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AGE FEATURES OF CERVICAL ARCH AND HEIGHT OF HUMAN RENAL CALYCES IN MATURE AND ELDERLY AGES

Abstract. *The material of the study are 175 corrosive preparations of pyelocaliceal complex mature and elderly humans. We studied linear parameters of human renal calyces and their changes depending on age. As a result of the study we found that height of human renal calyces (h_c) significantly changes in different age groups (t>2) and diameters of calyceal arch (d_c) and calyceal cervix (c_c) didn't change significantly. These data can be used in urological clinics in nephrourological operations (extracorporeal lithotripsy, percutaneous puncture, etc).*
Key words: *kidney, pyelocalyceal complex, renal calyx.*

Introduction. In connection with the introduction into surgical practice of organ-preserving operations (percutaneous puncture of renal calyces, extracorporeal lithotripsy) and the use of noninvasive diagnostics (ultrasound, NMR and computed tomography) in modern nephrourology, a detailed study of morphometric parameters of initial department of the extrarenal urinary tract (kidney calyces) and their age characteristics.

Aim of study. To study the age-related changes in morphometric characteristics of human renal calyces.

Material and methods. The material of the study included 175 human kidneys (88 of men and 87 of women), obtained from corpses of mature and elderly people who lived in Ukraine in Kharkiv and Kharkiv region and died as a result of accidents or died of diseases not associated with renal disease. We obtained pyelocalyceal complexes with corrosive method and measured their linear parameters: diameter of calyceal arch (d_c), calyceal height (h_c), and diameter of calyceal cervix (c_c) and performed statistical analysis of data by methods of linear regression, informational-entropic analysis variational method, etc.

Results and discussion. Diameters of calyceal arches (d_c) are variable in different age groups (Table 1) and vary between 11,5±5,7 mm (upper renal calyx) and 5,6±1,3 mm (lower renal calyx). Difference in average sizes between the biggest (upper) and the smallest (lower) renal calyces is highly significant (t>3). Arches of all renal calyces don't significantly change in different age groups (except lower one, t>2)). Height of renal calyces h_c (Table 2) significantly (t>2) changes in different age groups: S - decreases by 2.5-3 times, P_2 - decreases by 1.5-1.7, I – increases by 2 times. Height of other renal calycesA_1, A_2, A_3, P_3, P_1) doesn't significantly change in different age groups. Upper renal calyx has maximal number of variants of height individual changes, especially in age 57,3±3,0 years.

The range of values of calyceal cervix diameter c_c (Table 3) in different age groups doesn't differ significantly and is within 4,6±7,9 mm. This fact demonstrates sufficiently stable morphometric value of index (both in types of renal calyces and in age aspect).

Conclusions. Studying age and morphological characteristics of renal calyces in order to properly orient of nephrostome canal during its passage through the renal parenchyma and the vault of the renal calyx enables us to avoid complications such as perforation of the renal calyx followed by the formation of urinary fistula, as well as damage of renal vessels that lead to bleeding and infarction of kidney.

Table 1

Diameters of calyceal arches of mature and elderly humans (in age aspect)

Name and designation of renal calyces		Number of organs	Age groups	$d_c \pm \delta$ (mm)
Upper	S	7	<29 years	9,9±2,9
		28	30-39 years	11,4±3,9
$t_{min-max}$=1,8		42	40-49 years	11,5±5,7
		57	50-59 years	11,5±5,0
		41	>60 years	11,0±4,0
Upper anterior	A_3	7	<29 years	7,0±1,1
		28	30-39 years	7,0±2,8
$t_{min-max}$=1,1		42	40-49 years	7,1±1,8
		57	50-59 years	6,7±2,4
		41	>60 years	6,7±1,9
Upper middle	A_2	7	<29 years	7,2±1,5
		28	30-39 years	7,5±1,9
$t_{min-max}$=0,9		42	40-49 years	7,1±1,8
		57	50-59 years	7,6±2,1
		41	>60 years	7,4±2,2
Lower anterior	A_1	7	<29 years	7,8±2,6
		28	30-39 years	7,8±3,3
$t_{min-max}$=1,3		42	40-49 years	7,4±1,9
		57	50-59 years	7,1±2,0
		41	>60 years	6,9±2,0
Upper posterior	P_3	7	<29 years	8,9±2,7
		28	30-39 years	8,0±3,3
$t_{min-max}$=1,1		42	40-49 years	8,5±3,2
		57	50-59 years	8,9±2,9
		41	>60 years	7,8±2,7
Middle posterior	P_2	7	<29 years	9,0±3,0
		28	30-39 years	8,4±3,5
$t_{min-max}$=1,7		42	40-49 years	8,2±2,1
		57	50-59 years	7,7±2,0
		41	>60 years	7,2±2,0
Lower posterior	P_1	7	<29 years	8,2±3,9
		28	30-39 years	7,3±2,3
$t_{min-max}$=1,6		42	40-49 years	7,0±2,1
		57	50-59 years	7,3±2,4
		41	>60 years	7,2±1,9
Lower	I	7	<29 years	6,4±1,3
		28	30-39 years	8,9±3,9
$t_{min-max}$=2,3		42	40-49 years	7,2±2,2
		57	50-59 years	7,2±1,7
		41	>60 years	7,2±1,9

d_c – average diameter of calyceal arch

δ – standard deviation

Table 2

Height of calyces of mature and elderly humans (in age aspect)

Name and designation of renal calyces		Number of organs	Age groups	$h_c \pm \delta$ (mm)
Upper	S	7	<29 years	32.8±5.1
		28	30-39 years	17.4±9.1
$t_{min-max}$=1,8		42	40-49 years	12.7±7.9
		57	50-59 years	14.4±9.5
		41	>60 years	12.9±6.4
Upper anterior	A_3	7	<29 years	7.1±2.3
		28	30-39 years	6.7±3.3
$t_{min-max}$=1,1		42	40-49 years	7.0±2.8
		57	50-59 years	7.4±3.3
		41	>60 years	7.7±2.9
Upper middle	A_2	7	<29 years	11.7±2.6
		28	30-39 years	10.0±4.8
$t_{min-max}$=0,9		42	40-49 years	9.9±4.7
		57	50-59 years	11.5±5.6
		41	>60 years	11.2±5.4
Lower anterior	A_1	7	<29 years	10.0±4.0
		28	30-39 years	7.8±3.2
$t_{min-max}$=1,3		42	40-49 years	8.9±4.8
		57	50-59 years	9.8±4.9
		41	>60 years	9.2±4.4
Upper posterior	P_3	7	<29 years	11.4±5.6
		28	30-39 years	8.7±4.8
$t_{min-max}$=1,1		42	40-49 years	8.3±4.3
		57	50-59 years	8.5±4.8
		41	>60 years	8.4±3.8
Middle posterior	P_2	7	<29 years	17.0±5.8
		28	30-39 years	11.7±5.4
$t_{min-max}$=1,7		42	40-49 years	9.8±4.5
		57	50-59 years	10.2±4.4
		41	>60 years	10.4±5.4
Lower posterior	P_1	7	<29 years	6.0±0.9
		28	30-39 years	7.3±4.4
$t_{min-max}$=1,6		42	40-49 years	6.6±3.0
		57	50-59 years	6.0±2.5
		41	>60 years	8.7±4.2
Lower	I	7	<29 years	5.1±1.6
		28	30-39 years	10.2±3.1
$t_{min-max}$=2,3		42	40-49 years	9.1±5.4
		57	50-59 years	8.0±3.9
		41	>60 years	8.6±4.3

$d_{пч}$ – average height of human calyx

δ – standard deviation

Table 3

Diameter of calyceal cervix of mature and elderly humans (in age aspect)

Name and designation of renal calyces		Number of organs	Age groups	$c_{пч}$±δ (mm)
Upper	S	7	<29 years	7.0±2.6
		28	30-39 years	6.7±1.7
$t_{min-max}$=1,8		42	40-49 years	7.9±2.2
		57	50-59 years	7.3±2.6
		41	>60 years	7.0±2.3
Upper anterior	A_3	7	<29 years	5.1±1.4
		28	30-39 years	5.3±1.4
$t_{min-max}$=1,1		42	40-49 years	5.3±1.4
		57	50-59 years	5.0±1.6
		41	>60 years	4.2±1.7
Upper middle	A_2	7	<29 years	4.8±0.8
		28	30-39 years	5.2±1.6
$t_{min-max}$=0,9		42	40-49 years	5.0±1.6
		57	50-59 years	4.5±1.6
		41	>60 years	4.9±1.8
Lower anterior	A_1	7	<29 years	4.5±1.5
		28	30-39 years	5.2±2.2
$t_{min-max}$=1,3		42	40-49 years	4.6±1.5
		57	50-59 years	4.9±1.9
		41	>60 years	4.5±1.8
Upper posterior	P_3	7	<29 years	6.7±2.5
		28	30-39 years	5.9±1.9
$t_{min-max}$=1,1		42	40-49 years	5.7±2.0
		57	50-59 years	6.1±2.1
		41	>60 years	5.1±2.1
Middle posterior	P_2	7	<29 years	6.0±2.1
		28	30-39 years	4.9±1.9
$t_{min-max}$=1,7		42	40-49 years	5.5±2.2
		57	50-59 years	5.2±1.8
		41	>60 years	4.7±1.5
Lower posterior	P_1	7	<29 years	5.4±0.7
		28	30-39 years	4.5±1.7
$t_{min-max}$=1,6		42	40-49 years	5.5±2.5
		57	50-59 years	6.0±2.4
		41	>60 years	5.0±2.2
Lower	I	7	<29 years	5.4±1.7
		28	30-39 years	6.2±2.5
$t_{min-max}$=2,3		42	40-49 years	4.9±1.7
		57	50-59 years	5.3±1.8
		41	>60 years	5.3±2.6

$c_{пч}$ – average diameter of calyceal cervix

δ – standard deviation

Perspectives of further studies. Increasing number of cases of urolithiasis and their "rejuvenation" requires morphologists to study in detail the morphometric characteristics of renal calyces and to change them in various aspects (age, sex, etc.).

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