

Simplified quantification of regional cerebral blood flow with ^{99m}Tc -ECD SPECT and continuous arterial blood sampling

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The goal of this study was to develop a simple method for quantification of regional cerebral blood flow (rCBF) with ^{99m}Tc -ethyl cysteinate dimer (ECD) SPECT. Following an intravenous constant infusion of ECD for one minute, serial dynamic SPECT imaging was performed for 40 minutes in 6 healthy male volunteers with intermittent arterial blood sampling. PET scan with ^{15}O -water was performed on the same day before the SPECT study for measurement of rCBF. Arterial blood data demonstrated rapid conversion of ECD to the hydrophilic metabolites, and most of the arterial input to the brain was completed within 5 minutes after the injection. Brain activity reached a peak value soon after the cessation of infusion, and was stable thereafter with very little washout. Net extraction of ECD in the brain calculated by arterial input of ECD and rCBF demonstrated a rapid decrease within a few minutes, reaching 42.7% at 5 minutes. The simulation study suggested that the arterial blood activity obtained by continuous drawing for 5 minutes and a single SPECT scan would provide a reasonable estimate of rCBF under the assumption of constant net extraction in the brain.

Key words: ^{99m}Tc -ethyl cysteinate dimer (ECD), regional cerebral blood flow (rCBF), SPECT, quantification, arterial sampling