

# General anesthesia

**General anesthesia** has the task of knocking out the patient's consciousness, ensuring amnesia, inducing analgesia and neurovegetative stabilization. At the same time, it ensures the comfort of the operator during the performance.

General anesthesia consists of three components:

- **hypnotic**
- **analgesic**
- **myorelaxant**

## Division

Depending on the procedures performed and the use of general anesthetics, we distinguish several variants. **TIVA** (**T**otal **I**ntravenous **A**nesthesia), when only intravenous anesthetics are used and opioids. Furthermore, **balanced anesthesia (supplemented)**, which is a combination of the use of inhalation anesthetic, opioids and relaxation (for the introduction in adults i.v. anesthetic). We also have **combined anesthesia**, which combines supplemental anesthesia with one of the seductive methods (most commonly used for major procedures in the abdominal and thoracic cavity). And the last one is intramuscular and rectal, which are used very rarely.

## Distribution of the course of general anesthesia

It begins with an introduction to anesthesia, when unconsciousness is induced, or myorelaxation, and the airways are secured. The patient is further maintained under anesthesia (maintenance of analgesia and state of unconsciousness, control of vital functions). Finally, he is brought out of it by stopping the supply of anesthetics and bringing him out of unconsciousness.

- Introduction to anesthesia - for adults it is usually IV, for children inhalation.
- Monoanesthesia - anesthesia with only one preparation, only for very short procedures, during outpatient procedures.

## Stages of Anesthesia

- I. stage - analgesia with preserved consciousness.
- II. stage - loss of consciousness - discoordination, excitation.
- III. stage - stage of surgical tolerance and overall stabilization of hemodynamics and vegetative balance.
- IV. stage - stage of failure of basic vital functions.

Too shallow anesthesia risks vegetative hyperreactivity. Conversely, too deep anesthesia limits hemodynamics and leads to hypotension.

## Distribution of general anesthetics

 For more information see *General Anesthetics (Pharmacology)*.

Intravenous anesthetics:

- **barbiturate:**
  - thiopental, methohexital - they have a short to ultra-short duration of action, they are used less often for induction of anaesthesia;
- **non-barbiturate;**
  - propofol, midazolam, etomidate, ketamine

### Inhalation anesthetics

- nitrous oxide|N<sub>2</sub>O, isoflurane, sevoflurane, desflurane, halothane, xenon

The depth is determined by the concentration of the anesthetic in the CNS, which cannot be measured, so the anesthesiologist is guided by the concentration of the anesthetic in the inhaled and exhaled air.

### Opioid analgesics



Anesthetic machine

- fentanyl, sufentanil, alfentanil and remifentanyl

### **Myorelaxants**

- peripheral (non-competitive) depolarizing:
  - succinylcholine
- peripheral (competitive) non-depolarizing:

We divide these into benzylisoquinoline derivatives: atracurium, mivacurium, cisatracurium, alcuronium and substances with a steroid structure: vecuronium, rocuronium, pipecuronium, pancuronium.

## **Patient monitoring during anesthesia, adjuvant methods**

During monitoring, we monitor the state of vital functions - regular blood pressure measurement, listening to breathing, checking the ECG,  $pO_2$  in the blood,  $pO_2$  and  $pCO_2$  in the inhaled and exhaled air, the state of muscle relaxation, body temperature is also checked during long operations. During surgery, not only the surgeon's requirements are important, but also blood loss and muscle relaxation. For a correct course, the technical systems must be running absolutely correctly - gas supply - inspiratory pressures, operation of devices. The position of the patient is such as to prevent hyperextension of the head and oppression of important structures. If all is not as it should be, it is important to note the warning signs of an unstable condition. These include: Hypo/hypertension, tachycardia, bradycardia, sweating, cyanosis, pressure and increased bleeding in the operative field.

## **Means for providing general anesthesia**

There must be reliable venous access, or two, for procedures requiring invasive monitoring of central venous pressure, necessary parenteral nutrition and procedures in the posterior fossa of the cranial central vein. It is also important to safely ensure the patency of the airways - triple maneuver, laryngeal mask, endotracheal intubation. In order for the patient to be intubated, there are several conditions that are determined by short muscle relaxation - suxamethonium (onset of effect within 30s, wears off in 3min), mivacurium, atracurium, cis-atracurium, vecuronium or pancuronium. Other means also include artificial lung ventilation, infusion therapy, invasive blood pressure measurement, central venous pressure measurement.

## **Risks and Complications**

The most risky factor is the introduction to anesthesia and the awakening phase.

### **Complications during introduction to anesthesia**

Aspiration into DC (either acid juices or contents on a full stomach). Other, less common ones include: impossibility of tracheal intubation, anaphylactic shock, airEmbolism from the operative field, sudden bleeding and hypotension, AMI, malignant hyperthermia.

### **Complications on awakening**

These complications include hypoventilation, overuse of myorelaxants, inadequate replacement of blood loss, blood transfusion, development of shock and hypothermia. A fatal intraoperative complication is usually associated with bronchospasm or massive aspiration.

Other risks include: laryngospasm, postoperative nausea and vomiting, injury or even damage to the teeth during intubation, injury or damage to the mucous membrane of the oral cavity by the oral tube or laryngeal mask, postoperative chills, and postoperative pain.

## **Therapy of complications**

In case of regurgitation or aspiration, we aspirate the contents of the hypopharynx, check the pH, deepen the anesthesia and intubate followed by UPV and PEEP. If the pH is below 2.5, perform a bronchial lavage and administer a betamimetic. In case of cardiac arrest, we start advanced emergency resuscitation. In case of pain, we will give a sufficient dose of analgesic or opiates.

## **Links**

### **Related Articles**

- Anesthesia (pediatrics)
- Crush introduction to anesthesia
- Endotracheal intubation
- Epidural anesthesia in obstetrics
- Anesthesiological machine
- General anesthetics (pharmacology)
- History of Anesthesia

## Source

- Beneš, J., Study materials (<http://www.jirben.wz.cz>)
- KRETZ, Franz-Josef – TEUFEL, Frank. *Anästhesie und Intensivmedizin*. 1. edition. Heidelberg : Springer, 2006. 695 pp. ISBN 3-540-62739-1.
- Lectures and materials from the mandatory optional subject Basics of anesthesiology