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Preventing inadvertent perioperative hypothermia in adults

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Abstract

Inadvertent perioperative hypothermia is a serious clinical problem, which could lead to the development of serious complications that prolong hospital care and increase medical costs. Anesthesia, surgery and microclimate in the operating room contributes to impaired physiological mechanisms of thermoregulation and thus the development of hypothermia in the patient. Therefore, it is essential that personnel responsible for the safety of perioperative patient had knowledge of the principles of maintaining normothermia and applied in clinical practice.

Keywords: Intraoperative hypothermia, thermoregulation, complications

Introduction

For perioperative hypothermia condition it is considered to lower the temperature of the central body below 36°C [9]. It is estimated that in 50-90% of patients the phenomenon of unintended hypothermia, which is a consequence of errors in perioperative care, consisting m. In. the lack of control of body temperature and not taking preventive measures onset of hypothermia [5,7].

Physiology of thermoregulation process

Normothermia is one of the components of homeostasis. Heat is generated in the system in a continuous manner in the course of metabolic processes taking place mainly in the liver, muscle, brain, heart and kidney. The heat loss takes place in the processes of: radiation, convection, conduction and evaporation. Under physiological conditions, the heat 2/3 of the whole body is stored in the internal organs of the abdomen, chest and brain, central acting temperature [3]. The remainder of the heat is stored in the range of the peripheral, which is a limb skin and subcutaneous tissue throughout the body.

Central thermoregulatory center located in the hypothalamus and receives impulses from the skin and internal organs. The role of this center is to keep the body in proper, adapted to the time temperature. The drop in temperature causes the activation of the central autonomous mechanisms to prevent hypothermia, which is manifested, among others, shrinkage of peripheral blood vessels. The increase in body temperature, helps to run the autonomous mechanisms to prevent hyperthermia, such as the relaxation of peripheral blood vessels and sweating. It should be borne in mind that the process temperature control focuses on maintaining a relatively constant core temperature of the body, and the temperature of the peripheral part of the body is mainly dependent on the conditions of the external environment [11].

Anesthesia and the course of the operation, and the body's thermoregulation

As a result of anesthetic used in anesthesia occurs impaired thermoregulatory mechanism by lowering the response threshold precapillary vessels. According to data from the medical publications body temperature of the patient undergoing surgery under general anesthesia may decrease by up to 1.5°C within the first 60 min of analgesia [6]. In the case of a regional anesthesia of mechanisms to prevent cooling of the anesthetized area they are impaired by sympathetic blockade, causing the blood vessels in the area of anesthesia. Wired anesthetized patient feels the heat in the area of the lock, despite the fact that in reality loses heat. The breadth and duration of surgery, and thus the exposure of unprotected surface of the body and the surgical field increases the risk of unintended intraoperative hypothermia. The factors leading to the loss of heat during operation should also include a low temperature and air movement in the operating room, evaporation of disinfectants in the area of the body being prepared for surgery, the use of cold rinsing fluid, transfusion unheated liquids and use of unmoisturized respiratory gases. Increasing the heat loss is increased in the case of extensive and lengthy surgical procedures performed urgently [8].

The consequences of unintended intraoperative hypothermia

Reduced core temperature disrupts the production of immunoglobulins, which contributes to impaired activity of the immune system. Hypothermia therefore increases the incidence of surgical site infections and increases the wound healing process [1,8]. Acute coronary events are one of the most common causes of death in the perioperative period. Hypothermia, especially for the elderly or even three times increase the incidence of perioperative coronary events leading to acute heart failure and death. This is due to increased levels of catecholamines in plasma, shrinkage of blood vessels and increased blood pressure in a cooled patient. Hypothermia affects blood clotting, among others, interferes with platelet function, prolonged prothrombin time and clotting time and affects the process of fibrinolysis. Even in patients in a state of slight hypothermia, coagulation disorder of these mechanisms may contribute to increased perioperative bleeding and thus increasing demand for blood products. The consequence of intra-operative hypothermia is prolonged awakening of the patient, which is related to metabolism disorder drugs used during anesthesia. Reduced temperature affect the half-life and elimination intravenous anesthetics including opioids and muscle relaxants striated. In the hypothermia also it increases the solubility of inhalation anesthetics in the tissues, which results in a certain state of equilibrium increased content of the anesthetic in the body. Therefore, the minimum alveolar concentration is reduced in conditions of hypothermia.

Risk factors for unintentional perioperative hypothermia

The risk of developing hypothermia depends on factors associated with the patient, such as:

- Age (children, the elderly)
- female
- low BMI
- The risk of perioperative aspirin > 2
- Joining of co-morbidities such as diabetes, hypothyroidism, unconscious patients, multiple trauma, spinal cord injury, burns
- Low body temperature before surgery $<36^{\circ}\text{C}$ and the inability to warm up because of the urgency surgery

Prevention of perioperative hypothermia

According to the recommendations of the Working Group PTPAiIO each patient prepared for surgery should be assessed the risk of intraoperative hypothermia. If the in-phase preoperative patient's body temperature is below 36°C should be used pre-warming for about 10 minutes before surgery [2]. Perioperative complex protocol in order to improve the results of treatment

(called Enhanced Recover After Surgery erase) recommends heating fluid infusion and blood during surgical procedures longer than 30 minutes to maintain the patient's perioperative normothermia. It is recommended that prior to administration to a patient in a volume greater than 500 ml were heated for by this device [4,10]. During surgery the body temperature should be monitored in a patient either continuously or every 15 minutes in the absence of a method of continuous recording of the measurement.

During all surgical procedures lasting more than 30 minutes should be used with the device of forced circulation of hot air, mats, blankets or heating. The temperature in the operating room should not be lower than 21°C, and the fluids used to irrigate intraoperative be heated to a temperature of 37-40°C. Maintaining normothermia should be continued post-operatively at recovery room until the feeling of thermal comfort to the patient [2].

Summary

According to the practice of evidence-based unintended intraoperative hypothermia it is very common and causes many complications. If there are no clinical indications to put the patient into a state of hypothermia should strive to maintain normothermia using the existing recommendation. The principles of risk assessment and prevention methods should be known and used by the staff caring for the patient because of the possibility of unintended hypothermia at every stage of perioperative care.

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