No correlation between estimated and actual glomerular filtration rates in pediatric oncology patients.

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Background

We read with interest the article by Bernhardt *et al* [1], describing a retrospective single institution study comparing estimated glomerular filtration rate (eGFR) with actual GFR in children with cancer. As glomerular filtration is a key route of excretion of many chemotherapy agents, its accurate determination is essential in order to allow appropriate dosing of such drugs. Formal GFR measurement requires the use of the radioisotope technetium-99m-diethylenetriaminepentacetic acid (DTPA) [2], and repeated serum measurements, to determine its clearance. It has therefore been suggested that formulae estimating the GFR from parameters such as serum creatinine and patient height are simpler, cheaper, avoid use of radioisotopes and may be sufficient [2]. Bernhardt *et al* assessed three estimation formulae (Schwartz, revised Schwartz and Counahan-Barratt) and showed that none provided a reliable estimate of actual GFR [1]. We recently performed a similar retrospective single institution study, and share our timely and corroborative data here.

Methods

We reviewed 79 consecutive actual GFR measurements from a cohort of 29 patients with common oncology conditions receiving nephrotoxic chemotherapy. Data was collected from the electronic medical record, including patient diagnosis, age, gender, weight, height, serum creatinine clearance and actual GFR. Four formulae were used to calculate eGFR, namely the Schwartz, revised Schwartz and Counahan-Barratt methods and, in addition, the height-independent Pottel method [3]. To assess for correlations between these approaches and actual GFR, we compared the values obtained for each of the eGFR methods with the actual GFR by linear regression analysis ($p<0.05$ significant). We also undertook subgroup analyses for actual GFR measurements by gender (males=37, females=42) and patient weight (<10kgs=17, ≥10kgs=62).

Results

The mean and standard deviation (range) of the cohort was 21.3±13.5 (0-80.0) kgs (weight), 6.1±4.8 (0-16) years (age) and 104±20.5 (53-160) ml/min/1.73m^2 (actual GFR). There was no significant positive correlation between any of the eGFR methods and actual GFR (Schwartz p=0.39, revised Schwartz p=0.17, Counahan-Barratt p=0.36 and Pottel p=0.96; $R^2 \leq 0.02$ for all comparisons) (Figure 1), i.e. none of the formulae gave a reliable estimation of actual GFR. Furthermore, for children weighing <10kgs, the eGFR methods were even less reliable than for the cohort as a whole (data not shown). There were no differences by gender (data not shown).

Discussion

The use of simple formulae for estimating GFR in children is recommended for certain patient groups, such as those with chronic kidney disease, in order to monitor renal function during long-term follow-up [4]. Pediatric oncology patients require accurate determination of GFR for the safe dosing and delivery of nephrotoxic chemotherapy. The use of eGFR for this purpose is widespread. Of concern, the GFR may change acutely in the short-term in such patients, e.g. due to the concomitant use of other nephrotoxic agents such as antimicrobials. Until recently, available data on the appropriateness of eGFR methods for this group were limited. Our study, and that of Bernhardt *et al* [1], has confirmed that none of the currently used eGFR formulae gives values that are reliable compared with actual GFR in children with cancer. Consequently, we conclude that eGFR formulae are not safe to use to for chemotherapy dosing in such patients.

Legend to Figure

Figure 1.

Linear regression analysis comparing methods for estimating glomerular filtration rate (eGFR; *y*-axis) with the actual DTPA-based GFR measurement (*x*-axis) in a cohort of pediatric oncology patients. A) Schwartz method; B) Revised Schwartz method; C) Counahan-Barratt method and D) height-independent Pottel method. All GFR values represent ml/min/1.73m^2.

References

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