Brain Tumor Scanning by Multiscintigram System

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Histology	Cases	Scintigraphic Grade				
		+++	++	+	±	−
Glioma	24	4	7	9	2	2
astrocytomas	8		2	4	1	1
astroblastoma	1			1		
glioblastomas	5		2	2	1	
oligodendroblastomas	1			1		
oligodendroglioma	1	1				
ependymoma	1		1			
medulloblastomas	2	2				
cerebellar sarcoma	1		1			
unclassified gliomas	4	1	1	1	1	
Meningiomas	5	1	1	2		1
Craniopharyngiomas	4	2	1	1		
Acoustic Neuromas	2				2	
Pituitary Adenomas	4			2	2	
Pinealomas	2			1	1	
Chordoma	1			1		
Metastatic Tumors	4	1		3		
Histology Undetermined	18		8	8	1	1
Total	64	8	17	27	8	4
Positive	52					
Negative	12					
Accuracy	81%					

We studied few comparisons of the scanning results in both RIHSA and ^{203}Hg-Neohydrin in the same series of patients. The mechanisms of the selective localization of tracer substance in or around intracranical lesions are not yet fully known, and the authors feel that there is no difference between these tracers in the detection of lesion. In this series, similar results were obtained from both compounds, but ^{203}Hg-Neohydrin had given no more informations than RIHSA. So we are using RIHSA mainly for routine clinical purpose and ^{203}Hg-Neohydrin as a supplement.

The dose of RIHSA was 7 microcuries per kg. of body-weight to a maximum of 480 microcuries. Patients were given iodine solution orally to block the thyroid gland prior the injection. Scan was made at 24 hours after the injection and serial scans were performed also as late as 48, 72 hours and so on, if necessary.

We administered to a patient 5 to 7 microcuries per kg. of radioactive Neohydrin with no premedication, but as present, we are using 1ml. of meralluride sodium solution (non radioactive Neohydrin=Eizai Co.) intramuscularly one day before the scheduled scan. Scan was started 1½ hours after the injection. We have not made many scans by ^{203}Hg- or ^{197}Hg- tagged Neohydrin as yet, and the results will be reported in the future.

We use mainly RIHSA and have performed 150 scans for brain tumor by Multiscintigram System in the past 3 years. 37 patients of them, whose diagnoses were established by clinical tests and who had no lesion in the brain, showed negative patterns on the scintigrams. 12 scans, who had non neoplastic leisons in the brain proved after surgery, were delineated with positive patterns. These cases are so-called the false positive, and they were cerebral vascular lesion, softening encephalitis, hematomas, etc. 33 scans of them were studied by serial scans and followed after post operative irradiation by tele-cobalt, and in many cases the scintigraphic patterns of pre-operative tumor which in spite of removal by the operation, remained much the same through several months of serial scans after surgery.

The remainders were 64 intracranial tumors, and most of them were confirmed later by gross anatomy and histological study after surgery or autopsy. The results of these scans are shown in the table. In this series, a correct diagnosis was made in 81 per cent or 52 tumors. Most of the tumors lay in the cerebral hemisphere and, except acoustic neuroma, pituitary adenoma and pinealoma, with correct diagnosis in 50 per cent or less, and in many of cases the localization was such that a positive diagnosis

could not be made.

The usefulness of the brain scanning has not gained popularity in our country, but in some cases the contour and topography permit a precise pathological diagnosis. Unfortunately this is by no means always so, but it is hoped that still greater accuracy may be achieved by refining the technique.

Renal Scanning

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Since the development of scintiscanner by B. Cassen (1950) organ scanning has been building up its own clinically important field, paralleling the improvement of radiopharmaceuticals and scintiscanner. Although no one doubt the necessity of scanning of the thyroid gland, liver, pancreas, spleen and the other organs which can not easily be diagnosed roentgenologically, scanning is underestimated in the kidneys which can be examined accurately by X-ray. Since 1962 more than 200 renal scannings were performed using ^{203}Hg Neohydrin (chlormerodrin).

To obtain scintigraphic informations as many as possible, multi-cut off scanning is essential. The scintiscanner has a 2×2 inch sodium iodide crystal, a 37 hole lead collimator, a medical spectrometer, four thyratrons and four solenoid pens which enable one to get four scintigrams, each with a different recording condition simultaneously (cut off levels 20, 35, 45 and 55%).

As a scanning agent ^{203}Hg Neohydrin is most common. Recently ^{197}Hg Neohydrin became available in Japan and it is obvious that ^{197}Hg Neohydrin is preferable from the standpoint of reduced radiation exposure to the patient due to its short physical half-life of 65 hours. However, some colleague in U.S.A. is insisting that the deep-seated lesions such as brain tumor are more difficult to visualize with agents having soft gamma rays (^{197}Hg: 0.077 MeV) than with more energetic gamma rays (^{203}Hg: 0.279 MeV) in brain scanning. In renalscanning, on the other hand, our in vitro study using an Alderson Organ Scanning Phantom revealed that there was no difference in tumor detection rate between two nuclides, ^{203}Hg and ^{197}Hg. Our gamma-spectrometric analysis of ^{197}Hg Neohydrin showed less than 1 per cent ^{203}Hg contamination. Despite of the advantage of a lower radiation dose to the patient, too short half-lived isotopes such as ^{197}Hg is impractical economically, at present in this country. In most cases, therefore, 200 μCi of ^{203}Hg Neohydrin was administered intravenously and scanning was begun approximately one hour later.

Information can be derived from renal scintigram about the position, size, shape and internal configuration especially presence of space-occupying lesion. From these points of view, renal scan could be classified into seven types as following:

Standard type. Usually the kidneys are from 10 to 12 cm in length, from 5 to 5.5 cm in width scintigraphically and the discrepancy in length is no more than 1 cm. Discrepancy in size, either small or large, indicates some abnormality. Position, shapes should keep within normal variation and internal configuration should be homogenous. In a few instances patchy decrease occurs in renal pelvis and faint delineation of the liver is seen. This pattern includes all normal cases as well as false negative cases of glomerulonephritis, renal vascular disease, tumors of the kidney and renal stone.

Abnormal shape or position. Congenital anomalies such as fetal lobulation, pelvic kidney, or horseshow kidneys are readily detectable by scanning. Extrarenal masses may also displace the kidney from its normal position.

Enlarged type. The kidney is more than 13 cm in length and this type occurs unilaterally either with or without homogenous internal configuration. Polycystic kidney,