Dobrowolska-Czopor Barbara, Maj Agnieszka, Czykieta Izabela. Thermoregulation and its disorders in the children's perioperative period. Journal of Education, Health and Sport. 2019;9(2):222-234. eISNN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.2563887
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The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 30.01.2019. Revised: 30.01.2019. Accepted: 13.02.2019.

Thermoregulation and its disorders in the children's perioperative period

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Summary

Disorders of termoregulation is a phenomeon that can occur as a result of any kind of anaesthesia. In the perioperative period, infants and small children are most exposed to significant and dangerous changes in body temperature, especially hypothermia. When the body cools to values under 36˚C during simple surgery, it is called uncontrolled hypothermia and can be dangerous to the health or even lifethreating to a small patient. Preventive measures of intraoperative accidential hypothermia are according room temperature. Hypothermia as an intended phenomenon artificially produced is used in such medical fields as:

- cardiosurgery in cases of cardiotomy surgery in infants
- neurosurgery in lowering intracranial pressure
- analgesia through cooling as an effective pain - relieving method

Disorders of termoregulation mechanism leading to rising body temperature is called hyperthermia. It can occur as a sudden reaction to an anaesthetic agent (halothane, enufluran, izofluran, sewofluran, desfluran, suksametonium) revealed during anaesthesia – a genetically determined disease called Fulminant Hyperthermia. The essence of hyperthermia treatment is early diagnosis and fast treatment relying on the removal of causes and symptoms and, above all, needs to be preventative.

Regular measurement of both surface and central temperature can allow for quick action against hypothermia or hyperthermia in children.

Key words: termoregulation, hyperthermia, hypothermia, perioperative period, children

Introduction

Humans (like other mammals and birds) can maintain a constant body temperature regardless of the temperature of the environment. Constatation is a pass to get to know the world: thanks to it, the body can function in all conditions.

Man has a constant temperature, because the differences in the heat production of various parts of the body levels circulating blood and lymph, the behavior of this balance is subject to strict control, through the center and thermoregulatory effectors. "The most constant temperature prevails in the right ventricle." (12) The definition of thermoregulation says it is a nervous-hormonal regulation of the body temperature that ensures its stability, and thus the independence of life processes from the temperature (maintaining thermal homeostasis in the human body). It involves adjusting the amount of heat produced in the body (in metabolic processes) to the heat given up, among others by conduction, radiation, evaporation - from the skin and airways. In children, the greatest heat loss occurs through radiation on adjacent surfaces, eg in newborns on the walls of the incubator.

The production of heat in the body comes from sources such as:

- Basic metabolism
- Throne thermogenesis - heat produced by increased skeletal muscle tone, muscular tremor
- Nontoxic thermogenesis - heat generated without skeletal muscle (in low ambient temperature the activity of the sympathetic system increases, the release of heat-generating hormones - glucagon, thyroid hormones)

In newborns, the only way to increase the heat generated is non-wipe thermogenesis, which is, among others, on the combustion of fatty acids, glucose and indirectly on gluconeogenesis of amino acids using oxygen for this. The basic source of this mechanism is brown adipose tissue. This mechanism remains under the control of the sympathetic nervous system. Clusters of brown adipose tissue are found, for example, between the shoulder blades, around the cervical vessels, in the axillary region, in the mediastinum, around the kidneys and adrenal glands and along the spine. It is a specialized energy tissue, richly vascularized with numerous cytochromatic mitochondria that give it a characteristic brown color. Brown fat stores do not recover. The main organ that produces heat is the brain. Its share in the newborn is 6 - 7 times higher than in the adult.

In older children, during shivering of heat production, there are chills and conscious increase in movements. This reaction is negligible even in full-term newborns.

"The thermoregulation system consists of three basic elements:

1) thermoreceptors and thermo-detectors
2) thermoregulation center

3) thermoregulatory effectors (physical - circulatory system, sweat glands, chemical - mainly skeletal muscles, liver and brown adipose tissue) "(12, 19) Peripheral thermoreceptors are located mainly in the skin and are divided into cold and heat receptors. This division is based solely on the functional criterion. The thermoregulatory center ensures that the temperature inside the body remains constant. It is in the brain in a place called the hypothalamus in the front and the back of it. In the front part of the hypothalamus, there is a heat elimination center that controls the heat loss. In the back of the hypothalamus, there is a heat preservation center, which regulates the retention of heat in the body and stimulates its production. "In the thermo-neutral environment, heat loss and energy expenditure are minimal. Such environmental temperature is 34˚C for premature babies, 32˚C for newborns and 28˚C for adults "(7). It follows that in small patients it is very important to increase the temperature of the environment.

Assumptions

Thermoregulation disorders which are both hypothermia and hyperthermia may occur during anesthesia as well as in the perioperative period. This applies in particular to premature babies, infants and young children. It is important to prevent the occurrence of these disorders and their appropriate treatment in order to ensure the comfort and safety of the patient.

Objectives

- Discussing the methods and possibilities of monitoring changes in thermoregulation in the perioperative period.
- Presentation of the methods of preventing intraoperative hypothermia in newborns and infants, including applied surgical techniques.
- Presentation of thermoregulatory disorders caused by the used anesthetics to the planned anesthesia, taking into account the risk of occurrence of malignant hyperthermia.
- Discussing the clinical classification of febrile states in the postoperative period and their causes.

Monitoring of body temperature changes during surgical procedures and in the postoperative period.

Reduction of metabolism and oxygen consumption during hypothermia is used to protect organs in cardiac surgery and neurosurgery. However, unintentional and uncontrolled hypothermia is a very dangerous condition.

Body temperature is a constant parameter monitored by anaesthesiologists in small patients in operating rooms, it is treated as a standard of conduct. During surgical procedures, body temperature disturbances are a common occurrence. Newborns are particularly vulnerable to cooling and infants because their body / volume ratio is 2.5 times higher than in adults, which is synonymous with a larger area of heat loss. Malignant hyperthermia, which must be immediately recognized and treated, is life threatening.

In case of small patients, body temperature monitoring is necessary even during a very short duration of anesthesia. During the whole central temperature monitoring, one must remember about the differences that occur depending on the location of the sensor (18, 1, 15). If there are significant differences between measurements may indicate vascular contraction on the periphery.

We usually use a thermistor sensor to measure temperature. This sensor measuring deep water temperature can be assumed:

- in the esophagus. The temperature measured in 1/3 of the lower esophagus corresponds to the blood temperature in large mediastinal vessels (aorta) and heart

(central temperature). Indications for such measurements are long-term operations on the heart or large vessels as well as extensive operations in the chest area.

- in throat. The temperature measured in this place corresponds to the heat of the brain, it does not require special sensors. The result of this measurement can be understated if there is a possibility of leakage around the tracheal tube and the patient is ventilated with unheated gases.
- in the rectal rectum is the most popular way to check the central temperature. However, the rectal temperature reacts more slowly to central heating disturbances. Such measurement is associated with the risk of damage to the anal wall, and may also be inadequate due to the presence of stool, which may act as an insulator. In premature babies lying on the back, it can be disturbed due to heated water mattresses.
- in the external auditory canal. Warmth almost like the temperature of the blood flowing through the brain. Falsification of the result of this measurement can be caused by waxy acting as an insulator. In young children we do not use this measurement because it is a risk of damaging the tympanic membrane.
- underarm measurement - this is an easy way to check the peripheral temperature. The measurement result may be disturbed due to the proximity of the brown adipose tissue. However, during uncomplicated procedures it is usually enough to place the sensor under the armpit.

For optimal conditions in the operating room ensuring comfort and reducing the risk of heat loss, we can also include:

- before the procedure the air temperature in the operating room should be raised to a minimum of 24 ° C in order to give full comfort to the staff working in it, and strive to eliminate the risk of thermoregulatory disorders in the patient
- each child should be placed on a heated operating mattress or heated operating table
- untreated surfaces during the procedure should be covered with warmed napkins or a special foil (this applies especially to newborns), the head has to be covered with a special cap
- all transfused infusion fluids and disinfection solutions should be heated to 37 °C
- the breathing mixture has to be moisturized and heated
- in newborns, hypothermia increases oxygen consumption and delays recovery from anesthesia, therefore the necessary condition for extubation is to warm the child to the correct temperature and to make sure that the spontaneous breath is efficient
- in older children, during an awakening after the procedure in which hypothermia occurred, there are chills leading to higher oxygen consumption and worsening myocardial function

The best standard of operating room equipment is a heated operating mattress, heaters for infusion fluids and a heated oesophageal tube.

The ideal ambient temperature for an undressed newborn is 32-34°C, for premature babies around 35.5°C, and adults 28°C. If the ambient temperature falls below the lower limit of the neutral temperature, then cold reactions start to appear.

Hypothermia as a disorder resulting from exceeding the thermoregulatory capabilities of the body

Uncontrolled hypothermia (unintended) occurring during anesthesia is a decrease in deep body temperature below 36˚C. It is a very serious threat to younger patients. It increases the risk of morbidity and mortality in the intraoperative and postoperative period, in particular in

pre-term infants, newborns and younger infants, and causes a number of adverse symptoms. A period of awakening is a particularly dangerous moment. Because hypothermia can occur as a predictable effect of any type of surgery or surgery, the task of proper care of the patient is to take all steps to prevent it from occurring. The operating room temperature should be 21 - 24 ° C. If it falls below 21 ° C, the average shallow anesthetized child (without opening large body cavities) loses heat. When the temperature drops to a value lower than 36 ° C, during the postoperative period, muscular shakes (chills) may occur with increased consumption and oxygen demand and shock caused by circulatory failure (increased myocardial function). In newborns, the mechanism of muscular tremors is still unstable, and the production of heat occurs mainly in the brown adipose tissue. The reduction of central warmth occurs fastest during the first hour of anesthesia and during the induction period. This is the effect of the redistribution of heat from the interior to the body surface due to the expansion of the vascular bed and inhibition of the thermoregulatory center under the influence of anesthetic agents.
A drastic reduction of the temperature already occurs during the transport to the operating room. Heating the body surface before anesthesia in older children prevents intraoperative warmth and shivering during the postoperative period, even after operations lasting longer than three hours.
During tubular anesthesia, there is no vasoconstrictor, which may cause impairment of thermoregulatory ability to maintain a constant central temperature.

Degrees of hypothermia
Hypothermia is a "clinical condition of deep body temperature reduction" below 35 ° C. Depending on the severity of the course, we distinguish:

- light hypothermia (mild) 37 ° - 32 ° C; the ability to stop circulation: 4 - 10 min
- moderate 32 ° - 28 ° C; the ability to stop circulation: 10 - 16 min
- deep 28 ° - 18 ° C; the ability to stop circulation: 16 - 60 min
- significant 18 ° - 4 ° C; the ability to stop circulation: 60 - 90 min

Hypothermia reduces metabolism and increases organ tolerance to ischemia. Despite this, any unintentional hypothermia is a life-threatening condition, combined with high mortality, especially for young children. "Mortality in hypothermia ranges from 36% to 80%.

The factors conducive to heat loss in children include:

- general anesthesia (type and duration of surgery)
- wide opening of the abdominal cavity (use of moist drapes)
- use of unheated liquids for intravenous flushing and transfusion
- heat loss through the respiratory system through evaporation
- inadequate temperature of the operating room
- insufficient protection of unoperated places
- drugs used for general anesthesia and muscle relaxants interfere with central thermoregulatory mechanisms by abolishing thermogenesis. Opioids reduce the response to central dropping, central and peripheral. An additional factor that deepens hypothermia is peripheral vasodilatation by histamine-releasing muscle relaxants. Local aortic anesthesia, causing vasodilatation and lack of chills in the block area, leads to a decrease in body temperature and disturbances in thermoregulatory mechanisms, prolongation of anesthesia, prolongs the period of return to normothermia. The larger the area covered by the blockage, the more clearly the disturbances are.

During general anesthesia, body temperature should be kept within the normal range. This is very important in newborns because death can occur already below 35 ° C. The decrease in body temperature occurring in the perioperative period causes many nonspecific clinical symptoms, which may also occur in other disease entities.

Clinical symptoms:

- **skin symptoms** - cooling of the coatings, light pink color (delusive symptom of a good-looking child associated with the increasing oxygen affinity of hemoglobin at low temperatures leading to reduced oxygen supply to tissues), possible central cyanosis or pallor
- **general symptoms** - no response to pain stimuli, disruption of the coagulation process - hemorrhagic diathesis, lower hepatic flow leading to a slower drug metabolism.
- **respiratory disorders** - hypothermia causes relief and shortness of breath as well as abnormal respiratory rhythms with apneas.
- **circulatory symptoms** - there is a decrease in cardiac output, bradycardia proportional to the degree of temperature reduction resistant to administration of atropine, edema of the distal limbs and face, scleroderma, oliguria. As the temperature decreases, the blood pressure decreases.
- **metabolic disorders** - any degree of temperature decrease and pH moves towards alkaline - metabolic acidosis, hypoglycaemia, hyperkalemia, increased urea.

The effects of thermal stress are:

- hypoxia, worsening of lung problems, increased ventilation requirements,
- intensification of metabolic acidosis as a result of the metabolism of brown adipose tissue and release of fatty acids and anaerobic metabolism (lactic acid),
- contraction of the pulmonary placenta as a result of metabolic acidosis,
- increased risk of hypoglycaemia (need for intravenous therapy)
- weakening of the child's growth and prolonging the stay in the hospital (infants)
- apneas, bradycardia,
- inhibition of endogenous surfactant production and reduction of the action of therapeutic surfactant (newborns)
- in chronic hypothermia - poor weight gain due to calorie consumption for thermogenesis.

Post-operative management in hypothermia depends on the general condition, cardiovascular and respiratory system, metabolic conditions, and hypothermia.
Treatment of the newborn in hypothermia involves placing it in an incubator at a temperature of 1o – 1.5o C from the temperature of the child and slowly increasing it under constant control. At the same time, the cooled child should be given intravenous infusions of 10% glucose, oxygen therapy adapted to his condition and the results of arterial blood gas tests and eliminate causes as soon as possible. According to some sources that report distant complications after a hypothermia in the neonatal period, abnormal psychomotor development was noted, this is the result of concomitant hypoglycaemia and hypoxia which leads to brain damage in the neonatal period.
Immediately after awakening, 5-35% of anesthetized children experience chills that increase oxygen consumption by 400-500%, inducing hypoxia, lactic acidosis, and then accelerate heart rate, increase in average blood pressure, increase lung minute ventilation. (18, 1, 8, 5) They can occur both after inhalation anesthesia (halothane), thiopental use and various combinations of these drugs. However, they usually appear after halothane. The mechanism

of shivering is not yet fully understood, but it can also occur as a result of a long-lasting surgery during which the deep temperature of the body has been significantly reduced.

It is thought that chills are a response to changes in the central and peripheral mechanisms of heat regulation occurring during anesthesia. Therefore, especially in small patients, all the possibilities should be used, limiting the occurrence of hypothermia during surgery and in the post-operative period, consisting in compensating for heat deficiencies and possible reduction of chills.
Treatment consists of protection against cooling (passive heating), additional covering of the patient (active heating - electric blankets), administration of oxygen, possibly pethidine or clonidine. (18) Children should be fully protected from chills in the perioperative period. (18)

Hyperthermia as a condition characterized by excessive temperature rise
Hyperthermia that occurs during anesthesia is an increase in deep body temperature above 37.5 ° C or a rise of 2 ° C per hour. It develops when the amount of heat gained by the organism or the time generated in the unit exceeds the possibility of heat loss. The thermoregulatory response to the increase in body temperature is the opening of arterio - venous anastomoses, lowering the CO2 pressure in venous blood and increasing the secretion of sweat.
The causes of hyperthermia are: causes of the environment - excessive ambient temperature, overheating, excessively wrapped child; infections - bacterial or viral infections; dehydration; the medicines administered (e.g., atropine overdose in young children, prostaglandins E1); rare causes - solstice or thyroid storm; Rile - Day syndrome (disturbances in temperature regulation and secondary fever).The clinical picture is more complex than hypothermia, as it is complicated by water and electrolyte disturbances.

In the course of developed hyperthermia, there are:

- hemodynamic changes, consisting of peripheral vasodilation, resulting in lowering of blood pressure, acceleration of heart rate and reduction of circulating blood distribution, which leads to anemization of internal organs in favor of better blood supply to the skin,
- changes in the composition of the blood consisting in a decrease in blood volume circulating due to loss of water and electrolytes from the intracellular space, accompanied by an increase in blood viscosity and elevated hematocrit,
- acceleration of the breathing action,
- decreased efficiency of the central nervous system, changes in the concentration of metabolites (increase in glucose, pyruvic and lactic acid) and hormones (increased adrenergic activity - excessive secretion of catecholamines)
  High temperature is a stress factor, proof of this is the above hormonal and metabolic changes.

Severe hyperthermia during anesthesia may cause convulsions. They start as individual contractions of the muscles of the head, neck and limbs. These can be followed by generalized, epileptic, clonic contractions that lead quickly to respiratory distress disorders due to respiratory muscle failure. There are known cases of permanent damage to the central nervous system in patients who have undergone seizures during anesthesia.
"Malignant hyperthermia occurs in all human cases with an average frequency of 1:60 thousand. anesthesia, most commonly in children and adolescents. "(29)
It is a condition occurring suddenly, directly life-threatening through disorder of skeletal muscle function, it is caused by volatile anesthetics and succinylcholine. Hypothermia is characterized by an unusually rapid and turbulent course, it is a metabolic myocardium

conditioned genetically revealed during or immediately after anesthesia. The corollary is the acceleration of calcium-dependent metabolic processes in skeletal muscle with a significant oxygen consumption, and general metabolism. It leads to increased myocardial function, increased lung ventilation and is the cause of acidosis, excessive secretion of sweat quickly leads to hypovolaemia.
Until 1980 it was not known that the most important factor in the pathogenesis of malignant hyperthermia is abnormal intracellular Ca sequestration dependent on ryanodine receptor mutation, which controls the calcium channel. "Inhalant anesthetics and depolarizing relaxants activate the receptor mutation, leading to rapid calcium release from the sarcoplasmic reticulum and an increase in intracellular Ca-ion concentration." (25)
If malignant hypothermia arises as a result of dosing with suxamethonium, the first symptom may be the stiffness of the masseter muscles that makes intubation difficult. The occurrence of this symptom should result in discontinuation of anesthesia.

Table 4.2.2. Inducers that do not induce malignant insulences (6)

Dangerous drugs	- succinylcholine - Inhalant anesthetic agents
Drugs that are not available or controversial	- d-Tubocurarin - Phenothiazines
Safe drugs	- Antibiotics - Antihistamine - Atrakurium - Barbiturates - Benzodiazepines - Droperidol - Etamine (typical effects on the circulatory system can mimic the malignant insanity) - Local anesthetics - Intensities - Pankuronium - Nitrous oxide - Propofol - Propranolol - Antipyretic - Wecuronium

Standard procedure in the attack of Malicious Hyperthermia
The treatment of malignant hyperthermia (fever) is already carried out according to pre-established standards developed by the American Association for the Fight against Malignant Hyperthermia, adopted by the European association. (29)

Emergency proceedings.
1. Request for help.
2. Discontinue anesthesia (immediately stop using Halogen agents and N2O nitrous oxide).
3. Hyperventilation with 100% oxygen, change the anesthetic system to non-returnable (in the semi-open system, also mention, if possible, the calcium absorber).

4. For the basal dose, use 3 mg / kg bolus dantrolene (ampoule 20 mg to be diluted in 60 ml of water for injection to obtain a solution for injection). If does not respond within a few minutes after the initial injection, continue dosing dantrolene (each subsequent dose of 1 mg / kg bolus, not to exceed the total dose of 10 mg / kg).
5. Cool the child: deep cooling - transfusion of icy fluids, gastric lavage and bladder washing with ice-cold solutions (physiological saline solution and water distilled in equal parts), cooling with ice-filled containers, rinsing the operating field with cold salt.
6. Give sodium bicarbonate, 1 - 2 mEq / kg and perform gasometry.
7. During treatment of acidosis and hyperkalemia, rhythm disorders (dantrolene and sodium bicarbonate) usually disappear. If necessary, you can give procaine at a dose of 15 mg / kg i.v. Lidocaine and calcium inhibitors are contraindicated in this case.
8. To defeat hyperkalemia and brain edema, one should give: furosemid 1mg / kg i.v., mannitol 0.25mg / kg, hypertonic glucose solution (1mg / kg i.v. 30% glucose solution) .
9. To constantly supervise the gasometer, you should have direct access to arterial.
10. Also insert the bladder catheter and insert into large vessels.
11. Take blood for an ionogram, sugar, calcium, CPK, coagulogram.
12. The child should be transferred to the intensive care unit.

Dantrolene, synthesized in 1967, is a derivative of hydantoin used orally in the treatment of spastic muscle disorders. It works by lowering the intracellular Ca++ concentration, most likely by slowing the release of Ca++ from the sarcoplasmic reticulum or by inhibiting the excitation-contraction coupling at the level of the transverse channels. The solution is prepared immediately before use by adding 60 ml of distilled water to 1 vial of the substance. The addition of mannitol is aimed at forcing diuresis and rinsing particles of free myoglobin from the kidney tubules.

Identification of children at risk - prone to hyperthermia reaction is based on: history, muscle tests, DNA markers, enzymatic tests (CPK level).
The interview should include:

- occurrence of malignant hyperthermia in the family,
- unexplained deaths or complications due to anesthesia in the family,
- bone, joint and muscle diseases in the subject and in the family,
- temperature increase in the immediate postoperative period of unknown origin,
- appearance of dark urine after surgery and after anesthesia.

The only recommended muscle test is the exposure of muscle to halothane and caffeine, and the observation of an abnormal systolic response.

Precautions and anesthetic procedures in children at risk of malignant hyperthermia.

1. Anesthetic agents "not causing malignant hyperthermia" should be used: benzodiazepines, opiates, barbiturates.
2. Necessarily reduce preoperative stress by premedication containing benzodiazepines.
3. Use a non-returnable anesthetic system, without an evaporator.
4. Monitor the child during and after anesthesia, especially body temperature and CO2 levels.

5. If possible, use aortic anesthesia as a good alternative to general anesthesia, ester and amide compounds of local anesthesia are not considered to be agents that cause malignant hyperthermia.
6. Dantrolene is also administered as prophylactic.

Clinical classification of febrile states in the postoperative period.

Fever is an increase in body temperature with fully preserved efficiency of thermoregulatory centers and mechanisms that are adjusted or adapted to maintain a higher body temperature. Decisive importance in the formation of fever have pyrogens acting on the temperature control center in the hypothalamus. The extrinsic pyrogens include structural molecules of fungi, bacteria and viruses or parasites, and intrinsic immunological complexes and lymphokines, resulting from the antigens acting on sensitized lymphocytes. As a result of moving the hypothalamic thermostat to a higher level, mechanisms that promote the increase of body temperature are activated, they include:

- shrinking of blood vessels in the skin - thus reducing heat loss,
- muscle tremor - increased heat production (not in newborns)
- less sweating which reduces the heat released by the body

There are many different causes of fever in the postoperative period, it can be caused by infection and a non-infectious agent. Both the postoperative period in which the fever occurred, as well as its height, the course have diagnostic significance in the diagnosis of postoperative complications.

1. In the first hours after the surgery, the temperature may increase due to overheating. Usually this is a consequence of thermoregulatory disorders induced by anesthetic drugs as well as atropine and parasympathomimetic drugs (reduce sweating). The increase in temperature may also be due to thyroid crisis, thyroid insufficiency and the transfusion of infected or pyrogenic blood. If the operation was performed in an infected environment, the developing sepsis may cause fever a few hours after the surgery.
2. Another cause of fever is postoperative pulmonary complications. In the immediate postoperative period, some patients develop atelectasis of numerous small areas of the lungs. This is a consequence of the action of anesthetics, weakening of the respiratory muscles, pain, weakness of cough reflexes, long-term immobilization, heavy intravenous infusions and aspiration to the gastric fluid. In the areas of bronchial secretion, infection develops rapidly. Symptoms in the form of tachypnoea and tachycardia occur after a few hours, fever after 24 - 48 hours, at the same time weakening of the respiratory murmur at the base of the lungs and in the large bronchi, and only after 3 - 4 days there are changes in the x-ray image. In the case when we recognize:
    - actelectasis - the procedure consists of: respiratory gymnastics, suction of bronchial tree secretion, and in severe cases bronchoscopy.
    - infiltration in the lungs - administration of antibiotics, preparation of bronchial secretions.
3. Elevation of temperature in 3 - 4 days after surgery may be a cause of urinary tract infection. Following urinary stasis and bladder catheterisation, the infection develops, mainly in the urethra and bladder, and later in the upper urinary tract. The microbe that is responsible for inflammatory changes is most often Escherichia coli (colon bacilli occurs constantly in the digestive tract of humans and animals). The fever rises quickly to 38-39 ° C, accompanied by chills and urination disorders. Diagnosis should be confirmed by urine sediment and culture.

The procedure involves the administration of antibiotics and proper bladder drainage.

4. Infection of the surgical wound is the cause of fever, about 4 - 5 days after the surgery. However, if the high temperature combined with tachycardia occurs after 24 hours, the pressure drops strong pain near the wound, one should suspect an anaerobic infection, mainly Clostridium. When infecting a Staphylococcus wound or intestinal bacteria that give rise to a normal 4-5 day postoperative, the temperature is low in the morning and high in the evening with low tachycardia, chills and increased leukocytosis. The wound is tender - painful when it is palpated, swollen tissue, excessively insulated and red. Patients who receive antibiotics may have reduced symptoms of wound infection. In open surgical wounds with prolonged infection, the temperature remains at a normal level.
5. An upper clover vein clot or an inflamed site within the intravenous infusion cannula can also cause elevated temperature. The procedure consists of removing the catheter, applying local compresses and administering antibiotics.
6. Intraperitoneal abscesses can cause relapsing fevers after 4-5 days. In the afternoon hours, the temperature rises to 39 - 40 ° C, so that it will significantly decrease in chills and sweats. If we are dealing with a suprapathic abscess, which develops no earlier than on the 10th - 12th day, the diaphragm elevation is visible on the radiograph. In the case of suspected abscess in the smaller pelvis, a daily examination per rectum is obligatory. Proceedings with confirmed diagnosis consist in administering antibiotics and abscess drainage.

One should always be taken into account that anti-inflammatory drugs (e.g., acetylsalicylic acid, salicylates) administered in high doses may mask inflammatory symptoms by inhibiting the reaction of fever. With continued intake of glucocorticoids, fever may not even occur despite an increased infection.

Occurrence of fever in the postoperative period is an indication for:

- immediate assessment of the patient's condition with special regard to hydration and medications
- examination of the wound and preparation of the cultures
- examination of the urinary and respiratory system, performing smears and cultures
- performing blood cultures with the least suspicion of bacteraemia, especially if there was an unexplained drop in pressure
- radiological examination of the chest

In small children during fever may occur so-called fever convulsions. They are a reaction of the young body to a growing temperature, usually in a rapidly growing warmth to 39 - 40 ° C, in the course of pneumonia, bronchitis. There are fewer seizures, but they usually appear in between 1 and 4 years, more often in boys. The child suddenly begins to tremble and loses consciousness, it lasts for a few minutes, which means that the body can not cope with fever. In the majority of small patients, such convulsions do not leave permanent consequences.

Conclusion

The disturbance of thermoregulation in the perioperative period, which includes hypothermia and hyperthermia due to the low tolerance range in small patients, may cause immediate threat to life or death.

Temperature monitoring in newborns and children is a necessary standard in the management of anesthesia and is based on a constant measurement of body temperature during anesthesia and in the immediate perioperative period. Thanks to more and more effective methods and

possibilities of monitoring temperature changes in the perioperative period, excessive cooling and overheating of the body can be prevented.
Intraoperative hypothermia is a disorder that may accompany anesthesia. General and ductal anesthesia induces hypothermia by affecting thermoregulation increased by peripheral vasodilation, loss of heat and reduction of tremor thermogenesis, and so little or no prevalence in young children. Therefore, both learning about the ways of preventing and treating intraoperative thermoregulatory disorders, as well as the ability to use the knowledge possessed on this subject, has a huge influence on the future of the little patient and subsequent prognosis.
Hypothermia is a genetically determined disease with severe course and very poor prognosis. In the case of planned anesthesia in a child, a family history should be conducted, it is necessary every time when the diagnosis of hyperthermia was made or when it is suspected.
The occurrence of fever in the postoperative period has various causes depending on the time that has elapsed since the day of surgery. The cause may be both an infectious agent as well as overheating, thermoregulation disorders through the drugs used.

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