Diagnosis of Acoustic Neurinoma by Pneumoencephalo-Roulette Tomography

Technical Note

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The diagnosis of acoustic neurinoma is not difficult when all of the clinical symptoms appear. In early stages, however, it is not easy to determine the extent, size, and nature of the lesion. It has been particularly difficult to obtain objective evidence of the outline of a small acoustic neurinoma within the skull.

For such cases, we have recently used air contrast studies combined with a new technique called "roulette tomography" and have been able to demonstrate clearly the outline of the acoustic neurinoma.

Method and Apparatus

In cases without evidence of increased intracranial pressure, lumbar pneumoencephalography was performed in the usual fashion. Ordinary pneumoencephalography involving total replacement of fluid by air may be harmful when the presence of a brain tumor is strongly suggested by neurological and otological examinations, or in the presence of papilledema or increased intracranial pressure. In such cases we have found the following procedures safe and useful. Lumbar puncture may be done in a lateral position with the head and shoulders elevated approximately 20° and the head bent forward about 15°. Cerebrospinal fluid is then cautiously replaced by air. Ziedes des Plantes described the supine position and suboccipital punctures to meet this situation. When there is obvious danger of tonsillar herniation, continuous ventricular drainage is instituted before injecting 20 to 40 ml of air through the lumbar puncture and without draining any fluid or releasing any air.

Immediately following the air injection, the patient is placed on an x-ray table equipped for roulette tomography. The position of the head is adjusted so that the line that connects between the superior margin of the orbit and center of external auditory meatus is vertical to the film. "Roulette tomography" is then performed in five planes: two planes are established 5 mm and 10 mm anterior to the center of the external auditory meatus, one through the center of the external auditory meatus, and two 5 mm and 10 mm posterior to the meatus. Subsequently, the patient is placed in the right lateral position and films made in five different sagittal planes: the center, and 5, 10, 15, and 20 mm to the left. The procedure is repeated in the left lateral position, with exposures 5, 10, 15, and 20 mm to the right of the center.

The apparatus in this study was a Toshiba LGC-3. The x-ray tube was a Toshiba Rotanode DRX-80A with a focus of 1 × 1 mm and a tube-to-film distance of 160 cm. Films were Fuji KX, and intensifying screens were Kyokko FS. The exposure was accomplished utilizing a 3-looped superior epitochoial tube shift with the full-range x-ray exposure system. The total adult exposure time required for one film was 12 sec with a voltage of 82 kV and a current of 20 mA.

Case Reports

Case 1. For 1 year this 35-year-old man felt as if he were hearing from a distance when he used the right ear in telephoning. During the same time, he had occasional mild bilateral frontal headaches, right-sided migraine, and high-pitched ringing of the right ear. Nevertheless, he had continued in his usual work as a policeman. He was found to have early signs of papilledema.

Lumbar puncture was performed in the left lateral position. The cerebrospinal fluid pressure was 300 mm H₂O. Then the head

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Fig. 1. Case 1: A 35-year-old man with a right acoustic neurinoma. A pneumoencephalo-roulette tomogram taken in the frontal plane 5 mm anterior to the external auditory meatus is shown. A, central part of the right lateral ventricle; B, central part of the left lateral ventricle; C, the third ventricle; D, inferior horn of the right lateral ventricle; T, right acoustic neurinoma with a diameter of about 15 mm; F, dilated right internal auditory canal; G, left internal auditory canal; H, basilar part of the pons; I, junction of the right and left vertebral artery entering into the basilar artery; J, right external auditory canal; and K, left external auditory canal.