Special Reports

Translabyrinthine Microsurgery for Acoustic Neuromas*

ERNEST SACHS, JR., M.D.
Hitchcock Clinic and Mary Hitchcock Memorial Hospital, Hanover, New Hampshire

This course was a presentation of the work of the Los Angeles Otologic Medical Group on the transtemporal bone microsurgical operation for acoustic neuromas by the middle-fossa subtemporal approach and the translabyrinthine method. It was presented before a group of 145 invited and interested neurosurgeons and otologists. The principal participants were the members of the Los Angeles Otologic Medical Group and three invited neurosurgeons, Drs. Collin MacCarty, Frank Mayfield, and Lawrence Pool.

The House group has shown that the very early diagnosis of acoustic neuromas is possible when there are only 8th nerve symptoms and signs, by the use of exacting audiological, vestibular, neurological, and radiological studies.

Discussion

Audiology. The following detailed audiological tests help differentiate a cochlear lesion from a more a central nerve lesion:

1) the PB test (phonetically balanced word test) to measure auditory discrimination;
2) the Spondee word test to measure speech reception threshold;
3) the ABLB (alternate binaural loudness balance test) to measure recruitment;
4) Békésy audiometry* to compare the response to continuous and intermittent tones;
5) the SISI (short increment sensitivity index) test for cochlear perception of loudness.

It seems quite clear that the contributions of modern audiology can help get the patient to the surgeon before these lesions reach the large size with which most neurosurgeons are familiar.

Vestibular Testing. Of the patients with acoustic neuromas in the House series 96 per cent had abnormal caloric responses by one or more of the detailed vestibular tests, which included:

1) the “minimal caloric test of Linthicum”† using as little as 0.2 cc. of ice water to stimulate the labyrinth;
2) electronystagmography‡ combined with the bi-thermal test of Fitzgerald and Hallpike§

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* Critique of a course presented by the University of Southern California School of Medicine and the Los Angeles Foundation of Otology, February 15–18, 1965.

to measure quantitative directional preponderance.

Although there appears to be no characteristic feature of the caloric test which distinguishes the acoustic neuroma from other lesions of the vestibular system, these studies demonstrate that early minimal changes in vestibular function can be identified and help the physician to suspect an acoustic neuroma.

Facial Nerve Involvement and Testing in Acoustic Neuromas. It has always been surprising that the 7th cranial nerve, lying in the internal auditory canal in such close proximity to the 8th, is not involved earlier than the trigeminal nerve. The House group has shown that detailed quantitative testing of the motor, sensory and parasympathetic functions of the facial nerve reveals abnormalities in a higher percentage of cases of acoustic neuromas. These tests† are:

1) quantitative measuring of the blink reflex with high-speed photography;
2) quantitative testing of taste by a microameter;
3) quantitative measurement of tearing by the Boberg-Ans variation of the Schirmer test.

Radiological Studies. a) Plain Films. The Los Angeles Group reported that well-taken plain films of the petrous pyramids and the internal auditory meati reveal changes in 85 per cent of their acoustic neuromas. Camp and Cilley§ drew attention to the fact that the internal auditory canals do not vary more than 2.5 mm. in the same individual. Using these criteria the diagnosis of acoustic neuroma was suspected in many small tumors while still intracanalicular. They emphasized the importance of fine-focus tubes with the smallest possible cones and the routine use of the Shuller-Caldwell view through the orbits as well as the Towne and Stenver views.

b) Positive-Contrast Radiography. The use of Pantopaque in the cerebellopontine angle as described by Gass,† Baker,§ and Scanlan§ will often show the size of a tumor and whether it is still intracanalicular or encroaching upon the brain stem. This may be the best indication as to whether the tumor should be removed by the translabyrinthine or the more spacious suboccipital approach.

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Cerebrospinal-Fluid Protein. In contrast to most published series House et al.\textsuperscript{7} found that 25 per cent of their first 36 acoustic neuromas had spinal-fluid proteins of less than 50 mg. per cent, with 61 per cent under 100 mg. per cent. They concluded that the very small tumors usually had a normal cerebrospinal-fluid protein and that the protein was elevated in the large tumors. The finding of a normal spinal-fluid protein should not by itself rule out the presence of a small acoustic neuroma.

Surgical Technique. The House group reported a total of 81 acoustic neuromas operated upon by the middle fossa, the suboccipital, and the translabyrinthine approaches. Sixty-eight acoustic neuromas were removed by the translabyrinthine microsurgical technique perfected by W. F. House. In 40 cases there was a total removal of the tumor with 2 deaths (5 per cent), and in 27 cases only a subtotal removal could be accomplished with 1 death (3.5 per cent).

The translabyrinthine operation through a retroauricular transmastoid approach to the internal auditory canal is not easy even for an accomplished microsurgeon and probably should be undertaken only by an experienced team of otologist and neurosurgeon.

Total vs. Subtotal Removal. A particularly valuable part of the session concerned the question of total versus subtotal tumor removal. Thanks to refined audiological and radiological diagnostic techniques, it is now possible for the otologist to recognize acoustic neuromas while they are still intracanalicular, and to spare the facial nerve in the majority of such cases. By closed-circuit television we saw W. F. House completely remove two small acoustic neuromas, the larger of which was 1 cm. in diameter. There seems to be no doubt that these tiny tumors can be safely approached with sparing of the 7th nerve by the translabyrinthine microsurgical operation, because they are primarily “ear tumors.” Even when the tumor projects a few millimeters out of the internal auditory meatus but has not yet become adherent to the pons or the 5th nerve, there is much to be said for this route because of its low morbidity and low mortality. It must be remembered, however, that these tumors can also be removed by the suboccipital approach without the risk of going through the contaminated mastoid field which Cushing and Dandy feared so much.

The translabyrinthine approach has great limitations, however, for the large acoustic neuroma (small tumors 2 or 3 cm. in diameter must be considered “large” when attacked through so small a field). Severe bleeding cannot be controlled, the pons is on the far side of the tumor, and total removal under these conditions is extremely difficult. Although the Los Angeles group has operated upon a number of these larger tumors, their figure of 27 subtotal removals (39 per cent) in a series of 68 cases indicates the limitations of this approach. The familiar neurosurgical suboccipital operation appears to be the procedure of choice for the larger tumors. House\textsuperscript{7} discussed this question but arrived at the opposite conclusion, namely that subtotal intracapsular removal was justified for large tumors with reoperation later if necessary.

Drs. Frank Mayfield, Lawrence Pool, and Collin MacCarty each presented his results of total versus subtotal removal of acoustic neuromas. These are shown with certain other series in Table 1. Most neurosurgeons now prefer to carry out total removal of an acoustic neuroma at the first operation and believe\textsuperscript{8} that a higher eventual mortality will result from a subtotal removal.

Microsurgery Through the Posterior Fossa. Drs.

\begin{table}[h]
\centering
\caption{Results in 8 series of operations for acoustic neuromas}
\begin{tabular}{|l|c|c|c|c|c|}
\hline
Series & \multicolumn{2}{|c|}{Total Removal} & \multicolumn{2}{|c|}{Subtotal Removal} & \\
\multicolumn{2}{|c|}{Mortality}
\hline
& & Per Cent & & & Per Cent
\hline
Cushing (reported by List\textsuperscript{9}) & 13 & 7.7 & 176 & 10 & 56\textsuperscript{a}
Dandy\textsuperscript{8,10} & 140 & 22.1 & & & \\
& 82 & 7.3 & & & \\
& 41 & 2.4 & & & \\
Horrax & Popper\textsuperscript{9} & 72 & 11.1 & & & \\
McKenzie & Alexander\textsuperscript{11} & 66 & 12.1 & & & \\
House\textsuperscript{7} & 40 & 5 & 27 & 3.5 & \\
Mayfield\textsuperscript{12} & 21 & 4.7 & & & \\
Pool\textsuperscript{13} & 24 & 4.2 & 21 & 14 & \\
MacCarty et al.\textsuperscript{19} & 97 & 12.6 & 45 & 7.7 & \\
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\end{table}
Theodore Kurze and Robert Rand showed a movie of the suboccipital total removal of an acoustic neuroma using the operating microscope and high-speed diamond dental drills for the removal of the posterior lip of the internal auditory meatus. This is a refinement of the technique illustrated by Poppen and Dandy and offers great promise to the microneurosurgeon by enabling him to remove that part of a large tumor which extends well into the internal auditory canal. It was the consensus of the neurosurgeons present that this might be the procedure of choice in the future.

Summary

The Los Angeles group gave a stimulating and provocative course. They showed that with a high index of suspicion, expert audiological, otological, radiological, and neurosurgical work-ups, earlier diagnosis of small acoustic neuromas is possible, and that these can be removed with a low mortality, sparing the facial nerve. Close cooperation between otologist and neurosurgeon is essential. The consensus was that the larger tumors, 3 cm. and over, which involve the 5th nerve, cerebellum and pons, can not be totally and safely removed by the translabyrinthine approach, and are more properly operated on by the classical suboccipital procedure.

References

10. MacCarty, C. Personal communication.
12. Mayfield, F. Personal communication.
13. Pool, J. L. Personal communication.