167

THE CHRONO-AUTORADIOGRAPHICAL STUDY USING I-125-IMP AND F-18-FAP.

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N-isopropyl-p-125-iodoamphetamine (IMP) has been reported to remain within 1 hour after uptake, so we selected IMP as a control CBF tracer. IMP(60∿70μCi/100g) was infused for 1 min and arterial blood was sampled. Ten minutes later, methylphenidate (MP;10mg/Kg) or saline was injected intravenously.Twenty-one minutes or 26 min after IMP infusion, F-18-Fluoroantipyrine (FAP) (10mCi/body) was infused for 1 min and arerial blood was sampled. The rats were decapitated 1 min after FAP infusion. Autoradiograms were obtained by the first exposure of F-18 for 8 hrs, and the second exposure of I-125 for 7 days after 2 days interval. Brain concentrations of F-18 and I-125 were quantified with C-14 sources calibrated for F-18 and with I-125 sources, respectively. IMP blood curve was corrected by the octanol extraction fractions at 1,2, 5,15 and 22 or 27 min after infusion. CBF values with IMP and FAP method were calculated by the microsphere model and by the diffusible tracer model, respectively. CBF values in MP administered rat were markedly increased in parietal cortex, globus pallidus, substantia nigra, while not so changed in saline injected rat. From these results, we conclude that this technique enables us to obtain CBF values at pre- and post-medicated condition in the same section of the same animal.

168

THE QUANTITATIVE ANALYSIS OF DOUBLE TRACER LABELLED AUTORADIOGRAM.

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The double tracer labelled autoradiography using F-18 and C-14 is useful technique. However, the preparation of F-18-standard source has been inevitable in each experiment. For long time use, we prepared C-14-source calibrated by F-18-FAP and examined the utility. In control study using C-14-IAP and F-18-FDG, the rCBF and rCMRGlc values that obtained by us had close correlation with that reported by Sakurada (1978, r = 0.812) and by Sokoloff (1977, r = 0.936), respectively. The simultaneous injection study of C-14-IAP and F-18-FAP showed that rCBF values obtained with F-18-FAP according to Sako et al (1984) agreed with those determined with C-14-IAP. However, we have reported early metabolism of F-18-FAP in blood. The rCBF after the correction of F-18-FAP metabolite in blood and the use of 1.0 as a partition coefficient showed about 15 % higher values than that calculated by Sako et al (1984). The hypoperfusion study using C-14-IAP and F-18-FAP showed the possibility of inhomogenous rCBF autoregulation in all over the brain. From these results, we conclude that C-14-standard calibrated by F-18-FAP is useful and F-18-FAP is available tracer for rCBF determination.

169

COUPLING AND UNCOUPLING OF BLOOD FLOW AND METABOLISM DURING PENICILLIN - INDUCED EPILEPTIC SEIZURE IN RATS.

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Recently developed multiple label autoradiography using a positron emitting radionuclide tracer of florine-18 has proved unique and useful as a means for determining multiplephysiological changes simultaneously. Double label autoradiographic techniques with [F-18]-fluorodeoxyglucose and [C-14]-iodoantipyrine enabled us to obtain LCGU and LCBF from the same sections. We applied this method to penicillin-induced epileptic seizures in rats in order to reveal local uncoupling between blood flow and glucose metabolism. In mild unilateral motor seizure, increase in local cerebral glucose utilization correlated well with the change of local cerebral blood flow in all brain regions. On the other hand in severe bilateral motor seizure intermitent with status epileptics, regional increase in metabolism was not accompanied by an increase in regional flow in endopiriform nuclei, claustrum, globus pallidus, substantia nigra, and hippocampus. The dissociation between metabolism and flow is considered to play a possible role in the pathogenesis of brain damage.

170

The Pictorial Detection of Cerebral Microcirculation Utilizing a Digital Autoradiography Technique.

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Insufficient oxygen supply to living tissue caused by the plasma-skimming phenomenon is considered to be brought in ischemic state. In order to depict this phenomenon in cerebral microcirculation, we established a novel method for labeling erythrocytes (RBCs) with high specific radioactivity using glucose analogues. Fresh autologous blood was washed to eliminate blood glucose and suspended RBCs were incubated at 37°C for 30min in buffered saline, where 25μCi of C-14-2DG or 3mCi of F-18-FDG were added. Labeling efficiency was about 75%(C-14-2DG) and 25%(F-18-FDG). On the other hand, plasma flow indicator such as antipyrine or serum albumin were conventionally labeled by I-123 orTc-99m respectively. Focal ischemia was introduced by microsphere embolic method in rats, and a pair of radioactive tracers were administered intravenously after the insult. Brain sections were contacted twice to a γ and ß-ray sensitive imaging plate for a while according to half time of isotopes, and autoradiographic image proessing were made digitaly by a computed radiography system. For the result, paired digtal autoradiograms exhibited that cerebral distribution area of RBCs was limited compaired with plasma flow area and especially was clear in the watershed regions, which suggested that the plasma-skimming might occur during focal ischemia. These subtraction images were made directly by digital scoring, and this method will be useful in image processing instead of conventional film method.