

## Reappraisal of single-sample and gamma camera methods for determination of the glomerular filtration rate with $^{99m}\text{Tc}$ -DTPA

Kazuo ITOH,\* Satoshi TSUSHIMA,\*\* Eriko TSUKAMOTO\*\*\* and Nagara TAMAKI\*\*\*

*Departments of \*Radiology and \*\*Internal Medicine, JR Sapporo General Hospital*

*\*\*\*Department of Nuclear Medicine, Hokkaido University School of Medicine*

The aim of this study was to assess the clinical validity of single-sample methods and gamma camera uptake methods with  $^{99m}\text{Tc}$ -DTPA for the estimation of the glomerular filtration rate (GFR). The study was performed in 50 patients with various degrees of renal function (29 males and 21 females; age 27–90 yrs; serum creatinine level 0.34–6.49 mg/dl). As a reference the “true” GFR (GFRt) was determined from plasma clearance by means of the two compartment model curve fitting 10 plasma samples. The GFRt of more than 30 ml/min in 46 patients was compared to the GFR which was estimated with 7 single-sample methods, two gamma camera uptake methods and 24-hour endogenous creatinine clearance (24hCcr). Close correlation was observed in all single-sample methods. The highest linear correlation was observed in the Christensen and Groth’s method rewritten by Watson for a 180-min plasma sample ( $r = 0.991$ ,  $\text{see} = 5.84 \text{ ml/min}$ ). The smallest random error was observed in the Groth and Aasted’s method for a 180-min plasma ( $r = 0.989$ ,  $\text{see} = 4.31 \text{ ml/min}/1.73 \text{ m}^2$ ). Our method was lowest in % absolute difference analysis ( $\text{mean} = 4.10\%$ ). The gamma camera uptake methods correlated significantly with the GFRt ( $r = 0.746$ – $0.774$ ), but were less reliable than any of the single-sample methods ( $\text{see} = 15.41 \text{ ml/min}$ – $19.14 \text{ ml/min}$ ). The lowest correlation was observed in the 24hCcr ( $r = 0.698$ ,  $\text{see} = 50.76 \text{ ml/min}/1.73 \text{ m}^2$ ). The single-sample method was more accurate than the gamma camera method, and the gamma camera method was more accurate than 24hCcr. The single-sample method should be recommended for the accurate determination of the GFR with  $^{99m}\text{Tc}$ -DTPA in a patient with mild to moderate renal dysfunction.

**Key words:** glomerular filtration rate, radionuclide,  $^{99m}\text{Tc}$ -DTPA, plasma sample method, renography