Mercury 197 and Technetium 99m Brain Scans in the Diagnosis of Non-Neoplastic Intracranial Brain Lesions*

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The value of radioactive brain scanning in the detection and localization of non-neoplastic intracranial lesions has been the subject of various publications in recent years. Radioactive mercury (203) and the positron emitters Cu and As have been the most frequently used radioactive tracers.

This report is an analysis of more than 600 brain scans obtained from patients hospitalized for various nontumor conditions (Tables 1 and 2). Whereas Hg was the tracer of choice in the first half of this study, Tc pertechnetate was used in the later scans. Technetium 99m has a very short half-life (6.5 hours) which allows a tenfold increase in the injected dosage, thus significantly reducing the time of scanning. The total body radiation is comparable to that of radioactive mercury. The kidney is not affected. Quinn, et al., have recently reported their experience with this tracer in 96 consecutive positive scans. It appeared to us, however, that the number of so-called equivocal scans and even of false positive interpretations had increased since we began using Tc for brain scanning. The evaluation of this impression was our primary concern.

Results

Unverified Brain Tumor Suspects. There were 10 patients with positive scans in whom focal intracranial lesions could not be verified; nine of these 10 scans were obtained with Tc. Clinical evaluation suggested an intracranial space-occupying lesion in two of these patients. The first of these was a 45-year-old woman with headaches and papilledema but no localizing signs. The brain scan (Hg) was strongly suggestive of a subdural hematoma (Fig. 1). Subsequent angiography and ventriculography failed to reveal any abnormality. After a decompressive craniotomy was carried out, the papilledema subsided. No satisfactory explanation could be found for the positive brain scan in this case. Meanwhile we have learned that, besides a subdural hematoma, other conditions such as simple scalp trauma, meningeal carcinomatosis, Paget's disease, cortical infarcts, pachymeningitis hemorragica interna, or even a craniotomy site can produce a similar scan pattern.

The second patient was a 28-year-old man with generalized neurofibromatosis and a choreoathia and long-standing history of a right-sided spastic paraparesis. The Tc brain scan showed a marked increase in isotope concentration in the right posterior fossa (Fig. 2). At the time of surgical exploration, no abnormality was found except for a subcutaneous lipoma and a markedly thickened suboccipital squama.

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Fig. 1. Brain scan showing increased pickup over the convexity of the right hemisphere. No history of trauma. No subdural hematoma found.
sometimes detectable activity of the carotid siphon should also be kept in mind while interpreting the Te $^{99m}$ scan. The superior longitudinal, torcular, and lateral sinuses are also usually outlined by this radioactive material. With this in mind, one should be able to avoid being misled by these normal structures, although they probably were responsible for the scan abnormalities in some of our cases.

In only three of our 10 cases with so-called false positive scans did angiography precede brain scanning. We did not think that angiography contributed to the abnormal scan, for in many other cases the contrast studies preceded, yet the brain scans that followed were normal.

Since Te $^{99m}$ is also excreted through the salivary glands, a contamination of any portion of the patient's head with his saliva could also lead to a false positive interpretation. An experienced technician can easily prevent such an error.

There were 27 patients whose scans were interpreted as equivocal. A scan was classified as equivocal when there was an asymmetry between the right and left side as seen in the anterior, posterior, or lateral views. This asymmetry is most commonly found in the posterior fossa, along the base of the skull (Fig. 3) or around the superior sagittal sinus (Fig. 4). We have tried to improve our scanning technique of the posterior fossa by scanning this area in the suboccipito-frontal projection. This has greatly improved the visualization of the posterior

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**Fig. 2.** Brain scan showing increased pickup in the area of the right posterior fossa. Subcutaneous lipoma and an abnormally thick suboccipital squama were found at the time of surgery.

The remaining eight patients who had definitely abnormal scans (Te $^{99m}$) had been admitted because of a variety of symptoms such as headaches, dizziness, psychomotor phenomena, and generalized convulsions. In all of these patients, the neurological examination and contrast studies were normal. It was felt that there was insufficient evidence for the diagnosis of cerebrovascular disease.

McAfee, et al.,

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**Fig. 3.** Asymmetry in the pickup between the two temporal poles. No clinical correlation.