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Key Aspects Of The Safe Use Of Nonsteroidal Anti-Inflammatory Drugs In Children

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Abstract

Nonsteroidal anti-inflammatory drugs (NSAIDs) occupy an important place in pediatric practice due to their pronounced analgesic, antipyretic, and anti-inflammatory effects. However, their use in children requires particular caution due to age-related differences in pharmacokinetics and pharmacodynamics, immature detoxification systems, and increased sensitivity to side effects. The aim of this article is to comprehensively analyze key aspects of the safe use of NSAIDs in children, including indications, dosage, potential risks, drug interactions, and current approaches to minimizing adverse reactions. This paper summarizes clinical observation data, the results of modern research, and international guidelines, allowing for the formulation of practical conclusions for clinicians. Particular attention is paid to issues of gastrointestinal, nephrotoxic, and cardiovascular safety, as well as the rational choice of drug based on age and clinical situation.

Keywords: Nonsteroidal anti-inflammatory drugs, pediatrics, drug safety, ibuprofen, paracetamol, side effects, pharmacotherapy in children.

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1. Introduction

In modern pediatric practice, the problem of rational and safe use of drugs occupies one of the key places, since the children's body is highly sensitive to pharmacological effects and has limited compensatory capabilities.

Of particular importance in this context are non-steroidal anti-inflammatory drugs, which are widely used to relieve pain, reduce body temperature and suppress inflammatory processes in children of various age groups.

Nonsteroidal anti-inflammatory drugs are one of the most frequently prescribed groups of drugs in outpatient and inpatient pediatrics.

According to clinical observations, drugs in this group are used both for acute infectious and inflammatory diseases and for chronic conditions accompanied by pain and inflammation.

Their availability, pronounced therapeutic effect and relative ease of use have led to widespread use both in medical practice and in independent use by parents, which, in turn, increases the risk of uncontrolled use.

Despite their proven clinical effectiveness, the use of non-steroidal anti-inflammatory drugs in children is associated with a number of potential risks.

This is due to age-related characteristics of pharmacokinetics and pharmacodynamics, immaturity of liver enzyme systems, characteristics of renal excretion, as well as changes in the regulation of water and electrolyte balance.

In childhood, even minor deviations from the recommended doses or timing of treatment can lead to the development of undesirable drug reactions.

The problem of NSAID safety is of particular relevance in the context of increasing incidence of acute respiratory infections and inflammatory diseases in children, when drugs of this group are prescribed repeatedly and often without sufficient medical supervision.

In some cases, this leads to the development of gastrointestinal complications, functional disorders of the kidneys, allergic reactions and other adverse consequences that can affect the further health of the child.

In the scientific literature of recent years, there has been an increase in the number of publications devoted to the analysis of the side effects of non-steroidal anti-inflammatory drugs in pediatrics.

However, these studies are often fragmented and do not always take into account the complex interaction of risk factors, such as the child's age, concomitant diseases, nutritional and hydration status, and the concomitant use of other medications.

In addition, in clinical practice, the problem of choosing the optimal drug from the NSAID group, taking into account the individual characteristics of the patient, remains.

Differences in selectivity of action, duration of effect and safety profile require a balanced approach to prescribing each specific drug, especially in early childhood. Errors at this stage can significantly increase the likelihood of drug-induced complications.

An important aspect is the insufficient level of awareness of parents about the principles of safe use of non-steroidal anti-inflammatory drugs.

Independently increasing the dose, reducing the intervals between doses, or combining several drugs with a similar mechanism of action often causes overdoses and toxic effects. This emphasizes the need to formulate clear clinical recommendations and their active implementation in practice.

Thus, the problem of the safe use of non-steroidal anti-inflammatory drugs in children is multifaceted and requires comprehensive scientific understanding.

Systematic analysis of modern data on indications, mechanisms of action, possible risks and ways to minimize them is an important task for both clinical pediatrics and pharmacology.

The purpose of this study is to analyze the main aspects of the safe use of non-steroidal anti-inflammatory drugs in children, taking into account age characteristics, clinical risk factors and modern approaches to rational pharmacotherapy.

The implementation of this goal will make it possible to substantiate practical recommendations aimed at increasing the effectiveness and safety of treatment in pediatric practice.

This study was carried out within the framework of an analytical and generalizing scientific approach and is aimed at a comprehensive study of aspects of the safe use of non-steroidal anti-inflammatory drugs in pediatric practice.

The methodological basis of the work was the principles of evidence-based medicine, system analysis and interdisciplinary comparison of clinical and pharmacological data.

During the study, a systematic analysis of scientific publications, clinical recommendations and the results of observational studies on the use of non-steroidal anti-inflammatory drugs in children was carried out.

The analysis included data reflecting the pharmacokinetics and pharmacodynamics of NSAIDs in different age groups, as well as information on the frequency and structure of adverse drug reactions.

The criteria for including sources in the study were their scientific reliability, clinical significance, and relevance to the topic of safety of drug therapy in children.

Particular attention was paid to studies that examined issues of dosing, duration of use, as well as risk factors for the development of complications when using NSAIDs in pediatrics.

Publications that did not sufficiently describe the methodology or had limited clinical applicability were not included in the analysis. To ensure objectivity and reproducibility of the results, a comparative analysis of

data from various representatives was used group of NSAIDs most often used in pediatric practice. Efficacy rates, incidence of side effects, and safety profiles were compared when using drugs in therapeutic doses.

The analysis was carried out taking into account the age differentiation of patients, including early childhood, preschool and school age. Additionally, the method of logical-structural analysis was used, which allows us to identify cause-and-effect relationships between the features of the application non-steroidal anti-inflammatory drugs and the development of adverse drug reactions. Within the framework of this approach, the influence of such factors as violation of the dosage regimen, combined use of drugs, the presence of concomitant diseases and the state of hydration of the child's body was assessed.

Statistical processing of the summarized data was descriptive and included an analysis of the relative frequency of detected complications, as well as an assessment of trends reflecting the relationship between the duration of therapy and the risk of side effects.

The results obtained were interpreted taking into account the clinical significance and the possibility of their practical application in pediatrics. The ethical aspects of the study were fully respected as the work was analytical in nature and did not involve interference with clinical practice or direct contact with patients.

The data used was presented in aggregate form and did not contain personalized information. Thus, the applied methodology made it possible to provide a comprehensive and objective analysis of the problem of the safe use of non-steroidal anti-inflammatory drugs in children, and also to create a scientifically based basis for the formulation of practical recommendations aimed at increasing the effectiveness and safety of pharmacotherapy in pediatric practice.

The analysis of scientific and clinical data made it possible to identify a number of patterns that determine the safety of the use of non-steroidal anti-inflammatory drugs in children. It has been established that the risk profile and frequency of adverse drug reactions vary significantly in depending on the patient's age, clinical condition, duration of therapy and compliance with the principles of rational dosing. The results of generalization of clinical observations indicate that that ibuprofen and paracetamol are most common in pediatric practice, due to their proven effectiveness and relatively favorable safety profile.

Exceeding the daily dose or reducing the intervals between doses led to an increase in the frequency of gastrointestinal disorders, including dyspepsia, pain in the epigastric region and functional digestive disorders.

These complications were more often recorded in young children, which is associated with the immaturity of the protective mechanisms of the gastrointestinal mucosa. The results regarding the nephrotoxic effect of NSAIDs deserve special attention.

It has been established that in children with signs of dehydration, as well as in the presence of acute infectious diseases, the risk of transient renal dysfunction increases with the use of non-steroidal anti-inflammatory drugs.

In such cases, an increase in creatinine levels and a decrease in diuresis were noted, which emphasizes the need for a preliminary assessment of the patient's fluid and electrolyte status. Data analysis also revealed a relationship between the duration of therapy and the incidence of side effects.

Short-term use of NSAIDs, limited to a few days, as a rule, was not accompanied by significant complications. In contrast, long-term use of drugs without clinical indications was associated with an increased risk of systemic adverse reactions, including allergic manifestations and liver dysfunction.

A comparative analysis of various groups of NSAIDs showed that non-selective cyclooxygenase inhibitors, when used incorrectly, have a more pronounced adverse effect on the gastrointestinal tract compared to drugs with a more selective mechanism of action.

However, if age recommendations and correct dosing were followed, differences in the safety profile were limited. An important result of the study was the identification of the significant role of concomitant drug therapy.

The combined use of NSAIDs with other drugs, especially glucocorticosteroids and antibacterial drugs, increased the likelihood of developing unwanted drug interactions.

This emphasizes the need for a comprehensive assessment of drug load when prescribing anti-inflammatory therapy to children.

Generalization of the data obtained made it possible to

establish that the majority of registered complications were preventable in nature and were not associated with the pharmacological properties of drugs such as such, but in violation of the principles of their rational use. In cases where recommendations on drug selection, dosage and duration of therapy were followed, the use of NSAIDs in children was characterized by a high level of clinical safety.

Thus, the results of the study confirm that the safety of non-steroidal anti-inflammatory drugs in pediatric practice is determined by a combination of clinical and organizational factors.

A rational approach to prescribing these medications can significantly reduce the risk of adverse reactions and provide effective treatment for pain and inflammatory syndromes in children.

The results obtained during the study confirm the relevance of the problem of safe use of non-steroidal anti-inflammatory drugs in pediatric practice and are consistent with modern ideas about pharmacotherapy in childhood.

Analysis of the identified patterns allows us to consider the safety of NSAIDs not as a fixed property of a particular drug, but as the result of a complex interaction of pharmacological characteristics, age characteristics of the patient and the clinical context of the prescription.

One of the key conclusions that require discussion is the high importance of the age factor in shaping the safety profile of NSAIDs.

In childhood, especially in the early periods of ontogenesis, functional immaturity of the enzyme systems of the liver and kidneys is observed, which directly affects the rate of metabolism and excretion of drugs.

This explains the increased sensitivity of children to even minor deviations from recommended doses and emphasizes the need for strict individualization of therapy. When discussing gastrointestinal complications, it should be noted that they remain one of the most frequently described adverse reactions when using NSAIDs.

However, the data obtained indicate that with short-term use of drugs in therapeutic doses, the risk of clinically significant gastrointestinal lesions in children remains relatively low.

A significant increase in the frequency of such complications is observed mainly in cases of violation of the dosage regimen or unreasonable extension of the course of treatment, which indicates the leading role of organizational and behavioral factors.

The discussion of the nephrotoxic potential of NSAIDs deserves special attention. Unlike adult patients, renal complications in children are often transient in nature and may remain underestimated in clinical practice.

The study results confirm that the risk of renal dysfunction increases in the presence of concomitant factors such as dehydration, fever or infectious and inflammatory diseases.

This emphasizes the need for a comprehensive assessment of the child's condition before prescribing anti-inflammatory therapy, rather than formally following standard treatment regimens. In the context of discussing the pharmacological choice between various representatives of the NSAID group, it is important to notethat differences in the safety profile between drugs when clinical recommendations are followed are less pronounced than is commonly believed. The results obtained indicate that the decisive factor is not so much the selectivity of the drug as the correctness of its use.

This has important practical significance and allows us to shift the focus from searching for the "safest" drug to creating a culture of rational drug prescribing. A separate aspect of the discussion is the role of drug interactions.

In pediatric practice, children often receive several medications at the same time, especially when treating infectious diseases.

The study results confirm that the combined use of NSAIDs with other groups of drugs may increase the risk of adverse reactions, which requires careful analysis of the entire treatment regimen. Underestimation of this factor can negate the benefits of even the most modern and clinically studied drugs.

The problem of uncontrolled use of NSAIDs outside of medical supervision is also significant. The wide availability of these drugs and their perception as "safe" drugs encourages independent use by parents without taking into account age and clinical restrictions.

The results discussed confirm that a significant part of adverse reactions are associated precisely with such uncontrolled use, and not with the objective toxicity of

drugs. From a scientific point of view, the conclusion about the preventive nature of most complications associated with the use of NSAIDs in children is important.

This means that by following the principles of evidence-based medicine, individual dosing and limiting the duration of therapy, the risk of developing serious side effects can be significantly reduced.

This finding has not only clinical but also organizational significance, as it emphasizes the need to increase the level of pharmacological literacy of both medical workers and parents.

In a broader context of discussion, the study results support the feasibility of moving to a personalized approach in pediatric pharmacotherapy.

Consideration of age, body weight, comorbid conditions and individual risk factors should be considered an essential element of NSAID prescribing and not as an additional precaution. This approach corresponds to modern trends in the development of clinical pharmacology and pediatrics.

Thus, a discussion of the data obtained allows us to conclude that the safety of the use of non-steroidal anti-inflammatory drugs in children is a controllable parameter that directly depends on the quality of clinical decisions.

The rational use of NSAIDs in compliance with scientifically based recommendations provides a favorable balance of effectiveness and safety, which makes these drugs an important and justified tool in pediatric practice.

Thus, the safe use of non-steroidal anti-inflammatory drugs in children is possible subject to the principles of evidence-based medicine, individualization of treatment and constant assessment of potential risks.

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