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Development of an equation to estimate the glomerular filtration rate in Korean children with chronic kidney diseases

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Objectives : An accurate evaluation of kidney function is essential in the detection and management of chronic kidney diseases. The glomerular filtration rate (GFR) is accepted as the best measure to assess kidney function but this measure is very complicated in using at clinical practice. Alternatively, GFR estimation equations based on serum creatinine or serum cystatin C have been developed. Although race is an important determinant for estimating GFR, relevant studies for Korean children have never been conducted. This study aimed to develop an equation to estimate the GFR in Korean children with chronic kidney diseases.

Methods : The data, including 51Cr-EDTA GFR (isotope GFR; iGFR), demographic variables, and biochemical markers of renal function, were retrospectively collected from pediatric chronic kidney disease patients in Seoul National University Hospital between October 2010 and June 2016. The data were randomly split into a training data set to develop the equation and a validation data set to test the applicability of the equation. For derivation of the candidate GFR prediction equations, linear regression analyses using the training data set were performed, defining iGFR as the dependent variable, and other variables as the explanatory variables. The performance of four new candidate formulas and three previously published equations was evaluated using the validation data set by applying 95% limits of agreement method and the proportion of estimated GFR within 10% or 30% of iGFR.

Results : There were 111 sets of observation in the entire data set (median age, 14.3 years (interquartile range 10.3 ~ 16.2); median iGFR, 42.4 ml/min/1.73m2 (interquartile range 14.4 ~ 75.9); median serum creatinine (Scr), 1.36 mg/dl; median serum cystatin C (Scys), 1.68 mg/dl; 71.2% male. We developed a GFR estimating equation using a training set and applied it to a validation data set. When this equation was applied to the whole data set, the limits of the agreement range was 36.5, and 85.6% and 39.6% of estimated GFR values

were within 30% and 10%, respectively, of the iGFR values.

Conclusions : This study developed a new GFR estimating equation for Korean children with chronic kidney diseases. The new equation will support more accurate evaluation of kidney function especially for children with GFR range from 15 to 75 ml/min/1.73m2.

Keywords : Glomerular filtration rate, Kidney function, Children, Chronic kidney disease