SYSTEMIC COMPLICATIONS OF LOCO-REGIONAL ANESTHESIA

Risk factors:

Although all types of anesthesia involve some risk, major side effects and complications from anesthesia are uncommon. Specific risks depend on the health, the type of anesthesia used, and body's response to anesthesia.

Personal risk factors:

- Age may be a risk factor. In general, the risks associated with anesthesia and surgery increase in older people.
- Certain medical conditions, such as heart, circulation, or nervous system problems, increase the risk of complications from anesthesia.
- Some medicines can raise the risk of problems too.
- Smoking, drinking alcohol, or use of illegal drugs.
- Pregnancy

All complications are classified in:

1. General (systemic) and local
2. Primary and secondary
3. Light(easy) and grave
4. Temporary and permanent

General complications determined by the LA are:

- Toxic complications
- Lipothymia (fainting)
- Convulsions
- Syncope
- Collapse
- Allergic complications:
  - Anaphylactic shock (anaphylaxis)
  - Quincke's edema
- Complications caused by vasoconstrictors
- Hysterical complications
- Nervous complications

Toxic complications

When used properly, local anesthetics are safe and have few major side effects. But in high doses, local anesthetics can have toxic effects caused by being absorbed through the bloodstream into the rest of the body (systemic toxicity). This may significantly affect breathing, heartbeat, blood pressure, and other body functions. Because of these potential toxic effects, equipment for emergency care must be immediately available when local anesthetics are used.

Complications from local anesthesia are often due to overdosage. Predisposing factors, such as the patient's age, weight, state of health, and other medications that the patient may be taking may cause increased free local anesthetic blood levels due to a lack of plasma proteins available for binding.

Toxic complications can be caused by too fast passing of anesthetic substance into blood circulation or by its overdose. These complications are of variable severity and depend on:

- Way of solution introducing
- Vascularization (blood supply) of the injected area
- Quantity and concentration of the anesthetic solution
- General state of the patient
- Personal sensitivity

Anesthetics toxicity acts on CNS, cardio-vascular system and on respiratory center. It evolves in 2 phases: stimulating phase and depression phase.

More often, toxic complications are caused by overdose of Procaine, Lydocaine, Marcaine, Carbocaine. In this case the symptoms may be the following:

- Dizziness, headache, general weakness, nausea, vomiting.
- Teguments and mucous membranes become pale, appear cold sweat.
- Superficial, apnea breathing, motor excitation.
- May appear convulsions, arterial pressure decreases, weak pulse.
- As a result of respiratory center irritation may appear cardiac and respiratory stop.

First aid:

1. At the appearance of first overdose symptoms anesthetic injection must be immediately stopped.
2. Patient must be placed in horizontal position.
3. Inhalation of ammonia vapors.
4. Intravenous is introduced 20% - 40 ml Glucose solution.
5. At a grave intoxication, to decrease the excitation phase is introduced:

- Sodium thiopental sol.
- Cardiac glycosides, blood substitutes (reopolyglucina 500-100 ml).
- For dieresis stimulating (lazix 2-4 ml, i/m or i/v).
- Is made artificial respiration.

Lipothymia (fainting, faintness)

This complication is the most frequent in dental practice, setting up usually when the patient is in a sitting position in the dental chair.

Fainting is a partial loss of consciousness as a result of acute cerebral hypoxia determined by circulatory and respiratory failure, caused by the hypotensive action of LA.

Symptoms:

- At onset, patient complains of general weakness, associated with tendency to yawn, dizziness, tinnitus, apathy, visual disorders, palpitations, nausea.
- Face becomes pale, appears cold sweating and patient loses partially his consciousness.
- Pupils are dilated, pulse is weak, irregular and slowed.
- Blood pressure decreases.
- Breathing becomes superficial with decreased rhythm

First aid:

1. Injection or dental treatment is stopped.
2. Placing the patient in horizontal position with the head lower than the body and the neck in hyperextension for a better irrigation of respiratory and cerebral centers.
3. All constricting clothes around the neck and superior part of the thorax are removed.
4. Windows should be opened.
5. Massage of the facial teguments with humid cold towel.
6. Inhalation of ammonia vapors.
7. If the patient doesn't recover after all preceding measures is necessary to introduce cardiac and analeptic drugs:

- Ephedrine – 1 ampule of 1ml 5%, i/m or i/v mixed with saline sol.
- Calcium Chloride – 1 ampule of 10 ml 10%, i/v very slow.
- Hydrocortisone Hemisuccinate – 100-200mg i/v.

Prevention consists in:

- Avoid negative emotions, stress.
- Correct psycho-emotional preparation of the patient (pre-medication).
- Clothes around neck should be unbuttoned.
- Avoid sharp movements of the head.
- Needle insertion should be performed in the moment of a deep inspiration (to distract patient attention).

Syncope

Syncope may happen suddenly or can be a continuation of lipothymy. In this case loss of consciousness is total. There are 2 forms of syncope:

1. Blue (respiratory) syncope – appears cyanosis of the teguments caused by breathing stop, pulse is imperceptible but the heart continues to beat.
2. White (cardiac) syncope – sudden heart stop. The pulse and heart sounds are absent, blood pressure is collapsed. Appears cyanosis of capillary system.

If there is no intervention, installs respiratory stop. If the absence of cerebral perfusion exceeds 1,5-2 min., appears non-reactive mydriasis.

First aid: the main goal is to oxygenate vital organs.

1. The patient is arranged on a horizontal, hard surface.
2. Release of airways.
3. Puncture of a superficial vein with intravenous perfusion system connection.
4. Breathing monitoring, pulse determining at carotid artery.
5. Artificial respiration with extern heart massage, frequency 30:2 for adults and 15:2 for children (not less than 100 compressions per minute).

6. All drug substances are given dissolved in saline sol. 0,9% - 10 ml :

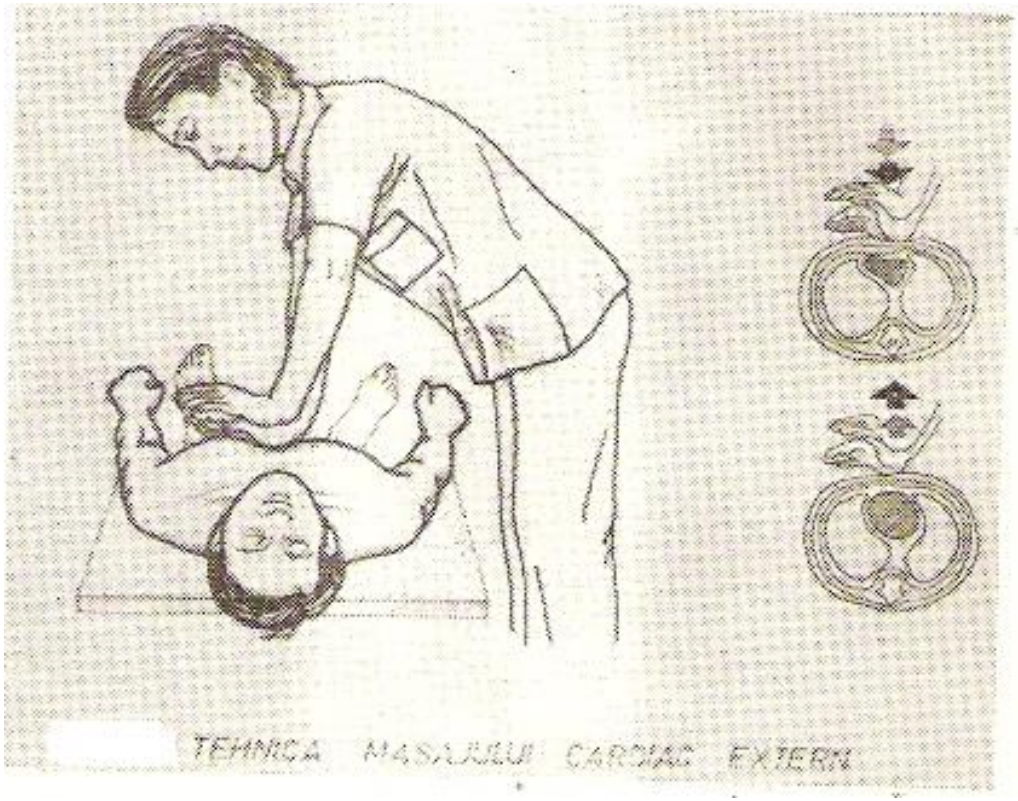
- Hormonal drugs – Prednisolone 60-90 mg (one dose) maximum 160-480 mg/day, Dexamethasone 4-8 mg/dose
- Anti-histamine drugs – Chloropiraminum (Suprastin) 2%-1ml or Clemastine (Taveghil) 2mg/2ml
- Ionic solutions – sodium chloride sol. 0,9%, glucose sol. 5%-10%
- Adrenaline sol. 0,1%-0,5ml (one dose) with repeating at every 3-5 min.
- Atropine sol. 0,1%-0,5 ml
- Sodium bicarbonate sol. 4% 20-40ml

7. Patient must be transported to the hospital by specialized team.

Syncope can aggravate and pass into cardiopulmonary arrest (stop), which clinically is characterized by the absence of pulse, blood pressure, heart beats and respiratory movements. First aid consists in cardiopulmonary resuscitation measures applied in 3 consecutive stages:

I. Circulation: Restore blood circulation with chest compressions

1. Put the person on his or her back on a firm surface.
2. Kneel next to the person's neck and shoulders.
3. Place the heel of one hand over the center of the person's chest, between the nipples. Place your other hand on top of the first hand. Keep your elbows straight and position your shoulders directly above your hands.
4. Use your upper body weight (not just your arms) as you push straight down on (compress) the chest at least 2 inches (approximately 5 centimeters). Push hard at a rate of about 100 compressions a minute.



TEHNICA MASAJULUI CARDIAC EXTERN

POZITIA MÎINILOR PENTRU MASAJUL CARDIAC

II. Airway: Clear the airway

1. If you've performed 30 chest compressions, open the person's airway using the head-tilt, chin-lift maneuver. Put your palm on the person's forehead and gently tilt the head back. Then with the other hand, gently lift the chin forward to open the airway.
2. Check for normal breathing, taking no more than five or 10 seconds. Look for chest motion, listen for normal breath sounds, and feel for the person's breath on your cheek and ear. Gasping is not considered to be normal breathing. If the person isn't breathing normally begin mouth-to-mouth breathing.

Verificarea
mișcărilor respiratorii

Verificarea
pulsului carotidian

III. Breathing: Breathe for the person

Rescue breathing can be mouth-to-mouth breathing or mouth-to-nose breathing if the mouth is seriously injured or can't be opened.

1. With the airway open pinch the nostrils shut for mouth-to-mouth breathing and cover the person's mouth with yours, making a seal.
2. Prepare to give two rescue breaths. Give the first rescue breath — lasting one second — and watch to see if the chest rises. If it does rise, give the second breath. If the chest doesn't rise, repeat the head-tilt, chin-lift maneuver and then give the second breath. Thirty chest compressions followed by two rescue breaths is considered one cycle.

CONVULSIONS

Are frequently determined by an overdose of LA (mostly Xyline) but as well can appear after an incorrect treatment of lipothymy or at patients with altered liver metabolism (cirrhosis), or at altered hepatic blood flow (heart failure, treatment with beta blockers), in different neurologic diseases (cerebral tumors, epilepsy), in certain neuropsychological states (hysteria, neurosis), in endocrine diseases (hyperthyroidism, hypocalcemia).

Clinical picture is the same as at fainting, only the symptoms appear suddenly with signs of CNS depression. Convulsions may take the aspect of epilepsy.

First aid:

Treatment is made with anticonvulsants:

- Diazepam – 1-2 ampules, i/v or i/m.
- Phenobarbital – 1-2 ampules i/m.
- Pentotal sodium – 2,5% by 5mg/kg of body i/v.
- Magnesium sulphate – 25% 10-20ml i/v.
- Glucose – 33% 10-7 ampules i/v.

Collapse

A circulatory collapse is defined as a general or specific failure of the circulation, either cardiac or peripheral in nature. A common cause of this could be shock or trauma from injury or surgery or drugs that affect blood pressure.

Cardiac circulatory collapse affects the vessels of the heart such as the aorta and is almost always fatal. It is sometimes referred to as "acute" circulatory failure.

Peripheral circulatory collapse involves outlying arteries and veins in the body and can result in gangrene, organ failure or other serious complications.

The effects of a circulatory collapse vary based on the type of collapse it is. Peripheral collapses usually involve abnormally low blood pressure and result in collapsed arteries and/or veins, leading to oxygen deprivation to tissues, organs, and limbs.

Acute collapse can result from heart failure and results in collapse of the primary vessels of the heart collapsing, perhaps combined with cardiac arrest.

Symptoms:

- Consciousness is present
- Appears headache, weakness, apathy.
- Teguments are pale, cold and wet.
- The pulse is frequent, weak and hardly perceptible.
- Blood pressure decreased.
- Superficial respiration.
- Tremor of the hands, air thirst.

First aid:

1. Patient arranged on a hard horizontal surface.
2. Release of the airways.
3. Breathing monitoring, pulse determining at carotid artery.
4. Puncture of superficial vein and connect the intravenous perfusion system.
5. Intravenous drugs are given dissolved in saline sol. 0,9% - 10ml:

- Hormonal drugs – Prednisolone 60-90mg (unique dose)
- Cardiamine sol. 2ml
- Caffeine sol. 10%-2ml
- Ionic sol. – NaCl 0,9%, Glucose 40% 20-60ml + ascorbic acid sol. 5% 2-5ml
- If necessary Adrenaline sol. 0,1%-0,5ml (unique dose) or Mesatone 1ml

6. Ventilation of the room.
7. Oxygen-therapy (oxygen inhalation through mask)

COMPLICATIONS CAUSED BY VASOCONSTRICTORS

Adrenaline when is injected in high quantity can determine general toxic accidents. To this can be add as well favoring factors: atherosclerosis, hypertension, ischemic cardiomyopathy, valve lesions or mental stress.

Symptoms:

- Sudden pallor of the face, tightness in the chest.
- Anxiety, headache, palpitations, tremors, dizziness.
- Teguments are cold covered by cold sweat.
- Blood pressure increases, appear pain in heart region, arrhythmia, thirst in air.
- In severe intoxication: vomiting, tachycardia, loss of consciousness, may appear pulmonary edema, intracranial bleeding or cardiac syncope and death.

First aid:

1. Atropine sulphate sol. – 0,1% 0,6-1,0 ml i/v.
2. Cordiamine sol. – 2ml i/v.
3. Strophanthin sol. – 0,05% 1,0 ml i/v
4. Inhalation of amyl nitrite
5. Oxygen-therapy
6. For blood pressure decreasing:

- Dibazol sol. – 0,5% 6-8 ml i/m
- Papaverine or Eupheline Sol. – 2,4% 5-10 ml i/m
- Magnesium sulphate sol. – 25% 5-10 ml
- Nitroglycerin pills sublingual
- Diazepam – barbiturate

Hysterical complications

- Laughter, crying, screaming.
- Erotic states.
- Theatrical performances.

Nervous complications

- excitation, delirium, verbose, psychic depression, epileptic crisis, transient amnesia.

Anaphylaxis

- Anaphylaxis is a severe allergic reaction of rapid onset affecting many body systems. It is due to the release of inflammatory mediators and cytokines from mast cells and basophils, typically due to an immunologic reaction.
- In the immunologic mechanism, immunoglobulin E (IgE) binds to the antigen. Antigen-bound IgE then activates receptors on mast cells and basophils. This leads to release of inflammatory mediators such as histamine. These mediators subsequently increase the contraction of bronchial smooth muscles, trigger vasodilation, increase the leakage of fluid from blood vessels, and cause heart muscle depression.

- Worldwide 0.05–2% of people are estimated to have anaphylaxis at some point in their life and rates appear to be increasing. The term comes from the Greek words ana - *against*, and phylaxis - *protection*.

Classification:

- There are several forms (types) of anaphylaxis:
- Typical
- Cardiac
- Asthmatic (respiratory)
- Cerebral (CNS)
- Abdominal (gastrointestinal)
- By the type of development:

1. Momentary
2. Easy form
3. Medial form
4. Grave form

Causes:

Anaphylaxis can occur in response to almost any foreign substance. Common triggers include venom from insect bites or stings, foods, and medication. Foods are the most common trigger in children and young adults while medications and insect bites and stings are more common in older adults. During anesthesia, neuromuscular blocking agents and antibiotics are the most common causes. The cause remains unknown in 32-50% of cases, referred to as "idiopathic anaphylaxis".

Symptoms:

- Anaphylaxis typically presents with many different symptoms over minutes or hours with an average onset of 5 to 30 minutes if exposure is intravenous and 2 hours for foods. The most common areas affected include: skin (80–90%), respiratory (70%), gastrointestinal (30–45%), heart and vasculature (10–45%), and central nervous system (10–15%) with usually two or more being involved.

- In case of a typical form in a small period of time after injection patient becomes anxious, appear tingling, stings of the facial head and hands skin, hives, tinnitus, flushing or swelling of the lips, headache, sweating. Develops a sudden pallor of the teguments. May appear convulsions, swelling of the conjunctiva. Pupils dilate and don’t react to the light. Sensation of retro-sternum constriction that then passes in the heart region.

- Blood pressure considerably decreases, appears significant tachycardia, the skin may become blue tinged due to the lack of Oxygen. Unpleasant sensations in epigastric region that may pass into abdominal cramps with vomiting. At some patients develops abdominal bloating, involuntary defecation and urinating, asphyxia.

- **Respiratory type:**

Respiratory symptoms and signs that may be present, including shortness of breath, wheezes or stridor. The wheezing is typically due to spasms of the bronchial muscles while stridor is related to upper airway obstruction secondary to swelling. Hoarseness, pain with swallowing, or a cough may also occur.

- **Cardiac type:**

Coronary artery spasm may occur with subsequent myocardial infarction, dysrhythmia, or cardiac arrest. A fast heart rate due to low blood pressure is more common, but in 10% of cases a slow heart rate is associated with low blood pressure. A drop in blood pressure or shock may result in the feeling of lightheadedness or loss of consciousness. Rarely very low blood pressure may be the only sign of anaphylaxis.

- **Other types:**

Gastrointestinal symptoms may include crampy abdominal pain, diarrhea, and vomiting. There may be confusion, a loss of bladder control or pelvic pain similar to that of uterine cramps. Dilation of blood vessels around the brain may cause headaches.

- In other forms of the shock dominate symptoms that affect certain organs. Momentary and grave forms may end with death.

Treatment (firs aid)

1. Immediately stop anesthetic injection.
2. Horizontal position of the patient with his head lower than his legs.
3. Release airways.
4. Puncture of superficial vein with connection of intravenous perfusion system.

5. Drugs:

- Place of LA injection is blocked with Adrenaline sol. *0,18%-0,1-0,3ml*.
- Adrenaline sol. – *0,1 % 0,5 ml i/v*, if patient state doesn't improve in 5-10 min. again is introduced *1,0 ml* of sol. (to stabilize blood pressure).
- Adrenaline sol. – *0,18%-1ml 0,5mg i/m* in different parts of the hip, repeating each 5 min, till blood pressure stabilizes.
- Adrenaline sol. – *1-10mg/min i/v* in perfusion, dissolved in sodium chloride (saline sol.) *0,9% 500-1000ml i/v in perfusion*.

- **Antihistamines one of the following:**

  - Suprastine sol. – 20mg i/m or i/v very careful (1ml = 20mg).

  - Diphenhydramine sol. – 10-20mg i/m or 20-50mg with saline sol. 75-100ml i/v in perfusion (1ml = 10mg).

- **Corticosteroids one of the following:**

  - Dexamethasone sol. – 0,2-0,3mg/kg, i/v (maximum 2-4mg/kg in 24h) (1ml = 4mg).

  - Prednisolone sol. – 1-2mg/kg (30-60mg) i/v, repeating each 6h (maximum 10-20mg/kg/24h), unique dose.

  - Hydrocortisone sol. – 100-200mg, i/v, repeating each 4h (maximum 2g/24h).

- **In case of bronchospasm:**

- Eupheline sol. – *5-6mg/kg, i/v* slow, 20-30min, followed by *0,5mg/kg/h, i/v* in perfusion (*2,4% 5-10 ml* in sodium chloride sol. *0,9%*), (1ml = 24mg).

- **To maintain cardiac activity are given cardiac glycosides and diuretics:**

  - Caffeine sol., or Cordiamine, or Corazoli *20% 1-2 ml*
  - Lazex sol. – *2-4ml, i/v*
  - Corglicon sol. – *0,06% 0,5-1ml, i/v*

- **In case of cardiovascular insufficiency:**

  - Strophantini sol. – *0,05% 0,5-1ml, i/v*
  - Atropine sol. – *0,5-1mg, i/v* (1ml = 1mg).
  - Mezatoni sol. – *0,1 % 1ml, i/v*
  - Dopamine sol. – *5-20mg/kg/min, i/v* in perfusion (5ml = 25mg).

6. Artificial respiration with extern massage of the heart.

7. Patients must be transported to the hospital.

- Prevention: consist of a careful analysis of patient allergy anamnesis.

Quincke’s edema

- Angioedema or Quincke's edema is the rapid swelling (edema) of the dermis, subcutaneous tissue, mucosa and submucosal tissues. It is very similar to urticaria, but urticaria, commonly known as hives, occurs in the upper dermis. The term angioneurotic oedema was used for this condition in the belief that there was nervous system involvement, but this is no longer thought to be the case.
- Cases where angioedema progresses rapidly should be treated as a medical emergency as airway obstruction and suffocation can occur.

Signs and symptoms

- The skin of the face, normally around the mouth, and the mucosa of the mouth and/or throat, as well as the tongue, swell up over the period of minutes to several hours. The swelling can also occur elsewhere, typically in the hands. The swelling can be itchy or painful. There may also be slightly decreased sensation in the affected areas due to compression of the nerves. Urticaria (hives) may develop simultaneously.
- In severe cases, stridor of the airway occurs, with gasping or wheezy inspiratory breath sounds and decreasing oxygen levels. Tracheal intubation is required in these situations to prevent respiratory arrest and risk of death.