

Letters to the Editor

Iodine-123 IMP Uptake in Brain Metastases from Lung Cancer

TO THE EDITOR: It has been postulated that iodoamphetamine (IMP) localization in the brain is a function of blood flow (1,2) and a number of mechanisms may be responsible for the actual focal concentration of this radiopharmaceutical (3,4). These include blood flow and perfusion, pH differential, and nonspecific binding sites for amphetamines (5). The lack of these mechanisms have been suggested to be responsible for the decreased uptake in tumors, even when they are shown to be relatively vascular (6).

We are presenting a case of increased uptake of iodine-123 IMP in cerebral metastases. The only other reported case of increased uptake in a brain tumor occurred in a low-grade astrocytoma (7).

This 55-yr-old white male patient was diagnosed as having a small-cell carcinoma of the left main bronchus in February 1984. He was deemed inoperable because of mediastinal, liver, and bony metastases. He was free of neurological symptoms and signs and his head computed tomography (CT) was normal

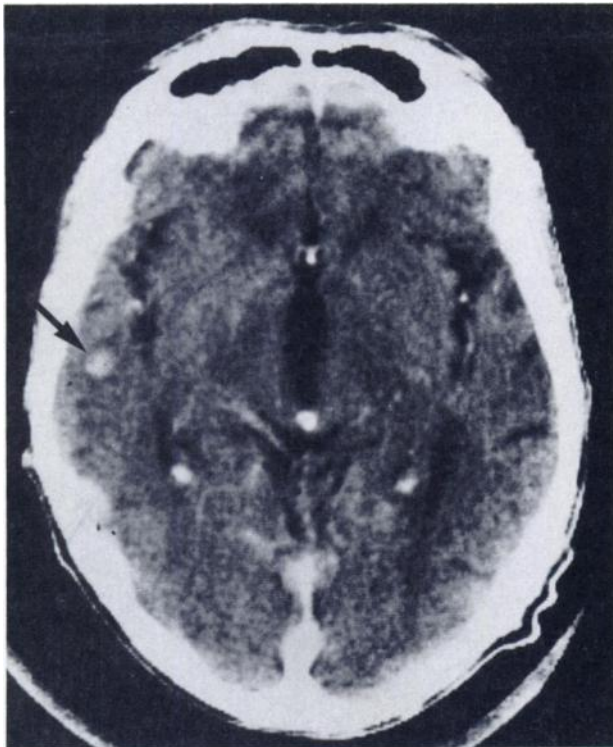


FIGURE 1
Contrast enhanced CT study shows lesion in right temporal lobe, indicated by arrow

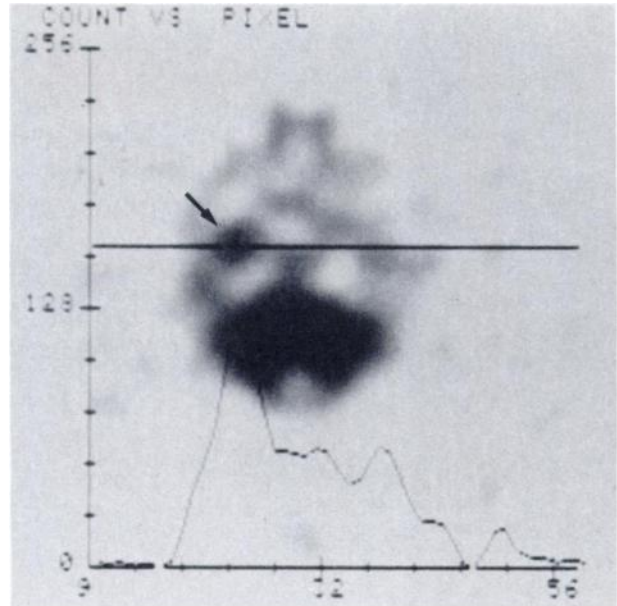


FIGURE 2
Transverse [¹²³I]IMP SPECT image of same lesion demonstrating increased [¹²³I]IMP concentration

at that time. He was treated with chemotherapy and radiotherapy to the spine, where his bony metastases were symptomatic. He also received prophylactic cranial radiotherapy as per NCIC protocol.

The patient was readmitted on September 2, 1984 with focal and generalized seizures. A CT scan on September 4 showed at least five focal nodular enhancing lesions, ranging in size from 0.5 to 1.5 cm in diameter (Fig. 1). An IMP tomographic brain scan using a scintillation camera* showed several areas of increased IMP concentration corresponding to the enhancing lesions seen on the CT scan (Fig. 2). It is significant that at the time of administration of the nuclide he was free of seizures.

Concentration of IMP is dependent on two factors, blood flow and extraction efficiency. It has been reported by Hill et al. (8) and LaFrance et al. (6) that cerebral tumors displayed decreased extraction efficiency in spite of the fact that some of these tumors demonstrated increased vascularity. One can only speculate about the reason for increased IMP concentration in this case. While increased concentration of IMP has been reported in seizure foci (9), these patients were injected during seizure activity whereas ours was not. It is unlikely that breakdown in the blood-brain barrier is responsible for the increased uptake, as several neoplastic lesions, which are known to exhibit increased uptake on standard brain scintigraphy, in fact showed decreased uptake on IMP scan. Highly vascular lesions have also been shown to demonstrate decreased IMP uptake (6). One can only, therefore, speculate that certain tu-

mors may have increased extraction efficiencies and/or amine receptors, which could account for increased IMP localization.

FOOTNOTE

*Siemens dual detector Rota camera with ADAC 3300 image processor.

References

1. Von Schulthess GK, Ketz E, Scubiger PA, et al: Regional quantitative noninvasive assessment of cerebral perfusion and function with N-isopropyl-[123]-iodoamphetamine. *J Nucl Med* 26: 9-16, 1985
2. Holman BL, Hill TC, Lee RGL, et al: Brain imaging with radiolabelled amines. In *Nuclear Medicine Annual, 1983*, Freeman LM, Weissmann HS. New York, Raven Press, 1983
3. Winchell HS, Baldwin RM, Lin TH: Development of I-123 labelled amines for brain studies: Localization of I-123 iodophenylalkyl amines in rat brain. *J Nucl Med* 21: 940, 1980
4. Winchell HS, Horst WD, Braun L, et al: N-isopropyl-[I-123] p-iodoamphetamine: Single pass brain uptake and washout: Binding brain synaptosomes and localization in dog and monkey brain. *J Nucl Med* 21: 947, 1980
5. Holman BL, Hill TC, Magistretti PL: Brain imaging with emission computed tomography and radiolabeled amines. *Prog Clin Radiol* 17: 206-215, 1982
6. Lafrance ND, Wagner HN Jr, Whitehouse R, et al: Decreased accumulation of isopropyl-iodoamphetamine (I-123) in brain tumors. *J Nucl Med* 22: 1081-1083, 1981
7. Ell PJ, Cullum I, Donaghy M, et al: Cerebral blood flow studies with ¹²³iodine-labelled amines. *Lancet* :1348-1352, 1983
8. Hill TC, Holman BL, Lovett R, et al: Initial experience with SPECT of the brain, using N-isopropyl I-123 p-iodoamphetamine (IMP). *J Nucl Med* 23: 191-195, 1982
9. Magistretti P, Uren R, Shomer D, et al: Emission tomographic scans of cerebral blood flow using ¹²³I iodoamphetamine in epilepsy. *Proceedings Third World Congress, Nuclear Medicine and Biology*, Vol. 1, pp 139-143.

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Congenital Lobar Emphysema: Segmental Lobar Involvement Demonstrated on Ventilation and Perfusion Imaging

TO THE EDITOR: We performed ventilation and perfusion imaging in an infant with proven congenital lobar emphysema (CLE). Our studies, confirmed by surgical and pathologic examination, demonstrated a segmental distribution of emphysema within the involved lobe. This distribution of disease has not been previously reported.

A 29-day-old male infant was transferred to our facility for evaluation of persistent respiratory distress. The infant was the product of a normal term pregnancy and uneventful Cesarean section; however, tachypnea, tachycardia, and cyanosis were

noted within 24 hr of birth. The chest radiograph showed a relatively radiolucent left hemithorax, with shift of the mediastinum to the right, suggesting hyperexpansion of the left lung. Ventilation and perfusion pulmonary imaging was requested for further evaluation. Xenon-133 gas was administered through an endotracheal tube using a closed rebreathing system and manual bag ventilation. Perfusion imaging was subsequently performed using 2.0 mCi of technetium-99m macroaggregated-albumin. A large field-of-view gamma camera with a converging collimator was used for both studies to provide adequate magnification. The ventilation study showed first breath defects involving the apicoposterior and lingular segments of the left upper lobe (LUL) with sparing of the anterior segment (Fig. 1) These defects filled in during equilibration and prolonged retention of radioactivity in the left hemithorax was seen on washout images. The perfusion images showed matching LUL segmental defects with intact perfusion of the anterior segment (Fig. 1). Because of continued respiratory compromise, a thoracotomy was performed revealing a grossly hyperexpanded LUL. Although the anterior segment appeared normal, a left upper lobectomy was performed due to the technical difficulty of preserving the anterior segment in such a small infant. Microscopic examination of the affected segments revealed emphysema, with dilated air spaces and bridging of alveolar septae. Bronchi from the diseased segments showed segmentation and disorganization of the bronchial cartilage with mucosal papillary infoldings. These findings are characteristic of CLE. The infants improvement and subsequent discharge was so rapid that a follow-up ventilation and perfusion study was not feasible.

CLE is a rare disorder which usually presents in the neonatal period as respiratory distress due to air trapping and hyperexpansion of a pulmonary lobe (1). The classic radiographic appearance is hyperinflation of a lobe with preservation of bronchovascular markings in the lucent region. Mediastinal shift with atelectasis and displacement of adjacent and contralateral lobes is frequently seen (2). Coexistence of respiratory distress in a neonate or young infant and the classic radiographic presentation of CLE is usually diagnostic and adequate to justify immediate thoracotomy and curative lobectomy. However, CLE not uncommonly presents later in infancy or childhood with less convincing radiographic findings (3). The less urgent clinical setting and the desire to avoid unnecessary surgery may result in the opportunity to perform ventilation and perfusion imaging to permit a more accurate diagnosis. Since the original report by Mauney and Sabiston, several authors have reported perfusion imaging to be safe and informative in evaluating CLE (4, 5). Few ventilation studies of children with CLE have been published and as expected, the pattern reported to date has been one of matching ventilation and perfusion defects involving the emphysematous lobe with prolonged Xenon retention (6, 7). No previous report has illustrated that the disease may have a segmental distribution within the involved lobe.

Ventilation and perfusion imaging may reduce the need for more invasive studies and may prove useful in following the clinical response of surgically and conservatively treated children with CLE (8, 9). We have demonstrated that CLE can occur in a segmental distribution within an involved lobe. This pattern must be recognized for proper interpretation of ventilation and perfusion images in children with possible CLE.