Anosmia following operation for cerebral aneurysms in the anterior circulation

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Damage to the olfactory nerve during frontotemporal approach to the basal cisternal region has not previously been investigated in a quantified manner. In this retrospective study of 25 patients operated on for ruptured intracranial aneurysms via the frontotemporal route, 22 patients suffered postoperatively from anosmia ipsilateral to the side of surgery. This complication most often goes unrecognized by the patient as well as the physician, and attention should be drawn to it because of its widespread occurrence. This investigation demonstrates a high incidence of anosmia (24 (88.9%) of 27 surgical sides) occurring ipsilateral to the frontotemporal approach in aneurysm surgery. Recovery after traumatic anosmia has been recorded up to 5 years after injury. Nevertheless, the authors believe that the damage is permanent when lasting 35 months or longer.

Key Words: frontotemporal approach • basal cistern • craniotomy • anosmia • aneurysm • complication

The frontotemporal approach, also known as the Dandy approach, is commonly employed in surgery for aneurysms, pituitary lesions, and epilepsy. In this approach, the skull is opened along the frontal base and across the lateral edge of the sphenoid wing. The dura is incised along the basis and across the superficial part of the sylvian fissure. After the dura is opened, a brain retractor is placed on a wet cotton strip on the inferior surface of the frontal lobe. The sphenoid wing is then followed medial to the point where the olfactory and the optic nerves cross the wing. The sylvian fissure is opened by dividing the arachnoid. The frontal lobe and the olfactory nerve are gently retracted until sufficient space has been achieved, an elevation of 10 to 15 mm depending on the target and the degree of brain atrophy. Retraction is maintained for the rest of the operation, which may last from less than 1 hour to several hours. The retractor is often placed across the olfactory nerve causing strain on the nerve as well as the olfactory striae leading to the frontal and temporal lobes.

Clinical Material and Methods

The study included patients surgically treated for saccular aneurysms during the period between December, 1983, and April, 1986, in Copenhagen Municipal Hospital, Hvidovre, with a postoperative Hunt and Hess Grade I or II. Patients who had an impaired sense of smell preoperatively and those living in remote areas were excluded from this study. Of the 35 patients considered for the series, 10 were excluded: one had impaired olfaction preoperatively, four were living in remote areas, and five refused to participate in the study.

Thus, the series consisted of 25 patients, 16 women and nine men, with a mean age of 49 years (range 35 to 64 years). The mean observation period was 35.1 months (range 18 to 58 months). The median time from subarachnoid hemorrhage (SAH) to operation was 5.0 days (mean 9.3 days, range 1 to 24 days). In only one patient was the aneurysm diagnosed without SAH; the other 24 patients suffered rupture of the aneurysm. At operation, 26 aneurysms were ligated at the neck and one was trapped. The localization of the 27 aneurysms is shown in Table 1. From the medical records we obtained data on the duration of operation, the presence of edema, mannitol usage, and necessity for draining ventricular fluid.

At their follow-up examination, the patients were asked if they had noted any difficulties concerning sense of smell either pre- or postoperatively. They were then examined using a setup for quantitative olfactometry as described by Zilstorff, and modified by the use of a fully saturated steam of phenylethyl alcohol. Distinction was made only between normal sense of smell and anosmia. After the olfactometric examination, a common clinical “sniff test” was carried out. Patients were examined first on the operated side, then on the non-
Anosmia after anterior circulation aneurysm surgery

### TABLE 1

<table>
<thead>
<tr>
<th>Side of Lesion</th>
<th>Arterial Location</th>
<th>Total Aneurysms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACoA</td>
<td>ACA</td>
</tr>
<tr>
<td>right</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>midline</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>left</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>total aneurysms</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*ACoA = anterior communicating artery; ACA = anterior cerebral artery; MCA = middle cerebral artery; ICA = internal carotid artery; PCoA = posterior communicating artery.

### TABLE 2

<table>
<thead>
<tr>
<th>Study</th>
<th>Normal</th>
<th>Reduced</th>
<th>Absent</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>subjective</td>
<td>21</td>
<td>3</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>objective</td>
<td>3</td>
<td>20</td>
<td>2</td>
<td>25</td>
</tr>
</tbody>
</table>

*Subjective report compared to test results.

### TABLE 3

<table>
<thead>
<tr>
<th>Side of Nerve</th>
<th>Normal</th>
<th>Reduced</th>
<th>Absent</th>
<th>Total Nerves</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipsilateral</td>
<td>3</td>
<td>0</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>contralateral</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>total nerves tested</td>
<td>26</td>
<td>0</td>
<td>24</td>
<td>50</td>
</tr>
</tbody>
</table>

*Results of testing by sniff and olfactometry are expressed as the number of olfactory nerves tested related to the side of operation.

Operated side. The test was repeated after 15 minutes and completed with the sniff test.

### Results

#### Subjective Examination

Upon investigation, 21 patients did not notice any impairment of their sense of smell. Of the remaining four patients, three noted impaired olfactory sense and one reported total loss of olfactory sense; all four patients reported bilateral impairment, although only two had undergone bilateral operations (Table 2).

#### Objective Examination

The results of olfactometry and the sniff test are presented in Table 3. Objective examination revealed only three patients with bilateral intact olfactory sense; all three had undergone surgery on the left side. Twenty-two patients exhibited anosmia: 20 unilaterally and two bilaterally. In all cases, anosmia was found on the operated side. There was no correlation with duration of operation, brain swelling, mannitol treatment, or cerebrospinal fluid drainage.

### Discussion

Damage to cranial nerves following SAH and operation for ruptured intracranial aneurysms is well described in the literature. However, the literature is rather sparse concerning the olfactory nerve, except in relation to anterior communicating artery aneurysms.

In 1961, Pool reported bilateral transection of olfactory nerves using a bilateral frontal craniotomy and interhemispheric approach. He noted that those patients were anosmic although they were not dissatisfied. However, Suzuki, et al., achieved preservation of olfactory sense in 80% of their patients by dissecting the olfactory tract from the frontal lobe.

We have failed to find any description of the risk of damage to the olfactory nerve associated with surgery via the frontotemporal approach. The site of the lesion in these cases was not clear. It is well known that the nerve can be pulled out from the cribriform bone when retraction exceeds a certain degree, and that even a moderate strain of compression on cranial nerves may result in temporary or permanent damage. From an anatomical point of view, it is even possible that strain can be applied to olfactory radiation in the basal frontal and medial temporal lobes. Compared to symptomatology associated with head injury, where olfactory damage occurs in 3.5% cases after 1 year, it is remarkable that parosmia was not noted by any patient in our study. This might exclude the cribriform plate as the site of the lesion and implicate direct pressure to the olfactory tract or radiation.

### References


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