Serum Lipids and Uric Acid Relationship in Ischemic Thrombotic Cerebrovascular Disease

BY B. C. BANSAL, M.D., R. R. GUPTA, M.D., M. R. BANSAL, M.B.B.S., AND C. PRAKASH, M.D.

Abstract: Serum lipids and serum uric acid have been studied in 50 patients with ischemic thrombotic cerebrovascular disease. Patients having diseases known to predispose to hyperuricemia were excluded. Abnormalities of large vessels were present in 14 of 30 cases (46.6%) as a whole, and in 9 of 16 cases (56.5%) below 40 years of age. Thirty percent of the cases showed hyperuricemia. A statistically significant rise in serum triglycerides, pre-beta lipoproteins and serum uric acid was found in all 50 patients and in patients below 40 years of age. In patients above 40 years of age, only the rise in serum triglycerides and pre-beta lipoproteins was found to be statistically significant. A statistically significant rise in serum triglycerides, pre-beta lipoproteins, cholesterol and uric acid was found in patients with abnormal angiograms. A statistically significant correlation was observed between serum uric acid and serum triglycerides in all the groups, between serum uric acid and pre-beta lipoprotein in patients below 40 years of age, and between serum uric acid and serum phospholipids in patients with abnormal angiograms. These factors may be playing a role in the causation of ischemic thrombotic cerebrovascular disease in general and especially in patients below 40 years of age.

Additional Key Words
risk factors  pre-beta lipoprotein  triglycerides
age  cholesterol

Ischemic thrombotic cerebrovascular disease is more common in older individuals than in younger individuals. Increasing numbers of cases are being observed in younger age groups. However, the etiological factors responsible for this are not understood. The role of abnormalities of blood lipids and uric acid has been mentioned in relationship to the etiology of coronary artery disease. The part played by elevated values of blood lipids and uric acid in the causation of ischemic thrombotic cerebrovascular disease is not understood. The present study was undertaken to assess the status of lipids and uric acid in patients who had ischemic thrombotic cerebrovascular disease.

Methods
Fifty cases of ischemic thrombotic cerebrovascular disease (stroke) were studied. All cases had sudden development of neurological deficit and satisfied currently accepted diagnostic criteria for stroke. Patients having diseases known to predispose to hyperuricemia were excluded. Patients with cerebral venous sinus thrombosis occurring during puerperium, patients with cerebral or subarachnoid hemorrhage, or patients with some systemic cause for embolism also were excluded from the study. Clinical history and detailed physical examination were recorded on special forms. The biochemical investigations were done three weeks after the onset of stroke. These included the following: hemoglobin, total and differential leukocyte count, BSR, blood for STS, blood sugar, blood urea, urine, stools, chest x-ray, ECG, serum uric acid, serum triglycerides, serum phospholipids, serum free fatty acid, serum lipoprotein, and serum cholesterol. Percutaneous carotid angiography was done in 30 cases. The contrast material used was meglumine iohexal 60% (CONRAY-280). An equal number of age-matched and sex-matched healthy individuals were taken as controls for these special investigations except for arteriography. A total of 50 cases of nonembolic cerebral infarction was studied. These patients were divided into the following groups for analysis: Group A: 50 patients as a whole; Group B: 25 patients over 40 years of age; Group C: 25 patients below 40 years of age; Group D: 14 patients with abnormal angiograms, and Group E: 16 patients with normal angiograms. Groups A, B and C were compared with corresponding controls while Group D was compared with Group E.

Results
The age and sex distribution of these 50 cases is shown in table 1. Clinical features are shown in table 2.

Sixteen patients had normal angiograms and 14 revealed various abnormalities, as displayed in table 3.
TABLE 1

Age and Sex Distribution of 50 Patients With Ischemic Thrombotic Cerebrovascular Disease

<table>
<thead>
<tr>
<th>Sex</th>
<th>Below 40 years</th>
<th>Above 40 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>25</td>
</tr>
</tbody>
</table>

TABLE 2

Clinical Features in 50 Patients With Ischemic Thrombotic Cerebrovascular Disease

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceding febrile illness</td>
<td>7</td>
</tr>
<tr>
<td>Preceding delivery</td>
<td>6</td>
</tr>
<tr>
<td>Preceding convulsions</td>
<td>1</td>
</tr>
<tr>
<td>Preceding headache</td>
<td>1</td>
</tr>
<tr>
<td>Unconsciousness</td>
<td>16</td>
</tr>
<tr>
<td>Right-sided hemiplegia</td>
<td>25</td>
</tr>
<tr>
<td>Left-sided hemiplegia</td>
<td>21</td>
</tr>
<tr>
<td>Monoplegia</td>
<td>3</td>
</tr>
<tr>
<td>Left upper limb with face</td>
<td>1</td>
</tr>
<tr>
<td>Left lower limb</td>
<td>1</td>
</tr>
</tbody>
</table>

Abnormalities of large vessels were present in 46.6% of the cases (14 of 30) in Group C and 56.5% of the cases (9 of 16) in Group A.

Preceding febrile illness was observed in these patients. A statistically significant increase in the mean level of serum cholesterol was found in Group D as compared to Group E (P < 0.05).

The mean for serum uric acid levels in the controls was 5.8 mg % (± SD 0.77). Patients having a uric acid level above 7.3 mg % were considered hyperuricemic. Thirty percent of the patients had hyperuricemia of this degree. The mean level of serum

TABLE 3

Angiographical Findings in 30 Patients

<table>
<thead>
<tr>
<th>Findings</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group D (abnormal angiograms)</td>
<td>14*</td>
</tr>
<tr>
<td>Internal carotid block (extracranial)</td>
<td>5</td>
</tr>
<tr>
<td>Internal carotidatheroma (intracranial)</td>
<td>4</td>
</tr>
<tr>
<td>Middle cerebral artery block</td>
<td>4</td>
</tr>
<tr>
<td>Anterior cerebral artery block</td>
<td>5</td>
</tr>
<tr>
<td>Group E (normal angiograms)</td>
<td>16</td>
</tr>
</tbody>
</table>

*Four had multiple abnormalities
TABLE 5
Comparison of Serum Uric Acid in Various Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Serum uric acid (mg %)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6.5 ± 1.19*</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>B</td>
<td>5.8 ± 0.77*</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>C</td>
<td>6.6 ± 1.24*</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>D</td>
<td>5.4 ± 0.73*</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>E</td>
<td>6.4 ± 1.18*</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>5.4 ± 0.69*</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>7.3 ± 1.22*</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>6.3 ± 1.19*</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

*SD.

Group A: patients as a whole.
Group B: patients above 40 years of age.
Group C: patients below 40 years of age.
Group D: patients with abnormal angiograms.
Group E: patients with normal angiograms.

uric acid was greater in patients in Group A compared to controls; the rise was statistically significant (P < 0.05). A comparison between Groups B and C with corresponding controls showed a statistically significant elevation of serum uric acid only in Group C (P < 0.05). Likewise, a statistically significant elevation in serum uric acid level was found in Group D (P < 0.05) (table 5) when compared with Group E.

The serum uric acid values were correlated with each of the lipid fractions. In assessing the relationship between hyperuricemia and elevated lipid fractions, the intercorrelation (Pearson's Product moment) was calculated between serum uric acid and the lipid fractions. A statistically significant correlation (P < 0.05) was observed between serum uric acid and triglycerides in Groups A, B, C and D; between serum uric acid and phospholipids in Group D; and between serum uric acid and pre-beta lipoprotein in Group C. These relationships are shown in table 6.

Discussion
In the present study, though the mean level of all lipid fractions was raised, the increase was more pronounced and statistically significant for the serum triglycerides and pre-beta lipoprotein fractions. This observation is in agreement with most reported studies. There is no correlation between serum phospholipids and ischemic thrombosis cerebrovascular disease. Lack of rise in the level of serum cholesterol, correlated with the frequency of stroke, is also in agreement with the findings of some other observers. The hyperuricemia found in 30% of these patients does not seem to be a secondary or transitory phenomenon as the diseases known to predispose to hyperuricemia were excluded from this study (also serum uric acid estimated three weeks after the onset of stroke). This finding suggests that the hyperuricemia may be one of the factors in the pathogenesis of atheroma. Meyer et al. noted that 17 of 19 hyperuricemic patients had atherosclerosis of the large aortocranial vessels. In this study a statistically significant correlation was found between serum uric acid and serum triglycerides in Groups A, B, C and D. Likewise, a significant interrelationship was observed between serum uric acid and serum phospholipids in Group C and between serum uric acid and pre-beta lipoprotein in Group D. This suggests that a rise in serum uric acid and serum triglyceride may play some part in the etiology of ischemic thrombotic cerebrovascular disease. Other lipid fractions may be particularly important in patients below the age of 40 in whom ischemic thrombotic cerebrovascular disease develops and in causation of occlusive disease of large aortocranial vessels.

References

TABLE 6
Intercorrelation of Serum Uric Acid and Lipid Fraction in Various Groups of Patients

<table>
<thead>
<tr>
<th>Uric acid</th>
<th>Triglycerides</th>
<th>Phospholipids</th>
<th>Free fatty acid</th>
<th>Cholesterol</th>
<th>Beta</th>
<th>Lipoprotein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.5814*</td>
<td>0.1346</td>
<td>0.0898</td>
<td>0.1500</td>
<td>0.0978</td>
<td>0.118</td>
</tr>
<tr>
<td>Group B</td>
<td>0.592*</td>
<td>0.1163</td>
<td>0.133</td>
<td>0.204</td>
<td>0.0826</td>
<td>0.211</td>
</tr>
<tr>
<td>Group C</td>
<td>0.7682*</td>
<td>0.4159</td>
<td>0.0348</td>
<td>0.1585</td>
<td>0.2265</td>
<td>0.3444*</td>
</tr>
<tr>
<td>Group D</td>
<td>0.5271*</td>
<td>0.5599*</td>
<td>0.4343</td>
<td>0.1265</td>
<td>0.2812</td>
<td>0.662</td>
</tr>
</tbody>
</table>

*P < 0.05 (significant).

Group A: patients as a whole.
Group B: patients above 40 years of age.
Group C: patients below 40 years of age.
Group D: patients with abnormal angiograms.
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