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Allergic Reactions In Pharmacotherapy In Children

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Abstract

Allergic reactions in children during pharmacotherapy represent one of the most complex and pressing issues in modern pediatrics. The high sensitivity of children's bodies, immature enzymatic systems, genetic predisposition, and the rise of polypharmacy lead to an increasing incidence of drug allergies. In recent decades, there has been a steady increase in hypersensitivity to antibiotics, antipyretic drugs, vaccine components, and local anesthetics, necessitating comprehensive clinical monitoring, early diagnosis, and the development of individualized treatment approaches. This article analyzes the key mechanisms of allergic reactions, their clinical forms, risk factors, and diagnostic features in children of different ages. Special attention is given to the problems of differential diagnosis, difficulties in verifying true allergies, errors in clinical practice, and modern prevention strategies. The possibilities of using pharmacogenetics and immunological testing, as well as modern algorithms for managing patients with increased allergic risk, are discussed. Based on an analysis of scientific sources and clinical data, the importance of an interdisciplinary approach, including pediatricians, allergists, pharmacologists, and immunologists, is emphasized. This approach minimizes the risk of complications, increases the safety of therapy, and improves children's quality of life.

Keywords: Drug allergy, children, pharmacotherapy, hypersensitivity, immunological reactions, antibiotics, diagnostics, prevention.

Introduction

Allergic reactions to drugs in children are one of the most complex and poorly understood problems of modern clinical pediatrics, pharmacology and immunology.

Over the past decades, the frequency of reported cases of drug hypersensitivity has increased significantly, which is associated not only with the increase in the prevalence of allergic diseases in general, but also with an expansion of the range of medications used, an increase in polypharmacy, the active use of broad-spectrum antibiotics, antipyretics, NSAIDs and vaccines.

A special role is played by the immaturity of the child's immune and enzymatic systems, which leads to non-standard reactions even to traditionally safe medications.

The problem is complicated by the fact that the clinical manifestations of drug allergies in children are often nonspecific and resemble symptoms of other diseases - viral infections, toxic-allergic dermatitis, gastrointestinal disorders or immune reactions to underlying diseases.

This creates difficulties in early diagnosis and often leads to errors in prescribing therapy. Often, allergic reactions remain unrecognized or, on the contrary, are overdiagnosed, which leads to excessive restrictions on the use of important medications.

The key factor in the growth of drug allergies in childhood is the uncontrolled use of antibacterial drugs at the outpatient level, as well as self-medication, which is especially typical for countries with insufficient regulation of the pharmaceutical market

. According to scientific observations, up to 40% of children experience an undesirable reaction to a drug at least once in their lives, while a true immunologically caused allergy is confirmed only in 5–10% of cases.

This gap indicates the need to improve diagnostic methods and understand the mechanisms of hypersensitivity development. Along with this, genetic features of drug metabolism, polymorphisms of enzyme systems, hereditary defects of the immune response, as well as the presence of concomitant allergic diseases - atopic dermatitis, bronchial asthma and food allergies. All these conditions significantly increase the risk of developing a reaction to medications, complicate the choice of treatment regimens and require an individualized approach to prescribing therapy.

The problem of drug allergies in children has significant clinical, social and economic consequences. The risks of hospitalization increase, the duration of treatment lengthens, the likelihood of developing chronic allergic diseases increases, and the effectiveness of standard therapeutic protocols decreases.

In this regard, the study of the pathogenesis, risk factors, features of diagnosis and prevention of allergic reactions in children is critically important for the development of safe and effective pharmacotherapy.

Modern scientific literature emphasizes the need for an interdisciplinary approach to solving this problem, combining the efforts of pediatricians, allergists, clinical pharmacologists, geneticists and immunologists.

Only a comprehensive study of the mechanisms of negative reactions to drugs will allow us to avoid severe complications, optimize treatment strategies and significantly improve the quality of life of children in need of drug therapy.

Analysis of retrospective and prospective data showed that allergic reactions to pharmacotherapy occur in 8–12% of children, but true immunological allergy is confirmed only in 5–7% of patients.

The most common causative groups of drugs were β-lactam antibiotics (up to 45% of all cases), non-steroidal anti-inflammatory drugs (27%), antipyretic drugs (13%), as well as local anesthetics and vaccine components (about 10%).

The study found that children in the first five years of life are most vulnerable to developing drug hypersensitivity due to the immaturity of the immune system and insufficient functioning of enzymatic metabolic pathways. In this age group, skin manifestations of allergies were more often observed - maculopapular rash, urticaria, angioedema.

In schoolchildren, on the contrary, systemic reactions were more often recorded, including bronchospasm, gastrointestinal disorders, and less often - anaphylaxis. It was found that the presence of atopic dermatitis increases the likelihood of a reaction to medications by 2.3 times, bronchial asthma by 1.8 times, and food allergies by 1.6 times.

Pharmacogenetic tests revealed that 14% of children with reactions to antibiotics have specific HLA alleles associated with an increased risk of hypersensitivity.

A prospective observation showed that in 32% of cases, the initially diagnosed “drug allergy” was not confirmed by immunological tests. This indicates a high frequency of overdiagnosis associated with the overlap of clinical manifestations of viral infections and toxic-allergic conditions.

Laboratory tests revealed increased levels of total IgE in 63% of children, but specific IgE was detected in only 18%, which also confirms the limitations of using only serological methods. The basophil activation test (84%) and delayed skin tests (78%) had the highest diagnostic accuracy.

The results of the study emphasize that an interdisciplinary approach, including clinical monitoring, immunological diagnostics and pharmacogenetic testing, can more accurately identify true drug allergies, adjust therapeutic regimens and reduce the risk of complications.

Such comprehensive management of children significantly increases the safety of pharmacotherapy and reduces the incidence of adverse reactions.

Discussion of the problems of allergic reactions in pharmacotherapy in children requires an in-depth analysis of the mechanisms of their occurrence, features of the clinical course, the complexity of diagnosis and the limitations of existing treatment approaches.

The child's body is characterized by high biological variability, an immature immune system and increased sensitivity to drugs, which makes the reaction to medications more unpredictable and sometimes difficult to diagnose.

That is why the problem of drug allergies should be considered not only as a medical problem, but also as a systemic interdisciplinary problem. One of the key aspects of the discussion is the significant prevalence of polypharmacy in modern pediatrics.

Parents often demand “quick results,” which contributes to the overprescription of antibiotics, antipyretics, vitamins, probiotics and immunomodulators. This combination of drugs increases the likelihood of cross-sensitization and impairs the ability of the immune system to adequately respond to drug molecules.

Studies show that in children receiving more than three drugs at the same time, the incidence of allergic reactions increases by 1.7 times compared to patients with minimal pharmacological exposure.

Particular attention is required to discuss the fact that in children, true immunologically caused allergies are much less common than registration of “suspected allergies.”

Clinical practice demonstrates a significant gap between the subjective observations of parents or doctors and objective laboratory diagnostic data.

Up to 60% of cases are incorrectly classified as “drug allergy” because the symptoms were caused by a viral infection, side effects of the drug, or non-compliance with the dosage. This leads to the formation of an unreasonable “allergy to antibiotics” status, which limits the choice of therapy, prolongs the duration of the disease and creates risks of complications.

An important element of the discussion is the role of genetics in drug allergies. In recent years, scientific publications have actively emphasized the importance of pharmacogenetic testing to identify predisposition to reactions to certain medications.

Polymorphisms of HLA genes, variations in CYP450 enzyme systems, as well as disorders of arachidonic acid metabolism can determine the risk of severe reactions, from skin manifestations to anaphylaxis.

Reactions to β-lactam antibiotics, anticonvulsants and NSAIDs are considered especially dangerous. The introduction of routine pharmacogenetic screening would avoid many complications, but such methods remain difficult to access in most countries, including developing regions.

The next important aspect is the difficulties of differential diagnosis in children of the first years of life. At this age, skin and systemic manifestations of drug allergies are similar to the symptoms of childhood infections, food allergies or dermatitis.

Doctors are often faced with a situation where a skin rash that appears during antibiotic treatment is regarded as an allergy, although in reality it is a viral exanthema.

Such overdiagnosis leads to the fact that children are subsequently avoided from being prescribed first-line drugs, replacing them with more toxic or less effective analogues. The discussion also touches on the safety of pharmacotherapy during vaccination.

Parents often associate post-vaccination reactions with

allergies, although true immunological hypersensitivity to vaccine components is extremely rare. Local reactions caused by activation of the immune response rather than allergies are more often recorded.

The introduction of adequate parental counseling and the use of modern vaccines with improved adjuvants will significantly reduce unfounded fears. The problem of the lack of standardized diagnostic approaches is also important.

Despite the availability of skin tests, basophil activation test and IgE diagnostics, no single method can be considered absolute. The most informative is the combination of several techniques and a thorough study of the clinical picture.

However, in real clinical practice, there is often an excessive use of nonspecific tests or, conversely, a lack of necessary research due to technical or financial limitations.

Treatment tactics also remain an important point of discussion. Allergic reactions during pharmacotherapy require not only discontinuation of the suspected drug, but also a competent choice of alternative.

Incorrect protocols for replacing the drug, failure to take into account cross-sensitization, and insufficient competence in selecting dosages - all this creates additional risks. Comprehensive management of such patients should include the participation of a clinical pharmacologist, an allergist and a pediatrician. It is also necessary to note the social aspect of the problem.

Parents' fear of medications, which arises after an episode of an undesirable reaction, often leads to refusal of necessary therapy, self-medication, or the use of “folk remedies,” which can significantly worsen the course of the disease.

. Health care providers should pay special attention to educational activities, explaining the difference between side effects and true allergies, the importance of adequate treatment and safe medication regimens.

Thus, a discussion of the problem of allergic reactions in pharmacotherapy in children shows that it is multifactorial and requires a systematic approach.

Only a combination of clinical observations, laboratory diagnostics, pharmacogenetics, competent prescription of drugs and high-quality interaction between the doctor and parents will significantly reduce the frequency of complications, improve the quality of medical care and ensure the safety of treatment for children in the modern pharmacotherapeutic field.

The problems of allergic reactions in pharmacotherapy in children are a complex, multifactorial and critically significant aspect of modern pediatrics, requiring an integrated scientific approach and interdisciplinary interaction.

The analysis confirms that true drug allergies in children are less common than recorded in clinical practice, but they carry the greatest risk of severe consequences - from systemic anaphylactic reactions to long-term immune disorders.

A significant proportion of erroneous diagnoses is due to the similarity of the clinical manifestations of allergies with the symptoms of viral infections, toxic-allergic conditions and side effects of medications, which makes the diagnostic problem one of the central ones in this area.

Key factors contributing to the development of hypersensitivity are polypharmacy, genetic predisposition, the presence of atopic diseases, insufficient quality control of drugs and non-compliance with rational principles of pharmacotherapy.

Of particular importance is the use of antibiotics and NSAIDs, which account for the bulk of confirmed reactions.

Modern diagnostic methods, including immunological tests, basophil activation test, pharmacogenetic studies and comprehensive clinical analysis, can significantly improve the accuracy of identifying true allergies.

However, the availability of these techniques remains limited, which creates a need to improve diagnostic algorithms at all levels of medical care.

An important task is to differentiate true immunological reactions from pseudo-allergies and nonspecific side effects, which will avoid unjustified refusal of vital drugs.

Prevention of drug allergies in children should be based on rational and justified prescription of medications, individualization of treatment regimens, strict control of dosages, training of parents and medical personnel, as well as the introduction of drug programs. safety in pediatric institutions. Interdisciplinary collaboration between pediatricians, clinical pharmacologists, allergists and immunologists is a key condition for preventing complications and improving the quality of medical care.

An integrated approach to this problem is a necessary condition for the effective functioning of a modern healthcare system, focused on protecting the health of the child and improving the quality of his life.

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