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A new method to estimate rCBF using IMP and SPECT without any blood sampling

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We developed and evaluated a method to measure rCBF without any blood sampling by using iodine-123 IMP and SPECT. An integral of arterial input function, $\int_0^T Ca(t)dt$, can be expressed as TC(T)/CO, where TC(T) is radioactivity delivered to the body in T minutes and CO is cardiac output. If T is acceptably small, rCBF can be determined by means of a microsphere model analysis with IMP as Cb(T)/(TC(T)/CO), where Cb(T) is cerebral radioactivity at T minutes. We derived TC(T) and CO from a chest dynamic scan. The method was applied to 45 patients who underwent rCBF studies (58 studies) with arterial blood sampling (ABS). Data from the chest scan were analyzed in comparison with ABS data in the first 28 studies, and equations for correction yielding an accurate TC(T)/CO were derived. The validity of the proposed method was evaluated in the subsequent 30 studies. The method yielded rCBF (rCBF-test) which agreed well with rCBF obtained by a two-compartment model analysis of dynamic SPECT and ABS data (rCBF-ref) with the mean and SD of differences between rCBF-test and rCBF-ref being 1.0 and 2.7 m*l*/100 g/min, respectively. In eleven subjects who underwent more than two studies, a percentage change in rCBF-test between the studies also closely approximated that of rCBF-ref ($y = 1.11x + 2.63$, $r = 0.92$). The method can be used with acceptable reliability to measure rCBF without any blood sampling.

Key words: iodine-123 IMP, regional cerebral blood flow, SPECT