

VIII. Brain and Nervous System

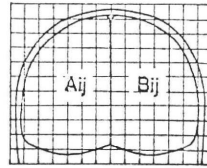
Diagnostic Studies on Brain Scintigrams (Bilateral Collation Method)

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We have performed brain scans on more than two hundred patients as a screening test for the past two years. In reading the scintigram, it was required to get the objective view of the brain scintigram. Because we had met much suspectable appearances in the cases of cerebrovascular accidents and astrocytomas etc. In this purpose, we had tried the method to emphasize and smooth the positive areas of brain scintigrams by using a radioisotope data processing system including a minicomputer. The pictures by this display method were better than the original appearances, but the lesions could not be always clarified. In the view of the symmetrical observation of both hemispheres, the scintigrams were divided in 6 mm × 6 mm sections and the bilateral

BRAIN SCANNING BILATERAL COLLATION METHOD



$$A_{ij} : a_{ij} \pm \sqrt{a_{ij}}$$

$$B_{ij} : b_{ij} \pm \sqrt{b_{ij}}$$

$$C_{ij} : a_{ij} - b_{ij} \pm \sqrt{a_{ij} + b_{ij}}$$

$$D_{ij} : b_{ij} - a_{ij} \pm \sqrt{a_{ij} + b_{ij}}$$

collation method was applied as follow:
Using this newly developed procedure, we could detect the unidentified lesion in the original picture as an accurately positive area, objectively.

Limitation in Differential Diagnosis of Intracranial Lesions by the Simple Brain Scan

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The value of the simple brain scan was discussed in differentiating intracranial lesions without additional clinical informations. In reviewing a scan the following factors should be considered: a) the number of lesions, b) the location of the lesion, c) size of abnormal uptake, d) density, e) margins and shape of the abnormal uptake, f) temporal factors.

1) number of lesions: The presence of two or more areas of abnormal uptake must be taken as a sign of metastases or brain ab-

scences.

2) The location of the lesion: This is one of the most valuable aspects of analysis of the positive scan. The major categories of uptake, namely brain tumors and infarcts, were separated in 52 percent by some knowledge of neuroanatomy and neuropathology. The analysis of abnormal uptake in a given location was narrowly limited by knowing the relative frequency of tumor types of different locations.

3) density: This was found from the following expression by using isosensitive scanning: $\text{Density} = a \cdot b / cd$; $a = \text{dot numbers in mass/cm}^2$, $b = \text{dot numbers in the area of the normal opposite hemisphere/cm}^2$, $c = \text{dot numbers in parietal portion/cm}^3$, $d = \text{depth of mass (cm)}$. It was proved that meningiomas, metastases and glioblastomas tend to be quite

dense, but low grade astrocytomas and A-V malformations show only faint uptake. Density of abnormal uptake may be helpful for the diagnosis of malignancy.

4) Margins and shape of the abnormal uptake: Morphological classification of scan images is available to a certain degree but sometimes too subjective.

Hemodynamic Study of Radiocardioccephalogram —Orthostatic Hypotension and Shy-Drager Syndrome—

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The postural changes in cardiac and cerebral hemodynamics of orthostatic hypotension have been studied.

The radiocardioccephalogram, obtained following intravenous RISA ($40 \mu\text{Ci}$) injection and external computation method was simulated with curve fitting method by the analog-computer. Then the cardio-cerebral circulation values was calculated as previously reported.

The transference of posture was brought about by a manual tilt-up table. The problems related with postural changes in collimation condition were discussed.

A case of Shy-Drager syndrome, aged 47 man, having suffered from micturition disturbance, impotence, anhydrosis, cerebeller ataxia, micturition syncope and incontinence for three years have been examined. The hemodynamics were studied in supine position, head-up tilting 80° and supine again. Cardiac Index decreased excessively (-42%), heart rate unchanged and blood pressure decreased from $140/72$ to $92/58$ mmHg in head-up tilting. Central blood volume, that is pulmonary

blood volume plus total mean heart volume, diminished from 590 to 400 ml/m², and cerebral blood volume 83 to 65 ml, suggesting the increase of postural venous pooling. Calculated peripheral vascular resistance, involving cerebral vascular resistance, increased only so slightly that the blood pressure fall was not enough compensated. Cerebral blood flow fraction (CBF/systemic blood flow) was also decreased and CBF diminished from 55.5 to 27.7 ml/min/100gr (-50%), indicating a loss of autoregulation mechanism.

With replacement to supine position, central blood volume excessively increased to 850 ml/m², pulse rate fixed, mean ejection rate increased to $0.54(r)$ $0.47(l)$ and cardiac index and stroke index increased above normal limit (5.7 L/min/m², 88.8 ml/beat/m²). Blood pressure and CBF returned to previous values and CBFF nevertheless decreased from 9.5% to 7.8% .

According to these results, it seems that the orthostatic hypotension in Shy-Drager syndrome is probably due to multiple disturbances in circulatory control system.