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Quantitative PET cerebral glucose metabolism estimates using a single non-arterialized venous-blood sample

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The purpose of this study is to develop a method of quantitating the cerebral metabolic rate of glucose (CMRglc) by positron emission tomography using a population-based heated venous curve and one-point sampling from a non-heated vein, i.e. that can avoid arterial puncture. ***Methods:*** We conducted this study on 17 subjects with a mean age of 61 ± 9 years. A time-concentration curve as an input function was obtained by sampling 24 blood samples, from the heated left hand vein, one before and the others after intravenous injection of 259 MBq of F-18-fluorodeoxyglucose into the right cubital vein. A non-heated venous sample was also obtained from the right cubital vein. ***Results:*** The population-based input function was calculated by averaging time-concentration curves from the first 7 subjects. A single sample obtained from 10 other subjects from 7.5 to 20 minutes and 35 and 40 minutes after injection predicted input function well with an error of less than 4.5%. The radioactivity in the non-heated 40 minutes' sample was 1.7 ± 2.9% higher than in the heated vein. When we calibrated the population-based curve using the non-heated venous samples at 40 minutes in 10 subjects, the calculated CMRglc values were 1.3 ± 5.4% lower than the actual values. ***Conclusions:*** Non-heated venous one-point sampling and the population-based curve can decrease the complexity of the procedures and the manpower required, and also make the FDG study less invasive, without a significant increase in measurement error.

Key words: ^{18}F-FDG, PET, cerebral metabolic rate of glucose, input function, venous sampling