region of 6 glioblastoma multiformes decreased, in spite of increase in pathologic vessels and arteriovenous shunts in arteriograms. In some of these cases, an initial peak of clearance curves as seen in the case of arteriovenous mulformation was noted. This initial peak might show a rapid passage of the isotope through the shunt. As the blood flow through the shunt does not contribute to the brain metabolism, the rCBF in these tumors having arteriovenous shunts might not be so large as in the case with meningioma.

Dual Foci RI-Detector on Measurement of Cerebral Hemispheric Hemdoynamics

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We have already reported the method of measuring intra and extra-cranial blood volume with the use of a new dual foci detector head. In this report, we have discussed the new theory about the measurement of cerebral hemispheric hemodynamics with the use of this new dual foci detector head and have presented interesting findings in the cerebral hemispheric blood volume of cerebro-vascular disturbances.

The following is the description of the method:

The dual foci scintillation detector head was placed on the temporal region of a human's head with one focus on the right cerebral hemispheric region and the other on the left, and RISA was injected into the cubital vein. After RISA was completely mixed within the body, the external counts were measured with the use of each focused detector head. Approximately 5 minutes following the injection of RISA, its concentration was measured by using a well-type scintillation counter on the blood drawn from the cubital vein.

Theory of the method:

The whole cranial blood volume (V) is described by equation No. 1.

$$V = V_R + V_L = n \times \frac{R}{B} + n' \times \frac{R_L}{B} \cdots\cdots\cdots\cdots (1)$$

In this equation, Vr stands for the right cerebral hemispheric blood volume and V_L, the left cerebral hemispheric blood volume, both measured with the use of a short focused collimator (S-channel). B indicates the concentration of RISA in one ml the blood taken at the same time n and n′ were calculated from the phantom simulated to a human head with the both right and left hemispheric cavities. Observed external counting rates of S and 1-channels were indicated by R and R′. Rr, Rl and R′r, R′l were expressed the external count of right and left hemispheric cranium which we could not observe directly with the use of S and 1-channels.

Toerefore,

$$R = R_L + R_R \cdots\cdots\cdots\cdots (2)$$

$$R' = R'_L + R'_R \cdots\cdots\cdots\cdots (3)$$

The equation No. 3 was converted

$$R' = R_R \times y + R_L \times \delta = (R - R_L)y + R \times S$$
$$= R_L(\delta - y) + R \times y$$

$$R_L = \frac{R' - R \times y}{S - y} \cdots\cdots\cdots\cdots (4)$$

Then, the left cerebral hemispheric blood volume was represented by equation No. 5

$$V_L = \frac{u}{B} \times \frac{R - R \times y}{S - y}$$

Hence, $S = \frac{R'_L}{R_L}$ and $y = \frac{R'_R}{R_L}$ could be calculated from the above phantom.

The result:

The focus cerebral hemispheric blood volume of cerebro-vascular disturbances, with average

age of patients 59.6 years, was average 43.7 ml and it was lower than the normal cerebral circulation time of focus cerebral hemispheric cranium was 11.3 sec. and it was appreciably prolonged as compared with normal cerebral hemispheric cavities circulation time.

Cererbal Hemodynamics Study by an Intravenous Injection of Radioisotope

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In addition to the brain transit time measurement, the cerebral circulation curves obtained by intravenous injection of a radioisotope were studied and analysed in the flolowing ways, expecting to obtain the cerebral hemodynamics in more detail.

(1) Simultaneous recording of a radioaortogram through a gamma-ray detector placed over the sternum. The ratio of the height of aortic peak(P) to that of the bottom of downward slope(H) and the time interval between P and H give an estimation of the density and width of the bolus before entering the head. Thus, any eventual cardiopulmonary abnormality, which, of itself, results in the deformed bolus, could be detected.

(2) The measurement of the time between the aortic peak and the peak of the cerebral circulation curve on each side was made. This aorta-to-peak time indicates the symmetry or asymmetry of the cerebral circulation.

(3) The ratio of the height of the peak on the cerebral criculation curve to that of the bottom of downward slope was then calculated. This will be lowered on the side where arterio-venous shunt (partial), irregular blood flow, decreased blood flow or increased blood pool is present. One case of severe head injury resulted in the development of right carotid-cavernous sinus fistula showed an increase of this value of that side. This was considered due to almost complete blood flow through the shunt.

(4) Observation of the deformed peaks on the cerebral circulation curves. This indicates the presence of the irregular inflow and/or outflow of the bolus in the cranium, caused by the intracranial vascular abnormalities as well as any cardiopulmonary abnormalities.

(5) On the cerebral circulation curve, the widths of the curve at 1/2 and 2/3 of the height of peak were respectively measured. The latter was observed to be well correlated with the brain transit time, while the former with the radioaortogram.

(6) Finally, cases, in which the results of the above mentioned analysis correlated with the results of the cerebrla blood flow measurement from the ^{85}Kr clearance curve, were presented and discussed.

This simple and atraumatic testing of cerebral circulation will give useful and accurate information of clinical value as to the cerebral hemodynamics if above mentioned analysis is employed.