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MORPHOMETRICAL CHANGES OF DUPLEX KIDNEYS IN CHILDREN IN DIFFERENT DEGREE OF URODYNAMICS INFRINGEMENT AND WITHOUT URODYNAMICS INFRINGEMENT

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SUMMARY

Morphometrical comparison of duplex kidney and ureter structural elements in children was done taking in account the gravity of the pathological process and methods of treatment. Morphological objects giving the possibility to prognose the method of surgical treatment and it's outcome depending on the quality and quantity of changes of the duplex kidney structure were determined. The principal difference of quantitative changes of structural elements of a duplex kidney without the violation of urodynamics in moderate violation of the outflow of urine and also in a steadfast loss of the function because of the violation of urodynamics of a grave degree was confirmed.

KEY WORDS: pediatric urology, anomaly of development, duplex kidney, diagnostics, treatment, histology, morphometry

INTRODUCTION

In all the diversity and growing of informativity of investigative methods of the studying of duplex kidneys in children until to – day remains unjustified low the attention paid by pediatric surgeons and urologists to such informative and simple for adoption, investigative methods of studying the viability of duplex kidney tissues, as morphometrical methods [1, 4, 5]. This is also confirmed by rather rare scientific works on the theme of morphometrical investigation of duplex kidneys [2, 3, 6].

The aim of our work is to answer to the question: which morphological tissue elements of duplex kidneys on a microscope level can be used to determine the question of the removal of the affected duplex kidney or of doing plastic reconstruction of urinary tracts.

MATERIALS AND METHODS

Children at the age of from 0 to 15 years which had duplex upper urinary tracts and which had surgical correction of the urinary system were studied. Functional deficiency of the kidneys was revealed by excretory urography and in laborious diagnostics cases by isotope scintigraphy. This examination was done in 15 cases (material was taken from 5 cases where the kidney was not liable to surgical correction because of the absence of urodynamics infringement and in 5 cases of every type of operative treatment).

All the children were divided into three groups corresponding to the methods of treatment:

the 1 group consisted of children in which the kidney poles were to have biopsy done and did not have any evidence of urodynamics infringement and were not operated;

the 2 group of children in which the kidney poles were to have biopsy done, had urodynamics infringement and needed plastic – reconstructive methods of operative treatment done in order to better the function (operation of pyelopyelo or pyeloureteroanastomosis);

the 3 studied group consisted of children with mainly severe urodynamics infringement when as a result of the full loss of the function the removal of the sick organ was done (heminephrureterectomy).

The histological material was ablated intraoperatively from different sections of the kidney, calyces and ureters. The average size of ablated tissues pieces was from 2 to 10 mm. In the pathological laboratory of C C L preparations were made. The tissues were fixed in 10% neutral formalin, were passed through alcohol and embedded into parafin. From parafin blocks sections 5 mkm thick were prepared which were then stained with hematoxilin and eosine and by Slinchenko.

Morphometry was done by the cytohistostereometrical method of G.G. Autandilov with the help of a standard net for the eyepiece with 100 dots and not less than 10 applications in every case [1]. The per cent of cell elements in each section and the average devergement for every studied tissue element were counted. The results were compared between groups 1, 2 and 3. The authenticity value of received results was done by the Student criterion.

For the kidney the standard scheme had the visual calculation of large and small renal corpuscles, large and small blood vessels, invariable and dystrophic nuclei of the renal tubule epithelium , connective tissue cells, the average sum of all cells, per cent of the base substance, edema and necrosis (Table 1).

Table 1

Structural elements of the kidney parenchyma which underwent morphometry

C	Large (arteries) vessels
D	Small (arterioles) vessels
E	Inflammatory cells
F	Dystrophic nuclei of renal tubule epithelium
G	Invariable nuclei of renal tubule epithelium
H	Connective tissue cells
I	General quantity of cell elements
J	Small renal corpuscles
K	Large renal corpuscles
L	Base substance
M	Edema
N	Necrosis

The scheme for ureter tissues had the calculation of large and small blood vessels, inflammatory cells, invariable and dystrophic nuclei of muscle tissue, invariable and dystrophic nuclei of the transitional epithelium, connective tissue cells, the average sum of all cells, per cent of the base substance, edema and necrosis (Table 2).

The sum of cystic tubules was not counted because of the imperfect selection by the eye.

Table 2

Structural elements of the ureter tissue which underwent morphometry

O	Large (arteries) vessels
P	Small (arterioles) vessels
Q	Inflammatory cells
R	Dystrophic nuclei of muscle cells
S	Invariable nuclei of muscle cells
T	Dystrophic nuclei of transitional epithelium
U	Invariable nuclei of transitional epithelium
V	Connective tissue cells
W	General quantity of cell elements
X	Hemorrhages
Y	Base substance
Z	Edema
AA	Necrosis

The results were entered in MS Excels tables of an Office 98 Professional Relies packet. Statistics were done with the help of statistics program of Statistica for Windows Relies 5,1.

RESULT AND DISCUSSION

The summary table 3 of received results had such an appearance.

Table 3

Indexes of the morphometry of kidney and ureter tissues in children ill with duplex kidney in dependence from the gravity of the infringement of urodynamics and vitality method of treatment

Object of morphometry	Group 1	Group 2	t	Group 3	t	Groups 2&3	t
C	7.4 ± 1.517	7.8 ± 2.72336	-0.3158	4.8 ± 1.08233***	4.22187	***	4.061
D	3.8 ± 1.304	5.6 ± 0.19024**	-3.0438	2.9333 ± 1.4376	1.19115	***	6.345
E	1.8 ± 2.049	4.6 ± 2.95804*	-2.0082	15.9333 ± 3.77***	-7.90566	***	-10.58
F	10.8 ± 2.775	11.28 ± 3.18224	-0.3133	11.0667 ± 3.39	-0.15822		0.2
G	18 ± 3.162	14.4 ± 3.75278*	2	4.3333 ± 1.7593***	12.3	***	9.73
H	10.4 ± 3.647	9.56 ± 3.58329	0.4773	23.3333 ± 6.81036***	- 4.00893	***	-8.401
I	52.2 ± 6.76	53.24 ± 5.13387	-0.3934	62.4 ± 3.2906***	- 4.58267	***	-6.174
J	9.4 ± 2.702	4.6 ± 2.1602***	4.3631	0.3333 ± 0.48795***	13.05976	***	7.499
K	10 ± 1.225	8 ± 3.3541	1.3003	3.5333 ± 2.85023***	4.8554	***	4.304
L	18.6 ± 4.93	16 ± 3.58236	1.3951	10.2 ± 1.2072***	6.36396	***	6.041
M	7.6 ± 1.517	12.24 ± 2.48797***	-3.9902	11.8 ± 2.17781***	- 3.96863		0.566
N	2.2 ± 1.924	5.92 ± 3.90427**	-2.0595	11.1333 ± 3.90726***	- 4.85502	***	-4.087
O	10.6 ± 2.074	7.52 ± 5.33948	1.2561	4.3333 ± 2.22539***	5.53473	*	2.191
P	3.6 ± 0.548	2.08 ± 2.11975	1.5723	1 ± 0.84515***	6.38287		1.878
Q	2 ± 1.414	5.16 ± 3.65923	1.8807	2.6667 ± 1.91485	- 0.71107	*	2.438
R	3.4 ± 1.14	7.56 ± 4.6105*	-1.9793	8.9333 ± 3.39046**	- 3.52704		-1.001
S	12.6 ± 1.342	7.08 ± 3.31562***	3.6216	5.7333 ± 3.41147***	4.32517		1.23

T	3 ± 1.581	4.92 ± 3.53459	-1.1782	9 ± 2.64575***	- 4.74342	***	- 3.861
U	11.6 ± 1.817	6.92 ± 4.55448*	2.2361	8 ± 2.9277*	2.56273		- 0.82
V	27.6 ± 1.14	28.92 ± 3.47515	-0.8301	33.4 ± 4.61055*	-2.73843	**	- 3.489
W	74.4 ± 2.074	70.16 ± 4.08942*	2.2385	73.0667 ± 3.86313	0.72846	*	- 2.221
X	1 ± 1	1.32 ± 2.968	-0.2355	1.0667 ± 1.38701	-0.09848		0.31
Y	19.2 ± 1.643	19.36 ± 3.402	-0.1017	15.8667 ± 2.35635**	2.91056	**	3.497
Z	3.6 ± 1.817	5.4 ± 2.199	-1.7105	5.8667 ± 2.41622	-1.91131		- 0.626
AA	1.8 ± 1.483	3.7 ± 1.2***	-3.215	4.1333 ± 1.3557**	-3.26219		- 0.927

* - the level of the significance sing by the Student criterion ≤ 0.05
** - the level of the significance sing by the Student criterion ≤ 0.01
*** - the level of the significance sing by the Student criterion ≤ 0.001

Analysis of shown in the table data revealed in tissues of the kidneys and ureters an authenticity reduction of the per cent of vessels in the 3 group in comparison with the 1 and also the 2 group. Thus, a sharp lowering, about 2 times, of the per cent content of blood vessels of a duplex kidney can be the index of the viability absence of these tissues and can be a factor to doing heminephrureterectomy.

Among inflammatory cells the tendency of a rising of their quantity in dependence with the severity of the status of the kidney looking at the method of operative treatment is very noticeable. If in kidney tissues the rising has an authenticity character and the most of cells come on group 3 where the functional viability is low, the kidney was ablated. In ureter tissues such a tendency is not confirmed.

A significant lowering of the quantity of invariable renal tubule epithelium, invariable nuclei of muscle cells and invariable nuclei of the transitional epithelium of the ureters can testify their diagnostic value in context with the revealing of the degree of functional viability of duplex kidney tissues.

The per cent quantity of connective tissue, as we think, is the most important index of structural changes in duplex urinary tracts. An authentic rising of the quantity of connective tissue of the kidney parenchyma connects with the intensification of the gravity of the pathological process, it sharply rises when functional possibilities of the kidney lower in group 3. The volume of connective tissue in the ureters in group 3 also have a difference, in their volumes, in group 1 and group 2.

Investigation of the general per cent quantity of cell elements in kidney tissues showed a correlation of group 3 with group 1 and group 2. The calculation of the general quantity of cells in the ureters revealed variations in the results in different groups without legible connections with the degree of pathological state.

Renal corpuscles, which were divided visually to large and small in size, when compared, showed resembling quantitative tendencies. Small renal corpuscles in group 1 had an authentic bigger per cent than in group 2 and in group 2 a lot bigger than in group 3. The quantity of large renal corpuscles also lowered correspondingly to the gravity of the affect by the pathological process and had the minimum significance in group 3. Thus, a lowering of the quantity of renal corpuscles can be used as one of the indexes of the gravity of the affection by the pathological process but we think that this index can be objectively used only when using the age aspects, using the change of the correlation of renal corpuscles in dependence to the age of the child.

The quantity of base substance in the parenchyma of the kidney and ureter tissues progressively lowers from group 1 to group 3, and correlates with high authenticity in group 3. This can be used as an informative factor in revealing the functional inability of a duplex kidney or as an index of the gravity of it's affection.

The per cent quantity of necrosis raised with the rising of the gravity of tissue affection and differed authentically between groups 1, 2 and 3 in kidney and ureter tissues.

Edema of kidney tissues was expressed noticeably and authentically raised with the lowering of the functional ability of the kidney. At the same time correlation of edema indexes in ureter tissues was defaulted and because of this could not be used as an indices of the gravity of metabolic disturbance.

When comparing the quantity of hemorrhages between investigated groups correlation was not revealed.

CONCLUSION

In order to solve the question of the method of operative treatment of the duplex kidney complexly can be used such morphologic indexes:

а) a lowering of the blood vessel quantity in tissues of the duplex kidney;

б) the simultaneous rising of the general quantity of connective tissues in the kidney and ureter tissues when there is a lowering of the quantity of base substance;

в) a rising of the per cent quantity of dystrophic nuclei of renal tubule epithelium, the dystrophic nuclei of muscle cells and the dystrophic nuclei of the transitional epithelium of the ureter.

REFERENCES

1. Автандилов Г.Г. Медицинская морфометрия. Руководство. - М.: Медицина, 1990. - 384 с.
2. Бобкова В.П. //Урология и нефрология. - 1985. - № 1 - С. 25 - 28.
3. Кущ Н.А., Вечерко В.Н., Шнырев А.Н. // Урология и нефрология. - 1987. - № 2. - С. 3-6.
4. Лакин Г.Ф. Биометрия. Учеб. пособие для биол. вузов. - 4 -е изд., перераб. и доп. - М.: Высш. шк., 1990. - 351 с.
5. Плохинский Н.А. Биометрия. - М. Изд-во: МГУ, 1970. - 276 с.
6. Lee B.R., Partin A.W., Epstein J.I., et. al. // Journal of Urology. - 1992. - Vol. 148, № 5. - P.1482-1486.
7. Tan P.H., Chiang G.S., Tay A.H. // Annals of the Academy of Medicine, Singapore. - 1994. - Vol. 23. - P. 838 - 843.

МОРФОМЕТРИЧНІ ЗМІНИ В ПОДВОЄНИХ НИРКАХ У ДІТЕЙ З РІЗНИМ СТУПЕНЕМ ПОРУШЕННЯ УРОДІНАМІКИ ТА БЕЗ НЬОГО

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РЕЗЮМЕ

Проведено морфометричне зіставлення структурних елементів подвоєної нирки та сечоводів у дітей з урахуванням важкості ураження патологічним процесом та методу лікування. Означені морфометричні об'єкти, що дають можливість прогнозувати метод оперативного лікування та його вихід залежно від якісних та кількісних змін структури подвоєної нирки. Підтверджено принципову різницю кількісних показників структурних елементів подвоєної нирки за відсутності порушення уродинаміки, при помірному порушенні відтоку сечі, а також при стійкій втраті функції внаслідок порушення уродинаміки тяжкого ступеня.

КЛЮЧОВІ СЛОВА: дитяча урологія, аномалія розвитку, подвоєна нирка, діагностика, лікування, гістологія, морфометрія

МОРФОМЕТРИЧЕСКИЕ ИЗМЕНЕНИЯ В УДВОЕННЫХ ПОЧКАХ У ДЕТЕЙ ПРИ НАРУШЕНИИ УРОДИНАМИКИ РАЗЛИЧНОЙ СТЕПЕНИ И БЕЗ НЕГО

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РЕЗЮМЕ

Проведено морфометрическое сопоставление структурных элементов удвоенной почки и мочеточника у детей с учетом тяжести поражения патологическим процессом и метода лечения. Определены морфометрические объекты, дающие возможность прогнозировать метод оперативного лечения и его исход в зависимости от качественных и количественных изменений структуры удвоенной почки. Подтверждено принципиальное отличие количественных показателей структурных элементов удвоенной почки в отсутствие нарушения уродинамики, при умеренном нарушении оттока мочи, а так же при стойкой потере функции вследствие нарушения уродинамики тяжелой степени.

КЛЮЧЕВЫЕ СЛОВА: детская урология, аномалия развития, удвоенная почка, диагностика, лечение, гистология, морфометрия