served in the relation to the duration from the onset.

The results were summarized as follow;
1) 0–3 days after the onset; Hemispheric CBF was decreased (38.0±8.1 ml/100 g/min.), focal hyperemia and ischemia was not so common. Loss of autoregulation and impaired response to hypercapnea was observed in about 60% of examined cases.
2) 4–7 days after the onset; It was noteworthy that recovery of hemispheric CBF was observed in this stage (43.3±7.7 ml/100 g/min.). Vasoparalysis and loss of autoregulation was become to more prominent, frequency of arterial spasm was about 50%.
3) 2 weeks after the onset; Disturbance of cerebral hemodynamics was most prominent. Hemispheric CBF was decreased again (35.3±7.6 ml/100 g/min.), regional hyperemia and ischemia was most frequent in this stage (about 50%), vasoparalysis and loss of autoregulation was observed on most cases and was spread widely in the hemisphere. Angiospasm was observed 17 cases out of 20 cases.
4) Over 3 weeks; Only 7 examinations were done at this duration. Hemispheric CBF and angiospasm tended to recovery, but global loss of autoregulation was observed in 2 cases out of 3 cases at more than a month after the onset.
5) The results described above were confirmed also by follow-up observation of five cases.
6) Significant correlation between hemispheric CBF and consciousness of patients was observed.

RI Angiography and Cerebral Blood Flow Measurement with a gamma Scintillation Camera and a Data-store Playback Accessory

J. HANDA and K. TORIZUKA

Department of Neurosurgery and Department of Radiology,
Kyoto University Medical School, Kyoto

RI angiography following rapid intravenous (or occasionally intra-carotid) injection of 5 to 10 mCi of 99mTc pertechnetate has been routinely performed on the patient suspected of harboring an organic cerebral lesion, using a gamma scintillation camera and a data-store playback accessory. The merit and demerit of using a VTR system are pointed out.

Abnormal findings in RI angiograms are classified as (1) displacement, (2) increased radioactivity and (3) diminished radioactivity.

RI angiogram is most useful in the diagnosis of cerebrovascular disease, especially of occlusive nature. Up to date, more than 40 patients of acute as well as chronic phases of stroke were examined. The over-all result of static imaging was approximately 60 per cent positivity, but the RI angiogram disclosed abnormal findings virtually in every case. The RI angiogram in cerebrovascular occlusive disease essentially shows a diminished activity with delayed appearance and clearance. In 30 cases of arteriovenous anomalies and 2 cases of a giant aneurysm, an increased focal radioactivity with early appearance and clearance was specific. All 30 cases of arteriovenous anomalies showed specific abnormalities on RI angio-
gram, but 2 of them failed to show abnormalities in the static images.

In brain tumors, intracranial hematomas and inflammatory conditions, RI angiogram is less useful in the diagnosis. In most cases of meningiomas, RI angiograms were positive but the static imagings were also highly yielding and specific. Otherwise, the overall positivity of RI angiograms was approximately 10 per cent in the tumor series. Increased activity was found in meningiomas, cavernoma, hemangioma and highly vascularized gliomas. Most other tumors as well as hematomas and abscesses showed a diminished radioactivity.

In cases with an increased activity, the time course of appearance and clearance of increased activity is important, a focal increased radioactivity appearing in the late phase often indicates the normal variation in the cerebral venous drainage system.

In addition to the RI angiogram, a time activity data and the uptake ratio for regions of interest are obtained by using a VTR system. Those numerical data proved to be of use in checking the validity of the visual analysis of RI angiogram.

In the selected cases, 5 mCi of $^{133}$Xe in the saline were injected into the carotid artery, and the serial Xe scan and the washout curves for multiple ROIs were analysed. The rCBF was determined routinely in 6 ROIs; frontal, posterior frontal, parietal, temporal, sylvian and occipital. The inter-channel differences among 6 ROIs did not exceed 10.0 per cent, and the rCBF determinations with a gamma camera and VTR system proved to be reproducible and practical.

Focal and generalized decrease in blood flow, abnormal tumor flow with or without tissue peak or frank shunt peak, large shunt peak in arterio-venous anomalies, focal increase in the blood flow in and around the tumor, loss of autoregulation and/or chemical control of the blood flow in and near the pathologic focus were demonstrated. Pre- and postoperative determinations of blood flow proved to be in good correlation with the changes in the clinical conditions of the patients.

Intra-arterial injection of 10 mg of papaverine hydrochloride resulted in 60 to 100 per cent increase in rCBF in the control series. In cases with an increased intracranial pressure, the increase in rCBF was often much the less, or not seen. In the occasional cases, rCBF decreased after papaverine, seemingly due to the rapid expansion of cerebral vascular bed resulting in a decrease in the perfusion pressure.

Intravenous administration of 200 ml of hypertonic mannitol solution usually showed an increase in rCBF. No increase in rCBF or dissociation of response among the blood flow in the normal area and that in the tumor area was occasionally observed. The concept of tissue pressure controlling the vascular resistance was stressed in explaining these complex phenomena.

Lastly, further possibilities of clinical application of rCBF study in the cases with organic brain disease were pointed out.