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## **CHARACTERISTICS OF THE RENAL CALYCES MORPHOMETRIC PARAMETERS OF CHILDREN OF THE FIRST CHILDHOOD AGE**

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**Background.** The need of expand knowledge about the structure of the kidney and its anatomical structures is a consequence of the demands of the nephrourology clinics as well as the application of various methods of anatomical examination of the kidney: urography, stereotopometry, systemic analysis etc. The study and the synthesis of linear dimensions and individual anatomical variability of the renal calyces are the anatomical rationale for improving the development of organ-sparing pediatric surgery and for early diagnosis of morphological and functional disorders of the kidneys.

**Aim.** The study wa performed to evaluate morphometric parameters of human renal calyces in age period of the first childhood: diameter of renal calyx vault –  $d_{rc}$ , height of renal calyx –  $h_{rc}$ , diameter of renal calyx cervix –  $c_{rc}$ , renal calyx volume –  $V_{rc}$ .

**Materials and methods.** 23 kidneys of children of the first childhood period were included in the study. The first childhood period was determined as 4-7 years according to classification by L.K. Semenova. The average age was  $5.3 \pm 0.5$  years, age interval was 4.5-6.5 years. Kidneys were studied by the following methods: making of pyelocalyceal complex casts, internal contrasting, organometry of kidneys, pyelocalyceal complex (PCC) and renal calyces. Statistical processing was carried out by methods of variation statistics, the calculation of correlation, linear regression, information and entropy analysis.

**Results and discussion.** In 4-7 years old children, the upper renal calyx (S) (a constantly present anatomical formation of the PCC) ( $GS = 0$ ) is characterized by the following linear dimensions:  $dS = 9.7 \pm 1.3$  mm,  $hS = 9.8 \pm 1.6$  mm,  $cS = 5.5 \pm 0.9$  mm; as well as among children of younger age groups, its conical shape is preserved

with the prevalence of the diameter of the calyx vault over the diameter of its anastomosis with the biggest height of the calyx. The total volume of this renal calyx (VS) in 4-7 years old children ranges from 784.5 to 2407.3 mm<sup>3</sup>, VS = 1570.3 ± 416.1 mm<sup>3</sup>.

The lower renal calyx (I) in 4-7 years old children (present in all studied PCCs (GP1 = 0)) is characterized by the following linear dimensions: dI = 6.2 ± 0.8 mm, hI = 8.2 ± 0.9 mm, cI = 4.8 ± 0.9 mm. The considerable variability of the diameter of the calyx vault (dI = 3.0-9.0 mm), as well as the absence of differences (p>0.05) between its height and the diameter of its vault, does not allow us to say that this calyx has conical shape, although the calyx is high enough. It has a wide, unstable size of anastomosis (cI = 3.0-7.0 mm); its total volume (VI) has no significant differences from that in children of younger age groups, varies significantly (VI<sub>min/max</sub> = 681.1-2700.8 mm<sup>3</sup>), VI = 1038.0 ± 229.7 mm<sup>3</sup>.

In 4-7 years old children, anterior renal calyces (A1, A2, A3) are characterized by considerable heterogeneity. Thus, the anterior lower renal calyx (GA1 = 0.222) is absent most often, the upper and middle renal calyces (GA3 = GA2 = 0.170) are absent less often.

These renal calyces do not differ by linear dimensions, votive form and total volume (p>0.05), although anterior middle renal calyx ha bigger volume (VA2 = 359.0-821.0 mm<sup>3</sup>, VA2 = 535.8 ± 82.0 mm<sup>3</sup>). The peculiarity of the form of the renal calyces of this group is prevalence of the diameter of the renal calyx vault over the height (dA1 ≥ hA1; dA2 ≥ hA2; dA3 ≥ hA3), with the same sizes of anastomosis (cA1 = cA2 = cA3; p>0.05).

The posterior renal calyces (P1, P2, P3) in 4-7 years old children are characterized by greater heterogeneity that the anterior ones, which is manifested by a frequent absence of the posterior upper (GP3 = 0.500) and posterior lower renal calyces (GP1 = 0.280), and sometimes absence of posterior middle (GP2 = 0.170) renal calyx. The diameter of the vault of the renal calyces of this group is variable (dP1-3 = 5.0-8.0 mm), the height of the renal calyces does not exceed the diameter of

the vault ( $hP1-3 = 3.0-10.0$  mm), and the size of the anastomosis is not different from that in the anterior renal calyces.

The study of linear parameters, as well as the volumes, of renal calyces of 4-7 years old children allows summarizing the following:

- in 4-7 years old children, the upper (S) and lower (I) renal calyces are permanent structural components of the pyelocalyceal complex, while the anterior and posterior renal calyces may be absent;

- in 4-7 years old children, the upper and lower renal calyces are large, as well as anterior middle (VA2) and posterior middle (VP2) ones;

- the posterior renal calyces (P1, P2, P3) in 4-7 years old children are characterized by greater heterogeneity than the anterior ones, which is manifested by a more frequent absence of the posterior upper ( $GP3 = 0.500$ ) and posterior lower renal calyces ( $GP1 = 0.280$ ) and sometimes of the posterior middle ( $GP2 = 0.170$ ) renal calyx;

- the diameter of the vault of the posterior renal calyces is variable, the height of the renal calyces does not exceed the diameter of the vault, and the size of the anastomosis does not differ from the size of the anastomosis of the anterior renal calyces;

- in young children, the inverse correlation of middle force ( $r_{xy} = -0.63 \pm 0.10$ ) was found between the volume of the renal calyces and the corresponding heterogeneity index.

Conclusions. Morphometric analysis of the volume of the renal calyces of 4-7 years old children suggests that there are two groups of renal calyces, classified by volume. The upper renal calyx ( $VS = 1570.3 \pm 416.1$  mm<sup>3</sup>) has the largest volume, as well as the lower renal calyx ( $VI = 1038.0 \pm 229.7$  mm<sup>3</sup>) ( $p > 0.05$ ). The volumes of the anterior (A1, A2, A3) and posterior (P1, P2, P3) renal calyces are significantly ( $p < 0.05$ ) different from the upper one. In the analyzed age group, the volume of the lower renal calyx reliably ( $p < 0.05$ ) prevails over the volumes of the lower (A1, P1) and upper (A3, P3) renal calyces. Thus, in 4-7 years old children, the group of "large" renal calyces includes: S, I. The second group is represented by other renal calyces.

The percentage of the volumes of renal calyces in the total volume of the pyelocalyceal complex is: the upper renal calyx –  $32.4 \pm 4.3\%$ , the lower renal calyx –  $21.3 \pm 4.8\%$ , the posterior middle renal calyx –  $15.3 \pm 2.2\%$ , anterior middle renal calyx –  $12.9 \pm 2.9\%$ . A correlation analysis between the volume of individual calyces and the total volume of pyelocalyceal complex of 4-7 years old children revealed a direct correlation of middle force between the total volume of pyelocalyceal complex and the volume of the posterior lower renal calyx (VR3;  $r_{rc} = +0.47$ ).

Thus, along with the upper renal calyx, as the largest anatomical formation in the structure of the pyelocalyceal complex in 4-7 years old children. one more is distinguished – the lower renal calyx. A correlation of middle force was found between the total volume of pyelocalyceal complex and the volume of the posterior lower renal calyx, which takes a relatively large part in the total volume of the pyelocalyceal complex in children of this age