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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  $11,5\pm 5,7$  mm (upper

renal calyx) and  $5,6\pm 1,3$  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 calyces ( $A_1, A_2, A_3, P_3, P_1$ ) doesn't significantly change in different age groups. Upper renal calyx has maximal number of variants of height individual changes, especially in age  $57,3\pm 3,0$  years.

The range of values of calyceal cervix diameter  $c_c$  (Table 3) in different age groups doesn't differ significantly and is within  $4,6\pm 7,9$  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
		42	40-49 years	11,5±5,7
		57	50-59 years	11,5±5,0
$t_{\min-\max}=1,8$		41	>60 years	11,0±4,0
Upper anterior	A <sub>3</sub>	7	<29 years	7,0±1,1
		28	30-39 years	7,0±2,8
		42	40-49 years	7,1±1,8
		57	50-59 years	6,7±2,4
$t_{\min-\max}=1,1$		41	>60 years	6,7±1,9
Upper middle	A <sub>2</sub>	7	<29 years	7,2±1,5
		28	30-39 years	7,5±1,9
		42	40-49 years	7,1±1,8
		57	50-59 years	7,6±2,1
$t_{\min-\max}=0,9$		41	>60 years	7,4±2,2
Lower anterior	A <sub>1</sub>	7	<29 years	7,8±2,6
		28	30-39 years	7,8±3,3
		42	40-49 years	7,4±1,9
		57	50-59 years	7,1±2,0
$t_{\min-\max}=1,3$		41	>60 years	6,9±2,0
Upper posterior	P <sub>3</sub>	7	<29 years	8,9±2,7
		28	30-39 years	8,0±3,3
		42	40-49 years	8,5±3,2
		57	50-59 years	8,9±2,9
$t_{\min-\max}=1,1$		41	>60 years	7,8±2,7
Middle posterior	P <sub>2</sub>	7	<29 years	9,0±3,0
		28	30-39 years	8,4±3,5
		42	40-49 years	8,2±2,1
		57	50-59 years	7,7±2,0
$t_{\min-\max}=1,7$		41	>60 years	7,2±2,0
Lower posterior	P <sub>1</sub>	7	<29 years	8,2±3,9
		28	30-39 years	7,3±2,3
		42	40-49 years	7,0±2,1
		57	50-59 years	7,3±2,4
$t_{\min-\max}=1,6$		41	>60 years	7,2±1,9
Lower	I	7	<29 years	6,4±1,3
		28	30-39 years	8,9±3,9
		42	40-49 years	7,2±2,2
		57	50-59 years	7,2±1,7
$t_{\min-\max}=2,3$		41	>60 years	7,2±1,9

$d_c$  – average diameter of calyceal arch  
 $\delta$  – 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
		42	40-49 years	12.7±7.9
		57	50-59 years	14.4±9.5
$t_{\min-\max}=1,8$		41	>60 years	12.9±6.4
Upper anterior	A <sub>3</sub>	7	<29 years	7.1±2.3
		28	30-39 years	6.7±3.3
		42	40-49 years	7.0±2.8
		57	50-59 years	7.4±3.3
$t_{\min-\max}=1,1$		41	>60 years	7.7±2.9
Upper middle	A <sub>2</sub>	7	<29 years	11.7±2.6
		28	30-39 years	10.0±4.8
		42	40-49 years	9.9±4.7
		57	50-59 years	11.5±5.6
$t_{\min-\max}=0,9$		41	>60 years	11.2±5.4
Lower anterior	A <sub>1</sub>	7	<29 years	10.0±4.0
		28	30-39 years	7.8±3.2
		42	40-49 years	8.9±4.8
		57	50-59 years	9.8±4.9
$t_{\min-\max}=1,3$		41	>60 years	9.2±4.4
Upper posterior	P <sub>3</sub>	7	<29 years	11.4±5.6
		28	30-39 years	8.7±4.8
		42	40-49 years	8.3±4.3
		57	50-59 years	8.5±4.8
$t_{\min-\max}=1,1$		41	>60 years	8.4±3.8
Middle posterior	P <sub>2</sub>	7	<29 years	17.0±5.8
		28	30-39 years	11.7±5.4
		42	40-49 years	9.8±4.5
		57	50-59 years	10.2±4.4
$t_{\min-\max}=1,7$		41	>60 years	10.4±5.4
Lower posterior	P <sub>1</sub>	7	<29 years	6.0±0.9
		28	30-39 years	7.3±4.4
		42	40-49 years	6.6±3.0
		57	50-59 years	6.0±2.5
$t_{\min-\max}=1,6$		41	>60 years	8.7±4.2
Lower	I	7	<29 years	5.1±1.6
		28	30-39 years	10.2±3.1
		42	40-49 years	9.1±5.4
		57	50-59 years	8.0±3.9
$t_{\min-\max}=2,3$		41	>60 years	8.6±4.3

$d_{nH}$  – average height of human calyx  
 $\delta$  – 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	$c_{\text{н}} \pm \delta$ (mm)
Upper	S	7	<29 years	7.0±2.6
		28	30-39 years	6.7±1.7
		42	40-49 years	7.9±2.2
		57	50-59 years	7.3±2.6
$t_{\text{min-max}}=1,8$		41	>60 years	7.0±2.3
		7	<29 years	5.1±1.4
		28	30-39 years	5.3±1.4
		42	40-49 years	5.3±1.4
$t_{\text{min-max}}=1,1$		57	50-59 years	5.0±1.6
		41	>60 years	4.2±1.7
		7	<29 years	4.8±0.8
		28	30-39 years	5.2±1.6
$t_{\text{min-max}}=0,9$		42	40-49 years	5.0±1.6
		57	50-59 years	4.5±1.6
		41	>60 years	4.9±1.8
		7	<29 years	4.5±1.5
Lower anterior	A <sub>1</sub>	28	30-39 years	5.2±2.2
		42	40-49 years	4.6±1.5
		57	50-59 years	4.9±1.9
		41	>60 years	4.5±1.8
$t_{\text{min-max}}=1,3$		7	<29 years	6.7±2.5
		28	30-39 years	5.9±1.9
		42	40-49 years	5.7±2.0
		57	50-59 years	6.1±2.1
$t_{\text{min-max}}=1,1$		41	>60 years	5.1±2.1
		7	<29 years	6.0±2.1
		28	30-39 years	4.9±1.9
		42	40-49 years	5.5±2.2
Middle posterior	P <sub>2</sub>	57	50-59 years	5.2±1.8
		41	>60 years	4.7±1.5
		7	<29 years	5.4±0.7
		28	30-39 years	4.5±1.7
$t_{\text{min-max}}=1,7$		42	40-49 years	5.5±2.5
		57	50-59 years	6.0±2.4
		41	>60 years	5.0±2.2
		7	<29 years	5.4±1.7
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		42	40-49 years	4.9±1.7
		57	50-59 years	5.3±1.8
		41	>60 years	5.3±2.6
$t_{\text{min-max}}=1,6$		7	<29 years	5.4±1.7
		28	30-39 years	6.2±2.5
		42	40-49 years	4.9±1.7
		57	50-59 years	5.3±1.8
$t_{\text{min-max}}=2,3$		41	>60 years	5.3±2.6

$c_{\text{н}}$  – average diameter of calyceal cervix

$\delta$  – 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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**CONTENT:**

Yasnikovska S.M. Peculiarities of pregnancy progress in women with corrected isthmic-cervical incompetence	3
Shkolnikov V.S., Zalevskiy L.L., Zalevska I.V. Structural organization of the cerebellum of 17-18 week human fetuses during intrauterine development	5
Khmara T.V., Okrim I.I., Biriuk I.G., Komar T.V., Khmara A.B. The specialization degree of wood-destroying basidial fungi on trees in samur-davachi lowland forests of azerbaijan	10
Tkachenko P.V. Clinical-morphological prognostic characteristics of prostate cancer	14
Sasina O.S. Psychohygienic aspects of training of disabled adolescents with pathology of the vision (literature review)	19
Banul B.Yu. Development of paramesonephric ducts and their derivatives at the end of embryonic period of human ontogenesis	23
Niankovskiy S.L., Gorodylovska M.I. Heterogeneity of esophagitis in schoolchildren	26
Yevtushenko I.Y, Padalitsa M.A, Goryainova G.V. Age features of cervical arch and height of human renal calyces in mature and elderly ages	32
Vepruk Y., Rohovyy Y., Tovkach Y., Rykhlo I. Characteristic of aluminum salts influence on indexes of ion regulative renal function in mature and immature rats against the background of the pineal gland hyperfunction	35
Zakharchuk O.I., Kryvchanska M.I. Chronoregulating and rhythm-stabilizing role of melatonin in seasonal structure of circadian rhythms of non-specific immunity indices with aging	38
Kachko G.O., Omelchenko E.M., Pedan L.R., Polka O.O. Characteristics of congenital pathology with inherited and multifactorial nature in children of Kyiv region	41
Kosilova S.Y. Metabolic disorders in women depending on menopause duration	44
Kotelban A.V., Godovanets O.I., Burdeniuk I.P. Peculiarities of administration of antiseptic drugs in children suffering from chronic catarrhal gingivitis under conditions of diabetes mellitus	47
Reshetilova N.B., Navarchuk N.M., Popeliuk O.-M.V., Glubochenko O.V., Kulish N.M. Topographic peculiarities of the anterior cerebral vesicle on the 4th week of the embryonic period	51
Fik V.B., Paltov Y.V., Lohash M.V., Kryvko Y.Y. Peculiarities of morphological manifestation of the periodontal tissue in experimental animals against the ground of a short-term effect of opioid analgesic	54
Khomenko V.G. Renal tissue fibrinolysis against the ground of stress and xenobiotics	59
Dudenko V.G., Vdovychenko V.Yu., Kurinnoy V.V. Spatial topography of the diaphragm in the sagittal plane in women	61
Avdieyev Oleksandr, Dziubak Sergii Epidemiological analysis of dental diseases among individuals exposed to unfavourable psychoemotional surroundings	65
Andriets M. M., Andriets V.I. Psychological aspects of physical culture and sport	68
Malanchuk L.M., Kryvytska G.O. Renal tissue fibrinolysis against the ground of stress and xenobiotics	71
Bambuliak A.V., Galagdina A.A., Boychuk O.M. Diagnostics of the frontal sinus development with adjacent structures in the prenatal period of human ontogenesis	73
Kryvetskyi V.V., Narsiya V.I., Kryvetskyi I.V. Blood supply of the cervical region of the vertebral column during the fetal period and in newborns	76
Pavlovych L.B., Bilous I.I. The indicators of stimulation electroneuromyography in patients with diabetic polyneuropathy	80



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