Sequential acanning, 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 hematomal 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 frction, 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 hematoma.

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 ^{67}Grrium Citrate and ^{99m}Tecnetium Pertechnetate in the Brain Scanning by the Comventional Scanner

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Radioisotopic brain scanning has been evaluated with a number of agents using, ^{131}I diodofluoressin, ^{32}P, ^{42}K, ^{206}Bi citrate, ^{131}I PVP, ^{131}I antifibrinogen, ^{19}F potassium fluorate, ^{64}Cu, ^{75}As, ^{57}Co TPPS, ^{133}Xe, ^{131}I MAA, ^{131}I HSA, ^{197}Hg or ^{203}Hg, ^{169}Yb DTPA, ^{113m}In DTPA and

mainly ^{99m}Tc.

^{68}Ga with a short physical half-life of 68 minutes and an effective half-life of about 40 minutes emits 85% positrons with few non-annihilation gammas. There have been only two reports using ^{68}Ga as a positron emitter in brain tumors. (Shealey et al. 1964) (Gottschalk et al. 1965) There have yet been no reports of combination technique using ^{67}Ga citrate and ^{99m}Tc pertechnetate for brain scanning with conventional scanner. We have experienced brain scanning using ^{67}Ga citrate and compared this with ^{99m}Tc pertechnetate scanning in each case.

Meteods and Materials

The series was composed of 10 patients; 2 cases of brin abscess, 3 cases of metastatic brain tumors, 2 cases of meningioma, 1 case of meningosarcoma and 1 cases of acoustic neurinoma (von Recklinghausen's disease). Co bined technique using ^{67}Ga citrate and ^{99m}Tc pertechnetate were as follows: Patients were given of 200 mg of perchlorate and 30 minutes later, ^{99m}Tc pertechnetate were injected intravenously in a dose of 5 mCi. About 30 minutes later, brain scanning were begun in 4 projections with Toshiba dual scanner of 5 inches or with Toshiba gamma camera. In each case, ^{67}Ga citrate scanning were supplemented few days later. About 2–3 mCi of ^{67}Ga citrate were injected and brain scannig were done with conventional scanner in each case, twice, 30 minutes and 24 hours after injection. ^{99m}Tc images were compared with ^{67}Ga citrate images in each case.

Results

^{67}Ga citrate image of 24 hours were better than that of 30 minutes. In one case of brain abscess, the localisation of abnormal hot areas by ^{67}Ga citrate images was slightly different and wider than that of ^{99m}Tc image. In one case of metastatic tumors, multiple metastatic foci which could be demonstrated neither by ^{99m}Tc image nor angiography were observed only by ^{67}Ga image. In 2 cases of meningiomas, ^{67}Ga image were better than ^{99m}Tc image. In other 6 cases, ^{67}Ga and ^{99m}Tc images were same or better in ^{99m}Tc images.

Conclusion

^{67}Ga citrate can be evaluated in some selected cases, such as meningioma, as an adjunct scanning agents in combination with ^{99m}Tc pertechnetate.

Quantitative Evaluation of Abnormal Accumulation in Vivo of ^{99m}Tc-Pertechnetate in Intracranial Lesions

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Quantitative evaluation of abnormal accumulation in vivo of ^{99m}Tc-pertechnetate in intracranial lesions was attempted in order to establish more precise differential diagnosis. Brain scan was performed by using isosensitive scanner and its data was stored in the data analyser CDS-4096.

1) Size of the abnormal accumulation:

In order to obtain actual size of lesion, phantom examination was performed, utilizing nine sphere phantoms of different size and radioactivity. Their mean threshold level which indicated actual size was about 30% and their mean diviation was about 5%. Size measured by this method was relatively corresponded with actual size of operation specimens and their mean error was within 5 mm.

2) Shape:

Contour map of lesion image could be obtained on-line by assigning 30% level on the image histogram using the light pen. Contour maps of meningiomas were selatively regular circle or