log-likelihoods. It was found that the exponential infusion function was optimal among these three infusion functions for the calculation of regional CBF.

Finally, estimation errors of the parameters $\{A_i\}$ and $\{\alpha_i\}$ regarding to sampling intervals and total measurement durations are evaluated to calculate Cramer-Rao bounds in computer experiments, where several sets of parameter values $\{A_i\}$ and $\{\alpha_i\}$ were suitably assumed by previously obtained real data processings. Under these paramater values, it was found that one second sampling interval was sufficient and about 20 minutes sampling duration was necessary for the calculation or regional CBF.

## Comparison between V-P Shunt (Ventriculo-Peritoneal Shunt) and L-P Shunt (Subarachnoid Lumbo-Peritoneal Shunt), rCBF Study

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In 12 cases of adult hydrocephalus, ventriculo-peritoneal shunt (V-P shunt) or subarachnoid lumbo-peritoneal shunt (L-P shunt) procedures were performed on 7 and 5 cases respectively. The effect of these two operative methods was estimated by measuring pre and post operative regional cerebral blood flow (rCBF) and by physical examinations. Ten mCi of $^{133}Xe$ was injected into right or left internal carotid artery to obtain mean rCBF by two compartmental analysis of regional Xenon clearance method. Postoperatively almost all patients improved clincially. In V-P shunt group, postoperative mean rCBF increased about 15% compared with that of preoperation, whereas in L-P shunt group, postoperative mean rCBF increased about 22%. In conclusion, less traumatic L-P shunt procedure was proved to be of value to correct adult hydrocephalus observed frequently among the patients of senile dementia. This procedure, similar to V-P shunt, did accompany rCBF improvement.

## CSF Dynamics in Chronic Adult Hydrocephalus Before and After shunt Operation

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So called normal pressure hydrocephalus, chronic adult hydrocephalus after subarachnoid haemorrhage had been studied by many investigations using RI cisternography. Recently the CT scan added.

However the report of clinical study about comparison of CSF dynamics before and after shunt operation is rare.

Up to the present, we observed the morbidity after subarachnoid haemorrhage using clinical symptomes, EEG, air study, RI cisternography, and RI clearance curve study, consequently we determined the criteria of shunt operation.

Now we observed the CSF dynamics before and after shunt by RI cisternogram, RI clearance curve, EEG, and CT scan, in case of chronic adult hydrocephalus shunted following our criteria.

Materials:

Shunted cases after subarachnoid haemorrhage of ruptured aneurysm 19, AVM2 and others 1.

Results:

① RI clearance curve before shunt operation was classified to two types.
(1) Type I had RI peak time within 6 hours.
(2) Type II had more than 24 hours.
in each types, RI clearance curve was ab-

normal.

② The changes of RI clearance curve by shunt operation;
  (1) RI peak time became faster than before shunt from 24 hours to 6 hours.
  (2) RI clearance after peak time at 24 hours was less than 50%, almost 30%.

③ The changes of clinical symptoms correlated to rather RI clearance curve than RI cisternogram.

④ RI clearance curve after peak time suspected the shunt patency, too.

⑤ In comparison to other clincial examinations;
  (1) The cases obtained an improvement of clinical symptoms and RI clearance curve after shunt, were seemd an ameliorations in EEG.
  (2) In CT scans of such cases, marked reductions of size of ventricular systems were observed.

Hereafter in an observations of pathological conditions of hydrocephalus after subarachnoid haemorrhage, it seems to be necessary rather RI clearance curve and CT scans than RI cisternogram.

## Functional Image of Regional Cerebral Blood Flow Clinical Application to the Cases of Middle Cerebral Artery (MCA) Occlusion

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The functional imaging of regional cerebral blood flow (rCBF) is useful for understanding the hemodynamics and pathophysiology of the cerebrovascular disease. We reported the method of generating functional image of rCBF at the 16th Annual Meetings of the Japanese Society of Nuclear Medicine. Now, we report the clinical application to the cases of MCA occlusion. The cases were those with the complete occlusion of the stem of MCA in chronic stage. The rCBF study was performed at rest (control), at $CO_2$ inhalation, at hyperventilation and at contralateral digital compression of common carotid artery. We found that rCBF functional image of the cases of MCA occlusion offered the information of various types of pathophysiological and hemodynamic state. One case represents the generalized reduction of rCBF with ischemic focus at the territory of MCA. Another cases represent generalized slight depression of rCBF with no ischemic focus at the territory of MCA. And in this group, $CO_2$ reactivity of cerebral blood vessel is examined by $CO_2$ inhalation or hyperventilation. The case with the loss of $CO_2$ reactivity at the territory of MCA has also the loss of autoregulation at the territory of MCA which is assessed by the method of contralateral digital compression of common carotid artery instead of lowering systemic blood pressure. The functional image of each type is well correlated with the grade of clinical neurologic deficit and the development of collateral circulation. Consequently, rCBF functional image is very useful for detecting focal ischemia, $CO_2$ reactivity of cerebral blood vessel and the loss of autoregulation. And rCBF functional image will be also helpful for determining the indication of the bypass surgery (ST-MCA anastomosis).