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THE IMPORTANCE OF MACRO - AND MICROELEMENTS IN THE DEVELOPMENT OF THE CHILD'S BODY

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Abstract
The postoperative period is accompanied by a high risk of thrombotic and hemorrhagic complications, which requires timely monitoring of the hemostasis system. A modern and informative method for assessing coagulation status is thrombodynamics, a laboratory test that allows real time visualization and quantification of the thrombosis process. This article discusses the advantages of using thrombodynamics in the postoperative period for early detection of hypercoagulation and individualization of anticoagulant therapy. The data on the diagnostic and prognostic significance of the method in patients after surgical interventions of various profiles are presented. The importance of integrating thrombodynamics into the management protocols of postoperative patients in order to reduce the risk of thrombosis and improve clinical outcomes is noted.

Keywords: Thrombodynamics, hemostasis, postoperative period, thrombosis, coagulopathy, thrombosis, anticoagulant therapy, hemostasis monitoring.

Introduction

Macro - and microelements play a fundamental role in the physiological development of the child's body, as they are involved in almost all biochemical and metabolic processes. The etiological factors that determine the deficiency or excess of these substances in childhood are multifactorial and can be both exogenous and endogenous. Nutritional factors (alimentary): The most common cause of deficiency of macro- and microelements in children is an unbalanced diet. Insufficient consumption of foods rich in calcium, iron, zinc, iodine, magnesium, selenium and other elements, especially during the period of active growth, leads to their chronic deficiency. The risk increases with a vegetarian or monotonous diet, abuse of processed foods and sweets, as well as in the absence of breastfeeding at an early age. Malabsorption disorders in the gastrointestinal tract gastrointestinal diseases (celiac disease, chronic gastroenteritis, lactase deficiency, malabsorption syndrome) can interfere with the proper absorption of minerals. [1,2,5,10,13].

Even with normal consumption, such children are at risk for elementosis, especially iron deficiency anemia, hypocalcemia, and magnesium deficiency. The increased need for macro- and microelements, rapid growth, puberty, the period of teething, the development of the skeleton and

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nervous system are accompanied by an increase in the need for micro- and macroelements. With insufficient provision of the need, a relative deficit occurs, which can manifest itself as slow growth, deterioration of cognitive function, immunodeficiency and other disorders. Endogenous metabolic disorders: Metabolic and metabolic regulation disorders (including genetically determined diseases such as cystic fibrosis or congenital abnormalities of the kidneys and liver) can lead to impaired mineral homeostasis. Some pathologies are accompanied by loss of electrolytes and trace elements in urine or sweat. Environmental and toxic effects pollution of the environment by heavy metals, deficiency of trace elements in soil and water, as well as unfavorable sanitary living conditions of children can have a significant impact on their mineral status. For example, iodine deficiency in water and soil is one of the causes of endemic goiter. Taking medications and pathological conditions, some medications (diuretics, glucocorticoids, anticonvulsants) cause loss of calcium, magnesium and potassium. Chronic infections, stressful conditions, fever, and inflammation also alter the distribution and intake of micronutrients. Thus, the etiology of micro- and macronutrient balance disorders in children is complex and requires a multidisciplinary approach. Early diagnosis of the causes of deficiency and timely correction play a key role in ensuring normal growth, intellectual and physical development of the child. [1,2,6,9,10].

Macro- and microelements perform critically important functions in biological systems, especially during the period of active growth and formation of organs and systems in children. Their deficiency or imbalance leads to a chain of pathophysiological changes that have a direct impact on metabolism, structural development and regulation of homeostasis. Violation of enzymatic processes. Many trace elements, such as zinc, copper, iron, manganese, and selenium, are cofactors of enzymes involved in redox reactions, DNA and protein synthesis, and regulation of antioxidant activity. Their deficiency leads to a decrease in enzyme activity, which disrupts the main metabolic cycles (Krebs cycle, glycolysis, nucleic acid synthesis, etc.), slows down cell division and regeneration. [1, 4, 8].

Impaired tissue growth and development. Calcium, phosphorus and magnesium play a key role in bone mineralization and skeletal formation. Their deficiency leads to osteopenia, rickets, stunted growth, bone curvature, and in severe cases, to impaired tooth formation and cranial deformity. Iron is necessary for the formation of hemoglobin and for tissue respiration, and its deficiency leads to anemia, tissue hypoxia and a slowdown in psychomotor development. Disorders of the nervous system

Magnesium, zinc, copper, and iodine are involved in the development and functioning of the central nervous system. Iodine deficiency is especially dangerous in early childhood, as it causes irreversible brain development disorders, which is clinically manifested by a decrease in cognitive functions, up to cretinism. Magnesium and zinc deficiency can lead to neurological and behavioral disorders, including hyperactivity, anxiety, and sleep disorders. [4, 7, 11].Weakening of immune defenses. Zinc, selenium, iron and copper are involved in the formation of cellular and humoral immunity. Their deficiency reduces the activity of T-lymphocytes, macrophages, interferon production and antibodies, which makes the child's body more vulnerable to infectious diseases, contributes to the chronization of inflammatory processes and increases the risk of complications. Violations of the antioxidant system Selenium and zinc are part of antioxidant enzymes (for

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example, glutathione peroxidase) that protect cells from the effects of free radicals. Deficiency of these elements disrupts antioxidant protection, increases oxidative stress, damages cell membranes, especially neurons and epithelium, and accelerates tissue aging. [2, 5, 9].

Electrolyte and osmotic disorders. Potassium, sodium, chlorine, and magnesium provide a water-salt balance, nerve impulse conduction, and the functioning of the muscular and cardiovascular systems. Their imbalance leads to arrhythmias, seizures, decreased muscle tone, dehydration or edema. [3, 6, 11].

Diagnosis of disorders of macro- and microelement status in children is a complex process that includes clinical and anamnestic assessment, laboratory and instrumental methods aimed at identifying both obvious and subclinical forms of deficiency or excess of elements. In conditions of active growth of the child's body, it is important to identify deviations in a timely manner, since they may be latent and manifest themselves with nonspecific symptoms. Medical history and physical examination At the first stage, the doctor collects information about: the nature of the child's diet (including the duration of breastfeeding, diet, eating habits), the presence of chronic diseases (gastrointestinal tract, kidneys, endocrine system), previous infections and stress factors, taking medications and nutraceuticals, living conditions (environmental conditions, regional soil characteristics and water). Physical examination includes an assessment of body height and weight, skin condition, nails, hair, teeth, skeleton and nervous system. Signs indicating micronutrient deficiency may include pale skin, dryness and peeling, brittle nails, hair loss, muscle weakness, irritability, and delayed psychomotor development. [3, 4, 10].Laboratory diagnostic methods. Biochemical analysis of blood and serum To determine the concentration of key macro- and microelements: Calcium, magnesium, phosphorus – to assess mineral metabolism and bone tissue. Iron, ferritin, transferrin, and OHSS are used to diagnose iron deficiency conditions. Zinc, copper, selenium, manganese, chromium – according to indications, if systemic disorders are suspected. Iodine is indirectly measured by the level of thyroid–stimulating hormone (TSH), thyroxine, as well as by the concentration of iodine in urine. B. General blood test. It allows you to identify signs of anemia, leukopenia or leukocytosis, as well as common markers of inflammation, which may indicate functional disorders associated with a micronutrient imbalance. Analysis of hair, nails and urine for trace elements. The method of indication spectrometry is used to assess long-term mineral status and detect chronic deficiencies or accumulations of elements (for example, toxic ones: lead, cadmium, mercury). [2, 5, 9].

Ultrasound of the thyroid gland and bones is performed in case of suspected iodine deficiency or impaired bone mineralization. Densitometry is used to assess bone mineral density in patients with calcium and vitamin D deficiency. Neuropsychological testing is used for delayed psychomotor or speech development (in the context of iodine, magnesium, iron, zinc deficiency). Specific methods. Enzyme immunoassay (ELISA) methods allow quantifying the level of ferritin, ceruloplasmin, and markers of oxidative stress. Molecular genetic diagnosis – in case of suspected hereditary forms of disorders of the metabolism of trace elements (for example, Menkes disease, diseases of accumulation of copper or iron). [5, 7, 15]. Conclusion. Macro- and microelements play a key role in ensuring the normal growth, physical and intellectual development of the child's body. They are involved in the processes of bone formation, functioning of the nervous, immune, endocrine and cardiovascular systems. Etiological factors of deficiency include both nutritional

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causes (unbalanced diet) and pathological conditions (diseases of the gastrointestinal tract, kidneys, hereditary metabolic disorders), which requires an individual approach to diagnosis and correction. Pathogenetic mechanisms of elementoses are realized through disruption of enzymatic activity, inhibition of antioxidant protection, slowing of tissue growth and weakening of immune function, which can lead to serious and often irreversible consequences. Diagnosis of micronutrient status disorders requires an integrated approach using clinical, laboratory and instrumental methods, including biochemical analyses, the study of the mineral composition of hair and urine, as well as an assessment of the functional state of organs and systems.

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