ISSN NO: 2770-2936
Date of Publication:22-11-2022

Main Features of the Kidney and Urinary System in Infant and Their Differences from Children of Other Ages

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Annotation: If the baby's kidney is still immature in terms of its structure and function, it is capable of satisfactorily performing its function under physiological conditions and maintaining the stability of the internal environment. This is achieved due to the good effect of the consumed food on kidney function. The identity of the renal and urinary systems of adults and infants differ from each other in terms of ion composition, osmotic pressure and other characteristics.

Key words: game stasis, metabolic process, oliguria, stasis, fibrous capsule, kidney ball.

In a newborn, the mass of the kidney is relatively large, equal to 1\100 of the body weight, and in an adult, this figure will be close to 1\200-1\220.

The kidney is one of the main ones in the organs that provide homeostasis. It is one of the organs involved in maintaining the osmotic pressure, ionic composition, acid-base balance and volume constant of the fluids of the internal environment. In addition to these, metabolic processes are characteristic of the kidney. It is all determined that it occurs on the basis of the processes of filtration in the balls, reabsorption in the ducts, secretion and synthesis of substances in the renal parenchyma. The effectiveness of the indicated processes in children is subject to changes depending on the needs of metabolism, changes in the internal and external environment, the degree of adaptation, the development of a neuron and a whole kidney composed of them.

The baby's kidney is round in shape, the surface is curved-here it is 4.2 cm long, with a mass of around 12 grams, which will be located lower than in an adult. The scaly substance is thinner and accounts for 20-25% of the kidney thickness (40-50% in adults).

The number of balls in the kidney of a mature baby will not be equal to that of an adult, but small and densely located. Although 50 balls are found on an equal surface of the kidney Section, 7-8 balls are located. In adults, the diameter of the ball is 200 µm, while in infants it is equal to 85 µm. The renal tubules are also in a relatively small and thin state. The proximal canal in the baby's kidney has a diameter of 18-36 µm, while in adults it is 40-60 µm. The relative amount of blood flowing from the baby's kidneys is small, accounting for only 5% of the volume per minute (in adults, this figure is 20-25%). In addition, the surface on which filtration occurs in the baby is 5 times smaller than in adults, and the bribes in the filter are 2 times smaller in diameter, from which we conclude that the resistance to filtration in the baby's kidney is greater than in older people. It only happens if the amount of filtering pressure is sufficient in babies. This is because the lower blood hydrostatic pressure in the ball capillaries is balanced by the lower oncotic pressure generated by plasma calloids.

As a result of the small amount of blood flowing through the baby's kidneys, the small size and thickness of the filtering surface, the amount of filtrate calculated per unit body surface is 4-6 times less than in adults and is on average 26 ml\min. At the end of the infancy period, this indicator is approaching 40 ml\min. During this period, it was found that the filtration process is not harmonious, the amount of diuresis is more dependent on the intensity of filtration than in adults.

The mechanisms that promote reabsorption and substance secretion in babies are also considered not very well improved. In infants, the reabsorption of amino acids cannot be complete, as a result of which the rate of sodium withdrawal from the blood is 5 times less in infants than in adults. The property of the kidney to release sodium in small quantities is one of the main reasons for the rapid accumulation of water in the children's body.

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In adults, the transport of water and sodium in the distal ducts is one of the relatively independent processes. In infants, this process is in an interconnected state. Because of this, diuresis increases if a large amount of water gets into their body, but at the same time sodium excretion also increases, and Cation deficiency can develop. The effectiveness of removing excess water from the body is greatly increased in children from 5 days. In babies, the kidney's ability to condense urine will be limited. In them, the highest osmotic concentration of urine does not exceed 650 mosm\l (in adults, this figure is 1500 mosm\l). In newborns, insufficient development of the kidneys and ducts indicates insufficient secretion of substances stands. In infants, the activity of the mechanism by which penicillin is secreted from the blood to the urine is also in a very low state. But the secretion of hydrogen ions is equal to that of an adult when the body mass in weekly children is calculated by 1 kg. When calculating the volume unit of the filtrate, there will be three times more.

In babies, the limit of the amount of urine that they secrete overnight is considered to be much greater. In the early days, physiological oliguria (small amount of urine)can be observed. It has been established that from the third day of a child's life, diuresis increases and at the end of the week it is 7-8 times more than on the first day and is 60-65 ml\kg\24 hours. This indicator is 3-4 times more than the diuresis of an adult person.

Time passed after childbirth	Amount of urine ml\kgx24 hour	Natrium (mmol\l)	Kalium (mmol\l)	Chlorine (mmol\l)
1 day	8,75	31,6	32,6	42,1
2 day	8,90	22,1	27,0	24,1
3 day	19,2	19,4	23,0	18,2
4 day	28,9	15,7	14,7	16,0
5 day	49,0	10,7	8,6	11,2
6 day	64,3	11,2	8,1	13,7
7 day	60,8	16,6	6,7	20,0

Improvement of urine formation mechanisms

On the one hand, it leads to a change in lifestyle, on the other, to a change in the amount and composition of the last urine during the growth process.

The main changes in the composition of urine are considered to be an increase in osmotic concentration, an increase in the amount of creatinine, sodium chloride by 2-3 times, a decrease in the excretion of uric acid, potassium and phosphorus salts .

The baby may also not urinate for 12 hours after birth. For the next 5 days, urine begins to separate 4-5 times a day. From the second week, the child can urinate 20-25 times a day. Up to six months, the child urinates 20-25 times a day, after one year the number of urinary divorces decreases, and a 3-5-year-old child urinates 10 times, and 10-12-year-olds urinate 5-6 times. Emptying the bladder after the child reaches the age of two begins to shift into a series of voluntary processes.

During the nursing period, nephrons, superficially located in the scaly substance, develop rapidly. The amount of blood flowing through the vessels of the kidneys will increase. As a result, filtration is even faster. During the development of Nephron ducts, their sensitivity to hormones increases, and the chances of adaptation increase. However, neither the increase in kidney mass nor their activity is even. Periods of rapid development alternate with periods of slow development. By half of the nursing period (in children 5-6 months), the mass of the kidney is twice (from 12 grams to 24 grams). And when this period ends, it increases to three times (up to 36-37 grams). Then the growth of the kidney will slow down. During puberty, the growth of the kidney is accelerated once again, and in children 15 years old its mass is 115-120 grams (in adults 120-200 grams). The possibilities of functioning of the kidney also do not change in parallel with the age of the child and the amount of member mass. For example, the rate of filtration in balls (based on the clearance of endogenous creatine about this speed) increases sharply during the first month of a child's life

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Age of the child	Klirens (ml\min)	In proportion to % in adults	Age of the child	Klirens (ml\min)	In proportion to % in adults
1 day	10	7,5	6 month	55	70
1 month	28	40	12 month	65	85
2 month	30	45	Over 1 year old	100	100
3 month	37	50	in adults	100	100

During the breastfeeding period, the reabsorption of amino acids and proteins in the proximal canal is also improved and reaches full reobsorption levels. The rate of sodium and chlorine reabsorption in the Distal ducts remains very high even during the breastfeeding period. Even in children aged 1.5 years, the concentration of these ions in the final urine will be less than in older people. The low ability of the kidney to condense and dilute urine in children is due to the size of the Genle bladder and the insufficiently developed mechanism of twisting reverse discharge. During the first and second year of a child's life, a rapid increase in the height and width of the ducts allows the excretion of urine with a high osmotic concentration. The baby's kidney can also secrete hydrogen ions in the amount necessary to maintain the acid-base balance under physiological conditions. The mechanisms that ensure the secretion of substances during the nursing period also quickly improve. In children who have reached the age of two, the rate of penicillin secretion is almost equal to that of an adult. The importance of external nerves in improving the development and functioning of children's kidneys is considered significant. In young children, kidney nerve damage leads to atrophy of the organ. During the period of breastfeeding, the hormonal control of renal activity is not formed. Even if the antidiuretic activity of the pituitary gland in children from one to two months is equal to the indicator in adults, in one-year-old children this hormone does not significantly reduce the amount of urine. This is due to the fact that the structure and function of the kidney has not yet improved sufficiently. The formation of hormonal control mechanisms will end when the child is 5-7 years old, and the development of ball bearings and ducts is over.

As a result of observations, comparisons and studies of children in infancy using several more methods:

First, not all balls will be formed by the time of birth, only when part of them is not stratified.

Secondly, newborns and young childhood will have less ability to concentrate the kidneys. The reason for this is the slight brevity of the nephron bladder, the low power of the tube transport systems and the low sensitivity of the collecting tube cells to vasopressin.

Thirdly, the presence of a poorly dilated fibrosis capsule (veil) and hyper-hypo-osmotic changes in the connective tissue of the organ, too low the ability to accumulate an excess of water and sodium, the appearance of inflammation or violation of the outflow of urine lead to a sharp increase in hydrostatic pressure inside the kidney, a decrease in the filtration As a result of this, the effectiveness of water-salt homeostasis regulation in children decreases.

Fourth, due to the anatomical and physiological nature of the urinary excretory organs, children develop a tendency to stasis (stagnation) of urine. The reason for this is the location of the renal vessels inside the kidney, the hypotonic state of the curved urinary tract, the lack of physiological maturation of the neuromuscular apparatus.

Fifth, several metabolitic properties are also observed in children's kidneys.

Sixth, a feature of the renal circulatory system is that in this the abundance of scattered branches of the renal artery, the clarity of the venous network, is visible. The maturation of the vascular system is completed at the age of 5-7 years and goes with the accumulation of an intermediate substance in the vascular wall, an increase in the number of cells and vessels.

Seventh, there are few nerve endings in the kidneys, which indicates that nerve regulation is not perfect in the processes taking place. Only from the second month of life does a network of nerves appear in the child's kidneys.

In conclusion, it can be said that the baby's kidney has the ability to maintain the constancy of the composition of the internal environment, fulfilling its function satisfactorily in physiological conditions, although it has not yet been reached in terms of structure and functioning. This is achieved due to the good

ISSN NO: 2770-2936
Date of Publication:22-11-2022

effect of the food consumed (breast milk), the nature of the metabolism (protein metabolism) on kidney function.

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