ANEURYSMS OF THE ANTERIOR COMMUNICATING ARTERY

BIFRONTAL CRANIOTOMY AND ROUTINE USE OF TEMPORARY CLIPS*

J. LAWRENCE POOL, M.D.

College of Physicians and Surgeons, Columbia University, and Service of Neurological Surgery,
The Neurological Institute, The Presbyterian Hospital, New York, New York

(Received for publication April 12, 1960)

ANEURYSMS of the anterior communicating artery present a particularly difficult therapeutic challenge because of their critical location, the serious circulatory disturbances that may follow their rupture, the prevalence of associated local vascular anomalies, and their marked tendency to fatal recurrent hemorrhage unless treated properly. Tucked between and far under the frontal lobes these single or multilobed aneurysms, which are mostly of congenital origin, arise from the anterior communicating artery that normally links the two anterior cerebral arteries.

Despite their location at so vital a crossroad of the circle of Willis such aneurysms on rupture frequently give rise to no immediate symptoms or signs other than those of acute subarachnoid hemorrhage. Circulatory impairment, however, may develop as the result of vasospasm and lead to neurological signs, permanent brain damage or death. Critical reduction of circulation through one or both anterior cerebral arteries, for example, may initiate ischemic changes in one or both frontal lobes with consequent intellectual deficits, while involvement of perforating arteries and the recurrent artery of Huebner may initiate ischemic infarcts in the basal ganglia, internal capsule and anterior hypothalamus with resultant coma. If the circulation of the optic tracts or nerves is jeopardized or an expanding anterior communicating aneurysm seriously compresses the optic chiasm and nerves, blurred vision, visual-field defects or blindness may occur. Finally, remote widespread cerebral vasospasm or compression of blood vessels by a hematoma may result in ischemia sufficient to cause cerebral edema, infarction or remote areas of softening leading to coma or hemiplegia.

Without surgical intervention the mortality for anterior communicating aneurysms is close to 50 per cent (Table 1). Carotid ligation in the neck has often, though not always, proved equally unsatisfactory for this type of aneurysm, usually because of recurrent hemorrhage, while the morbidity from postligation hemiplegia or other disabilities can be high. It generally has been conceded therefore that intracranial surgery for this type of aneurysm is the procedure of choice, especially as it offers the best chance of eliminating the threat of a fatal recurrent hemorrhage.

While various types of intracranial operations have been practised, each of proven merit, each has in turn certain disadvantages. Proximal ligation of one anterior cerebral artery, for example, does not directly obliterate the aneurysm and may occasionally lead to serious ischemic changes in the brain. There is also the ever present possibility of a fatal recurrent hemorrhage, which may also happen after simply wrapping the aneurysm with muscle or other materials. When a unilateral craniotomy is used, even though the aneurysm is obliterated successfully, functions of the frontal lobes...
ANEURYSMS OF ANTERIOR COMMUNICATING ARTERY

TABLE 1

Aneurysms of anterior communicating artery

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mortality*</th>
<th>Morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Cases Incl. Coma</td>
<td>No Coma (Grades 1-4)</td>
</tr>
<tr>
<td>No surgery</td>
<td>50%+</td>
<td>30%+</td>
</tr>
<tr>
<td>Carotid occlusion</td>
<td>50%+</td>
<td>14%+</td>
</tr>
<tr>
<td>Intracranial surgery</td>
<td>25% (K**)</td>
<td>4.3-20%†</td>
</tr>
<tr>
<td>Bifrontal temporary clips (NINY‡)</td>
<td>17%</td>
<td>13.6%</td>
</tr>
<tr>
<td>1957-60 (23 cases)</td>
<td>—</td>
<td>7.7%</td>
</tr>
<tr>
<td>1959-60 (18 cases)</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

* See text.
** K = Krayenbühl.
† 4.3% Lepoir,26 9% Krayenbühl,27 11% Hamilton & Falconer,22 20% Botterell et al.,* 20% NINY† (techniques other than bifrontal temporary-clip method).
‡ NINY = Neurological Institute of New York.

lobe may be impaired if cerebral resection22,27 or extensive sacrifice of superior cerebral veins27,38 becomes necessary. Another problem to be considered is the important matter of planned temporary reduction of arterial supply to an aneurysm to prevent its premature rupture at operation.13 If this is done by precautionary occlusion of both the vertebral and carotid arteries in the neck8 additional surgery is required and the circulation to the entire brain is threatened, even though hypothermia is used.

Temporary bilateral routine intracranial local reduction of the circulation via a bifrontal bone flap, on the other hand, has proved to be a relatively simple and effective method of preventing premature rupture of the aneurysm and facilitating its direct exclusion from the circulation. Before describing details of this surgical approach as now used, it may be helpful to consider problems relating to the surgery of anterior communicating aneurysms.

PROBLEMS RELATED TO SURGERY OF ANEURYSMS

1. Timing of Operation. As a general principle it has seemed best to proceed with intracranial surgery for anterior communicating aneurysms (as for most other aneurysms) as promptly as possible provided the patient is in reasonably good condition.9,48 This means bilateral,40 and if necessary oblique10 and/or vertebral angiography on the day or night of admission, followed at once by surgery. Delays, especially if longer than a week, frequently result in fatal recurrent hemorrhage10 and occasionally in the late development of hemiplegia.22,31

Late hemiplegia occurring on the 6th or 7th day after subarachnoid hemorrhage, as in 2 of our 22 cases, may well be caused by progressive unilateral cerebral vasospasm as demonstrated arteriographically and confirmed at operation. Our 2 patients, like those reported by others22,31 showed no clinical, lumbar-puncture or operative evidence of further bleeding or of clot formation.

Prompt surgery, however, is not advised for very ill patients who are markedly obtunded and have angiographic evidence of severe widespread vasospasm. In such cases early surgery, or even the completion of contralateral angiographic studies at one stage, has made the patient's condition worse. If their condition improves in 2 or 3 days, completion of angiographic studies and surgery is then usually tolerated.

If cerebral vasospasm is local14,43 and not yet widespread, completion of angiography at one stage and prompt surgery has generally been well tolerated even when such patients are moderately obtunded and confused (Grades 3 and 4 of Botterell et al.).22 Comatose patients (Grade 5)9 have seldom survived surgery.22,27 However the only