

## HEADACHE IN CHILDREN AND ADOLESCENTS

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**Annotation:** Children and teenagers of all ages suffer from headaches ethnic and socio-economic groups. All medical workers, regardless of their place of work, face the need to provide emergency care to children and adolescents with headaches. If there is an established diagnosis, drug therapy is carried out – an obligatory weapon in the fight against this disease in "good hands". The article discusses the issues of medical support for children and adolescents with head pain. Attention is paid to the safety of the use of medicines in children, diet, principles of "behavioral therapy", etc.

**Keywords:** Child, tension headache, migraine, children's dosage forms, behavioral therapy, nursing, nurse.

Headache (cephalgia) – one of the most frequent complaints among school-age children. The problem of headaches is considered not only from a general medical perspective, but also from a socio-economic point of view: headaches reduce the quality of life of the younger generation, limit the activity of the child, disrupt social contacts; the frequency of headaches in the child and adolescent population increases. The presence of headache causes the use of analgesic and stronger drugs with the possible development of addiction, the need to increase doses with the risk of manifestation of a toxic effect.

Experience shows that up to half of children and adolescents complained of headaches, and in every 4-5 children, pain attacks are recorded with a certain regularity. More often complaints of headaches are observed in girls than boys (ratio 5:3). In girls aged 6-18, this trait mainly increases with age; on the contrary, among boys, by the end of school, the frequency of this trait tends to decrease. For girls, the most pronounced growth peaks are they occur for a period from 7 to 8 years, then

there is no increase and again increases slightly in 10-12 years. However, when building a trend, i.e. leveling fluctuations and determining the trend, a reliable dynamics of a decrease in the frequency of this complaint over the period of growing up emerges. In recent decades, there has been a rapid increase in research on the problem of headache (GB), although this is less relevant to childhood. Numerous professional societies are working and this has led to significant achievements, although the problem of headaches, especially in children and adolescents, it is still far from a final decision.

Classification of headaches. The main types of headaches include:

- primary GB is an independent pathology and is not associated with diseases that can cause headaches;
- secondary GB (or symptomatic) is a symptom of somatic pathology or an established underlying disease of the central nervous system.

ICD X revision is a standard assessment tool in medicine and healthcare. The following headings are highlighted for headaches:

- G43. Migraine
- G44. Other headache syndromes
- G44.0 "Histamine" headache;
- G44.1 Vascular headache, not classified elsewhere;
- G44.2 Tension type headache.

Chronic tension headache;

- G44.3 Chronic post-traumatic headache;
- G44.4 Headache caused by the use of medicines, not classified elsewhere.

Since 1988, it has been used in practice The international classification proposed by

The International Headache Society (ICGB); since 2004, the second revision - ICGB-II. Classification It consists of three parts, including primary and secondary headaches; cranial neuralgia, central and primary facial pains and other headaches are isolated in a separate part. The whole variety of headaches is divided into 14 groups, each of which implies forms, types, subtypes, etc.

In pediatric practice, primary headaches are observed mainly in the form of migraines and tension headaches (GBN). Based on these criteria, up to 10% of children and adolescents suffer from migraines, up to 20% – probable migraines and more 50% – GBN [Bonfert M. et al., 2013, etc.]. Both migraine and GBN are more common in children with a positive family history of these diseases.

The genetics of headaches. The most frequently mentioned genes in the literature with the risk of primary headache are MTHFR (encodes methylenetetrahydrofolate reductase, an intracellular enzyme that plays a key role in folate and methionine metabolism), TRPV3 (encodes vanilloid receptors, which are one of the most important integrators of pain and inflammatory stimuli, which allows them to be considered as a promising therapeutic target in the treatment of pain conditions), CGRP (calcitonin-gene-related peptide), HCRTR (encodes a receptor for hypocretins, neuropeptides synthesized in the hypothalamus). A large multicenter study showed an association of headaches with 6 more genes: TRPM8 (encodes the cold receptor protein), UFL 1 (encodes an immune system protein), FHL5 (encodes a protein that activates cAMP synthesis), LRP1 (encodes lipoprotein biosynthesis), TARBP2 (encodes a protein of the immune system) and NPFF (encodes a peptide involved in the process of analgesic tolerance/hyperalgesia) [Zhao H., et al., 2016]. However, the data presented in the literature are contradictory, the results of many studies of genetic markers of headache turn out to be false positive or non-reproducible in other studies.

The burdened family history in patients with migraine reaches 75-90%. The challenge remains to understand how genetic variations and environmental triggers can interact [Gormley P. et al., 2016].

The pathophysiology of headache. We cannot talk about the universal mechanisms

of headache. After all, there are no nociceptors in the brain tissue, that is, there is no device signaling damage/threat of damage to the pain centers of the brain. Although nociceptors are present in many other structures of the head, including blood vessels, muscles and nerves of the neck, face and scalp. The problems faced by these structures are the causes of the pain syndrome. So, the headache that occurs when eating ice cream is probably caused by sudden changes in blood flow through the veins located in the back of the skull. A similar effect of the origin of headache during dehydration is due to irritation of the blood vessels of the head, etc.

Brain maturation and neurophysiological disorders in headaches in children differ from those in healthy children. In this regard, age-related features are also superimposed on the variety of causes of the generation of primary headaches (migraines and tension headaches) in children. The mechanisms of damage in migraines with and without aura are particularly different, which is confirmed by neurophysiological studies.

For a long time, migraine was considered exclusively as a vascular pathology, but

recently more and more data has been provided on the primary significance of the cerebral cortex. In children with headaches, microcirculation disorders, the release

of free radicals, a violation of the ratio of neurotransmitters, intracellular and extracellular ions, a decrease in the energy activity of cells, and other phenomena are observed. The latter mechanism is universal for any pain.

Neurogenic factors are involved in the pathogenesis of migraine, vascular and endocrine-humoral mechanisms. At the time of the attack, there was a high concentration of serotonin and its metabolites, the release of thromboxane, vasoactive intestinal peptide, substance P (neuropeptide from the tachykinin family), prostaglandin E1 and some other vasoactive peptides.

Migraines and tension headaches are often a manifestation of a common polyalgic

syndrome: concomitant recurrent back and abdominal pain. The same phenomena were observed in most mothers of such patients. Polyalgic syndrome fully corresponds to the pronounced manifestations of autonomic dysfunctions and psychovegetative disorders in these children.

The clinical picture. Currently, more than 200 types of headaches have been described, among which there are both primary headaches, which are a separate disease, and secondary headaches, which serve as a sign of a number of diseases or

occur as a side effect when taking medications. The problem of "Headaches and public health" is recognized by WHO, leading neurologists and pediatricians of our country as one of the priority. Note that there are difficulties in making the correct diagnosis for a child with a headache. Paradox:



the incidence of headache in children and adolescents for help in medical institutions is fixed at a low level [Klein J. et Koch Th., 2020, et al.]

The symptoms vary significantly depending on the diagnosis of the disease (migraine, GBN, etc.), the localization and severity of the headache, and the presence of concomitant symptoms.

In most cases, headaches are They are reversible, and with timely determination of the causes of headaches, verification of the diagnosis, and correctly prescribed therapy, their prognosis in pediatric practice is favorable. The opinion that a child

may have a headache from time to time, especially in connection with "transitional age", should not lead away. On the contrary, special attention is required. The appearance of complaints of headaches in the "transitional age" is evidence that in the process of age-related restructuring of the body the functional adaptation systems of a teenager cannot cope with the increased, more often educational, loads. It is necessary to assess, perhaps, the excessive demands on the child from parents and teachers.

Danger signals in patients with headache complaints (GB):

- Sudden appearance of severe "thunderous" GB
- GB with atypical aura (duration of more than 1 hour or with symptoms of weakness in the extremities)
- Aura without GB in a patient without previous migraine
- The aura that first appeared on the background of the reception hormonal contraceptives
- GB, progressively increasing over several weeks, months
- Increased GB when changing the position

of the head or under stress associated with

increased intracranial pressure

(physical exertion, cough)

- The first occurrence of GB in a patient with cancer, HIV infection or immunodeficiency in the anamnesis or current status
- A change in the sphere of consciousness (deafness, confusion) or memory impairment
- The presence of focal neurological signs or symptoms of a systemic disease (fever, arthralgia, myalgia).

One of the serious problems of primary headaches is their comorbidity. In the population of children with primary headaches, a high percentage of vegetative dystonia syndrome, attention deficit disorder is registered and hyperactivity, difficulties in school education, functional disorders of the gastrointestinal tract and other diseases.

When migraine is combined with long-term symptoms of dizziness, it is necessary to differentiate these manifestations primarily with Meniere's disease, migraine with

stem aura, benign paroxysmal positional vertigo, vestibular paroxysmia. Migraine is a risk factor for the onset of depressive and panic disorder. Very high rates of comorbidity (30-65%) in patients with vestibular migraine and psychiatric diseases, that is, much more often than with other types of migraines [Sargent E.W., 2013].

The intense nature of the headache and its combination with other symptoms (nausea, vomiting, pallor, drowsiness, etc.) cause reasonable concerns on the part of both the patient and his parents. The question arises about the need to exclude serious diseases (for example, brain tumors, etc.).

For young children who find it difficult to explain the localization of headache, the most significant characteristic of headache for differentiating GBN and migraine becomes the intensity criterion. At the same time, the localization of headache often turns out to be an insufficiently specific diagnostic criterion in the pediatric population.

Migraine is a hereditary disease with primary neuronal initiation of a cascade of neurochemical processes culminating in a wide wave of cortical depolarization and regional oligemia. It is manifested by periodically recurring stereotypical attacks

intense headache, more often of a pulsating nature, localized mainly in one half of the head, in the frontotemporal, less often in the orbital region, which increases with

normal physical activity and is often accompanied by vomiting at the height of the attack, after which relief comes; simultaneous photophobia and phonophobia (fear of bright light and loud sounds), with a duration of seizures from 4 to 72 hours, mandatory subsequent sleep and full recovery.

It is believed that migraines are out of balance nociceptive and antinociceptive systems with insufficiency of the latter. Pain receptors in expanding and pulsating arterioles are a direct source of pain, which is directly related to the attack and the points of application of therapeutic agents used to relieve a painful attack.

In simple migraine (without aura), there are no significant changes in cerebral blood flow, and the mechanisms of its development are difficult to explain. In migraine with aura, paroxysmal depolarization of neurons in the cerebral cortex is involved in the mechanism of headache development. They have potassium homeostasis disorders, stresses, alimentary factors, etc., which cause the release of peptides from the trigeminal vascular system, are also important.

Classic migraines are characterized by two phases of the attack. In the first phase, vascular spasm and general hypovolemia occur, causing cerebral ischemia in the back of the brain and various focal

symptoms that trigger an attack. In the second phase (transcranial and extracranial vasodilation), pulsating headache prevails in the area of responsible innervation of the trigeminal nerve and upper cervical roots.

Migraine attacks in children and adolescents are provoked by factors such as stress, overwork, physical activity, eating and sleeping disorders, and a decrease in estrogen levels in the premenstrual period. Or the so-called modifiable factors of headaches

that can be corrected and prevented. In order to identify them, an observation diary is kept, which records episodes of headache, food consumed, stressful and other significant events that occurred during the day with the child.

Children are characterized by a number of specific paroxysmal conditions, which are considered precursors of migraines. For example, abdominal migraine, benign

paroxysmal dizziness of childhood, cyclic vomiting syndrome. These syndromes can later develop into classic forms of migraine with or without aura.

Tension headache (TH). This type of headache is a direct involvement of the "trigger" points of a number of muscles (trapezius, sternocleidomastoid, subclavian, temporal, etc.), the result of compression of vessels by a spasmodic muscle with venous congestion, dysfunction of the temporomandibular joint with the spread of pain to the temporal, parotid and occipital regions, violation of the closure of teeth

upper and lower jaws, etc. A significant risk factor for the development of GBH is a family predisposition on the maternal side and provoking external factors.

The pathogenetic feature of GBH in children is the immaturity of the mechanisms of psychological protection, which causes the appearance of pain when exposed to minor, from the point of view of adults, stress factors. GBN may be accompanied

by photophobia or phobia (but not both signs at once), does not increase under the influence of normal physical activity, without vomiting. Traumatic situations form anxiety disorders (phobic, generalized, school phobia, social phobia). Anxiety in the form of an anxiety disorder or an anxiety-pedantic accentuation of personality, of course, is primary in some patients.

Bilateral pain of a compressive, pressing or aching nature, mild or moderate, necessarily returns and has a significant duration. In severe cases, the pain with GBN is aggravated by the symptoms of a "helmet" / "helmet", "compression of the head with a hoop". Persistent unilateral headache (hemicrania) is usually associated with

with hypersensitivity of the pericranial muscles. Usually the pain appears in the afternoon and lasts until the evening. To identify the tension of the pericranial muscles and determine the "trigger" points in patients with TH, palpation of the temporal, frontal, occipital regions, muscles of the posterior surface of the neck,



trapezius and sternocleidomastoid muscles is performed. Attention is drawn to the high incidence of cerebrastrenic (and/or neurasthenic) disorders and cognitive impairments in children and adolescents with TH. Neurological symptoms are not typical.

Cluster (bundle) headache. The pathogenesis of the disease is not entirely clear, although it is known that with this type of H in the external jugular vein, there

is an increase in the content of some "painful" peptides (calcitonin gene-linked and intestinal). During an attack, they are released from the trigeminal ganglion neurons, which leads to the release of pro-inflammatory mediators and dilation of cranial vessels. A certain role is played by a defect in the chemoreceptors of carotid bodies on the side of pain, as well as impaired secretion of certain humoral factors (melatonin, cortisol,  $\beta$ -endorphin,  $\beta$ -lipoprotein, etc.).

Chronic migraine. The diagnostic criterion is the presence of a headache characteristic of migraines without aura, lasting at least 15 days a month for more than three months. Daily or almost daily headache is one of the most difficult forms of headache to diagnose and treat and is referred to as chronic daily headache (CHDH). CHDH is a syndrome that combines various types of headache without signs of organic brain changes.

CHDH, in turn, is divided into primary and secondary. The causes of secondary CHDH are idiopathic intracranial hypertension, post-traumatic headache, cervicogenic headache, as well as drug-induced (abusive) headache. Drug abuse is

the excessive use of symptomatic painkillers. We are talking about the abuse of analgesics, combined drugs, which include analgesics and sedative components.

The longer the duration of HEGB, the more pronounced the nonspecific pain of other localization: in the abdomen, back, neck, diffuse muscle and joint pain. Probably, the parts of the brain stem that transmit pain signals become more sensitive over time, and as a result, ordinary sensations are perceived as painful, covering all

large areas of the body.

The headache of starvation. In cephalgia associated with hunger, pain is usually concentrated in the occipital region and is oppressive or bursting in nature. It is difficult to correct analgesics. The headache during fasting is partly explained by hypoglycemia, which can be accompanied by dizziness, excessive sweating, general weakness and a feeling of "emptiness in the head". Accordingly, the measures of dietary correction in the described clinical situation will be to provide the child with essential nutrients (glucose, etc.). Types of headache during fasting: "headache of the first day of Ramadan", "headache on Yom Kippur", headaches with abrupt refusal of coffee, dehydration, sleep deficiency, gluten headache pain, etc.

Headaches of post-corneal chronic fatigue syndrome (CFS). A relatively new clinical phenomenon. Although the main symptom of CFS there remains the so-called "endless fatigue", but it is almost always accompanied by headache, dizziness, photophobia, dry eyes. Despite the small number of

factors that contribute to the occurrence of headache, isolation measures associated with COVID-19 are not associated with the frequency and intensity of primary headache [Raffaelli B. et al., 2021].

Diagnostics and additional examinations. When examining patients with complaints of headaches should always be determined whether GB is primary or secondary, concomitant with other problems (injuries, sinusitis, eye diseases, etc.), which determines the targeting and timing of consultations, the tactics of managing the patient himself and the amount of work with the family. Often, a headache is initially mistakenly regarded (especially of a chronic course) as a secondary one, that is, those that arose as a result of an organic disease of the central nervous system.

The exclusion of secondary headaches is a prerequisite for the diagnosis of primary headache.

First of all, they think about epilepsy. The head pain as a "harbinger" of epileptic seizures (preictal headache) can occur with a simple focal sensory epileptic seizure (ictal headache), as well as be post-acute. The headache may be isolated in nature, as well as to be an "aura" for a secondary generalized convulsive attack. A collected

headache history and a targeted neurological examination are crucial and in most situations allow you to distinguish between primary headaches (for example, migraine, TH or chronic daily headache) and secondary headaches (for example, those observed in brain tumors), pseudotumor syndrome of the brain, meningitis, encephalitis, hydrocephalus or acute febrile diseases).

The most common causes of secondary headaches are sinusitis, middle ear infections, systemic infections, as well as traumatic brain injuries, hypertension or hypotension. Less often they are associated with side effects of medicines (causing vasodilation or vasoconstriction). The frequency of headaches caused by volumetric formations of the brain brain and other neurosurgical pathology occupy 2.7% [Pacheva I. et al., 2016].

The symptomatic nature of the headache is indicated by the presence of focal symptoms in the neurological status, a change in the nature of the headache over time with an increase in the intensity of the pain phenomenon, the connection of the headache with the position of the head, the load on the cervical spine (when turning, tilting the head, somersaults), an increase in temperature, especially in combination with catarrhal and general infectious symptoms.

If cervicalgia is suspected (pain in the neck area, which occur when the cervical spine or muscles of this area are affected) with reflected headaches, the condition of the muscle groups of the neck and upper arms, back and upper extremities is assessed to identify active and latent myofascial trigger points. This syndrome is quite common and can affect a person at any age. An X-ray of the cervical spine is performed with functional tests.

**Treatment.** Most migraine patients require pharmacotherapy. A combination of medicinal and non-medicinal methods of prevention is more logical.

Drug therapy is performed for frequent, severe and prolonged seizures (during 3 or more days per month), accompanied by a serious violation of well-being and a decrease in the quality of life with



the help of drugs from different groups. Numerous school absences due to migraine attacks are also considered as indications for course treatment.

In the inter-criminal period for children and adolescents with migraine, for preventive purposes, courses of therapy are prescribed with one of the drugs belonging to various pharmacological groups: beta-blockers, calcium channel blockers, ciproheptadine, antidepressants, anticonvulsants.

The use of certain preventive medications simultaneously helps to overcome sleep disorders. Taking melatonin before bedtime eliminates sleep disorders. The drug has been officially approved since the age of 18.

Metabolics, anxiolytics and nootropics. An additional direction of drug therapy in children and adolescents with migraine and TH It consists in the appointment of drugs of metabolic action that improve metabolic processes in the central nervous system and indicators of cognitive functions, increase the "level of wakefulness"

and the resistance of the central nervous system to stress.

The use of energotropic drugs. They are also used as a means of additional treatment. As a result, repair processes improve, vegetative reactions normalize, and exercise tolerance increases.

Magnesium-containing drugs occupy a special place in the treatment of somatoform and emotional disorders. Magnesium ( $Mg^{2+}$ ) participates in energy exchange in cells and tissues of the whole organism, regulates the transmembrane potential of the cell and thereby stabilizes the cell membrane. It plays a decisive role in the synthesis of neurotransmitters, regulates the functions of neuroprotection and neuroplasticity at the cell level, etc. In the presence of pyridoxine (vitamin B6), the properties of magnesium are enhanced. The use of combined drugs in HEGB helps to reduce the frequency and intensity of headaches, regression of concomitant somatoform disorders, manifestations of asthenic and anxiety states.

Vitamins and vitamin and mineral complexes. Vitamins, usually in combination, have antioxidant, vasostabilizing, immunomodulatory and antiparoxysmal effects.

Regular use of multivitamin preparations and vitamin and mineral complexes makes it possible to prevent background vitamin and mineral deficiency conditions, contributing to the improvement of cephalogy. Similar effects are recorded when prescribing probiotics.

Treatment of a migraine attack. Modern The list of medicines for the treatment of migraine attacks combines drugs from various pharmacological groups. Analgesics and nonsteroidal anti-inflammatory drugs (NAID) are most actively used. In children, the use of some of the NAID for headaches is limited. The means of choice

are drugs with specific mechanisms of action: selective 5-HT<sub>1</sub> receptor agonists (sumatriptan and other triptans: eletriptan, naratriptan, zolmitriptan), as well as nonselective agonists of 5-HT<sub>1</sub> receptors (ergotamine and its derivatives). A separate group is combined funds.

Children are necessarily taught to recognize the approach of an attack, since early medication is most effective in relieving a migraine attack. It is better not to wait for the attack to unfold; in addition, when vomiting, the drug taken can be removed from the body. It should be remembered that the abuse of analgesics is unacceptable. An additional single dose of metoclopramide (10 mg) is recommended, and as early as possible, at the first sensations of an attack approaching, followed after 30 minutes by a single dose of NAID.

In order to relieve muscle tension in the pericranial and occipital muscles, patients with TH are prescribed muscle relaxants, usually in a course mode. The same applies

to ergot preparations that have a vasoconstrictive effect. By acting on serotonin receptors localized in the vascular wall, they prevent neurogenic inflammation and stop a migraine attack. Due to side effects, the use of these drugs is regulated.

Selective serotonin receptor agonists – triptans (almotriptan, sumatriptan, rizatriptan, zolmitriptan-SZ, eletriptan/relpax, naratriptan) are allowed for use in Russia from the age of 18, abroad – from the age of 12. The drugs block the release of substance P from the endings of the trigeminal nerve and prevent neurogenic inflammation. Side effects: tingling, pressure, heaviness in different parts of the body, facial hyperemia, fatigue, weakness, drowsiness. Triptans are contraindicated in concomitant pathology of the cardiovascular system, sugar diabetes, basilar and hemiplegic forms of migraine. Taking triptans, like NAID, can lead to severe headaches.

Thus, the pharmacotherapy of migraine is carried out in two main directions:

1. Arresting therapy in case of an attack.
2. Preventive / symptomatic therapy, which involves the appointment of a course of treatment with daily medication in order to reduce the frequency of seizures.

**Conclusion.** Comprehensive treatment is the most effective strategy for treating children and adolescents with headaches. It is very urgent the problem of compliance. Non-compliance with the regime Headache treatment is estimated

at 50-90% among children and adolescents. To assess the initial severity of the condition of children and adolescents with migraine and other forms of primary headache, as well as the dynamics of their condition during treatment, specially developed assessment scales are used: questionnaire PedMIDAS is a pediatric version of the well-known, well-proven questionnaire for adult patients MIDAS (Migraine Disability Assessment). The assessment test is also used headache (The Headache Impact Test – HIT-6). The criterion for the effectiveness of preventive

treatment is to reduce the frequency of migraine attacks by 25%.

Children and adolescents of all age, ethnic and socio-economic groups suffer from headaches. Headaches dramatically reduce the quality of life and can lead to disability. The reasonable use of methods of medicinal and non-medicinal therapy allows in most cases to reduce the number of seizures, to organize rational prevention of the diseases in question in pediatric practice.

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