Radioisotopic Diagnosis of glioma

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We have performed the comparative study of 29 gliomas, whether the localization diagnosis and histopathological diagnosis in various gliomas are possible or not, by means of RI scintigraphy, RI dynamic study and serial angiography.

These results were following:

1. On the RI scintigraphy and angiography, the diagnostic rate of localization of glioma was 100% in glioblastoma and 88% astrocytoma.
2. The scintigram of glioblastoma was compared with serial angiogram that is classified into four types. As a results, types are all possitive in scintigram. Especially type III containning the element of arteriovenous anastomosis showed tendency of marked increase activity in scintigram.
3. The RI concentration curve was compared to each types of angiogram. Its peak times was most rapid in type III.
4. For the diagnosis of other brain tumor which is difficult to differentiate with glioblastoma or astorocytoma, analysis of RI concentration curve was useful to a certain degree.

Profile Curve of Brain Tumor Scintigram

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The size of tumor image on brain scintigram in resulted from so many complicated factors existing in both patient and instrumentation, that it is practically impossible to estimate the accurate size of tumor by theoretical calculation.

Scintigrams of cylindrical and elliptic cylindrical phantoms filled with 99mTc-pertechnetate solution were taken in the air and water with a gamma camera and recorded in a digital magnetic tape to find gross relation between the size of tumor and image.

Since the image size of phantoms was variable depending on imaging factors, it was difficult to find the size of phantom on the profile curve of scintigram, however the distance between two points of inflection measured on the differential curve indicated good approximation to the diameter of phantoms.

Similar estimation tried on 22 scintigrams of clinical cases with various kind of brain tumors which sizes were measured fairly accurately during or immediately after surgery, were also found approximate to the tumor size with errors within the size of a single unit of matrix restricted by the memory capacity of our system. Clinical usefulness of this estimation of tumor size was proved in preoperative planning of the size of minimal craniotomy and the length of ligation of the

sagittal sinus required for the safe removal of a parasagittal meningioma with poor visualisation of its margin in CAG, and of a meatstatic carcinoma surrounded by large mass of reactive brain edema which obscured the size of tumor itself with distant effects in CAG. Follow-up evaluation of the effect of non-surgical treatment of tumor such as chemo or radiation therapy also showed the usefulness of this technique in two scintigrams of one patient taken with the same nuclide and projection, but with administration of different dose, with interval of four months and with a scanner for the first time and camera for the next time.

Profile curves of various kinds of brain tumor simply supported well known facts in characteristics of tumor scintigrams, but naked eyes were thought to have lower threshold in detection of slight change in curve than in density of image.

Count rate of tumor peak(T), bottom of normal brain tissue area (B, with BBB) and average height of skull margin (R, without BBB) on profile curves crossing the center of tumor image were measured in 75 scintigrams with 99mTc-pertechnetate of 39 cases with verified diagnosis.

Square areas surrounded by four lines indicating mean value$\pm$s.d. of T/B ratio in ordinate and of T/R ratio in abscissa on a graph for each group of tumor were arranged fairly linealy, glioblastoma, meningioma, metastatic tumor, neurinoma and low grade gliomas in that order.

To diagnose and unknown tumor on scintigram with this graph is somewhat difficult at present, due to fairly large overlapping among areas of each tumor, but uptake range of nuclide for each tumor on scintigram illustrated in this graph must give some useful information for the diagnosis of brain tumors.

Radioisotope Cisternography in Hydrocephalus with Quantitative Study

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Radioisotope cisternography gives the information about cerebrospinal fluid (CSF) dynamics with the sequential image of radionuclide distribution. However, to get more accurate estimates of the CSF clearance, the application of quantitative techniques is necessitated.

The purpose of our study is to devise the most suitable technique of quantitative study and to detect whether the quantitative cisternography is useful to determine the indication of shunt operation in hydrocephalic patients.

^{131}I-Human serum albumin or ^{169}Yb-DTPA was used in this study. Following ventricular or lumbar intrathecal injection of these radiopharmaceuticals, sequential anterior and lateral scintiphotos of head or spinal column were obtained with an Anger type scintillation camera at 1, 4. 24, 48 and occasionally 72 hours. The head count rate was calculated at same intervals. The head count rate at each interval was normalized with respect to the peak level of activity obtained and expressed as a percent of this maximum value.