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THE IMPORTANCE OF DETERMINING THE FUNCTIONAL RENAL RESERVE IN NEPHROLOGICAL PRACTICE

Over the past decades, there has been an increase in the number of diseases of the urinary system in the world. Kidney diseases often acquire a long, progressive course with an outcome in chronic renal failure (CRF) [1, 2].

An important feature of nephrological diseases is their propensity for progressive development. According to the latest data on the patterns of chronicity of kidney damage, the end result of a number of renal and non-renal diseases is the development of chronic kidney disease (CKD). The term "CKD" is known to have been coined by the American Association of Nephrologists in 2002. The criteria for determining CKD are: kidney damage lasting more than 3 months, which manifests itself in the form of structural or functional disorders of the organ's activity, with or without a decrease in the glomerular filtration rate (GFR) less than 60 ml per minute per 1.73 m^2 in the presence or absence of other signs damage [3].

Given the complex mechanism of GFR changes under physiological conditions, especially in pathology, it becomes necessary to measure filtration in active nephrons, as well as the total number of functioning nephrons. The only way to solve such problems today is to determine the functional renal reserve (FRR).

It is important to note that the determination of GFR under conditions of relative functional rest is not sufficient in diagnosis, indicating only its overall value at the time of the study that is, about basal GFR, and does not always make it possible to correlate this indicator with the total number (mass) of nephrons which is especially important [4].

The answer to these questions can largely be provided by the FRR indicator, which is defined as the difference between the maximum (stimulated) and basal glomerular filtration rate [5]. Depending on the degree of increase in GFR in response to stimuli, there is a preserved FRR, that is, the ability of the kidneys to increase GFR by more than 10%, a decreased FRR – with an increase in GFR in response to a stimulus by 5-10% and the absence of a filtration reserve - with an increase in GFR less than 5%. In healthy individuals, the increase in GFR in response to functional stimulation most often ranges from 10 to 100% or more, which reflects the preservation of the FRR [6]. The absence of FRR indicates that the level of GFR, in which the kidney operates, is extremely high, and this is considered equivalent to the state of hyper filtration [7, 8].

It is also known that today kidney disease in children is one of the most important problems and occupies one of the first places in the world [9, 10]. It was found that when taking a saline solution of sodium chloride, the activation of the functional renal reserve and mechanisms aimed at normalizing the water-salt homeostasis occurs [8]. In this connection, the purpose of our study was to identify the features of the functional renal reserve in children.

Materials and methods. Functional renal reserve was performed in 50 healthy children before and after water-salt load. Water-salt load was carried out by oral administration of 0.5% aqueous NaCl solution in an amount of 0.5% of body weight in the morning on an empty stomach for 3-5 minutes. After loading for one hour, the patient is in a sitting position. After an hour, the patient actively empties the bladder. The total volume of urine excreted is measured and a sample is taken from it to determine the concentration of creatinine. In urine and blood plasma, the concentration of creatinine is determined by the conventional method with picric acid. Subsequently, GFR was calculated based on the creatinine level in case of induced saline diuresis.

Subsequently, the value of FRR was calculated as a percentage of the GFR data obtained in daily diuresis, or according to GFR-EPI.

The response to water-salt load was assessed by the presence of urinary syndrome, urine osmolarity, urine creatinine, sodium and potassium before and after exercise.

Results. The age of the children was from 3 to 12 years old and averaged 5.45±0.67 years. When calculating GFR in children, it was within the age norm. According to the results of the general analysis of urine, urinary syndrome was detected in 16 people, which amounted to 32.0%. Moreover, he had the following characteristics: proteinuria in 5 children (10.0%), leukocyturia – 8 people (16.0%), erythrocyturia – 7 (14.0%), cylinduria – 9 (18.0%) children.

However, after the water-salt load, there was a decrease in the manifestations of urinary syndrome in 11 children (68.75%). There was also a 30-40% decrease in urine volume in 40 (80.0%) children, a 1.5-2-fold decrease in the Na level and a 2-fold increase in the urine K level. The decrease in the concentration function of the kidneys according to the urine osmolarity was as much as its increase after the water-salt load, and was noted in 24 (48.0%) children.

It was also found that in 10 children (20.0%), after the water-salt load, they could not urinate for several hours, and 3 children (6.0%) urinated earlier than the set 60 minutes.

Conclusions. According to the data obtained, the inclusion of FRR was observed in 68.75% of cases, as evidenced by a decrease in the manifestations of urinary syndrome in children after exercise.

Determination of FRR makes it possible to diagnose the presence and nature of kidney damage, damage or decrease in the number of nephrons, which significantly increases the diagnostic capabilities for detecting renal diseases and monitoring their development in children.

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