Radioisotope Scintigraphy of Cerebral Metastatic Tumors

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Scarcely any surgical treatment has been carried out for metastatic brain tumor in the past. Recently, however, operations are carried out positively for life prolongation and improvement of symptoms. The necessity for early detection of accurate localization and number of the tumor has been realized. We have studied 16 cases with serial cerebral angiography and brain scan. Angiographic findings of metastatic brain tumor are classified into 5 types and compared with positive scan. The phase of appearance of angiographic density (circulation time) was divided into arterial, venous and capillary phase to compare with the angiographic findings and the rate of positive scan was studied. The concentration ratio of radioisotope at the site of the tumor was calculated by the memory system and differential diagnosis was attempted through the chronological change.

Sequential Brain Scan with $^{99m}$Tc Pertechnetate

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Experimental and clinical studies have suggested that the optimum time for $^{99m}$Tc-pertechnetate brain scanning is approximately three hours after injection. This injection-time relationship has been confirmed by collaborative clinical studies comparing scans taken at one and at three or four hours after injection.

The purpose of our study was to determine what additional information would be available if sequential scintillation camera scans were obtained at multiple intervals at and following injection.

In 200 patients, where one-hour scans showed abnormal or suspicious findings or where there was a high index of clinical suspicion, eight interval scans were obtained. These were made during injection; at 10, 20 and 30 minutes; and at 1, 2, 3 and 4 hours at after injection.

While our studies confirmed that delayed scans at 3 or 4 hours were optimal for diagnosis in the majority of intracranial lesions, there were several notable exception. Arterio-venous malformations could be diagnosed only with the combination of immediate and subsequent scans; while pituitary adenomas were best identified on early scans at 30 to 60 minutes and were difficult and occasionally impossible to diagnose on later scans. Some ependymomas showed peak differential uptake at 1 or 2 hours and were not discernible on early or late scans in the series.

A most important observation was that in may instances small lesions, which could not be differentiated from normal variation on any single scan, were easily identified by observing interval changes with time. These lesions most commonly involved the occipital lobe, cerebellum and brain stem.
Sequential scanning, although obviously impractical on a routine basis, has proven extremely useful in selected cases. Also it has virtually eliminated indecision as to whether a scan is normal or abnormal.

An Experimental Study on the Mechanisms of Positive Brain Scan Associated with Cerebrovascular Accidents

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It has been generally accepted that abnormal brain scan associated with cerebrovascular accidents can be made more frequently in the second to third week after the onset. The mechanisms for developing the positive scan are still unknown.

For clarifying this points, the cerebral subcellular distribution of 99m-Tc-pertechnetate administered intravenously was studied on the course of experimental cerebral hematoma produced in rats. The experimental cerebral hematoma was prepared in the rat by the method of cloting blood injection into the cerebral hemisphere.

The rats were sacrificed by decapitation at 1 day, 1, 2, 3 and 4 weeks after preparing the hematoma. About 30 minutes before decapitation, 200 µCi of 99m-Tc-pertechnetate was injected into the rat tail vein. The rat hemisheres with and with hematoma were divided, homogenized with 0.25 M sucrose and centrifuged to fractionate the debris, mitochondrial, microsomal and supernatant fraction. The uptake ratio and the subcellular distribution of 99m-Tc-pertechnetate of the each hemisphere were examined.

The higher ratios of hematoma to control hemisphere (H/C) were observed in 1, 2 and 3 weeks groups with hematoma. It was found that the radioisotope activities of injected 99m-Tc-pertechnetate were concentrated in the supernatant fraction, existing a little in the debris, mitochondrial and microsomal fraction in the brain. The pathohistological studies were also carried out on the course of experimental cerebral hematomas.

Higher H/C ratios were obtained in coincidence with the stage when positive scans were more frequently made in the patients with cerebrovascular accidents.

Combination Technique with 67Griium Citrate and 99mTc-Pertechnetate in the Brain Scanning by the Conventional Scanner

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Radioisotopic brain scanning has been evaluated with a number of agents using, 131I diodo- fluressin, 32P, 42K, 204Bi citrate, 131I PVP, 131I antifibrinogen, 19F potassium fluorate, 64Cu, 75As, 57Co TPPS, 133Xe, 131I MAA, 131I HSA, 197Hg or 203Hg, 155Yb DTPA, 117In DTPA and