

Application of a beta microprobe for quantification of regional cerebral blood flow with ^{15}O -water and PET in rhesus monkeys

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A beta microprobe was successfully applied to monitor arterial input function for quantification of regional cerebral blood flow (rCBF) in the monkey brain with ^{15}O -water and positron emission tomography (PET). The sensitivity of the probe was approximately 0.83 to 1.67 cps/kBq/ml depending on the studies. A preliminary study was performed to find a suitable use and to evaluate the performance of the system and data analysis procedure. The results showed that dispersion correction of measured input function was unnecessary if microprobes were connected directly to the arterial catheter. Then multiple CBF measurements were done in three monkeys under anesthesia. Identical regions of interest were placed with the aid of magnetic resonance imaging (MRI) of each monkey and rCBF values were estimated. Estimated rCBFs were reproducible for several measurements. The mean CBF value for a pentobarbital anesthetized monkey was 46.0 ml/min/100 g ($\text{PaCO}_2 = 46.3$ mmHg). This shows that the use of the beta microprobe for quantification of rCBF with PET was validated. The lack of a need for dispersion correction of observed input function is an advantage with the beta microprobe system because the probes are small enough to be placed near the arterial sampling site.

Key words: regional cerebral blood flow, positron emission tomography, arterial input function