Ergotamine and Cerebral Blood Flow

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SUMMARY We measured the cerebral blood flow (CBF) of 16 patients by the xenon-133 intracarotid method before and after the intramuscular injection of ergotamine tartrate. The regional and hemispheric CBF was unaltered, even in 3 migraineurs in whom ergotamine relieved the headache. Ergotamine tartrate in therapeutic doses has no effect on the cerebral circulation.

EVIDENCE for an ergotamine effect on the cerebral circulation is indirect and contradictory; therefore, we measured cerebral blood flow (CBF) directly, before and after the administration of therapeutic doses of ergotamine tartrate.

Methods

Regional cerebral blood flow (rCBF) studies were carried out prior to clinically indicated carotid arteriography in 16 patients. Their age, sex and diagnosis are listed in the table. Although cases 5, 6, 8, 10 and 11 were investigated because of suspected brain disease, no brain lesions were demonstrated; hence these patients were, in effect, non-migrainous controls. Informed consent was obtained in all cases. Three millicuries of xenon-133 were injected through an indwelling catheter into the internal carotid artery. The intracarotid catheter was also used for mean arterial blood pressure (MABP) measurements and arterial blood gases analysis. The clearance rate of the isotope, and hence the rCBF, was measured by 16 extra-


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creased CBF; however, their data were obtained from cerebral blood flow in any of the patients. Three after ergotamine tartrate injection, but this rise was not statistically significant. Lennox et al. reported that ergotamine in-carotid angiograms, as reflections of CBF, have been equivocal. Lennox et al. reported that ergotamine increased CBF; however, their data were obtained from thermoelectric flowmeter studies of the internal jugular vein, an indirect and unreliable way of estimating CBF. Shenko, by using the nitrous oxide method, found reduced CBF after ergotamine; but his high control values for CBF and his failure to note Paco2 suggest that these data, too, may be unreliable. Using the more reliable intracarotid xenon-133 method, Simard and Paulson demonstrated that 1 mg of ergotamine, given intravenously, had no effect on rCBF during a prolonged migranous aura, nor three months later, when the patient was asymptomatic. The present study suggests, further, that ergotamine tartrate in therapeutic doses has no effect on the cerebral circulation of non-migraneurs.

**Results**

Ergotamine tartrate did not change the focal cerebral blood flow in any of the patients. Three migraineurs received the drug during the headache phase with relief of pain, but no change in rCBF. The mean hemispheric CBF value showed a slight rise after ergotamine tartrate injection, but this rise was not statistically significant (table).

**Discussion**

Observations of the effect of ergotamine on cerebrospinal fluid pulsatility, retinal vessels, and carotid angiograms, as reflections of CBF, have been equivocal. Lennox et al. reported that ergotamine increased CBF; however, their data were obtained from thermoelectric flowmeter studies of the internal cranial probes, and expressed as CBF corrected (milliliters of blood per 100 grams of brain per minute). rCBF studies were carried out before and 15-20 minutes after an intramuscular injection of 0.2-1.0 mg of ergotamine tartrate. Thus each patient served as his own control.

**Table 1** Cerebral Blood Flow Before and After Ergotamine Tartrate

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Paco2 (mm Hg)</th>
<th>MABP (mm Hg)</th>
<th>CBF (ml/100g/min)</th>
<th>CBF corrected to Paco2 of 40 (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>E</td>
<td>B</td>
<td>E</td>
</tr>
<tr>
<td>1</td>
<td>52</td>
<td>M</td>
<td>Normal pressure hydrocephalus</td>
<td>46</td>
<td>47</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>49</td>
<td>F</td>
<td>Dementia</td>
<td>40</td>
<td>41</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>53</td>
<td>M</td>
<td>Parasagittal meningioma</td>
<td>42</td>
<td>41</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
<td>M</td>
<td>L. temporal glioma</td>
<td>36</td>
<td>29</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>28</td>
<td>M</td>
<td>Temporal lobe epilepsy</td>
<td>43</td>
<td>44</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td>M</td>
<td>Temporal lobe epilepsy</td>
<td>43</td>
<td>44</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>7</td>
<td>57</td>
<td>M</td>
<td>L. cerebral infarct</td>
<td>40</td>
<td>41</td>
<td>110</td>
<td>115</td>
</tr>
<tr>
<td>8</td>
<td>61</td>
<td>M</td>
<td>TIA (R. hemiparesis)</td>
<td>43</td>
<td>47</td>
<td>130</td>
<td>140</td>
</tr>
<tr>
<td>9</td>
<td>55</td>
<td>M</td>
<td>R. hemisphere infarct (minimal)</td>
<td>43</td>
<td>47</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>10</td>
<td>68</td>
<td>F</td>
<td>R. arm weakness</td>
<td>54</td>
<td>50</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>11</td>
<td>43</td>
<td>M</td>
<td>Suspected brain tumor</td>
<td>42</td>
<td>43</td>
<td>115</td>
<td>115</td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td>F</td>
<td>L. parietal angioma</td>
<td>34</td>
<td>33</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>13</td>
<td>65</td>
<td>F</td>
<td>Progressive supranuclear palsy</td>
<td>40</td>
<td>39</td>
<td>125</td>
<td>130</td>
</tr>
<tr>
<td>14</td>
<td>18</td>
<td>F</td>
<td>Migraine</td>
<td>34</td>
<td>31</td>
<td>115</td>
<td>120</td>
</tr>
<tr>
<td>15</td>
<td>38</td>
<td>M</td>
<td>Migraine</td>
<td>37</td>
<td>35</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>16</td>
<td>24</td>
<td>M</td>
<td>Migraine</td>
<td>38</td>
<td>36</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td>41</td>
<td>41</td>
<td>100</td>
<td>106</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>5</td>
<td>6</td>
<td>25</td>
<td>23</td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Paco2 = partial arterial pressure of carbon dioxide; MABP = mean arterial blood pressure; CBF = mean hemispheric cerebral blood flow; CBF corrected = equivalent mean hemispheric cerebral blood flow at a Paco2 of 40 mmHg according to the formula of Olesen et al.; B = baseline; E = post-ergotamine.

There was no statistically significant difference between any of the baseline and post-ergotamine variables (t-test for paired observations).
2. Olesen J, Paulson OB, Lassen NA: Regional cerebral blood flow in man determined by the initial slope of the clearance of the intraarterially injected 133Xe. Stroke 2: 519-540, 1971
Ergotamine and cerebral blood flow.
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Stroke. 1978;9:594-596
doi: 10.1161/01.STR.9.6.594

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

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