), were included irrespective of etiology.

Exclusion criteria

Patients suffering from diabetes, hypertension, myocardial infarction, & cases of unconsciousness with fever and vomiting.

Methods

Biochemical parameters included serum TC, HDL-c, & RF [TC: HDL-c] that were estimated colorimetrically using appropriate wavelength filters. The 12-14 hr fasting samples (approximately 5 ml of whole blood) of patients were taken within 24 hrs of admission, i.e. on the 1st day and then again on the 7th day during the period of hospitalization. For invitro quantitative determination of activity of lipid fractions in serum following kit methods were implemented. Kits were manufactured by Sigma diagnostics (India) Pvt. Ltd., Baroda. The data were statistically analyzed using 't-test'. The methods employed are shown in table 4.

RESULTS AND DISCUSSION

Observations seen in both the control & morbid groups are:

Mean Values of Lipid Profile in Control Group (table 1):

TC was reported at a value of (max – min) 195 – 136 mgs/dL which was in accordance with average mean TC values by Gardner (1929)⁴. Mean

HDL-c & RF (54.12 ± 8.93 & $3.9: 1 \pm 0.529$) values were in accordance with the study conducted by Kiran Hasija & Hardeep K Bagga (2005)⁶.

Mean Values in Morbid Group on the Day of Admission (table 2)

On statistical analysis of the values of first day in morbid group versus the control group highly significant values were found for HDL-c & RF ($p < 0.001$), whereas for TC ($p < 0.01$) the t-value was found to be significant.

A recent overview of 10 prospective studies of association between plasma cholesterol concentration > 5.7 mmol/l and stroke risk found a pooled risk of 1.31 which was statistically significant {Quiziblash N, *et al.*, (1992)}¹¹ Lindenstrom, *et al.*, (1994) showed that the association between plasma cholesterol and risk of non-hemorrhagic event is not log linear; only relatively high cholesterol concentrations are associated with significantly increased risk³. Some studies found positive association with total stroke {Nubiola AR, *et al.*, (1981)⁹, ischemic stroke {Quiziblash N, *et al.*, (1991)¹²} which was in accordance with the present study ($p < 0.01$) when compared with control group. Highest level found in the present study was 280 mgs/dL (demonstrated as borderline high, 200 to 400 mgs/dL, according to Burtis, *et al.*, (2001).

The predictive power of low HDL-c concentrations in serum for CAD, independently of other risk factors, has been well demonstrated in numerous epidemiological studies involving populations {Assmann & Schulte (1992)}¹.

The present study demonstrated mean HDL-c value of 38.68 ± 11.8 (ranged from 88 – 25 mgs/dl) on admission. A highly significant variation was found between HDL-c & stroke ($p < 0.001$). Giubilei F, *etal* (1990) demonstrated that the mean lowest HDL-c value was observed in stroke patients⁵. The only prospective study that reported a relation between HDL-c and stroke risk is the Framingham Study, in which HDL-c has non-significant protective effect in both men and women and on ischemic stroke in men. According to William J Marshal ideal HDL-c > 1.0 ; borderline = $0.9 - 1.0$; & abnormal < 0.9 (lowest range in the present study was 25 mgs/dl [0.65 mmol/l]).

Table 1: Observations seen in both the control & morbid groups are**Table 1: Mean values \pm SD of lipids in control group**

| Biochemical Parameter | Range [Max-Min] (mgs/dL) | Mean \pm SD |
|-----------------------|--------------------------|---------------------|
| TC | 195 -136 | 159.36 \pm 15.865 |
| HDL-c | 74-40 | 54.12 \pm 8.931 |
| RF [TC: HDL-c] | 3.9: 1-2.1: 1 | 2.968 \pm 0.529 |

Table 2: Mean values \pm SD in morbid group on the day of admission

| Biochemical Parameter | Range [Max-Min] (mgs/dL) | Mean \pm SD |
|-----------------------|--------------------------|----------------------|
| TC | 398 - 143 | 190.24 \pm 52.24** |
| HDL-c | 88 - 25 | 38.68 \pm 11.8* |
| RF [TC: HDL-c] | 6.3: 1 - 3.4: 1 | 4.996 \pm 0.752* |

* p < 0.001 (highly significant); ** p < 0.01 (significant) on comparison of 1st day values with control group.

Table 3: Mean values \pm SD in morbid group on 7th day of admission

| Biochemical Parameter | Range [Max-Min] (mgs/dL) | Mean \pm SD |
|-----------------------|--------------------------|----------------------|
| TC | 278 - 124 | 158.16 \pm 33.65** |
| HDL-c | 63 - 22 | 35.68 \pm 7.93*** |
| RF [TC: HDL-c] | 5.9: 1 - 3.4: 1 | 4.5 \pm 0.691* |

* p < 0.001 (highly significant); ** p < 0.02 (significant); *** p > 0.05 (insignificant) when 1st day values were compared with those of 7th day.

Table 4: Methods employed

| Lipid Parameter | Method | Wavelength (nms) | Formula | Normal Value (mgs/dL) |
|-----------------|--------------------------------------|------------------|---------------------------------------|---|
| TC | Enzymatic (CHE, CHO, & POD) | 505 (green) | A (T) \cdot ₂₀₀ A (S) | 130 – 250 |
| HDL-c | PTA Precipitation & Enzymatic Method | 505 (green) | A (T) \cdot ₁₀₀ A (S) | 30 – 70 [Males = 30 – 63] [Females = 35 – 75] |
| RF | - | - | TC:HDL-c | < 4:1 |

Mendez I, *et al.*, (1987) demonstrated a correspondingly higher ratio of TC: HDL-c ($p < 0.01$) that could be marginally correlated with the present study with mean 4.996 ± 0.752 mgs/dL (6.3 to 3.4) ($p < 0.001$)⁸.

Mean Values in Morbid Group on 7th Day of Admission (table 3)

All the values showed a considerable decrease on the 7th day of stroke. The values of HDL-c & RF, though were found to be decreased on 7th day, but didn't show a very much compatible difference. A significant relationship was seen in values of TC ($p < 0.02$), highly significant relation for RF values ($p < 0.001$), & insignificant relationship was noted for HDL-c ($p > 0.05$) values, when statistical analysis was done between 1st day Vs 7th day. Therefore it is concluded that TC & RF tends to fall on 7th day whereas no significant conclusion can be drawn out for values of HDL-c. Hence it can be said that stroke causes particular derangement in values of lipids, which tends to decrease as severity of stroke decreases.

Comparison of 1st Vs 7th day

The present study demonstrated a considerable decrease in values on 7th day as compared to 1st day. Mean TC value was lower on 7th day and was in accordance with study by Mendez I, *et al.* (1987). According to him serum TC in cerebral infarction patients (50 – 69 years) was lowest on 7th day; intermediate on 1st day, and highest at 3 months, whereas HDL-c changed a little; however, the present study demonstrated HDL-c ($p > 0.05$) to be insignificant. The 1st day mean fasting HDL-c of cerebral infarction patients was significantly lower in subjects aged 50 – 59 years than in those aged 60 – 69 years (23 ± 3 Vs 42 ± 5 mgs/dl), and there was correspondingly higher ratio of TC:HDL-c ($p < 0.01$). The present study demonstrates RF to be highly significant ($p < 0.001$) on statistical analysis on 1st day Vs 7th day.

Similarly, according to Aull S, *et al.*, (1996) TC levels of group B patients (levels determined within 49 – 168 hours after an acute event) were significantly lower than group A levels (12 – 48 hours)². The present study demonstrated significant association for both TC ($p < 0.02$) when 1st day was statistically analyzed versus 7th day.

V Hachinski, *et al.*, (1996) demonstrated that plasma TC ($p = 0.003$) was significantly higher among patients with thromboembolic strokes and TIAs than among control subjects.⁽¹³⁾ This is in accordance with the present study ($p < 0.02$). Therefore, the study shows specific derangement in lipids (due to the effect of stroke) with all parameters found to be decreased on 7th day, which is in accordance with study by Aull S, *et al.* (1996) & Mendez I, *et al.* (1987), which demonstrated that lipids tend to temporarily fall after an acute stroke. The phenomenon is probably not strictly related to inadequate nutrition that might result from the conservative early management of dysphagia because the same phenomenon has been seen in patients with many acute neurologic conditions.

Thus to conclude, in the followup study a significant relation was seen for TC ($p < 0.02$) when compared with values on 1st day of admission while a highly significant relation ($p < 0.001$) was seen for RF values. These variations could be the result of conservative treatment, the patients underwent for the proceeding seven days. However, no significant change ($p > 0.05$) was seen in values of HDL-c.

CONCLUSIONS

All the values showed a considerable decrease on 7th day as stroke severity decreased.

Therefore all lipid parameters were found to be proportionally linked with stroke severity. These variations could be the result of conservative treatment the patients underwent for the proceeding 7 days. Therefore, CVA/stroke causes a significant derangement in lipids while comparing the 1st day Vs 7th day values (with increased values on 1st day & considerable decrease on 7th day). TC should be considered as a significant risk factor for CVA. HDL-c values couldn't draw out any significant conclusion. Whereas highly significant relationship was seen with RF in followup correlated with improved condition of patients on 7th day. However a larger study with more population of similar clinical background is needed to be planned to establish the role of low HDL-c as a risk factor in stroke; also predicting the role of CVA in causing derangement in levels of lipids.

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