Evaluation of Enzymes in Serum and Cerebrospinal Fluid in Cases of Stroke

N. Parakh, H.L. Gupta, A. Jain

Summary

Levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH) and creatine kinase (CK) were estimated in serum and cerebrospinal fluid of 25 patients of stroke, and were correlated with severity of disease. 21 (84%) patients had ischemic stroke and four (16%) had hemorrhagic stroke. Serum and CSF AST levels were significantly elevated in the study group. The rise in CSF AST was more in the hemorrhagic subtype than in the ischemic subtype. Serum ALT and CSF LDH levels were also significantly elevated in patients with ischemic stroke. None of the enzyme levels were related to the severity of disease as assessed by the Glasgow coma scale.

Key words : Cerebrovascular accident, Serum enzyme, CSF enzyme.

Introduction

Determination of levels of various enzymes is an established method for diagnosing and assessing the severity of many diseases of heart, liver, muscles, prostate, bone and many other organ systems but its role in neurological disorders is yet uncertain. Brain is a rich source of a variety of enzymes and any injury (e.g. stroke) to brain tissue could similarly result in an increase in activity of these enzymes in cerebrospinal fluid. A simultaneous increase in serum levels will probably depend on integrity of blood brain barrier. If injury is severe enough to disrupt the blood brain barrier there might be some rise in enzymatic activity in serum. It was in this context that the present study was done to assess the levels of various enzymes like aspartate aminotransferase (AST), alanine aminotransferase (ALT), creatine kinase (CK) and lactate dehydrogenase (LDH) in serum and CSF of patients with stroke. An attempt was also made to find out if any relationship exists between the extent of elevation of these enzymes and the severity of disease assessed as per Glasgow coma scale.

Material and Methods

The present study was conducted in the Departments of Medicine and Biochemistry, Lady Hardinge Medical College and Associated Hospitals, New Delhi. 25 patients, who presented with acute stroke syndrome and 10 age and sex matched subjects were included in the study. The controls included cases of hydrocele, hernia and minor surgical ailments, who were operated under spinal anesthesia, and a few psychiatric patients in whom lumbar puncture was performed in order to exclude organic brain disorder.

The following subjects were excluded from the study
i) Individuals having systemic hepatic, pancreatic, cardiac, muscular and other diseases known to cause increase in the levels of enzymes, under consideration, in study.
ii) Individuals having raised intracranial tension as confirmed by clinical and ophthalmological examination. Lumbar puncture was performed in all patients between 2nd to 5th day after onset of stroke.
Serum and CSF levels of enzymes AST, ALT, CK and LDH were determined in all patients. CT scan head was done in all patients. The assessment of severity of patients enrolled in study group was done as per Glasgow coma scale at the time of admission.

Results

There were 15 male and 10 female patients in the study group. Twenty one patients had ischemic stroke while 4 patients had hemorrhagic stroke. Age of patients in the study group ranged from 20 to 85 years (mean – 61 yrs). Except for one patient in hemorrhagic subtype where Glasgow coma score was 4, rest of the patients had score between 7 to 15. Patients in hemorrhagic subtype had lesser score than those in ischemic group. There was no significant change in serum and CSF ALT and CK levels in the study group. Mean serum and CSF AST levels were 20 U/L and 10.40 U/L respectively in control group. In study group these levels were 51.96 U/L and 17.28 U/L respectively. The elevation in both the levels was highly significant (p <0.01). Though there was no significant change in serum AST levels between ischemic and hemorrhagic subtype, it was more in CSF hemorrhagic subtype (p < 0.01). There was no significant change in serum LDH levels between the two groups but CSF LDH was significantly raised in the study group (p < 0.01). There was no correlation between the serum and CSF levels of enzymes studied. There was no correlation between the change

Neurology India, 50, December 2002 518
Table I

Various Enzyme Levels in Serum and CSF range (mean)

<table>
<thead>
<tr>
<th>Type of Patients</th>
<th>No. of Patients</th>
<th>Serum</th>
<th>CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALT</td>
<td>AST</td>
<td>CK</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12-34</td>
<td>12-32</td>
<td>46-174</td>
</tr>
<tr>
<td></td>
<td>(21.40)</td>
<td>(20)</td>
<td>(104.6)</td>
</tr>
<tr>
<td>Ischemic stroke</td>
<td>21</td>
<td>9-61</td>
<td>17-139</td>
</tr>
<tr>
<td></td>
<td>(31.05)</td>
<td>(55.29)</td>
<td>(133.5)</td>
</tr>
<tr>
<td>Hemorrhagic stroke</td>
<td>4</td>
<td>8-47</td>
<td>20-60</td>
</tr>
<tr>
<td></td>
<td>(21.25)</td>
<td>(34.50)</td>
<td>(82.75)</td>
</tr>
<tr>
<td>Total stroke cases</td>
<td>25</td>
<td>8-61</td>
<td>17-139</td>
</tr>
<tr>
<td></td>
<td>(29.48)</td>
<td>(32.50)</td>
<td>(125.4)</td>
</tr>
</tbody>
</table>

Discussion

Evaluation of enzyme levels in cerebrospinal fluid as well as in serum has evoked keen interest as a simple, economical, reliable and easily available method for the evaluation of severity, course, prognosis and to some extent in the differential diagnosis of various types of cerebrovascular accidents. The results of various studies done in this field are variable and contradictory. Serum and CSF AST levels were significantly raised above normal in stroke patients. Enzyme activity in CSF might be raised because of the following reason(s). i) an increased outflow from the serum through an incompetent blood brain barrier, ii) increased outflow from cells because of cytolysis, iii) leakage of enzymes from the cells without their obstruction, iv) decreased removal of these enzymes from CSF, v) increased synthesis and release of these enzymes in CSF as a response to vascular insult. Rise in serum AST levels can not be explained only on the basis of disruption of blood brain barrier as normally these enzymes have very low concentration in CSF as compared to serum. The only source from where enzyme could leak into blood is probably the destroyed nervous system, as a result of vascular injury. Various other studies have also suggested rise in serum and CSF AST levels and attributed it to necrosis or anoxic injury to brain tissue. The rise in CSF AST levels was more in hemorrhagic stroke than in ischemic stroke probably as a result of more damage to the brain tissue in cases of hemorrhagic stroke. In the present study rise in AST levels did not correlate with the severity of disease which was assessed as per Glasgow coma scale. Various studies had emphasized that patients with higher AST levels had poorer prognosis but they did not assess the severity of disease in relation to the change in enzyme levels. The reason for lack of correlation between enzyme levels and degree of severity may be due to the fact that changes in the AST levels denotes the degree of biochemical injury to the brain tissue, as a result of vascular insults but it might not reflect the extent and severity of brain injury in physiological terms.

Though Glasgow coma scale is quite simple and precise scale to assess the level of consciousness, it might not assess the exact severity and extent of cerebrovascular accident because of varying nature of presentation without affecting the level of consciousness. Serum ALT and CSF LDH levels were also significantly high in stroke patients but out of various enzymes AST remains the most important one in patients of stroke and may be used as a diagnostic tool in patients of stroke.

References