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 intravenousely 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 ellipse, while these were irregular in glioblastomas.

3) Densiti [RI accumulation ratio per unit volume (% dose/cm^3)]:
This is calculated from the following equation:

$$\% \text{ dose/cm}^3 = \frac{\text{number of counts in lesion/cm}^2\text{—number of counts in background/cm}^2}{\text{size of lesion (cm)}} \times \frac{\text{radioactivity in the sphere phantom } (\mu\text{Ci})}{\text{number of counts in the sphere phantom}} \times \frac{\text{weight of patient's body}}{\text{weight of standard's body}} \times \frac{100}{\text{dose of }^{99m}\text{TcO}_4\text{—administrated } (\mu\text{Ci})}$$

Though only density of lesion was not very useful to make differential diagnosis, it appeared that change of density with time was important factor.

It is well known that glioblastomas and metastases are visualized best on delayed scans and this could to be related that in these lesions not only tumor to brain ratio but absolute RI accumulation was higher on delayed scans than initial scans.

An Improved Method of the Measurement of Regional Cerebral Blood Flow

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The method of data acquistion and analysis of regional cerebral blood flow (rCBF) using gamma-scintillation camera had been reported.

Data processing system consists of the teletypewriter, the magnetic tape, a cathode ray tube (CRT), and a minicomputer with 8K words core memory. Radioisotope pulses from the gamma-scintillation camera are accumulated in the core memory for the settled sampling time and then transfered to the magnetic tape sucesively. The interesting areas can be determined by CRT display of brain scintigram at will. Each clearance curves can be displayed on CRT in linear scale or semilogrithmic scale, for the sake of recognition of arterial spike, shunt peak, and tissue peak.

The raw clearance data consist of one second sampling data during first 1 to 3 minutes and 10 seconds sampling data during the following time.

The calculations of rCBF parameters are done as follows:

The point of maximum counts is identified, the next four points are skipped, and the fifth datum point after the peak is the first one used in the analysis.

Before the calculation of rCBF (initial), rCBF (10 min.), rCBF (gray), and rCBF (white), one second sampling data are converted to 10 seconds sampling data.

An attempt is made to correct the remaining activities for previous measurement.

The initial slope index is calculated from the slope of the best fitting line to the initial 2 minutes curve taken logarithmically.

The 10 minutes height-over area index of rCBF is also calculated.

The slow component determination in two compartment analysis is done by calculating the regression line during 8 to 10 minutes data of the clearance curve taken semilogarithmically. The fast component determination in this analysis is done by the subtraction of slow component clearance curve from original one.

The on-line acquistition and analysis of Xe-133 clearance curves allow the immediate utilization of the results of cerebral blood flow.