

ON THE ISSUE OF THE INFLUENCE OF CALCIUM PREPARATIONS

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Abstract. *One of the vital minerals in the human body is calcium. This mineral takes part in more than 300 biologically active reactions. Medicines containing calcium salts have been used in medicine for many decades. This is due to the important role of this element in the modeling, remodeling and mineralization of bones. Depending on body type and gender, about 97-98% of calcium is found in the skeleton, in the form of hydroxyapatite, and only 2-3% in other tissues (muscles, skin). In total, the adult human body contains about 1000-1500 mg of Ca. In the body, calcium is found in two forms - ionized (free) and bound to Ca proteins (mainly albumins). A decrease in the concentration of ionized calcium causes signs of hypocalcemia. Calcium ions perform the following functions: activates the plastic function of osteoblasts and osteocytes; participate in the formation of bone and dental tissues; form the mineral basis of the skeleton, ensuring their strength and hardness; By interacting with the intracellular protein calmodulin, calcium ions regulate many biochemical processes. Calcium also plays a key role in a number of functions of the human body, including: cell division and differentiation; in the release of the transmitter from the endings of the efferent nerves into the synaptic cleft and the conduction of nerve impulses; in contraction – relaxation (together with troponin) of striated and smooth muscles; in the activity of neurosecretory organs; in the process of blood clotting; in transmembrane ion reactions involving selective calcium channels; in the regulation of the permeability of cell membranes and the activity of many enzymes and other protein, as well as non-protein, biologically active substances.*

Keywords: *transmembrane, intracellular protein calmodulin, calcium ions.*

The main way calcium enters the body is through the nutritional route. By consuming milk, dairy products, fish, meat, fruits, vegetables, and herbs, we take the daily requirement of calcium. According to WHO recommendations, the daily requirement for calcium depends on the age and gender of the person. An unbalanced diet and insufficient consumption of foods containing phosphorus and calcium inevitably leads to a deficiency of these substances in the body. The sources of calcium for children at different stages are different. The supply of calcium to the fetus depends on the saturation of the mother's body with calcium and vitamin D. In the last trimester of pregnancy, the rate of incorporation of calcium into the fetus' body increases, which means that the state of bone mineralization will also depend on the gestational age. After birth, the source of calcium is breast milk, and for bottle-fed children - an adapted milk formula. With breast milk, a child receives up to 300 mg of calcium, and in formulas, on average, 400 mg of calcium. Calcium is absorbed in both the small and large intestines. This process is carried out using two

mechanisms: active absorption and passive diffusion (with the participation of which at least 10% of calcium is absorbed). Absorption depends on the pH of gastric juice. H2 blockers - histamine receptors, inhibiting gastric secretion, can have a negative effect on calcium absorption. The absorption process also depends on the ratio of calcium and phosphorus, calcium and fats in food. With a high content of phosphorus and fats, insoluble calcium compounds are formed, which are poorly absorbed. The absorption of calcium salts is reduced by consuming foods such as spinach, rhubarb, bran, grain dishes, and foods containing phytates. Elderly people, children, as well as pregnancy, that is, with reduced gastric secretion, the absorption of calcium carbonate decreases, and calcium lactate does not change. The main bioregulator of calcium absorption is vitamin D, which increases the absorption of calcium from the gastrointestinal tract. The absorption of calcium directly depends on the content of vitamin D; when vitamin D is taken in parallel with calcium, the absorption efficiency reaches 80%. With a reduced dietary intake of calcium, but sufficient intake of vitamin D, the body adapts to fluctuations in calcium intake by increasing passive diffusion in the distal intestine. The deposition and mobilization of calcium from the depot is regulated by the hormones of the thyroid (calcitonin) and parathyroid (parathyroid hormone) glands. One part of calcium is excreted by the kidneys in the urine, the other is excreted into the intestines with bile and pancreatic secretions. Vitamin D enhances the process of active reabsorption of calcium in the kidneys, reducing its excretion in the urine. Thiazide diuretics reduce urinary calcium excretion. Abroad, in Russia, as well as in Uzbekistan, calcium metabolism disorders in children over 3 years of age are usually designated by the terms: “osteopenia”, “osteomalacia”, “osteoporosis”. Osteopenia is a decrease in bone mass. Osteomalacia is an osteopenic condition associated with impaired bone mineralization. Osteoporosis is a systemic skeletal disease characterized by a decrease in bone mass and microstructural restructuring of bone tissue, leading to increased bone fragility and the risk of fractures. bone mass and microstructural reorganization of bone tissue, leading to increased bone fragility and the risk of fractures. Depending on the age of the child, calcium deficiency leads to lower length and weight of the child at birth, signs of rickets in the first half of life, and negatively affects the quality of the skeletal bones of young children, the level of psychomotor development, and the intensity of morphofunctional maturation of internal organs. During childhood, peak bone mass accumulates, which is about 80% of an adult's bone mass and determines the strength of bone tissue throughout life. Lack of calcium during the period of active growth leads to growth retardation, sometimes to the formation of osteopenic syndrome. Many authors, domestic and foreign, point to the connection of somatic pathology with calcium metabolism disorders. There are works indicating a connection between calcium deficiency and caries, poor posture, changes in the shape of the chest, X and O-shaped deformities of the lower extremities, and decreased muscle tone. The range of chronic somatic conditions leading to calcium imbalance is large. Leading among them are pathologies of the endocrine organs (thyroid disease, diabetes mellitus), kidneys (chronic renal failure, idiopathic hypercalciuria) and the digestive system (malabsorption syndrome in various diseases, gastroduodenitis, duodenal ulcer).

There are works devoted to the influence of bronchial asthma and Crohn's disease on the state of calcium metabolism. However, we must not forget that metabolic disorders are also detected in practically healthy children. The following symptoms will help to suspect it in practically healthy children: general weakness, increased fatigue, decreased performance, dry skin, brittle nails and hair, progressive dental diseases (caries and periodontitis), paresthesia and muscle

twitching. Such children are prone to developing curvatures of the spine, poor posture, and other deformations of the skeletal system. It is possible that the child's growth may slow down, and sometimes a decrease in the already achieved body length. In the most severe cases of hypocalcemia, osteoporosis develops, the clinical manifestations of which are bone fractures. Timely selection of children into risk groups for the development of osteopenia and osteoporosis will help to suspect trouble. A thorough medical history is required, an examination including a general and biochemical blood test, a biochemical urine test, a urine test for osteoporosis markers, densitometry (X-ray or ultrasound), and, if necessary, bone radiography. Prevention and treatment of hypocalcemic conditions is complex and long-term. It is necessary to optimize the daily routine, be sure to exercise as much as possible, give up bad habits, and maintain a balanced diet rich in foods containing calcium and phosphorus. If there is a suspicion of a lack of sufficient minerals and vitamins in the diet or in the presence of diseases leading to hypocalcemia, work on the synthesis of drugs for the prevention and treatment of hypocalcemia and osteoporosis is necessary. There are three groups of drugs containing calcium salts: multicomponent preparations of various calcium salts; two-component forms, including, along with calcium salts, different dosages of vitamin D3 (or vitamin C); multivitamin prescriptions with mineral supplements, many of which contain calcium (this group of drugs is not used to correct hypocalcemic conditions due to low calcium content).

Calcium preparations are used for the prevention and treatment of hypocalcemic conditions, including osteoporosis. For these purposes, mono-(calcium) and two-component (calcium + vitamin D3, calcium + vitamin C) drugs containing high dosages of calcium are usually used. In some drugs used to treat osteoporosis, calcium salts are combined with fluorides. Calcium preparations: compensate for the deficiency of this ion; reduce tissue permeability; have anti-edema, anti-inflammatory, anti-allergic, hemostatic effects; inhibit osteoclast activity and reduce bone resorption; activate the reticuloendothelial system, the phagocytic function of leukocytes and increase the body's resistance. The smallest amount of calcium in 1 g of salt is found in calcium gluconate, the largest in calcium carbonate and calcium phosphate. It is believed that taking calcium citrate and lactate is not contraindicated in patients with urolithiasis. Calcium carbonate is more likely than other calcium compounds to cause constipation, especially when the acidity of the gastric juice increases. Calcium content (mg of element) in various calcium salts (per 1 g of calcium salt); calcium carbonate – 40%; calcium chloride – 27%; calcium citrate – 21%; calcium glycerophosphate – 19%; calcium lactate -13%; calcium gluconate – 9%. All calcium preparations can be divided into three groups: single preparations; calcium and vitamin D preparations; combined vitamin and mineral complexes containing calcium. Single preparations of calcium are inexpensive and widely available, but their use is limited due to the fact that vitamin D, as an important factor in maintaining calcium homeostasis, is also an important link in the pathogenesis of most forms of osteopenic conditions, and in case of its deficiency, taking single preparations is insufficient for either therapeutic or prophylactic purposes.

Taking medications that simultaneously contain calcium and vitamin D is pathogenetically justified. However, the use of these medications requires a balanced approach regarding the duration of use. It is well known that fat-soluble vitamins, including vitamin D, tend to accumulate in the body when taken for a long time. The higher the vitamin D content, the higher the risk of accumulation and development of hypervitaminosis. With long-term use of such drugs, regular monitoring of Ca levels in the blood and urine is mandatory. When taken orally, adverse effects

sometimes occur: pain in the epigastric region, heartburn, constipation, and sometimes diarrhea. Contraindications for taking calcium supplements are: hypersensitivity to the components of the drug, increased levels of calcium salts in the urine and blood.

The choice of drug is determined by the indications for use (prevention, treatment), composition (single drug, combined or vitamin-mineral complex), characteristics of administration (tablet, chewable tablet, effervescent tablet), taste preferences, and, most importantly, the value of the drug.

Currently, the pharmaceutical market in Uzbekistan is filled with calcium preparations and biologically active additives containing this element. Most drugs sold in pharmacies contain calcium carbonate (Calcium D3 nikomed, Ideos, Complivit Calcium D3, Kalcemin, Vitrum calcium D3, and there are also domestically produced drugs - CaD3 and Active calcium with magnesium-5). There are preparations containing calcium citrate (Osteomed, Kalcemin). The drug produced by our domestic manufacturers "Active calcium with magnesium-5" contains calcium carbonate 500 mg, calcium citrate 250 mg, as well as calcium bicarbonate 300 mg, and magnesium bicarbonate 35 mg. The liquid form of this drug allows it to be prescribed to both young children and elderly people.

In conclusion, we can conclude that it is better for young children and the elderly to use calcium preparations containing calcium citrate or calcium lactate, as well as those in liquid form (Active calcium with magnesium-5, Calvitalis, Kalcemin), while people of school age and adolescence and middle-aged people, there is a large selection of drugs containing calcium carbonate and in the form of tablets.

Thus, at present, the abundance of calcium-containing drugs allows one to make a choice in taking and prescribing a calcium drug, taking into account effectiveness, safety, acceptability and cost.

REFERENCES

1. Бауман В.К. Всасывание кальция в тонком кишечнике. Регуляция всасывания кальция в норме и патологии. //Рига: РМИ,-1987.-С.5-27.
2. Клиническая фармакология по Гудману и Гилману.//Практика. – Москва. – 2006. – С1316-1340.
3. Костылева М.Н. Место препаратов, содержащих кальций в профилактике гипокальциемии у детей.// РМЖ. Педиатрия – 2008.-№25. –С.1629-1637.
4. Котова С.М., Карлова Н.А., Максимцева И.М. и др. Формирование скелета у детей и подростков в норме и патологии.-СПб.-2002.-49с.
5. Почкайло А.С., Жерносек В.Ф. Остеопенический синдром и аллергические заболевания у детей и подростков//Медицинская панорама.-2007.-с24-29.
6. Ребров В.Г., Громова О.А. Витамины и микроэлементы-М.:АЛЕВ-В, 2003.-670с.
7. Спиричев В.Б. Роль витаминов и минеральных веществ в остеогенезе и профилактике остеопатий у детей.//Вопросы детской диетологии.-2003.-Т.1,№1.-С.40-49.
8. Стенникова О.В., Санникова Н.Е. Патофизиологические и клинические аспекты дефицита кальция у детей. Принципы его профилактики.//Вопр. Совр.педиатр.-2007. –Т.6. - №4. –С.58-65.

9. Хаустова Г.Г., Банина Т.В., Мухина Ю.Г., Щеплягина Л.С. Дефицит кальция и витамина Д при хронических заболеваниях желудка и тонкой кишки.//Доктор.ру.-2008.-№1.-С.14-18.
10. Щеплягина Л.А., Моисеева Т.Ю. Дефицит кальция-возможности пищевой коррекции у дошкольников.//Consilium medicum. Педиатрия.-2007.-№1.-С.80-83.