

CLINICAL ASPECTS OF BRAIN SCANNING WITH MERCURY

David Barry, M. D. *

For the past two and a half years we have been utilizing photo-scanning with Hg 203 labeled Neohydrin in patients suspected of harboring an expanding intracranial lesion. The results to date have been so encouraging that the procedure has become our prime diagnostic study, and is performed prior to arteriography or ventriculography. With a few exceptions, it has all but eliminated the use of air in patients with brain tumors. Arteriography is still performed routinely in patients with a positive scan. This is being done not so much as a diagnostic procedure, but rather to help confirm the lesion demonstrated on the scan, and to possibly give some information regarding the vascular circulation of the tumor.

As with all procedures photoscanning has both its advantages and disadvantages. One of the main advantages is that it can be performed as an out-patient procedure, without any discomfort to the patient, and carries no immediate risk. In addition, as an independent procedure, we feel it is probably more accurate than either the arteriogram or ventriculogram. The procedure is a direct method of demonstrating lesions, rather than the indirect method of contrast dye or air, which rely on either blood vessel or ventricular displacement. Finally, edema does not seem to influence the scan, and it, therefore, more accurately demonstrates the exact size of the lesion than either the arteriogram or ventriculogram. It is now possible to make smaller bone flaps at the time of surgery, and we find that the localization is excellent for those metastatic lesions which one would like to treat with radiation therapy.

The disadvantages include the fact that the patient must be fairly, cooperative to have the test performed; that it does not demonstrate the surrounding blood supply or vascular circulation of the lesion, which is sometimes important in planning the surgical attack, or in attempting to arrive at a pre-operative diagnosis of the exact pathology, and that there is some radiation to the kidneys, and we are not certain what the

* Neurological Surgeon, Providence, Rhode Island.

long-time effect from this will be. It is for this reason that we are not presently performing brain scans in small children, except in exceptional cases. However, with the introduction of Hg197 this may no longer pose a problem. The very short half life of this new isotope reduces the kidney radiation exposure by a factor of 100, as compared to the presently employed Hg 203. Finally, we have learned that on some occasions a non-surgical lesion will produce a positive scan.

I would now like to present a few typical cases. The cases have not been selected because they represent good scans, in fact some of them are poor demonstrations. They have been selected to show the diversity of the various pathologic lesions which have been picked up before the patient was subjected to either arteriography or ventriculography.

Case 1. R. C. a 39 year old man entered the hospital complaining of headaches and dizziness of two weeks duration. His neurological examination was normal with the exception of a right homonymous hemianopsia. The AP brain scan revealed an area of increased uptake, low down on the left side. The lateral scan placed this lesion in the posterior temporal-occipital region, but also suggested a second lesion higher up. The PA scan confirmed the lower of the two lesions. A left carotid arteriogram was performed. The AP view was unremarkable. The lateral film was compatible with the lesion in the posterior temporal occipital area. Surgery disclosed a thick walled abscess, containing approximately 45 cc. of purulent material. Several days postoperatively his condition began to deteriorate, necessitating reoperation. The abscess cavity was tapped, but was found to be dry. Attention was then directed to the site of the uppermost lesion demonstrated on the lateral scan (Figure 1),



Figure 1.

and at this point another abscess was encountered, containing approximately 30 cc. of purulent material. This case illustrates a patient with two lesions, one of which was demonstrated by both the brain scan and

arteriogram, and the other of which was picked up only with the aid of the scan.

Case 2. I. R. was a 57 year old woman, complaining of blurred vision. Her examination was negative, with the exception of a bi-temporal hemianopsia. the AP brain scan revealed an area of increased uptake, low down in the midline. Both the right and left lateral scan picked up this lesion equally well, confirming its midline location, and also placing it in the region of the sella turcica (Figure 2 a, b). A bilateral carotid

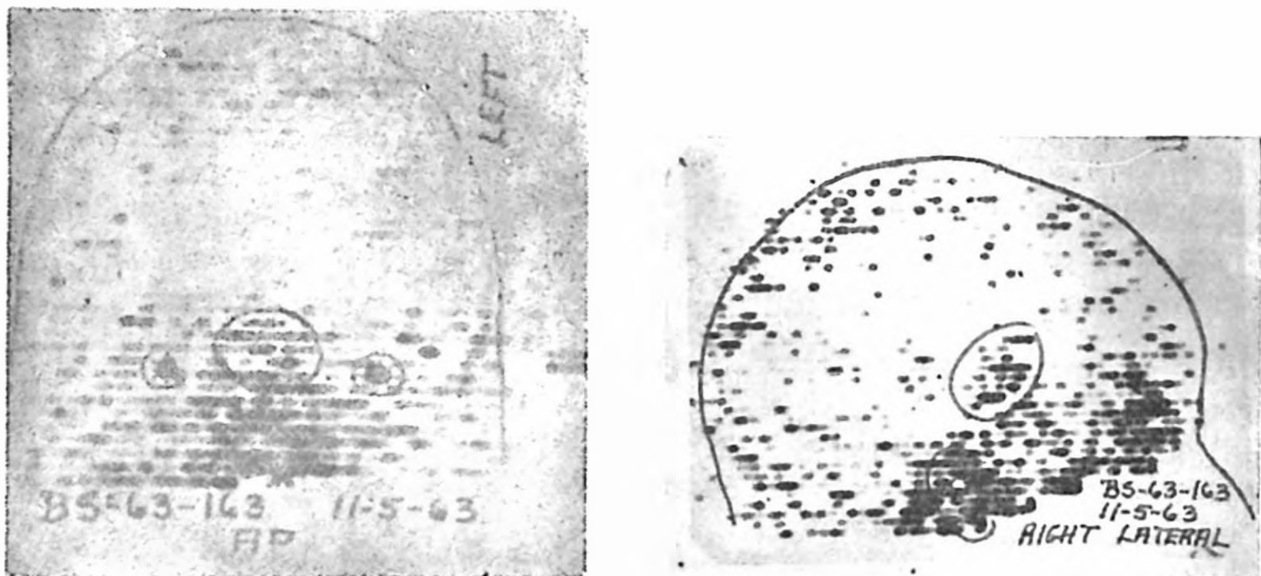


Figure 2 a, b.

arteriogram confirmed the elevation of both anterior cerebral arteries, suggesting a pituitary tumor. Since the sella turcica was borderline in appearance, and since we were not certain which, if any, pituitary tumors would show a positive scan, the patient did undergo surgery. She had a typical chromophobe adenoma.

Case 3. N. C. This 32 year old man experienced one grand-mal convulsion three years prior to entering the hospital. He had a two month's history of progressive lethargy, and confusion. The patient had been a prizefighter in his earlier youth, and had not been too successful, having been knocked out at least 15 times. With the exception of his lethargy and obvious mental confusion there were no focal neurological findings. The possibility of a chronic subdural hematoma was entertained. The AP brain scan revealed a large area of increased uptake on the left side. The left lateral scan placed the lesion in the frontal parasagittal area (Figure 3 a, b). A left carotid arteriogram was then performed. The AP view showed a shift of the anterior cerebral artery, and although poorly visualized on this slide, there is evidence on the regular x-ray of significant vascular contri-

bution from the external vessels. The left lateral arteriogram confirmed the presence of the parasagittal frontal lesion. A 98 gram meningioma

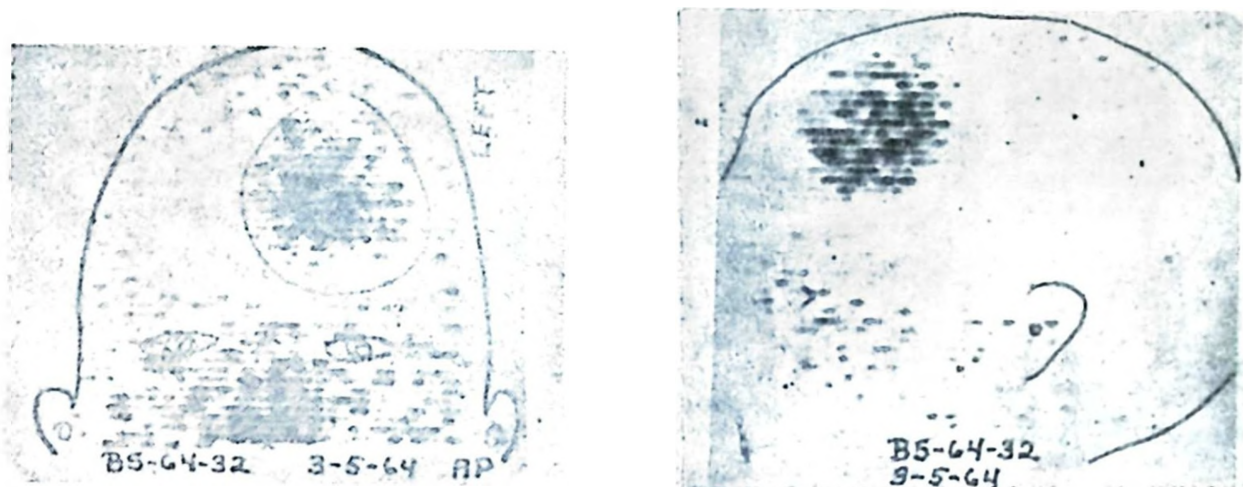


Figure 3 a, b.

was removed at surgery, and silver clips were placed exactly at the anterior and posterior extension of the tumor, after it had been removed. Postoperatively a skull film was obtained, and we have superimposed this x-ray over the lateral preoperative brain scan, in an attempt to demonstrate how accurately the scan delineates the actual extent of a lesion (Figure 3 c).



Figure 3 c.

Case 4. A. G. a 72 year old woman was brought to the hospital in a semi-comatose state. She did have some papilledema, but there were no localizing signs. The AP brain scan showed an area of increased uptake, low down and lateral, on the right side. The right lateral scan placed the lesion in the posterior temporal area (Figure 4). A right carotid arteriogram showed the anterior cerebral artery to be shifted on the AP view, and

on the lateral film the middle cerebral artery was markedly elevated. Surgery disclosed a very large malignant meningioma.

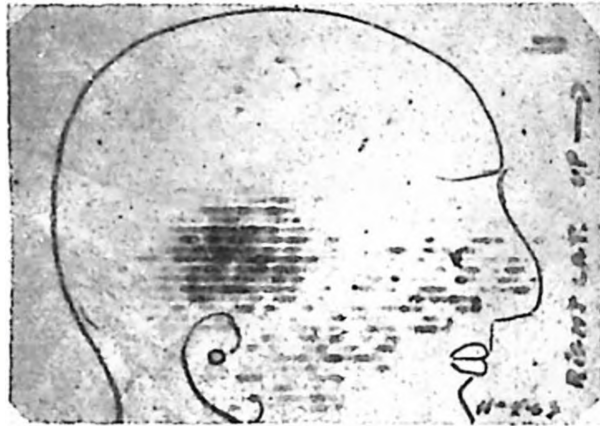


Figure 4.

Case 5. A. P. a 24 year old man complained of double vision. When I first examined him in my office he had slight blurred disks, and a classical Parinaud sign. There was some delay in obtaining a hospital bed for him, and by the time he was admitted the Parinaud sign had disappeared completely. His only findings consisted of the questionable blurred disks. The AP scan was interpreted as showing a midline lesion. The lateral scan placed the lesion in or about the area of the posterior third ventricle (Figures 5 a, b). You will note the very low target/non target ratio of this lesion. A subsequent air study did reveal this to be a lesion in the area of the posterior third ventricle, probably a pinealoma. The patient was treated with a shunt and cobalt therapy, and has subsequently done well.

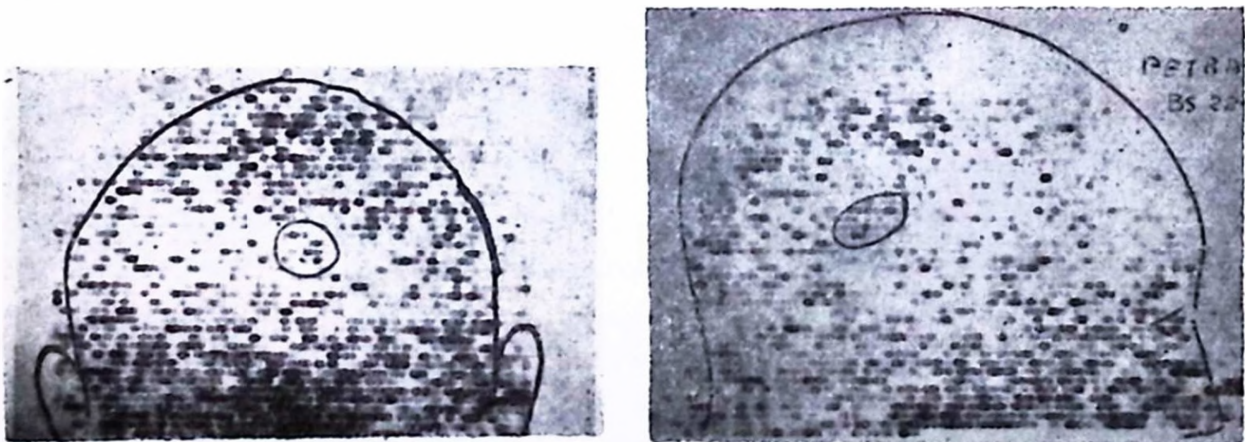


Figure 5 a, b.

Case 6. E. L. was a 52 year old woman with severe headaches of six weeks duration. The only objective findings consisted of a left homonymous hemianopsia. An AP brain scan confirmed a right-sided lesion,

and the lateral view placed it in the posterior temporal-occipital area (Figure 6). A right carotid arteriogram confirmed this impression. Surgery disclosed a fairly large cystic low grade astrocytoma.

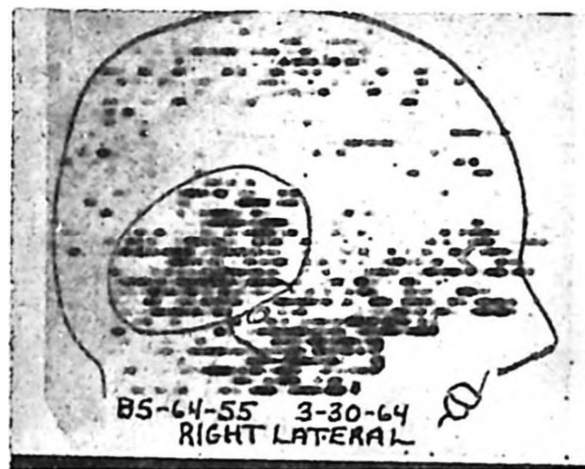


Figure 6.

Case 7. J.P., a 68 year old woman, was admitted to the psychiatric service because of bizarre behavior. She had no objective neurological findings, but complained of headache. Because of her poor cooperation it was difficult to obtain a complete scan. It was possible on the AP view at least to place the lesion on the right side. A limited right lateral scan localized the area of increased uptake to the frontal area (Figure 7 a, b). Under anesthesia a right carotid arteriogram showed the fairly typical appearance of a frontal lobe glioblastoma. A frontal lobectomy confirmed this clinical impression.

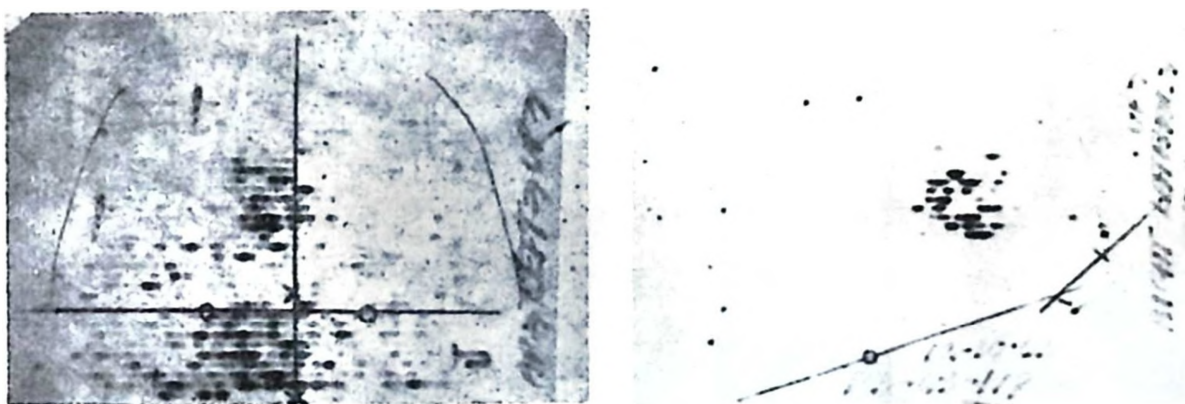


Figure 7 a, b.

Case 8. A.H. a 68 year old right-handed woman had the sudden onset of a typical Gerstman syndrome. The AP and PA scan confirmed that the lesion was on the left side, and the lateral scan localized it fairly well to the parietal lobe (Figure 8). At this particular time, we were not certain that vascular accidents might not sometimes give a positive scan, and

for confirmation we subjected this patient to arteriography and a pneumoencephalogram. The AP and lateral arteriogram were within normal limits. The pneumoencephalogram also failed to disclose any expanding lesion.

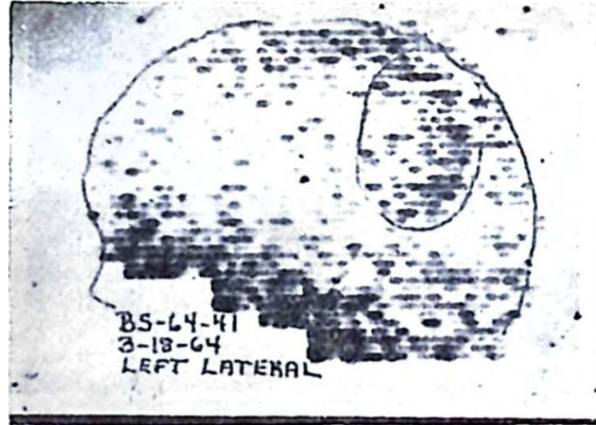


Figure 8.

Scans of Patients with Metastatic Tumors.

These scans represent metastasis from different parts of the body; the type and location has been confirmed by autopsy and surgery.

The first patient had been treated for a carcinoma of the bladder, and had developed headache and personality changes. An AP and left lateral scan revealed a left frontal lesion (Figure 9). Here again the low target/non target ratio can be noted.

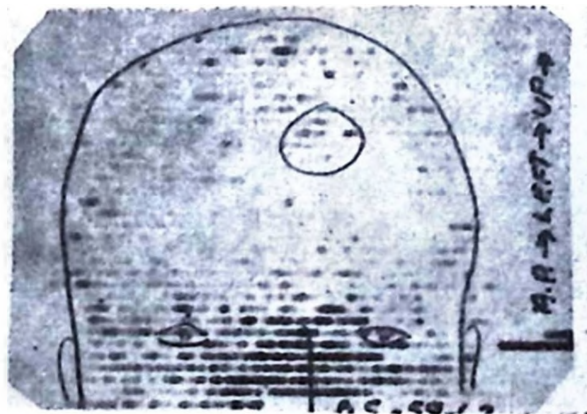


Figure 9.

The second patient had a melanoma removed from her back three years previously. She entered the hospital because of severe headaches.

An AP brain scan was negative. The PA view, however, showed a right-sided lesion. The right lateral scan placed it in the occipital area (Figure 10). A metastatic lesion was suspected however, because of the long time interval, and the absence of any other evidence of metastasis, and she underwent surgery. The tumor was a typical melanoma.

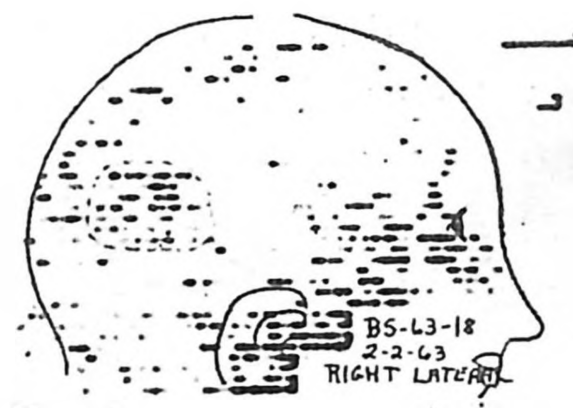


Figure 10.

The third patient had undergone surgery for bronchogenic carcinoma, and then developed fairly marked neurological signs and symptoms. An AP scan revealed bilateral lesions to be present (Figure 11). Both the left and right lateral scan placed them in the respective frontal lobes.

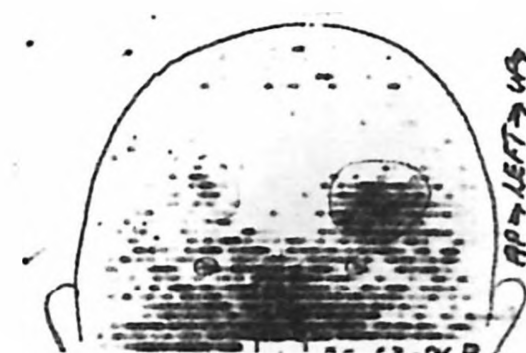


Figure 11.

The last patient entered the hospital with a history of having experienced a convulsion three months previously, and had some recent left-sided weakness. A PA and right lateral scan showed a large right parietal lobe lesion (Figure 12). Surgery disclosed this to be a metastatic lesion, which was easily removable from the surrounding brain. Microscopic

examination revealed that the tumor probably represented a spread from the respiratory system. A thorough postoperative search for the primary lesion, however, has been unsuccessful.

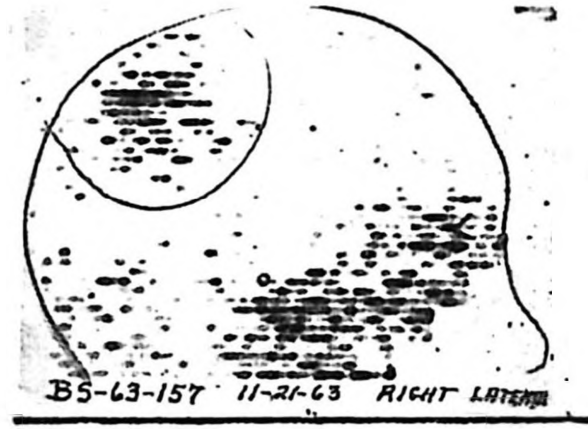


Figure 12.

In conclusion, it is our opinion that isotopic encephalography as an independent procedure offers the safest, least painful, and most accurate test available for the patient with an expanding intracranial lesion. Photoscanning of the brain has reached maturity in its development as a neurosurgical tool, and it should now take its rightful place as an invaluable diagnostic study.