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CAUSES OF HYPOTHERMIA IN CHILDREN

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Abstract: The article examines the causes, mechanisms of development, features of the course and approaches to therapy of hyperthermic syndrome in children.

Keywords: hyperthermia, method, children, treatment.

INTRODUCTION

Fever is an increase in the internal body temperature, which is an organized and coordinated response of the body to illness or any injury. In contrast to fever, hyperthermia is a violation of temperature homeostasis, resulting from uncontrolled heat production, insufficient heat transfer, or a disorder of hypothalamic thermoregulation [1]. It is known that fever in most cases is a protective-compensatory reaction, due to which the bactericidal activity of the blood increases, the activity of leukocytes, phagocytosis, the production of endogenous interferon increases, the intensity of metabolism increases, etc.

MATERIALS AND METHODS

It is impossible to determine the exact boundaries of normal body temperature. As with the assessment of many other physiological indicators, not only a wide range of the norm is found, but also a significant overlap between the temperature values in a healthy person and a sick person. It is believed that the range of normal rectal temperature fluctuates from 36.1 to 37.8 ° C, and oral - from 35.8 to 37.3 ° C. At the same time, body temperature changes depending on motor activity, circadian rhythm, ambient temperature, age, psychoemotional state and other factors. According to temperature indicators and its curve, fever is divided into subfebrile (37.2-38 ° C), low (moderate) febrile (38.1-39 ° C), high febrile (39.1-41 ° C) and hyperthermic - over 41 ° C [2]. In terms of duration, fever can be [3]:

- ephemeral — from several hours to 2 days;
- acute — up to 15 days;
- subacute — up to 45 days;
- Chronic — over 45 days.

RESULTS AND DISCUSSION

According to the nature of the temperature curve, fever is defined as [4]:

- Constant fever — the temperature exceeds 39 °C with daily fluctuations of less than 1 °C. Such a temperature is typical for typhoid and typhus, lobar pneumonia, etc.;
- Remittent fever — daily temperature fluctuations exceed 1 °C and it can drop below 38 °C, but does not reach normal figures. It is observed in viral diseases, bronchopneumonia;

- Intermittent fever — periods of normal and subnormal temperature (1–2 days) alternate with periods of temperature fluctuations with fluctuations of several degrees. Such fever occurs in malaria, sepsis;
- relapsing fever — high figures alternate with periods of normal temperature, it occurs in typhus;
- undulating fever — characterized by a wave-like course with relatively long periods of rise and fall, such fever occurs in brucellosis and lymphogranulomatosis;
- exhausting fever — daily fluctuations reach 4-5 °C, such type of fever occurs in tuberculosis and sepsis;
- Irregular fever, in which there are no patterns.

It should be noted that fever plays its adaptive role only to certain limits, since it is based on the imbalance between heat production and heat loss that occurs as a result of an infectious process, stressful situations, intoxications, allergic reactions and other causes. Changes in body temperature have a significant impact on metabolic activity and functioning of various organs and systems of the body. Thus, an increase in body temperature by each degree above 37 °C increases the basal metabolic rate by 10–12%, the respiratory rate by 4 breaths, and the pulse by 10 beats per minute; accordingly, the need for oxygen, fluid, and caloric supply increases. The respiratory rate and alveolar ventilation increase to a greater extent than the production of carbon dioxide, resulting in the development of respiratory alkalosis, the maximum of which occurs at a temperature of 40–41 °C. At a higher temperature, pulmonary ventilation begins to fall catastrophically, tissue metabolism is significantly disrupted, as evidenced by a decrease in the arteriovenous difference in oxygen with sufficient partial pressure in arterial blood. The oxyhemoglobin dissociation curve shifts to the right, which leads to a decrease in saturation and oxygen content in the blood [2].

Hypocapnia causes a decrease in cerebral blood flow, resulting in a deterioration in the supply of oxygen to the brain with the likelihood of developing seizures. An increase in the metabolic rate also requires increased cardiac output. Tachycardia and vasodilation in the systemic circulation contribute to a decrease in venous return and stroke volume of the heart. Systemic arterial pressure decreases, tissue perfusion falls [3]. With a high need for oxygen and reduced delivery, anaerobic glycolysis processes are activated, metabolic acidosis develops. At temperatures above 41 °C, enzymatic processes in the liver are inactivated, the structure of mitochondria and lysosomes is disrupted. Water-electrolyte metabolism is sharply disrupted, water and electrolyte losses increase significantly, iso- or hypotonic dehydration develops. Thus, hypoxic, metabolic, electrolyte manifestations of hyperthermia, especially in children of the first years of life, disorders of tissue and organ blood circulation and microcirculation can determine the development of critical conditions, in particular hyperthermic syndrome [7]. Hyperthermic syndrome is understood as a pathological variant of fever, in which there is a rapid and inadequate increase in body temperature, accompanied by a violation of microcirculation, metabolic disorders and progressively increasing dysfunction of vital organs and systems, in particular damage to the central nervous system. Irritation of the hypothalamic region as a center of thermoregulation plays a decisive role in the pathogenesis of hyperthermic syndrome. Decompensation of thermoregulation occurs with a sharp increase in heat production, inadequately reduced heat transfer and no effect from antipyretic drugs. The ease with which hyperthermia can develop in children is explained by several reasons: a relatively higher level of heat production per 1 kg of body weight than in adults, since the surface area of the body in children is larger than the volume of tissues that provide heat production, a greater dependence of body temperature on the ambient temperature, and underdeveloped sweating in premature babies, which limits heat loss through evaporation.

CONCLUSION

In conclusion, I would like to draw attention to the fact that before making a decision at the child's bedside about tactics in relation to elevated temperature, one should try to answer a number of questions that allow one to determine the appropriateness, safety, necessity and method of therapeutic interventions. Each doctor should take into account that the basis of therapy in children is always the treatment of the underlying disease that led to the increase in temperature, and antipyretic therapy is only symptomatic.

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