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МОРФОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ ПОЧЕЧНЫХ ЧАШЕК ПОДРОСТКОВ И ЮНОШЕЙ

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Морфометрический анализ объема почечных чашечек у подростков и юношей позволяет сделать вывод о наличии трех групп почечных чашечек, которые могут быть классифицированы по критерию объема. Так, наибольший объем имеет верхняя почечная чашечка ($V_S=3907,9\pm 476,4$ мм³), от которой достоверно отличается ($p < 0,05$) объем нижней почечной чашечки ($V_I=1927,9\pm 396,8$ мм³). Объемы передних (A_1, A_2, A_3) и задних (P_1, P_2, P_3) почечных чашечек достоверно ($p < 0,05$) отличаются от объема верхней. В анализируемой возрастной группе впервые (с момента рождения) объем передней средней почечной чашечки (A_2) достоверно ($p < 0,05$) преобладает над объемом передней нижней (A_1), а объем задней средней почечной чашечки (P_2) - над объемами задней верхней (P_3) и задней нижней (P_1) почечных чашечек.

Ключевые слова: почки, чашечно-лоханочный комплекс, почечные чаши

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MORPHOMETRIC PARAMETERS OF RENAL CALYCES OF ADOLESCENTS AND YOUNG MEN

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The morphometric analysis of the volume of renal calyces in teenagers and juvenile age was made. The three groups of renal calyces are presents as for volume characteristic. The superior renal calyx have the highest volume ($V_S=3907,9\pm 476,4$ мм³), that is certainly differed ($p < 0,05$) from the volume of inferior renal calyx ($V_I=1927,9\pm 396,8$ мм³). The volumes of the anteriores (A_1, A_2, A_3) and posteriores (P_1, P_2, P_3) renal calyces are certainly differed ($p < 0,05$) from the upper one. The volume of anterior middle renal calyx (A_2) is certainly exceeds ($p < 0,05$) on the volume of anterior inferior calyx (A_1), and the volume of the posterior middle renal calyx (P_2) is certainly exceeds on the volumes of the posterior superior (P_3) and posterior inferior (P_1) renal calyces was stated.

Key words: kidney, calico-pelvic complex, renal calyces.

Introduction. In connection with the use of organ-preserving operations on kidneys, anatomy of this organ continues to be the subject of close study. In recent years, various aspects of anatomy of renal pyelocalyceal complex [1] and kidney calyces of mature and elderly people have been intensively studied [2]. The anatomy of the kidney calyces of children, adolescents and young men has not been studied to date. Morphometric parameters of renal calyces can be used to improve the technique

of organ-preserving operations in surgery [3-5], as well as for early diagnosis of morphological and functional disorders of kidney during non-invasive kidney studies (ultrasound, CT, MRI and X-ray).

Aim of the study was to investigate morphometric parameters of renal calyces in adolescents and young men: the diameter of arch of the renal calyx - dRC, the height of the renal calyx - hRC, the diameter of the cervix of renal calyx - cRC, the volume of renal calyx - VRC.

Materials and methods. This group included males aged 13-21 years and females aged 12-20 years according to the classification of LK Semenova taking into account the periods of a child's life according to NP Gundobin. The mean age of the examinees was 14.8 ± 2.3 years. A total of 20 isolated organs of this age group were studied without congenital anomalies or pathology of the uronephrologic profile.

The following basic methods of anatomical research were used: making casts of pyelocalyceal complex, intrarenal contrasting, organometry of kidneys and pyelocalyceal complexes. The obtained morphometric data were subjected to statistical processing by variational statistics methods, calculation of correlation, linear regression, information-entropy analysis.

Results and discussion. In adolescents and young men, the upper renal calyx (S), the permanently present anatomical formation of the PCC (GS = 0), is characterized by the following linear dimensions: $dS=16.2\pm 1.1$ mm, $hS=11.6\pm 1.3$ mm, $cS=8.5 \pm 0.9$ mm; its conical shape is retained with the predominance of the diameter of the calyx vault over the diameter of its anastom with the highest calyx height. The total volume of this renal calyx (VS) varies in the range: 3088.2-5222.4 mm³, making $VS = 3907.9\pm 476.4$ mm³.

The lower renal calyx (I) in adolescents and young men, the anatomical formation present in all studied pyelocalyceal complexes (GF1=0) is characterized by the following linear dimensions: $dI=10.9\pm 1.2$ mm, $hI=9.4\pm 1.0$, $cI=6.5\pm 0.7$ mm. The individual variability of the diameter of the vault of this calyx ($dI = 7.0 \div 13.0$ mm) is less pronounced compared with younger age groups; there is no difference ($p > 0.05$) between its height and the diameter of its arch, which does not allow us to classify the

shape of this cup as conical, although this calyx is sufficiently higher height than anterior or posterior kidney calyces. The lower renal calyx has wide anastom with unstable size ($cI=5.0-8.0$ mm); its volume (VI) does not reach significant differences from that in children of younger age groups, varies considerably ($VI_{min/max}=872.1-2700.4$ mm³), making: $VI=1927.3\pm396.8$ mm³.

The anterior kidney calyces (A1, A2, A3) are characterized by considerable heterogeneity. Thus, most often there is no anterior upper renal calyx ($GA3 = 0.350$), less often - anterior lower ($GA1 = 0.050$) and anterior middle ($GA2 = 0.050$) renal calyces. According to the linear dimensions and the total volume, these kidney calyces do not differ in adolescence and young men ($p > 0.05$), but in volume one predominates (anterior middle kidney calyx), the volume of which is: $VA2=1553.7\pm252.7$ mm³.

The posterior kidney calyces (P1, P2, P3) are more heterogeneous than the anterior ones, which are manifested by frequent absence of posterior upper ($GF3 = 0.300$) and posterior lower renal calyces ($GF1 = 0.280$), less often the posterior middle ($GF2 = 0.050$) renal calyx . The diameter of the arch of renal calyces of this group is variable ($dP1-3 = 5,0 \div 10,0$ mm), the height of renal calyces does not exceed the diameter of the arch ($hP1-3 = 5,0 \div 12,0$ mm), and the size of cervix does not differ from that in the anterior renal calyces.

Thus, in adolescents and young men the group of "large" kidney calyces include: upper - S and lower - I. The second group is represented by medium renal calyces (anterior middle - A2 and posterior middle - P2). The third group is the upper and lower renal calyces, among which volume of middle posterior one (VP2) prevails. It is necessary to emphasize the reliable differences between the upper and lower renal calyces, which preserves the three-level classification of renal calyces by volume.

The specific gravity of the volumes of particular calyces in the total volume of the pyelocalyceal complex is following (in decreasing order): the upper renal calyx - $33.9\pm2.4\%$, the lower renal calyx - $16.1\pm2.1\%$, the middle one (the posterior calyx - $13,9\pm2,5\%$ and anterior- $13,2\pm1,1\%$). The correlation analysis between the volume of

particular calyces and the total volume of pyelocalyceal complex revealed a direct medium-strength relationship between the total volume of calyx and pyelocalyceal complex and the volume of the posterior lower renal calyx (VP1; rPCH = + 0.63) and the inverse mean force with volume of posterior middle (VP2; rPCH = -0.56) and posterior upper renal calyces (VP1; rPCH = -0.52).

The most distinctive feature of the anatomy of pyelocalyceal complex in adolescents and young men should be considered a progressive increase in the volume of the posterior and anterior renal calyces (their transition to the "large" class), which supports the ongoing evolution of kidney and pyelocalyceal complex (at the first stage - at the age of 1-3 years anterior and posterior middle renal calyces are differentiated, at the second stage increases the volume of lower and lower posterior calyces; in the third stage middle kidney calyces differentiate in independent group).

Conclusions. Analysis of the morphometric parameters of the volume of kidney calyces in adolescents and young men makes it possible to conclude that there are three groups of kidney calyces classified according to volume. The greatest volume has upper renal calyx ($VS = 3907.9 \pm 476.4 \text{ mm}^3$), from which the volume of lower renal calyx ($VI = 1927.9 \pm 396.8 \text{ mm}^3$) significantly differs ($p < 0.05$). Volumes of the anterior (A1, A2, A3) and posterior (P1, P2, P3) renal calyces significantly ($p < 0.05$) differ from the volume of the upper calyx. In the analyzed age group, volume of anterior middle renal calyx (A2) for the first time (from the moment of birth) significantly ($p < 0.05$) prevails over the volume of the anterior lower one (A1), and the volume of the posterior middle renal calyx (P2) - over the volumes of the posterior upper (P3) and posterior lower (P1) kidney calyces.

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