INTRACAROTID INJECTION OF SODIUM AMYTAL FOR
THE LATERALIZATION OF CEREBRAL
SPEECH DOMINANCE

EXPERIMENTAL AND CLINICAL OBSERVATIONS

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I
n 1948, during the course of studies on seizure mechanisms, one of us
(J.W.) carried out intracarotid injection of Sodium Amytal and Metrazol to investigate the mechanism of the spread of epileptic discharge
between the cerebral hemispheres in man.9–11 The intracarotid injection of
Sodium Amytal was found to induce a temporary loss of function in the
ipsilateral cerebral hemisphere, including aphasia when the dominant hemisphere was injected. The suggestion was made that this would be a useful
technique for the determination of the lateralization of cerebral speech
dominance. Approximately 80 patients were tested in this way in Japan
during the period 1948–1954, using doses of 50 to 300 mg. of 10 per cent
Sodium Amytal, and no complications were encountered.

In the surgical treatment of focal epilepsy, the presence of speech repre-
sentation has often been verified by electrical stimulation of the speech zones
in the frontal and parietal opercula with the cortex exposed under local anes-
thesia.4–7 Interruption of counting or naming produced by such stimulation
gives positive evidence in this regard. Lack of such response, however, is not
certain proof that speech is in the other hemisphere, since in some instances
the electrical stimulating current does not seem to be an adequate stimulus
and no effect is observed, even though speech is actually subserved by the
convolutions being stimulated. In view of the obvious importance of accurate
knowledge of the lateralization of speech dominance when operating near
the Sylvian regions in ambidextrous and left-handed individuals, further
studies regarding the technique of intracarotid injection of Sodium Amytal
seemed indicated, particularly with regard to the margin of safety in relation
to dose and to the effect of accidental injection into the vertebral artery.
This report concerns some experimental studies on the monkey bearing on
these points, and a brief clinical report on the use of this test in a consecutive
series of 20 patients.

EXPERIMENTAL STUDIES

I. METHODS

Eleven experiments (Table 1) were carried out in 8 macaque monkeys (2.4–5.5
kg.). In each experiment the animal was lightly anesthetized with Pentothal an-

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LATERALIZATION OF CEREBRAL SPEECH DOMINANCE

### TABLE 1

*Summary of monkey experiments*  
(*11 experiments in 8 monkeys*)

<table>
<thead>
<tr>
<th>Animal No.</th>
<th>Date of Experiment</th>
<th>Artery Injected</th>
<th>Dose of 10% Sodium Amytal (mg.)</th>
<th>Date of Sacrifice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apr. 12, 1956</td>
<td>Right common carotid</td>
<td>7, 20, 35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr. 19, 1956</td>
<td>Right vertebral</td>
<td>7, 10, 15, 21, 35, 70</td>
<td>Apr. 19, 1956 (at end of experiment)</td>
</tr>
<tr>
<td>2</td>
<td>Apr. 25, 1956</td>
<td>Right common carotid</td>
<td>140, 210</td>
<td>May 4, 1956</td>
</tr>
<tr>
<td></td>
<td>May 2, 1956</td>
<td>Right vertebral</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Apr. 29, 1956</td>
<td>Right common carotid</td>
<td>350 (20%)</td>
<td>May 19, 1956</td>
</tr>
<tr>
<td></td>
<td>May 18, 1956</td>
<td>Right vertebral</td>
<td>10, 30, 100</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>May 16, 1956</td>
<td>Right common carotid</td>
<td>10, 30, 100</td>
<td>May 17, 1956</td>
</tr>
<tr>
<td>5</td>
<td>May 16, 1956</td>
<td>Right vertebral</td>
<td>10, 30, 100</td>
<td>May 18, 1956</td>
</tr>
<tr>
<td>6</td>
<td>May 22, 1956</td>
<td>Right common carotid</td>
<td>10, 30, 100</td>
<td>May 24, 1956</td>
</tr>
<tr>
<td>7</td>
<td>May 22, 1956</td>
<td>Right common carotid</td>
<td>10, 30, 100</td>
<td>May 24, 1956</td>
</tr>
<tr>
<td>8</td>
<td>May 23, 1956</td>
<td>Right vertebral</td>
<td>10, 30, 100</td>
<td>May 24, 1956</td>
</tr>
</tbody>
</table>

Anesthesia, and either the right common carotid or right vertebral artery was exposed in the neck. One to 6 injections of varying doses of Sodium Amytal (10 per cent solution with 1 exception) were made in each monkey into the exposed common carotid or vertebral artery, using a tuberculin or 2 cc. syringe. The artery was cannulated with a polyethylene tube in the first few experiments, but thrombosis in the cannulated artery developed in 2 animals. In the remainder of the experiments, the in-