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INDIVIDUAL AGE AND GENDER CHARACTERISTICS OF ORGANOMETRIC PARAMETERS OF KIDNEY AND PYELOCALICEAL COMPLEX IN HUMAN OF MATURE AGE

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This work is a piece of research work «Anatomical and morphometric features of human renal pyramids in relation to minimally invasive surgery», state registration № 0109U001746.

Introduction. Use of new diagnostic (ultrasound, CT and MRI) and treatment (extracorporeal lithotripsy, percutaneous needle biopsy, etc.) methods in modern urological clinic requires further study of structures pyelocaliceal complex (PCC) of human kidney [1-5].

Purpose of the study. Identify the morphometric characteristics of the kidneys and PCC distributed by gender.

Matherials and methods. The material of this study were 175 human kidneys (88 kidneys of men and 87 kidneys of women), which were studied by morphometry and statistical analysis.

Results and discussion. Among organometric signs of human's kidney and PCC we should provide the most important: length, width, square of anatomical cut. Kidney and PCC are characterized by considerable individual variation, depending on gender, age, constitutional type and other factors. Therefore parameters of variation statistics are used for quantitatively describing.

In special morphometric research we studied mean values of length, width, square of anatomical cut of kidney and PCC for both sexes, and in general for the whole group **(tabl. 1).**

Length of kidney varies between 84,0-112 mm, its average value is 110,6 ± 11,2 mm (113,9 ± 10,4 mm in men and 106,1 ± 10,6 mm in women (P = 0,19)).

Width of kidney varies between 34,0-80,0 mm, its average value is 58,8 ± 7,7 mm (62,3 ± 8,4 mm in men and 55,3 ± 7,0 mm in women (P = 0,10)).

Square of kidney's anatomical cut varies between 40,8-97,2 cm^2, its average value is 65,2 ± 12,3 cm^2 (70,9 ± 10,4 cm^2 in men and 59,5 ± 11,3 cm^2 in women (P = 0,04)).

Height of PCC varies between 22,0-63,0 mm, its average value is 39,8 ± 6,0 mm, (40,6 ± 6,4 mm in men and 39,0 ± 5,4 mm in women).

Square of anatomical cut of PCC varies between 11,4-57,3 cm^2, its average value is 26,4 ± 6,6 cm^2 (27,8 ± 7,1 cm^2 in men and 25,1 ± 5,7 cm^2 in women (P = 0,17)).

It should be noted that in current study of linear dimensions and square of anatomic cut the significant difference of average sizes among men and women was found for the square of kidney's anatomic cut (70.9 ± 10.4 cm^2 in men and 59.5 ± 11.3 cm^2 in women) and kidney's width (62.3 ± 6.4 mm in men and 55.3 ± 7.0 mm in women).

Table 1.

Morphometric characteristics of mature and old human kidneys according to sex

Morphometric characteristics of kidney and PCC	In min-max	Me	M ± m
Kidney's width, mm			
men	48-80	63	62.3 ± 6.4
women	34-68	55	55.3 ± 7.0
both sexes	34-80	59	58.8 ± 7.7 p=0.10
Kidney's length, mm			
men	85-142	113	11.3 ± 10.4
women	84-130	106	106.1 ± 10.6
both sexes	84-142	110	110.6 ± 11.2 p = 0.19
Square of kidney's anatomical cut, cm^2			
men	40.8-96.2	69.7	70.9 ± 10.4
women	36.1-82.9	59.2	59.5 ± 11.3
both sexes	40.8-97.2	66.0	65.2 ± 12.3 p = 0.04
Width of PCC, mm			
men	20-63	40	40.6 ± 6.4
women	30-57	38	39.0 ± 5.4
both sexes	22-63	38	39.8 ± 6.0 p = 0.38
Length of PCC, mm			
men	37-92	67	67.0 ± 10.1
women	49-83	63	64.9 ± 8.7
both sexes	37-92	65	65.6 ± 9.5 p = 0.23
Square of PCC anatomical cut, cm^2			
men	11.1-57.3	27.2	27.8 ± 7.1
women	15.0-44.0	23.8	25.1 ± 5.7
both sexes	11.4-57.3	25.7	26.4 ± 6.6 p = 0.17

Note: In – the range of values; Me – median value of the distribution of characteristic; M ± m – the average value and its error; P – the reliability of index difference (male-female)

In other morphometric parameters of kidneys (length, sizes of PCC – length, width, square) significant difference according to sex were not revealed.

We conducted organometric analysis of linear dimensions (height, width and area of anatomic cut) of PCC variability in age aspect **(tabl. 2).**

Height of PCC in different age groups varies between 55.6 ± 4.7 mm to 66.9 ± 9.4 mm. This parameter increases with age, especially in 29-39 years, when height of PCC increases by 17-21%. In older age groups, the trend of increase of PCC height retains with significantly higher values in the age group over 60 years. Similar trends occur in subgroup dynamic of kidney's height. Average height is 110.1 ± 11.2 mm, minimal value is 104.0 ± 13.3 mm in 23.1 ± 2.1 years, maximal value is 112.9 ± 11.3 mm in 53.7 ± 3.0 years.

Average width of PCC is 39.8 ± 6.0 mm, minimal value is 38.1 ± 9.1 mm in 23.1 ± 2.1 years, maximal value is 41.0 ± 6.5 mm in 53.7 ± 3.0 years. Average value of anatomical kidney's cut of different ages is 58.8 ± 7.6 mm. There is trend of increasing of kidney's width from the younger age groups to 60 years, after which there is a decrease of kidney's width and the width of the kidney is less than in younger age groups (23.1 ± 2.1 years).

Square of pyelocalyceal anatomical cut is increases in 23.1 ± 2.1-34.6 ± 3.2 years and decreases by 63.9 ± 3.5 years to the initial level. Average square of anatomical cut of PCC is 26.4±6.6 cm^2, of kidney – 65.2 ± 12.3 cm^2. To evaluate the effect of gender on the variability of organometric parameters of kidney and PCC we performed ANOVA in a comparative perspective.

As a result of ANOVA we revealed that gender has an impact on all analyzed organometric parameters of kidney and PCC. The biggest impact is manifested in the formation of parameters of square of kidney's anatomical cut and PCC. Gender effect of medium strength is manifested in the formation of parameters of kidney's height and width. In the formation of parameters of width and height of PCC influence of gender is virtually absent.

Conclusions

1. Height of kidney increases with age, especially in 29-39 years. Maximal height is in age group after 60 years.

2. There is trend of increasing of kidney's width from younger age groups to 60 years after which there is a decrease of kidney's width and the width of the kidney is less than in younger age groups.

Table 2.

Morphometric characteristics of PCC in age aspect

Parameters	SI	Number of organs	N ± n	M ± m
Width of PCC	mm	175	47,9 ± 11,5	39,8 ± 6,0
< 29 years		7	23,1 ± 2,1	38,1 ± 9,1
30-39 years		28	34,6 ± 3,2	38,5 ± 4,8
40-49 years		42	44,6 ± 2,7	40,0 ± 6,1
50-59 years		57	53,7 ± 3,0	41,0 ± 6,5
> 60 years		41	63,9 ± 3,5	39,1 ± 4,5
Length of PCC	mm	175	47,9 ± 11,5	65,6 ± 9,5
< 29 years		7	23,1 ± 2,1	55,6 ± 4,7
30-39 years		28	34,6 ± 3,2	65,2 ± 9,7
40-49 years		42	44,6 ± 2,7	65,7 ± 9,9
50-59 years		57	53,7 ± 3,0	66,9 ± 9,4
> 60 years		41	63,9 ± 3,5	65,1 ± 8,8
Square of anatomical cut	cm^2	175	47,9 ± 11,5	26,4 ± 6,6
< 29 years		7	23,1 ± 2,1	19,9 ± 2,9
30-39 years		28	34,6 ± 3,2	25,3 ± 5,8
40-49 years		42	44,6 ± 2,7	26,1 ± 5,9
50-59 years		57	53,7 ± 3,0	28,4 ± 7,5
> 60 years		41	63,9 ± 3,5	26,3 ± 5,7

Note: N ± n – average age ± error; M ± m – average value ± error

3. Square of anatomical cut of PCC and kidney has trend to increase in 23.1 ± 2.1-34.6 ± 3.2 years and to decrease by 63.9 ± 3.5 years to initial level.

4. The biggest impact of gender is manifested in the formation of parameters of square of kidney's anatomical cut and PCC. Gender effect of medium strength is manifested in the formation of parameters of kidney's height and width. In the formation of parameters of width and height of PCC influence of gender is virtually absent.

Prospects for further studies. Results can be used in urological clinic during nephrourological operations (extracorporeal lithotripsy, percutaneous puncture, etc.). Perspective direction is use of the data for the quantitative approach to the diagnosis of norm and pathology of pyelocaliceal complex when using ultrasound, CT and NMR diagnostic [6-10].

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ІНДИВІДУАЛЬНІ ВІКОВІ ТА СТАТЕВІ ХАРАКТЕРИСТИКИ ОРГАНОМЕТРИЧНИХ ПАРАМЕТРІВ НИРКИ ТА ЧАШКОВО-МИСКОВОГО КОМПЛЕКСУ ЛЮДИНИ ЗРІЛОГО ВІКУ

Євтушенко І. Я.

Резюме. Матеріалом дослідження були 175 нирок людини (88 нирок чоловіків і 87 нирок жінок), які досліджувалися методами морфометрії та статистичного аналізу. Було виявлено, що висота нирки збільшується з віком, особливо у віковому періоді 29-39 років. Максимальний показник відзначається у віковій групі старше 60 років. Є тенденція наростання ширини нирки від молодших вікових груп до 60 років, після чого відбувається зменшення. Величина площі анатомічного зрізу чашково-мискового комплексу та нирки має тенденцію до наростання у віковому періоді 23.1 ± 2.1 – 34.6 ± 3.2 років при подальшому зменшенні площі до 63.9 ± 3.5 років. Найбільший вплив статі проявляється у формуванні показників площі анатомічного зрізу і чашково-мискового комплексу, вплив статі середньої сили проявляється у формуванні показників висоти і ширини нирки.

Ключові слова: нирка, чашково-мисковий комплекс, ниркова чашечка.

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ИНДИВИДУАЛЬНЫЕ ВОЗРАСТНЫЕ И ПОЛОВЫЕ ХАРАКТЕРИСТИКИ ОРГАНОМЕТРИЧЕСКИХ ПАРАМЕТРОВ ПОЧКИ И ЧАШЕЧНО-ЛОХАНОЧНОГО КОМПЛЕКСА ЧЕЛОВЕКА ЗРЕЛОГО ВОЗРАСТА

Евтушенко И. Я.

Резюме. Материалом настоящего исследования послужили 175 почек человека (88 почек мужчин и 87 почек женщин), которые изучены методами морфометрии и статистического анализа. Было выявлено, что высота почки увеличивается с возрастом, особенно в возрастном периоде 29-39 лет. Максимальный показатель отмечается в возрастной группе старше 60 лет. Имеется тенденция нарастания ширины почки от младших возрастных групп к 60 годам, после чего происходит уменьшение. Величина площади анатомического среза чашечно-лоханочного комплекса и почки имеет тенденцию к нарастанию в возрастном периоде 23.1 ± 2.1 – 34.6 ± 3.2 лет при последующем уменьшении площади к 63.9 ± 3.5 годам. Наибольшее влияние пола проявляется в формировании показателей площади анатомического сечения и чашечно-лоханочного комплекса, влияние пола средней силы проявляется в формировании показателей высоты и ширины почки.

Ключевые слова: почка, чашечно-лоханочный комплекс, почечная чашка.

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Abstract. Use of new diagnostic (ultrasound, CT and MRI) and treatment (extracorporeal lithotripsy, percutaneous needle biopsy, etc.) methods in modern urological clinic requires further study of structures pyelocaliceal complex of human kidney.

Purpose of the study was to identify the morphometric characteristics of the kidneys and pyelocalyceal complex distributed by gender. The material of this study were 175 human kidneys (88 kidneys of men and 87 kidneys of women), which were studied by morphometry and statistical analysis. To evaluate the effect of gender on the variability of organometric parameters of kidney and PCC we performed ANOVA in a comparative perspective. Among organometric signs of human's kidney and pyelocaliceal complex we provided the most important: length, width, square of anatomical cut. Parameters of variation statistics were used for quantitatively describing.

Length of kidney varies between 84,0-112 mm, its average value is 110,6 ± 11,2 mm. Width of kidney varies between 34,0-80,0 mm, its average value is 58,8 ± 7,7 mm. Square of kidney's anatomical cut varies between 40,8-97,2 cm^2, its average value is 65,2 ± 12,3 cm^2. Height of pyelocalyceal complex varies between 22,0-63,0 mm, its average value is 39,8 ± 6,0 mm. Square of anatomical cut of pyelocalyceal complex varies between 11,4-57,3 cm^2, its average value is 26,4 ± 6,6 cm^2.

In current study of linear dimensions and square of anatomic cut the significant difference of average sizes among men and women was found for the square of kidney's anatomic cut (70.9 ± 10.4 cm^2 in men and 59.5 ± 11.3 cm^2 in women) and kidney's width (62.3 ± 6.4 mm in men and 55.3 ± 7.0 mm in women). In other morphometric parameters of kidneys significant difference according to sex were not revealed.

As a result of ANOVA we revealed that gender has an impact on all analyzed organometric parameters of kidney and PCC. Thus it was found that the biggest impact of gender is manifested in the formation of parameters of square of kidney's anatomical cut and pyelocaliceal complex. Gender effect of medium strength is manifested in the formation of parameters of kidney's height and width. In the formation of parameters of width and height of pyelocaliceal complex influence of gender is virtually absent.

We conducted organometric analysis of linear dimensions (height, width and area of anatomic cut) of PCC variability in age aspect.

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Average value of anatomical kidney's cut of different ages is 58.8 ± 7.6 mm. There is trend of increasing of kidney's width from the younger age groups to 60 years, after which there is a decrease of kidney's width and the width of the kidney is less than in younger age groups (23.1 ± 2.1 years). Square of pyelocalyceal anatomical cut is increases in 23.1 ± 2.1-34.6 ± 3.2 years and decreases by 63.9 ± 3.5 years to the initial level. Average square of anatomical cut of PCC is 26.4 ± 6.6 cm^2, of kidney – 65.2 ± 12.3 cm^2.

Results of the study can be used in urological clinic during nephrourological operations (extracorporeal lithotripsy, percutaneous puncture, etc.). Perspective direction is use of the data for the quantitative approach to the diagnosis of norm and pathology of kidney and pyelocaliceal complex when using ultrasound, CT and NMR diagnostic.

Keywords: kidney, pyelocaliceal complex, renal calyces.

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