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## Estimation of Renal Growth Adequacy in Children with Congenital Solitary Kidney

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**Objectives :** Compensatory hypertrophy has been a well known phenomenon in patients with congenital solitary kidney.
However, the single renal length/width has not been well studied. The aim of this study was to develop a prediction method to assess the adequacy of renal growth in those children with congenital solitary kidney.

**Methods :** We obtained serial sonographic measurements of 126 children (aged from newborn to 15 years) with congenital unilateral renal agenesis. We obtained 912 valid measurements of renal length/width in these children. Age-related percentile charts were explored and the mean values of the renal length and width were obtained. Multiple linear regressions analysis was performed on measured renal length and width adjusted for gender, body weight and height.We also calculated the residuals (difference between measured and predictive renal length/width) to check the adequacy of the regression formulation.

**Results :** The mean age of diagnoses was 3.47 years (range, 1 day~14 years). The mean number of renal measurements was 6.24 (range, 1~21). The mean duration of follow-up was 45.94 months (range, once~118 months ). Compensatory hypertrophy was universal in our study population; the length and the width of the single kidney were well correlated to the child's gender, weight and height with statistical significance.
The Equation 1
Renal length (mm) = 31.36 + 6.15 (x 1 for girl, x 0 for boy) + 0.47 x Bw (kg) + 0.47 x Ht (cm)
Equation 2
Renal width (mm) = 17.88 + 1.99 (x 1 for girl, x 0 for boy) + 0.36 x Bw (kg) + 0.11 x Ht (cm)
The R square for the predictive renal length and width are 0.863 and 0.643 respectively.($p<0.0001$)
The difference between measured and predictive length/width was not significant. The residuals did not increase with renal length, though we found more significant renal compensatory hypertrophy as renal size increased over time. The mean ±SD for the residuals in length was $1.7178\times10-14 \pm 7.30$ mm, and that of renal width was $-2.40491\times10-14 \pm 5.32$ mm. The mean

differences for both renal length and width were close to zero, which could be considered negligible; the SD was ± 7.30mm for renal length; and ± 5.32mm for renal width. Thus, we propose using the mean ± 2 SD obtained above to establish an acceptable range of variability between the real and the predictive values for a simple clinical practice.

Conclusions : The adequacy of renal growth in children with congenital solitary kidney can be assessed by the regression formulation obtained by our study. We also proposed a table by age and its range of single renal size for clinical practice.

Keywords : congenital solitary kidney, regression formulation, length, weight, gender