

# Iodine-123 Iodoamphetamine Brain Scan in a Patient with Auditory Hallucination

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The case of an alcoholic patient with auditory hallucination is reported in which [<sup>123</sup>I] iodoamphetamine (IMP) brain imaging demonstrated increased accumulation in the left superior temporal lobe which corresponded to the left primary and secondary auditory areas. Thus, IMP brain scans seem to have the potential to objectively localize the brain abnormalities in auditory hallucination.

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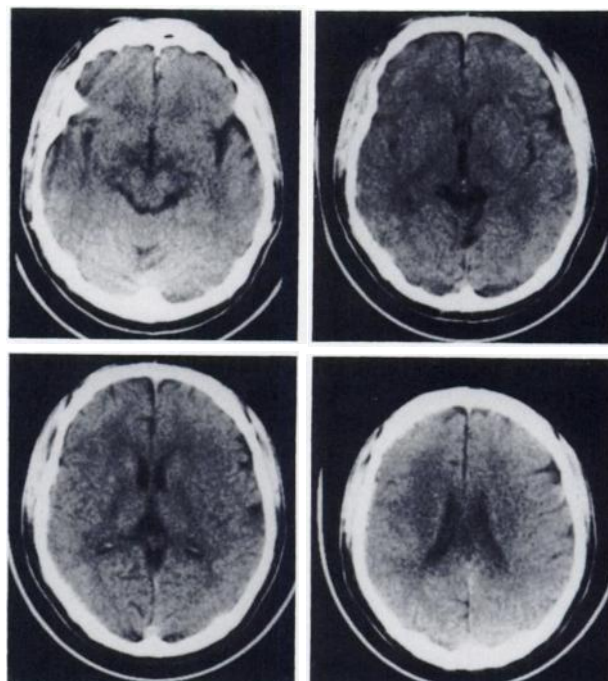
**N**-Isopropyl-(<sup>123</sup>I) p-iodoamphetamine (IMP) (*I*) brain scan has become a well-established clinical tool for assessing regional cerebral blood flow concomitantly with single photon emission computerized tomography (SPECT) systems. It has been applied to patients with cerebrovascular disorder (2-4), epilepsy (5,6), dementia (7,8), and brain tumor (2,9), and its clinical usefulness has been confirmed in these diseases. We present here an additional promising application of IMP scan to a patient with auditory hallucination.

### CASE REPORT

A 45-yr-old, separated, right-handed alcoholic factory worker reported that he had been a heavy drinker for the past 24 yr. He had no history of hospitalization, social withdrawal, or impairment of role functioning. He had consumed one to two pints of Japanese sake daily up until the age of 42 yr, when he described having had an onset of verbal auditory hallucination. In the frequent elaborate hallucinations, the voices were restricted to those of six persons; three women and their three boyfriends. The patient had had illicit love affairs with these women. The contents of the hallucinations were almost invariably related to threats to the patient or sexual behavior in a conversation manner. The frequency of the hallucination increased to show a temporal contiguity after he divorced his wife at the age of 44 yr. Neither neuroleptic treatment nor temperance in drinking to one-half a pint was effective in the remission of the hallucinations.

X-ray computerized tomography showed mild cortical atrophy in the left superior temporal and inferior frontal lobes (Fig. 1). Electroencephalography did not show any abnormality.

Tomographic scans were obtained at a time when the patient was having auditory hallucinations using a rotating camera system with a single head (Siemens ZLC/3700, Siemens Gammasonics Inc., Des Plaines, IL), equipped with a high resolution low-energy collimator and combined with minicomputer (Scintipac 70A, Shimadzu Co., Kyoto, Japan). The uniformity check of the camera and the correction of



**FIGURE 1**  
X-ray computerized tomographic scan of a 45-yr-old alcoholic patient showing mild cortical atrophy in the left superior temporal and inferior frontal lobes.

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rotation axis are performed at regular intervals. Acquisition of projection data was started from 30 min after intravenous injection of 4 mCi of [<sup>123</sup>I]IMP (Nihon Medi-Physics Inc., Takarazuka) and lasted for 32 min. Data were accumulated for 64 angles with 30 sec per angle. The filtered backprojection method (10) was used for image reconstruction after preprocessing projection data using a Butterworth filter. No attenuation correction was performed. The slice thickness was 6 mm. Transverse and coronal tomographic IMP images (Fig. 2) demonstrated increased accumulation in the left superior temporal lobe, which corresponded to the left primary and secondary cortical auditory areas including Wernicke's area.

A region of interest (ROI) was drawn over the left superior temporal lobe in the coronal slice showing the most pronounced accumulation (FRM 31 in Fig. 2 bottom). For comparison, an equal sized ROI was drawn over the corresponding region of the right hemisphere. The left to right count ratio was calculated between these ROIs, which was 1.16. On the other hand, in 11 normal volunteers (nine males and two females, aged 22–32 yr), the left to right count ratios in the superior temporal lobes ranged from 0.92 to 1.03 (0.98 ± 0.03, mean ± s.d.).

## DISCUSSION

Since auditory hallucination has been assessed only by interviewing the patient, psychiatric rating has failed to avoid a potential source of error depending on patient-interviewer interaction. For purpose of objective assessment of regional brain function in mental disorders, many investigations have been performed, however, there have been only a few reports (11–13) dem-

onstrating observations associated with auditory hallucination.

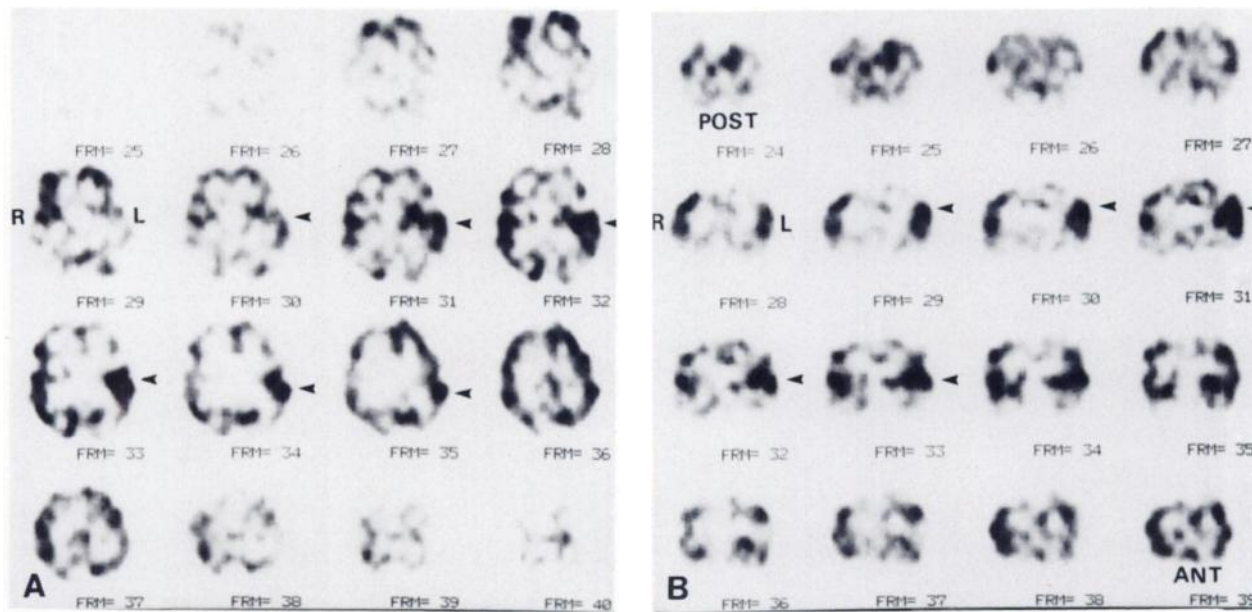
In these reports showing relative high flow in the post-central region, the two-dimensional xenon-133 clearance method was used. In this method, it is difficult to precisely determine the anatomic site of the high flow region, since the relatively large-sized detectors are placed over the head. Statistical averaging of many subjects, which is commonly used in this method, brings about further ambiguity in anatomic information. Moreover, no asymmetry was reported in these reports probably due to cross-talk phenomenon in the <sup>133</sup>Xe inhalation method (14). Accordingly, the question remains as to whether this relative high flow is observed in the auditory area.

Unlike the ambiguous result in <sup>133</sup>Xe clearance method, we obtained a definite finding associated with auditory hallucination, which is easily assessed by visual inspection. Quantitative assessment also revealed high left to right count ratio beyond 5-SD of the control values in the superior temporal lobe. To our knowledge, this is the first report of three-dimensional tomographic image demonstrating auditory hallucination.

In conclusion, IMP seems to have the potential to objectively identify the hitherto subjective symptom of auditory hallucination and of quantifying it.

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**FIGURE 2**

Transverse (A) and coronal (B) tomographic IMP images of the alcoholic patient with auditory hallucination showing increased accumulation in the left superior temporal lobe which corresponds to the left primary and secondary cortical auditory areas (arrowheads). The window level was set to 40–95% of the maximum counts. The left to right count ratio in the superior temporal lobe is 1.16 in the coronal slice (FRM 31).

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