

## The single-plasma-sample method for determining the glomerular filtration rate with Tc-99m-diethylenetriamine pentaacetic acid in childhood and adolescence: Is it age-dependent?

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The aim of this study is to assess the accuracy of the pre-existing single-plasma-sample method (SPSM) to measure the glomerular filtration rate (GFR) with Tc-99m-diethylenetriamine pentaacetic acid (Tc-99m-DTPA) in children and adolescents. In addition, the age-independent SPSM is evaluated with two algorithms (Bubeck and Russell) applied for Tc-99m-mercaptoacetyltriglycine (Tc-99m-MAG3) SPSM. **Patients and Methods:** The study was performed on 14 patients (12 men and 2 women; age range 3 to 19 yr) with renal diseases. Tc-99m-DTPA (5 MBq/kg) was injected intravenously and thereafter blood samples were taken at 5, 15, 60, 90, 120, 150 and 180 min via the indwelling tube. Radioactivity in the injection syringe and plasma was measured by means of a double-well single-plastic scintillation counter. The “true” GFR as a reference was determined by two methods: 1) 2-exponential curve fitting 7 samples (GFR<sub>7</sub>) and 2) 1-exponential curve fitting 3 samples between 90 and 150 min (GFR<sub>3</sub>) in a slow clearance phase. The GFR<sub>7</sub> and GFR<sub>3</sub> were searched for to the clearance (GFR<sub>1</sub>) estimated from a plasma concentration at various sample times by means of 3 equations designed for children (Groth & Aasted, Ham-I and -II) and 3 for adults (Christensen & Groth, Jacobsson, Itoh). **Results:** All the SPSM showed close correlations ( $r > 0.95$ ) with the reference methods. Among them, Jacobsson’s equation at sample time = 120 min tended to be the most accurate ( $r = 0.9826$ , RMSE = 7.8 ml/min). On the other hand, Ham-I’s equation at sample time = 120 min was the most accurate, when it was referred to GFR<sub>3</sub> in correction for overestimation ( $r = 0.9951$ , RMSE = 4.60 ml/min). The Bubeck and Russells’ algorithms showed that the regression equation between the GFR<sub>7</sub> and the estimates was different in 2 groups of adults (49 cases) and children/adolescents. **Conclusion:** Our study indicates that Jacobsson’s and Christensen & Groth’s equations designed for adults are also applicable in determining the GFR with Tc-99m-DTPA in children and adolescents. The algorithms applied for age-independent SPSM with Tc-99m-MAG3 appears to be applicable to SPSM with Tc-99m-DTPA in children, adolescents and adults, but the single age-independent equation with Tc-99m-DTPA will need further investigations.

**Key words:** glomerular filtration rate, plasma clearance, children, Tc-99m-DTPA