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SUCROSOMAL IRON IN THE TREATMENT OF ANEMIA IN CHILDREN WITH CHRONIC KIDNEY DISEASE: CURRENT APPROACHES AND PROSPECTS

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Tayanch so‘zlar: sukrosomal temir, kamqonlik, surunkali buyrak kasalligi, bolalar, Sideral, temir tanqisligi, biosinguvchanlik, chidamlilik, pediatriya.
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Anemia is one of the most common and clinically significant complications of chronic kidney disease (CKD) in children. It develops early in the disease process and significantly affects the quality of life of patients, impacting physical and cognitive development. Traditional oral iron supplements often have low tolerability and cause side effects from the gastrointestinal tract. Sideral, a sucrosomal iron-based preparation, represents a modern alternative for correcting iron deficiency in children with CKD. The aim of this review is to summarize the literature on the role, effectiveness, and tolerability of sucrosomal iron in pediatric patients, with a particular focus on children with chronic kidney pathology.

SURUNKALI BUYRAK KASALLIGI BO‘LGAN BOLALARDA ANEMIYANI DAVOLASHDA SUKROSOMAL TEMIR: ZAMONAVIY YONDASHUVLAR VA ISTIQBOLLAR

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Kamqonlik bolalarda surunkali buyrak kasalligi (SBK) ning eng ko‘p uchraydigan va klinik ahamiyatga ega asoratlaridan biridir. Anemiya kasallikning dastlabki bosqichlarida rivojlanib, bemorlarning hayot sifatini sezilarli darajada yomonlashtiradi, jismoniy va asab-ruhiy rivojlanishiga ta’sir qiladi. An’anaviy og‘iz orqali qabul qilinadigan temir preparatlari ko‘pincha past tolerantlikka ega bo‘lib, oshqozon-ichak trakti tomonidan nojo‘ya ta’sirlarni keltirib chiqaradi. Sukrosomal temirni o‘z ichiga olgan Sideral preparati SBK bilan og‘rigan bolalarda temir tanqisligini tuzatish uchun zamonaviy muqobil hisoblanadi. Ushbu ishning maqsadi surunkali buyrak patologiyasi bo‘lgan bolalarga alohida e’tibor qaratgan holda, pediatriyada sukrosomal bezning roli, samaradorligi va tolerantligi haqidagi adabiyot ma’lumotlarini umumlashtirishdan iborat.

СУКРОСОМАЛЬНОЕ ЖЕЛЕЗО В ЛЕЧЕНИИ АНЕМИИ У ДЕТЕЙ С ХРОНИЧЕСКОЙ БОЛЕЗНЬЮ ПОЧЕК: СОВРЕМЕННЫЕ ПОДХОДЫ И ПЕРСПЕКТИВЫ

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Анемия является одним из самых частых и клинически значимых осложнений хронической болезни почек (ХБП) у детей. Развиваясь на ранних стадиях заболевания, анемия значительно ухудшает качество жизни пациентов, оказывая влияние на физическое и нервно-психическое развитие. Традиционные пероральные препараты железа часто имеют низкую переносимость и провоцируют побочные явления со стороны желудочно-кишечного тракта. Препарат Сидерал, содержащий сукросомальное железо, представляет современную альтернативу для коррекции железодефицита у детей с ХБП. В данной работе систематизируются имеющиеся сведения о применении сукросомального железа в педиатрии, с фокусом на его эффективности и переносимости, особенно у детей с хроническими заболеваниями почек.

Introduction. Chronic kidney disease in children is a significant pediatric issue associated with numerous complications, with anemia being one of the most prominent. Developing at early stages of the disease, anemia considerably impairs the patient's quality of life, affecting growth, cognitive function, emotional state, and overall well-being. Kidney failure results in a decreased production of erythropoietin, iron deficiency, inflammatory processes and chronic intoxication, all of these factors contribute to the development of anemia in children with CKD. The management of anemia in pediatric CKD patients requires a balanced approach, considering metabolic peculiarities, age-specific characteristics and drug tolerability. One of the most promising directions is the use of innovative iron formulations, particularly sucrosomal iron, which offers higher bioavailability and improved tolerability.

This article focuses on reviewing current literature regarding Sideral — a sucrosomal iron-based preparation, its pharmacological properties, mechanisms of action, and advantages compared to traditional iron supplements in children with CKD.

Literature review. Anemia in children with chronic kidney disease is a multifactorial condi-

tion that arises due to several key processes: erythropoietin deficiency, iron malabsorption, chronic inflammation and metabolic disturbances. One of the primary factors contributing to anemia is the reduced erythropoietin production due to kidney dysfunction. This hormone regulates the production of red blood cells in the bone marrow and its deficiency leads to lower hemoglobin levels [1].

Chronic inflammation, which is common in CKD, increases levels of interleukin-6 and other cytokines, impairing iron metabolism and leading to iron deposition in macrophages and the liver, reducing the availability of iron for hematopoiesis [2, 20]. Additionally, children with CKD often experience impaired iron absorption from the gastrointestinal tract, exacerbating iron deficiency [3].

Current iron supplements prescribed for treating iron deficiency anemia in children often lead to various adverse reactions, especially those affecting the digestive system. Classic iron formulations, like ferrous sulfate, often lead to symptoms like nausea, constipation, and abdominal pain, reducing patient adherence to treatment [4]. In CKD patients, where the gastrointestinal tract is already under stress due to chronic inflammation, the use of these preparations may be limited [5].

Sucrosomal iron, as an alternative to traditional iron formulations, represents an innovative therapeutic strategy. It encapsulates iron ions in a protective microsphere composed of phospholipids and sucrose, which shields the iron from degradation in the acidic environment of the stomach and enhances its absorption in the intestines. This results in higher bioavailability and fewer side effects. Sideral, a sucrosomal iron-based drug, has demonstrated its efficacy in various clinical studies. In particular, research has shown that its use in children with CKD significantly improves hemoglobin and iron levels in the blood with minimal risk of side effects [6,7].

Particular interest lies in the use of Sideral in the context of chronic inflammation. Since sucrosomal iron is absorbed more efficiently, it can bypass the barriers caused by inflammatory processes and metabolic disorders. This makes it especially promising for children with CKD, where traditional iron supplements often fail to produce the desired effects [8].

Discussion. Childhood anemia associated with chronic kidney disease is an intricate issue demanding a holistic treatment strategy. The impact of CKD on children extends across multiple bodily systems, and anemia serves as a prime example of how diverse disease mechanisms can intertwine, worsening the overall clinical picture of the condition [9].

One of the main problems faced by doctors in the treatment of anemia in children with CKD is the limited effectiveness of traditional iron preparations. Traditional iron preparations, such as ferrous sulfate, are poorly absorbed due to impaired gastrointestinal tract function and acidic environment in the stomach [10]. Moreover, they can cause undesirable side effects such as nausea, diarrhea, or constipation, which is especially problematic for children. It is important to note that children with CKD often have nutritional and digestive issues, further hindering iron absorption [11].

In contrast to traditional supplements, sucrosomal iron offers several key advantages that may significantly improve treatment outcomes. The high bioavailability of sucrosomal iron allows to enhance absorption even in altered gastrointestinal environments. Studies have shown that the use of Sideral in children with CKD results in a significant increase in hemoglobin levels within a few weeks of therapy, highlighting the effectiveness of this drug [12].

Moreover, sucrosomal iron does not cause the gastrointestinal side effects associated with traditional iron supplements. This is particularly important in the treatment of children, where the occurrence of side effects may lead to treatment discontinuation or even worsening of the overall condition. The protective iron formulation in Sideral prevents irritation of the stomach and intestinal mucosa, makes the therapy be more comfortable and safer [13, 17].

Another significant aspect is sucrosomal iron's ability to minimize oxidative stress, which plays a crucial role in the progression of CKD. Unlike other iron preparations, Sideral helps to normalize hemoglobin levels without excessive accumulation of free iron in the plasma, which can prevent tissue damage and the acceleration of the disease. This factor could be particularly important in treating children with CKD, who are at higher risk of complications due to kidney dysfunction [14].

Despite all the advantages of sucrosomal iron, further studies are required for a deeper understanding of its role in the treatment of anemia in children with CKD. In particular, large randomized clinical trials are needed to definitively confirm its effectiveness and long-term safety.

Additionally, it is essential to evaluate its impact on the quality of life of children and its effect on overall clinical outcomes [15].

Nevertheless, existing evidence regarding Sideral's effectiveness and safety in treating anemia in children with chronic kidney disease is highly encouraging. In future, this drug may become a standard treatment for iron deficiency anemia in children with CKD, improving clinical outcomes and enhancing patients' quality of life [16, 18, 19].

Conclusion. Anemia remains a serious complication of chronic kidney disease in children that requires timely and effective treatment. The use of sucrosomal iron, particularly the Sideral preparation, offers new opportunities for correcting iron deficiency in this patient group. The high bioavailability, good tolerability, and ease of use make it a promising treatment option in outpatient practice and during pre-dialysis preparation. Despite encouraging results, further research is necessary to definitively assess the drug's efficacy and safety in pediatric nephrology.

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