Suboccipital Surgery for Acoustic Neurinomas: Advantages and Disadvantages*

J. Lawrence Pool, M.D.

The Neurological Institute, The Presbyterian Hospital, New York, N.Y.

This review is based on 76 patients with acoustic neurinomas operated upon between 1950 and 1965. Of these, 72 had a single (unilateral) tumor and 4 had multiple tumors, 3 being bilateral.

Suboccipital surgery has been the classical method of removing acoustic nerve tumors since 1917 when Cushing1 published his well known monograph on the subject.

Cushing preferred subtotal, intracapsular removals whereas Dandy2 subsequently indicated that total removals were preferable. Following Dandy's lead, more and more total removals have been successfully accomplished,10 partly because of improvements in surgical technique and anesthesiology, and partly because of earlier detection of these tumors before they have become dangerously large.

In recent years, House5 has perfected a microsurgical translabyrinthine or middle fossa operation by which total removal of small intracanalicular tumors can be accomplished with little or no risk of facial palsy and a remarkably low mortality. It is of interest that a translabyrinthine approach was first used by Panse and others as early as 1904, often with success.3,6,9 However, this approach is not satisfactory for the adequate removal of large tumors, which require craniotomy. Craniotomy also permits opening of the internal auditory canal (intracranially) for total tumor removal.2,11 A dissecting microscope is helpful in identifying and sparing the facial nerve.11

Diagnosis

Symptoms. Progressive deafness in one ear was the most common initial symptom of acoustic neurinomas in this series of 76 cases. Tinnitus was the next most common symptom, often occurring several months or years after the onset of deafness, while vertigo, sometimes suggestive of Ménière's disease, was a presenting symptom in only 3 patients. Symptoms suggesting trigeminal neuralgia were present in another 3 patients.

Later symptoms, indicative of a large expanding tumor, included imbalance and numbness or paresthesias of part or all of the face and even the opposite side of the body. Headaches, nausea and vomiting, impaired vision, and occasionally coma, occurred in some patients as the result of increased intracranial pressure.

On neurological examination the most common sign was, of course, partial or complete deafness in the affected ear. Some patients with a relatively small tumor had no other sign. Reduction of ipsilateral corneal sensitivity, the second most frequent abnormality, was usually present when the tumor was so large that it compressed the brain stem and/or the posterior root of the trigeminal nerve. However, it was sometimes associated with relatively small tumors.

Nystagmus and ipsilateral ataxia were usually associated with large or moderately large tumors. Facial weakness, although rare, may only be suggested by paralysis of the platysma. House and his colleagues, moreover, drew attention to reflex and parasympathetic changes indicative of early facial nerve dysfunction.5

Large tumors generally gave rise to additional signs such as pronounced facial nerve involvement, including impairment of taste on the anterior two-thirds of the tongue, ipsilateral sensory impairment of the face and/or pharynx, and perhaps paresis of the spinal accessory nerve. In such cases the tragus of the affected ear was often insensitive to pinprick, possibly as the result of dysfunction of the nervus intermedius or vagus nerve.

In addition, large tumors, compressing the
cerebellum and brain stem, frequently gave rise to pronounced ipsilateral ataxia and contralateral hemihypesthesia and/or hemiparesis.

Increased intracranial pressure secondary to the tumor mass or blockage of cerebrospinal pathways usually resulted in papilledema or retinal hemorrhages leading to blurred vision, and diplopia due to sixth nerve paresis. Finally, nausea and vomiting might become so severe that a gastrointestinal lesion, rather than a brain tumor was suspected. This happened in 3 cases. One had undergone an exploratory laparotomy, and 2 were subjected to a complete barium study before lapsing into the coma that led to neurosurgical consultation and emergency surgery.

Special Tests. The accuracy of diagnostic tests has steadily improved. Examples are the recruitment, Békésy, and other special tests of auditory discrimination, as well as refinements of vestibular tests including electronystagmography. Special x-ray views, including tomography, arteriography, air, and more recently Pantopaque contrast studies have also led to more accurate and earlier diagnoses. As a result these tumors can now be detected before they have reached the large size they did in Cushing's day, when they usually were not discovered until the patient was seriously ill because of increased intracranial pressure. Today, therefore, it is not unusual to make the diagnosis before the cerebrospinal fluid pressure or protein content have become elevated, as they usually are with large tumors, or before clear-cut findings appear on plain x-ray studies.

Treatment

Acoustic nerve tumors do not respond to x-ray or chemotherapy and can therefore be treated only by surgery. The sooner the diagnosis can be established and surgery performed the better. There have been no deaths in this series following removal of relatively small or moderate sized tumors in otherwise healthy patients. Mortality has been directly related to tumors of large size or serious systemic disease such as hypertensive cardiovascular disease. We firmly believe, therefore, that these tumors, like most brain tumors, should be operated upon as soon as the diagnosis is established. Delay only courts disaster.

Factors that must be evaluated include the age of the patient (Table 1); the neurological findings, including preoperative ataxia; systemic illness; and the size of the tumor.

Age of Patient. The operative mortality for patients less than 50 years of age following total (T) and radical (Ts) removals has been reduced in the last 10 years to 4 per cent, but remains close to 8 per cent for patients over 50 years old (Table 2).

**TABLE 1**

Results of suboccipital surgery on acoustic tumors (single) (1950-1965)

<table>
<thead>
<tr>
<th>Age</th>
<th>Operation</th>
<th>No. of Cases</th>
<th>Good</th>
<th>Poor</th>
<th>Operative Mortality</th>
<th>Late Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 50</td>
<td>T</td>
<td>24</td>
<td>18</td>
<td>3</td>
<td>2</td>
<td>1 (5 yrs.)</td>
</tr>
<tr>
<td>Over 50</td>
<td>T</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>34</td>
<td>25</td>
<td>4</td>
<td>4</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Under 50</td>
<td>Ts+S</td>
<td>16</td>
<td>12</td>
<td>1</td>
<td>2</td>
<td>1 (4 yrs.)</td>
</tr>
<tr>
<td>Over 50</td>
<td>Ts+S</td>
<td>22</td>
<td>13</td>
<td>5</td>
<td>3</td>
<td>1 (8 yrs.)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>38</td>
<td>25</td>
<td>6</td>
<td>5</td>
<td>2 (5.2%)</td>
</tr>
<tr>
<td>Total for all cases with single tumors</td>
<td>72</td>
<td>50 (70%)</td>
<td>10 (13.8%)</td>
<td>9* (12.5%)</td>
<td>3 (3.6%)</td>
<td></td>
</tr>
</tbody>
</table>

T = Total removal  Ts = Radical removal (total except for a scrap)  S = Subtotal intracapsular removal  * Mostly poor risk patients or very large tumors.