

Violation of Calcium-Phosphorus Metabolism in Children of a Patient with Chronic Pyelonephritis

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Abstract:

In addition to a high indicator in the composition of children's diseases, the pathology of the urinary system attracts attention with the severity of the prognosis. Unspecified diseases and late treatment often lead to the development of a pathological process and the development of chronic kidney failure, which leads to a delay in the growth and development of Children, Disability and a significant decrease in life expectancy.

Keywords: Chronic renal failure, pyelonephritis, young child, genitourinary.

The state of the organism is formed by various factors of the internal and external environment, among which the state of calcium-phosphorus metabolism occupies an important place. Violation of the structure and function of the organs involved in the regulation of phosphorus-calcium metabolism is the cause of various diseases that develop during the life of the child.

The kidneys are the main organ in the regulation of phosphorus-calcium homeostasis in both physiological and pathological conditions. The main physiological function of the kidneys is to maintain homeostatic parameters of the body. When primary urine is formed in the vascular glomerulus, it includes all trace elements of blood plasma. In proximal ducts, active reabsorption of minerals and water begins. In the initial part of the tubes, the absorption of single - valence cations is an active process, and in the last part of the tubules-an active and passive type. Absorption of bilavalent cations is an active process. Anions passively follow cations. In distal ducts, 10-20% of filtered cations are absorbed. The process of reabsorption of microelements is under the control of the nervous and endocrine systems. When the tubes are damaged, the active and passive reabsorption of trace elements from the primary urine is disrupted, which leads to a decrease in their

composition in the body. On the other hand, deformed mineral exchange contributes to the pathogenesis of kidney diseases and forms a kind of "Circle".

A number of authors conducted studies that found that a patient with chronic pyelonephritis violated the composition of such elements as magnesium, zinc, copper, iron in the body of children.

So Makarov t.P. (2021) in his work, a patient with chronic pyelonephritis noted a significant increase in the clearance and excretion of zinc in children compared to healthy children, which indicates an increase in excretory insufficiency and a decrease in the intracellular capacity of neutrophils with the development of this pathology. cases such as killing microorganisms, a stable decrease in immunity were noted.

A violation of magnesium metabolism in children with chronic pyelonephritis is characterized by a decrease in its level in the hair and blood serum. One of the causes of magnesium deficiency identified in children with a patient with localization of the pathological process in the tubulointerstitial tissues of the kidneys is an increase in the excretion of the macronutrient through the kidneys.

The ability of the kidney to perform homeostatic functions determines the main role of this organ in the processes of bone resorption and bone formation, as well as in the mineralization of teeth.

The defeat of the tubulo-interstitial apparatus in pyelonephritis in children is accompanied by changes in the state of phosphorus-calcium metabolism. A.A. according to. Baranova A.A. according to (2015), with the diagnosis of "chronic pyelonephritis" in children aged 8 months to 14 years, serum calcium concentration decreases in 77.78% of children with primary pyelonephritis and 78.95% of children with secondary pyelonephritis. A decrease in phosphorus levels was found in 77.78% of children with primary pyelonephritis and 31.58% of children with secondary pyelonephritis. These disorders are characterized by a violation of reabsorption in sick children with microbial-inflammatory diseases of the kidneys.

Svintsiskaya V.I. according to (2009) a densitometric (X-ray and ultrasound) study found that more than half (54.3%) of children with pyelonephritis had changes in bone mineral density, among which 25% of children had bone mineral density below chronological age. 29.3% - constitutes a risk group for the development of osteopenia.

Based on the results of a study of bone mineral density, 37% of children with chronic pyelonephritis have an integral indicator - a decrease in the strength index of bone tissue, while 9% of children have an indicator of bone tissue strength corresponding to osteoporotic changes in bone.

Currently, the effect of the parathyroid hormone, including on tooth tissue, is dominated by its three-way continuation:

- Enzymatic destruction of the bone matrix (increased activity of it), carried out by exposure to collagen and bone collagenase.
- The effect on enzymatic systems involved in the exchange of carbohydrates and the formation of organic acids (lemons, etc.).
- Activation of the calcium and phosphorus ion transport system (ion pump) from bone tissue to extracellular fluid.

However, not all of these phenomena occur separately in the body: the function of the parathyroid glands is influenced by various hormonal regulators, especially growth hormone, which is modified by the main biochemical factor-calcium levels. In addition, other hormones and mediators are involved in the regulation of calcium-phosphorus metabolism: thyroid hormones, thyrocalcitonin, glucocorticoids, estrogens, growth hormone and anabolic steroids are included.

Calcium is known to have great physiological significance for the body. It plays a leading role in ossification and formation of tissue structures. It is involved in the conduction of electrical impulses, reduces the permeability of cell membranes and, as a result, is a leading link in the electrogenesis of nerve, muscle and glandular tissues, synaptic processes, the molecular mechanism of muscle contraction, secretory and endocrine processes of the digestive tract and the activity of the endocrine glands. The presence of calcium is necessary to carry out normal blood clotting, since it is involved in the synthesis of thrombin and affects the vascular component of coagulation; the synthesis of aldosterone without calcium is impossible. With an increase in calcium concentration, the effect of the antidiuretic hormone on the renal ducts decreases, as a result of which water loss increases. The deviation of the amount of calcium in the blood and tissues from the norm leads to the development of not only functional, but also morphological changes in the functioning of many organs and systems of the body, including the development of pathology of mineralized tissues.

At the same time, another element - phosphorus is the most important plastic component of bone and other tissue structures. The body of an adult contains about 1120 grams of calcium, 95-99% of which is contained in bone tissue, which is mainly present in combination with phosphorus. The total concentration of calcium in the blood in the body is 2.5 mmol /L, of which 0.82 mmol /L, combined with proteins, is 1.53 mmol/l diffusion calcium. The composition of the latter includes 1.33 mmol /l of biologically active ionized calcium and 0.30 mmol /l of compounds with bicarbonate, phosphate and citrate. The distribution of inorganic phosphate in the blood serum is not so complicated. Negligible amounts of phosphorus bind to proteins and basically all inorganic phosphates are ionized. Bone tissue and other mineralized tissues represent a depot where calcium can accumulate. Absorption of both elements occurs in the upper intestines in a slightly acidic environment in a ratio of 1.2:1, and excretion is carried out by the kidneys and colon. As mentioned above, the intensity of these processes is regulated by the physiological system, in which the parathyroid hormone plays a leading role among a number of hormones and physicochemical factors. The delicate mechanism of the regulatory and controlling action of hormones is manifested mainly through enzyme systems, as a result of which the concentration of calcium ions is maintained at a constant level reliably. Parathyroid hormone has been shown to destroy the chromophore group of the truncated triphosphopyridine nucleotide, thanks to which the reaction in the Krebs cycle is possible only with the predominance of isocitrate and glycolysis processes up to the formation stage, and pyruvate, lactate, citrate are formed, leading to acidosis. Lowering the pH environment increases the solubility of hydroxyapatite. The Ca and P ions that form extracellular fluid enter the blood, and if the first accumulates in the serum due to its restriction by the kidneys, the second increases.

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