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Руководство к практическим занятиям по общей хирургии (на английском языке)

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General SURGERY

The manual

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CHAPTER II

ANAESTHESIA

Local anaesthesia is a reversible loss of sensation in some part of the body induced by a local anaesthetic agent.

The advantages of local anaesthesia involve the following:

- prolonged preoperative preparation is unnecessary;
- it can be used when general anaesthesia (narcosis) is unavailable;
- there is no need for postoperative observation of the patient, as distinct from narcosis.

Outpatient surgeries are often done under local anaesthetics. Similarly, when intubation narcosis is risky, the patient can be operated on under local anaesthetics.

Elderly patients, particularly debilitated ones, as well as those with cardiovascular disease are at increased risk, as far as postoperative mortality rate is concerned. In such cases anaesthesia may outweigh the risk of the operation itself.

Contraindications for local anaesthetics are as follows:

1. The patient's intolerance of local anaesthetics drug (e.g. due to allergies).
2. The patient's age below 10 years.
3. Concurrent psychiatric disease.
4. Scarring or pronounced inflammation of the tissues within the operative field, which may interfere with the infiltration of the anaesthetic.
5. Intractable internal bleeding which requires urgent operation.
6. Thoracic surgery.

Potentiated local anaesthesia can be achieved by combining anaesthetics with neuroleptic drugs (e.g. droperidol) and general analgesics (e.g. phentanyl). In combined anaesthesia, which includes local anaesthesia and neuroleptic analgesia, local anaesthetic effect is enhanced by the positive action of the neuroleptic and the patient's psychic status.

Neuroleptic analgesia and general anaesthesia are used to potentiate different kinds of local anaesthesia (infiltration, trunk block, spinal, epidural). With the aid of neuroleptic analgesia and general anaesthesia the dosage and therefore the toxic effect of local as well as narcotic agents can be reduced.

Complications of local anaesthesia are related to allergic reactions of the anaesthetic drug or its overdose or that of epinephrine. Allergy to a local anaesthetic drug is manifested by skin rash, itching, Quincke's oedema, laryngo- and bronchospasm. Antihistamines, glucocorticoids and spasmolytics are used to counteract the allergic reactions.

Overdose of local anaesthetic substances occurs if large amounts of the drug are injected. Symptoms of overdose are anxiety, skin hyperaemic, fast pulse, hypertension, twitching or convulsions. In serious cases of intoxication the patient can develop collapse, respiratory or cardiac arrest or even coma. Mild cases of overdose can be managed with barbiturates, narcotic agents and oxygen therapy. Serious cases may require inotropic and vasopressor agents are given, and transfusion therapy with cardiopulmonary resuscitation may be necessary.

Prevention of the complications includes a thorough interviewing the patient as to drug allergies and meticulous following the protocols of anaesthesia.

The main local anaesthetics and their properties are presented in tab. 1.

Table 1. Local anaesthetic agents

Agent	Effectiveness (in relation to Novocain)	Toxicity (in relation to Novocain)	Concentrations available	Type of anaesthesia
1	2	3	4	5
Novocain (Procaine)			5—10%, 0,25—0,5%, 1—2%, 1—3%	Infiltration, Intravenous, block, spinal, peridural, Intraosseous
Lidocain (xylocain, lignocain)	4 times	2 times	1—2—10%, 0,25—0,5%, 0,5—2%	Superficial, infiltration, block, epidural, intravenous.

Tab. 1. Contd.

1	2	3	4	5
Dicaine (tetracain)	15 times	10 times	0,25%, 0,5%, 1–2%, 3%	Superficial
Trimecain (mesocain)	3 times	$1^1/_2$ times	0,25–0,5%, 1%, 2%	Infiltration superbicialblock, peridural spinal
Articain (ultracain)	4 times	2 times	1–2–4%	Infiltration, block, peridural

During preoperative workup the patient is prepared psychologically for local anaesthesia. This derives from the fact that he/she will be conscious during the operation and his/her tactile sensation, as distinct from pain, will be intact. Before the operation preanaesthetic medication (injection of promedol, atropine, droperidol) is given to each patient. It is noteworthy that patients who develop minute psychiatric problems are put on sedatives and anti-anxiety agents for several days preoperatively.

INFILTRATION ANAESTHESIA

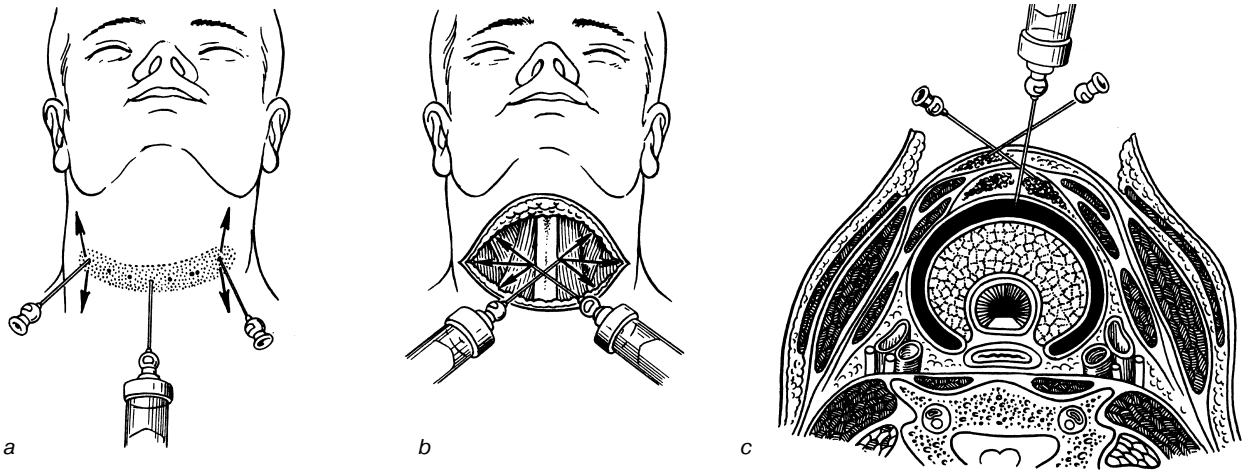
This type of anaesthesia is named after a famous Russian surgeon Alexander Vishnevsky. This way of anaesthesia combines the positive aspects of both infiltration and block anaesthesia. Anatomically, the method is based on the features of fascicular structures. The anaesthetic that is given under pressure into fascicular compartments spreads to engulf and penetrate the nerve and nerve ending. Tense infiltrates of novocain trickle along the fascial covering and converge with each other. Alexander Vishnevsky named his method **the tense-creeping** infiltrate.

It is the surgeon who is in charge of anaesthesia during the operation – he/she interchanges the injection and the scalpel during incision. Tissue infiltration should precede opening the skin or fascial covering.

Tense infiltration of anaesthetic allows for hydrous dissection of the tissues, in the mist of the infiltration it is easier to identify blood vessels, nerves and thus prevent their damage and enhance ligation of vessels to arrest bleeding. For infiltration anaesthesia to achieve, 0,25% novocain with epinephrine (0,15 mg of epinephrine to 100 ml of novocain) is used. Fascial covering anaesthesia requi-res a large amount of anaesthetic (as much as 800–1,000 ml), but because of the low concentration of anaesthetic and the fact that most of the solution pours away through the wound during operation, patients are unlikely to get intoxicated.

Thyroid turgeny may save as an example of that type of anaesthesia.

Two syringes (a 2- and 5- ml or 5- and 10- ml ones are normally used for the injections. To anaesthetise the skin a small needle is used intradermally to form «peau d'orange» along the intended incision line (fig. 6). Each further injection follows the pre-



a *b* *c*

Fig. 6. Infiltration anaesthesia for thyroid surgery.
a – anaesthetising the skin and subcutaneous tissue along the line of incision; *b* – injecting novocain beneath the cervical muscles; *c* – trickling infiltrate surrounding the thyroid gland.

vious one. Novocain is injected also into the subcutaneous fat through the infiltrated skin. Adequate infiltration is achieved when the whole area of incision becomes raised in the form of a fold. After incision of the skin, subcutaneous layer and subcutaneous muscle of the neck, the anaesthetic is injected through the midline, infiltrating the muscles, then under the muscles directing it upwards, downwards and to the sides.

Novocain injected under the muscles spreads beneath the medial cervical fascia to surround the thyroid gland in the form of a case.

After dividing the cervical muscles and delivering the thyroid gland into the incised wound additional infiltration of anaesthetic is given at the upper and lower poles of the gland as well as its posterior aspect.

BLOCK ANAESTHESIA

The following types of block anaesthesia are identified:

- anaesthesia of the neural trunks;
- anaesthesia of the neural plexuses;
- anaesthesia of a group of the nerve ganglia (paravertebral anaesthesia);
- spinal anaesthesia;
- epidural anaesthesia.

Block anaesthesia of the finger by Oberst–Lukashevich. This method is used to operate on the fingers (for abscess, trauma or tumours). Two or three millilitres of 1–2% novocain are injected into the side of the phalanx as follows (the same amount of novocain is used to anaesthetise the other side of the finger): a plastic tourniquet is applied to the base of the finger, distal to which the skin is anaesthetised, followed by the subcutaneous and further to the bon injections (fig. 7). Novocain is thus injected directly onto the nerves of the finger, which pass along its lateral aspects.

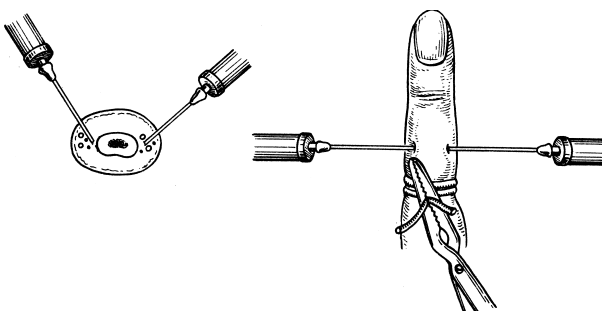


Fig. 7. Conduction anaesthesia (Lukashevich and Oberst's method).

INTERCOSTAL NERVE BLOCK

This type of anaesthesia is used in rib fractures. A few centimetres away from the fracture site towards the spine, the skin is anaesthetised by intradermal injection of novocain, using a needle and syringe (fig. 8). Novocain is injected through the needle, slowly pusher in the perpendicular direction as long

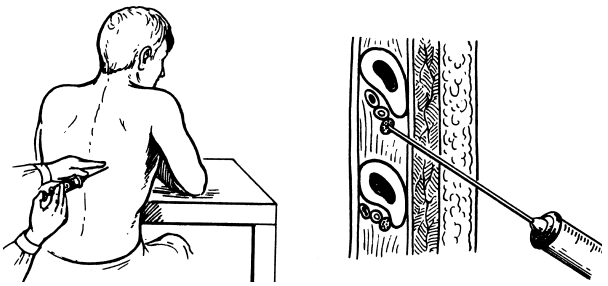


Fig. 8. Intercostal anaesthesia.

as it luts the fractures. Then the needle is pulled back for about 2–3 mm and is directed to the lower end of the rib along the lower surface and 3–5 ml of 1–2% of Novocain are injected. Passing onto the upper side of the same rib 2–3 ml of 1–2% novocain are injected after which the needle should be removed. In multiple rib fractures the procedure is repeated at the affected sides.

ANAESTHESIA OF THE BRACHIAL PLEXUS AFTER KULENKAMPFF

It is used during operations on the upper limb. With the patient supine and the head turned to the opposite direction the hand is may hang freely. In the supraclavicular depression pulsation of the subclavial artery is identified. Following the infiltration of the skin with novocain a long needle without a syringe is pushed laterally from the site of the arterial pulsation and sliding along the upper end of the rib towards the spines of the Th1–2 reaches the plexus (fig. 9). An unpleasant sensation in the hand,

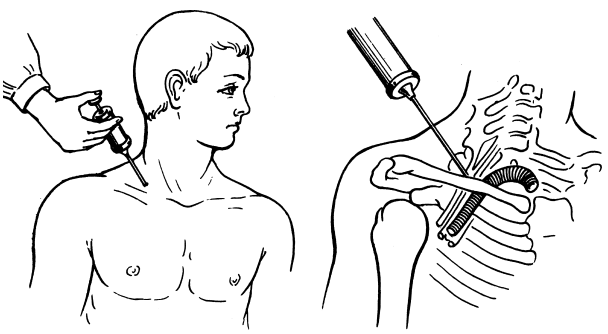


Fig. 9. Humeral plexal anaesthesia (Kulenkampff's method).

numbness or sharp «shooting» pain suggests that the needle has met with some of the branches of the plexus. Appearance of blood in the needle implies that the needle has entered a blood vessel. Following this the needle is withdrawn a little and its direction is changed. Unless blood is not flowing out of the needle, 30–50 ml of 1% novocain or 30–35 ml of 1 % lidocain are given. Anaesthesia is achieved after 10–15 minutes and is maintained for 2–4 hours or even for 6 hours if lidocain is used.

INTRA-ABDOMINAL COELIAC NERVE BLOCK AFTER BROWN

This is used in addition to general anaesthesia during gastric resections. Following laparotomy the left lobe of the liver is lifted up and to the right using a retractor, and the stomach to the left and downwards. In the region of the lesser omentum, the left index finger is used to feel for the pulsation of the aorta above the level of the **coeliac trunk** and press the vertebra on the right side of the aorta. The finger is thus placed between the aorta and the inferior vena cava. A long needle is used for anaesthesia with a syringe containing 0,5% novocain. The needle is pushed along the finger of the left hand till it hits vertebra Th12, then it is withdrawn a little. Unless there is no blood in the needle, 50–70 ml of 0,5% novocain are injected into the layer fat. The solution spreads into the retroperitoneal space and covers the coeliac plexus. Anaesthesia is achieved after 5–10 minutes and is maintained for $1^1/_2$–2 hours.

NOVOCAIN BLOCKING

The blocking is used for the prevention and treatment of traumatic shock and as the base for subsequent infiltration anaesthesia.

Blocking of the upper arm

With the arm flexed in the elbow joint and on the anterior surface of the middle third of the upper arm, a thin needle is used to inject novocain intradermally to anaesthetise the skin. Then, using a long needle with 0,25% novocain the skin is pierced followed by the fascia of the arm and the biceps brachii muscle. Pushing the solution of novocain in the needle path, advance the needle to the humerus; slightly drawing back the needle 50–60 ml of 0,25% novocain fill the fascial pouch of the biceps. Similarly, at the same level with the arm extended 50–60 ml of the drug are injected into the fascial pouch of the triceps.

Blocking of the forearm

This is done in the middle third of the forearm. 60–80 ml of 0,25% novocain are injected into the fascial pouches of the flexors and extensors of the forearm.

Blocking of the thigh

On the anterior aspect of the thigh in the middle third, a needle is injected preceded by a stream of novocain; the needle is pushed up to the bone and after withdrawing it slightly 150–180 ml of 0,25% of novocain are given (fig. 10).

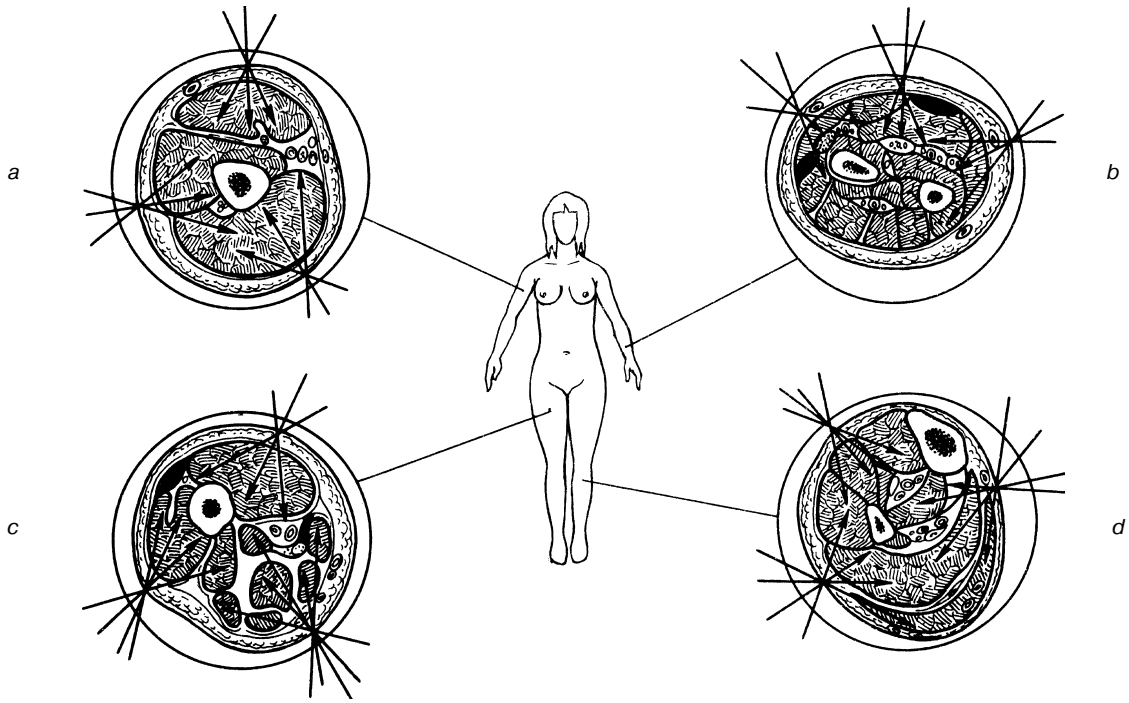


Fig. 10. Circular novocain limb blocks.

Blocking of the leg

Similarly to the previous techniques, novocain is injected into the fascia pouches of the extensor and flexor muscles in the middle third. The injection is placed at the lateral and medial sides of the tibia. 80–100 ml of novocain are injected into each muscular pouch (see fig. 10).

Retromammary block

This method is used to treat the initial stages of mastitis or as a part of local anaesthesia during operations on the breast: sectoral resection, incision and drainage. At the base of the breast in three points (upper, lower and the lateral aspects) 0,5% of novocain is injected intradermally (fig. 11). Then, with

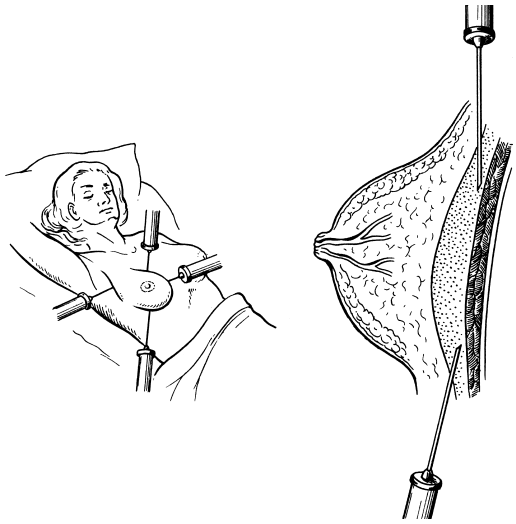


Fig. 11. Retromammary novocain block.

a long needle preceded by novocain in the pathway, the drug is injected into the retromammary space. 50 ml of 0,25% novocain are injected through each of the three points. No resistance should be felt during the injection, and after removing the syringe from the needle novocain should not flow out through the open needle. If the block is achieved, the breast looks raised and lying as if on a pillow.

Cervical vago-sympathetic block

It is used to prevent pleura-pneumonic shock in cases of injuries to the chest and as the basis for subsequent anaesthesia.

The patient is placed supine with a fold under the neck, the head is turned to the opposite side with the hand on the blocking side drawn downwards. At the posterior side of the sternocleidomastoid muscle, in its mid-portion upper or lower its place of intersection with the jugular vein 0,25% of novocain is injected to anaesthetise the skin. Using the left index finger push the muscle away anteriorly and medially together with the underlying vessels. Novocain (0,25%) in a syringe with a long needle is injected through the skin, with some novocain pushed ahead and the needle advanced up and medially, using the anterior surface of the vertebra as the hallmark. Draw the syringe periodically to be sure you have not entered a blood vessel. 40–50 ml of 0,25% of novocain are injected into each side if bilateral block is required. A successful block is achieved if Horner's sign (dilation of the pupil on the side of the intervention) is positive several minutes later.

Paranephral lumbar block

This method is used in blood transfusion shock, ileus (paralysis of the intestinal muscles), renal or hepatic colic.

The patient is placed on the intact side with a folded sheet under the waist. The leg lying on the top is stretched, while the other one is flexed at the knee joint. The point of injection lies 1–1,5 cm off the angle between the 12th rib and the latissimus dorsi muscle. After anaesthetising the skin insert a long needle perpendicularly to the body surface pushing along 0,25% novocain. On crossing the lumbar fascia, which is felt as the overcoming of resistance, the needle arrives at the paranephric fat (fig. 12). If drawing the piston a little indicates the absence of blood, 60–80 ml of 0,25% novocain are easily injected on each side. No solution trickling out after removing the syringe from the needle implies the needle has been in the right position. If some blood appears in the syringe, it should be withdrawn

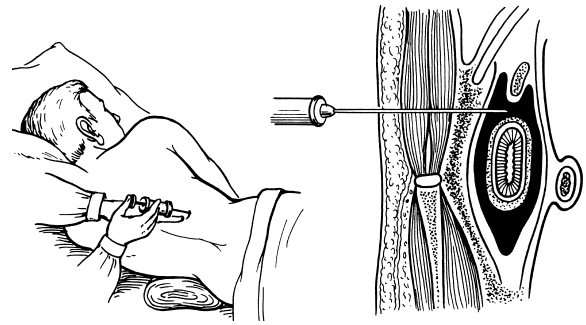


Fig. 12. Lumbar paranephric novocain block.

a little before injecting novocain. The latter spreads into the retroperitoneal fat engulfing the kidney, adrenal glands, solar plexus and coeliac nerves.

Intravenous anaesthesia

Intravenous anaesthesia is indicated for operations on the limbs (surgical debridement of wounds, manipulation of dislocations, repositioning of bone fragments, arthrotomy). The method is based on the

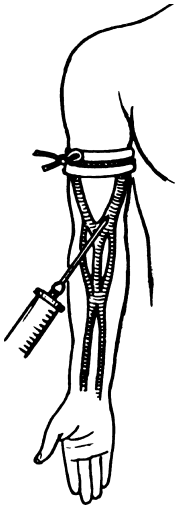


Fig. 13. Intravenous anaesthesia.

local effect (by way of diffusion of the anaesthetic given intravenously) of anaesthetics on the nerve endings of the segment of the limb isolated from the main blood circulation by a tourniquet (fig. 13).

Through venepuncture or venesection the anaesthetic is injected into the superficial veins of the forearm or elbow joint, or into the superficial veins of the leg. To enhance the venous blood flow, the limb is raised for 1–2 minutes and to stop arterial blood flow an elastic tourniquet is applied above the expected area of operation. During surgeries on the foot, leg or knee joint the tourniquet is applied on the lower third of the thigh; for operations on the fingers, hands, forearms or elbow joint – on the lower third of the arm. Instead of an elastic bandage for the tourniquet the cuff of a blood pressure apparatus can be used, air is pumped till the arterial blood flow is stopped. 150–200 or 200–250 ml of 0,25% novocain are used for operations on the upper or lower limb, respectively. At the end of the operation the tourniquet or cuff is removed slowly to prevent the solution of novocain from fast penetration into the systemic circulation.

Intraosseous anaesthesia

This is also a form of intravenous local anaesthesia. The anaesthetic given into the bone enters the venous system of the limb from where it diffuses into the tissues (fig. 14). Intraosseous anaesthesia is used during operations on the limbs. The limb is isolated from the general blood flow by applying a tourniquet or the cuff of a tonometer. The anaesthetic is injected into the humeral condyles, olecranons and fingers, femoral condyles, tarsal bones or malleolae. The tour-niquet is usually applied onto the arm, the lower third of the leg, the upper or lower third of the thigh.

Immediately above the site of the puncture the skin and the underlying soft tissues as deeply as the periosteum are anaesthetised with 0,25% novocain. A needle with mandrin used for bone puncture is pushed through the skin fatty layer and in a rolling manner is pushed into the cortical and spongy layers of the bone. 100–150 or 150–200 ml of 0,25% novocain are used for surgeries on the upper and lower limbs or the thighs, respectively. After removal of the tourniquet toxic effect of the anaesthetic's resorption can sometimes occur (weakness, dizziness, hypotension, nausea and vomiting).

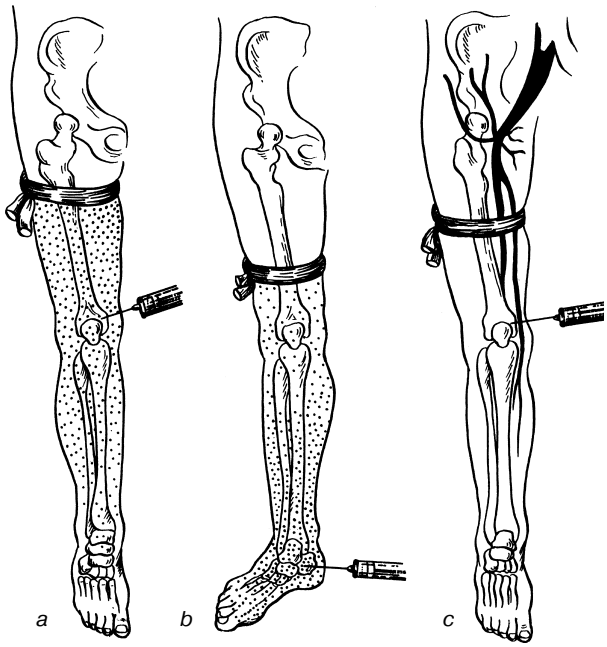


Fig. 14. Distribution of the anaesthetic following intraosseous anaesthesia.
a — injecting the anaesthetic into the humeral condyle; *b* — injecting the anaesthetic into the ankle; *c* — inadequate application of the tourniquet results in the anaesthetic escaping into systemic circulation.

To prevent the toxic effect of novocain, the patient is given 2 ml of caffeine solution subcutaneosly before removing the tourniquet which should be removed slowly.

Potentiated local anaesthesia can be achieved by combining anaesthetics with neuroleptic drugs (e.g. droperidol) and general analgesics (e.g. phentanyl). In combined anaesthesia, which includes local anaesthesia and neuroleptic analgesia, local anaesthetic effect is enhanced by the positive action of the neuroleptic and the patient's psychic status.

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lapse, respiratory or cardiac arrest or even coma. Mild cases of overdose can be managed with barbiturates, narcotic agents and oxygen therapy. Serious cases may require inotropic and vasopressor agents are given, and transfusion therapy with cardiopulmonary resuscitation may be necessary.

Prevention of the complications includes a thorough interviewing the patient as to drug allergies and meticulous following the protocols of anaesthesia.

Spinal and peridural anaesthesia

Spinal anaesthesia is a nerve block-type anaesthesia. It is done by injecting the anaesthetic into the subarachnoid space of the spinal cord and indicated for operations on the organs below the diaphragm (the stomach, intestine, liver and bile ducts, spleen, the pelvic organs) as well as the lower limbs. The anaesthetics block the posterior, or sensory, spinal roots, which leads to the loss of various sorts of sensation, and anterior, or motor, roots that causes muscular relaxation. Preganglionic sympathetic fibres that pass through the anterior roots are also blocked, which results in dilation of the local arterioles. When sympathetic fibres contributing to the coeliac nerves are blocked, the vascular dilation of abdominal and pelvic organs and the lower limbs can lead to the storing of blood into them and hence a fall of blood pressure.

Special spinal needles with well-fixed mandrin, syringes with tenth-millilitre graduations are used. 5% novocain, 1% ultracain, 1% trimecain or 2% lidocain is used. 2 ml of 20% caffeine solution and 1 ml of 5% ephedrine solution are given to the patient 30 minutes prior to the operation. The patient is set on a table, his/her feet put on a step, the knees raised a little and the spine in maximally flexed. The nurse standing in front of the patient presses down on his/her shoulders and helps to keep him/her in the required posture. If the puncture is to be done with the patient lying, he/she is put on a table lying on the side, the back at the edge of the table with the knees raised to the stomach and the chin lowered to touch the chest, the spine being maximally flexed. An assistant stands in front and with his/her one hand on the patient's neck and another on the hip fixes him /her as if trying to fold out his/her spine where the puncture is to be done.

The lumbar puncture is usually performed between L3 and L4 or L2 and L3 vertebrae processes. Lumber spine L4 is used as the hallmark of the line joining the superior posterior spines of the iliac bones (fig. 15). The operative field is cleansed with ether and alcohol. The skin of the injection site is infiltrated with 0,25% novocain. The needle is placed

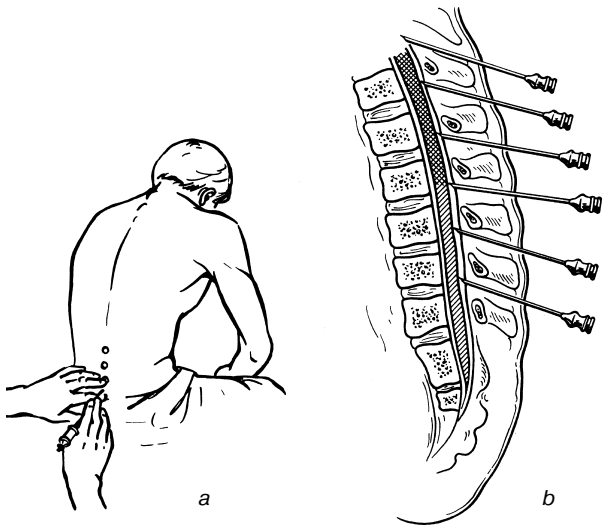

Fig. 15. Lumbar puncture.
a — choosing the optimum puncture site; *b* — directing the needle depending on the vertebral spinal slope.

in the midline in between the bone processes tilted a little (5–10°) downwards. When the needle passes through the intervertebral and yellow ligaments, some resistance, which vanishes after passing through, is felt. Some more resistance is encountered at the point of entry through the spinal dura matter, after this the guidance of the needle is stopped, the mandrin removed and the needle rotationally pushed forward for 2–3 more mm piercing the internal layer of the dura matter. The appearance of colourless fluid suggests successful puncture. If there is no or just a little fluid, the needle is rotated around its axis and advanced for about 1–2 mm. If there is still no fluid or blood appears, the needle is withdrawn and the process repeated through a different intervertebral space.

After successful puncture, 2–3 ml of cerebrospinal fluid are drawn into the syringe, mixed with 2 ml of 2% lidocaine or 1 ml of 5% novocain and then injected into the cerebrospinal canal. The patient is immediately placed on the operating table with the head end of the table *raised*. With this the anaesthetic is prevented from spreading to upper areas of the spinal cord and to the midbrain.

Contraindications for spinal anaesthesia:

- traumatic shock;
- severe intoxication as a result of peritonitis;
- concurrent hypotension;
- myocarditis;
- cutaneous infections on the spine;
- vertebral column deformity.

Complications

A serious complication of spinal anaesthesia is a fall in blood pressure, which results from block of the sympathetic nerve fibres. This type of complication often occurs when anaesthesia is performed at the level of the lower thoracic or upper lumbar

spines; the complication is very rare when the puncture is performed at the lower lumbar spines. To prevent hypotension, vasoconstrictors may be given before or during the procedure, transfusion therapy may also be of use. To centralise blood circulation, the lower limbs are bandaged and raised.

When the anaesthetic spreads upwards along the subarachnoid space, it can block the innervation to the intercostal muscles that control breathing hence affect it or even cause respiratory arrest. Oxygen therapy is used to treat pulmonary insufficiency, and if respiratory arrest is obvious, mechanical ventilation is required.

Headaches, lower limb paresis, suppurative meningitis can occur following spinal anaesthesia.

Because of its serious complications spinal anaesthesia is only rarely used. Recently, peridural anaesthesia has become widely used.

Peridural anaesthesia is a type of nerve block anaesthesia. The anaesthetic, given into the peridural space between the dura matter and the periosteum of the vertebrae, results in the block of the spinal nerve roots (fig. 16). This method of anaesthesia imparts all the advantages of spinal anaesthesia and is void of all its disadvantages.

Technically, the puncture of the peridural space is similar to that of subdural space. The puncture can be performed at any level of the vertebral column. It is noteworthy that the dura matter can easily be punctured, which will facilitate entering the drug into the subarachnoid space with resultant serious complications. The puncture is done with a needle connected to a syringe that contains normal saline solution. Resistance accompanies movement of the needle on pushing on the syringe until is passes through the intervertebral ligament and enters the peridural space, when no resistance is endured and the liquid is easily injected. Further evidence of the needle being in the correct space is that when the needle is connected to a water manometer, cerebrospinal fluid should not gush out, there should be a negative pressure reading on the manometer. Anaesthetic can be given with a needle or through a catheter which is introduced through the needle and left for a long period. To lengthen anaesthesia the drug can be given through the catheter in fractions.

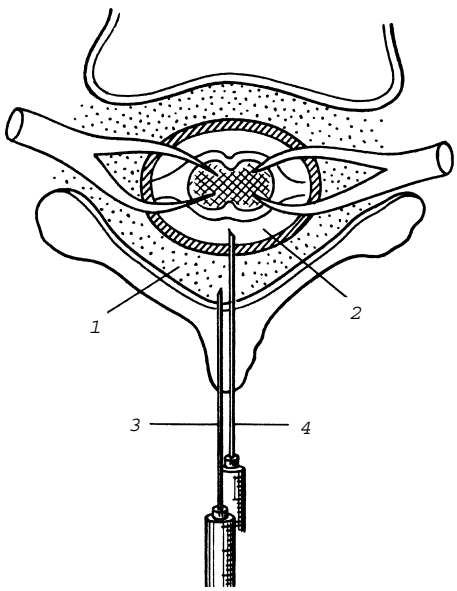

Fig. 16. Epi- and subdural puncture.
1 – epidural space; *2* – subdural space; *3* – the needle at the epidural space; *4* – the needle at the subdural space.

Up to 40 ml (fractionaly) of 1–2% lidocain or trimecain are introduced into the peridural space.

Peridural anaesthesia is used during trauma and orthopedic surgeries on the lower limbs, abdominal and pelvic operations. This kind of anaesthesia is used for old and elderly patients, those with serious cardiovascular and respiratory diseases, patients with metabolic disorders (obesity, diabetes mellitus).

Contraindications for peridural anaesthesia are similar to those for spinal anaesthesia.

Complications are very rare. Hypotension and respiratory problems, nausea, vomiting and seizures can occur. Anaesthesia may not be achieved in 5–10% of cases, which is accounted for by the presence of possible adhesions in the peridural space that prevent entry and spread of the anaesthetic drug.

GENERAL ANAESTHESIA (NARCOSIS)

General anaesthesia is a period of reversible unconsciousness, the absence of pain, reflexes and relaxation of skeletal muscles as a result of the effect of narcotic substances on the central nervous system. Depending on the way the drug is given into the body, the two types of general anaesthesia are identified: inhalation and non-inhalation anaesthesia.

Inhalation anaesthesia

Inhalation anaesthesia is achieved by breathing gaseous or volatile narcotic agents. Ether, halothane, methoxyflurane and trichloroethylene are volatile forms, while gaseous forms include nitrous oxide, cyclopropane.

Narcotic agents work to cause characteristic changes throughout the whole body. During the period of saturation with the substance a certain trend of events (stages) is observed, i.e. in changes in consciousness, breathing and circulation. The period narcosis is hence divided into stages that correspond

to the depth of anaesthesia. These stages are mainly obvious when ether is used.

The four stages are as follows: I – analgesia, II – excitement/agitation, III – surgical stage of 4 levels, and IV – awakening.

Analgesia (I). The patient is conscious but confused and answers questions reluctantly. He/she is not sensitive to superficial pain, whereas touch and heat sensitivity are intact. Minor operations (e.g. incision and drainage of abscesses and diagnostic procedures) can be performed during this period. This stage is very short as it persists for 3–4 minutes.

Excitement (agitation) (II). Inhibition of the cortical centres occurs in this stage while the subcortical ones are excited: unconsciousness, increased motor and speech reactions. Patients shout, attempt to get off the operating table. The skin is hyperaemic, pulse accelerated and blood pressure level increased. The pupils are dilated but react to light, tears appear in the eyes. Patients normally cough at this stage, their bronchial secretion is increased and vomit may even occur. Operating on at this stage is prohibited. It is necessary to continue saturating the body with the drug to deepen the narcotic effect. The maintenance period depends on the patient's condition and anaesthetist's qualification. Excitement normally lasts for 7–15 minutes.

Surgical stage (III). With the onset of this period the patient calms down, breathes smoothly, the pulse and blood pressure are near the basal values. Surgical interventions may be performed in this stage. Depending on the depth of anaesthesia, this stage is divided into 4 levels:

- *level 1:* the patient is calm, breathes smoothly, blood pressure and pulse approach the initial values. The pupils begin to constrict, still react to light. The eyeballs are placed eccentrically and move rolling. Corneal and swallow reflexes are maintained. The muscle tone is maintained, so it is difficult to perform operations on visceral organs;
- *level 2:* the eyeballs stop moving and are located centrally. Pupils start to gradually dilate; reaction of the pupils to light abates. Corneal and swallow reflexes weaken and at the end of the second level are absent. Breathing is quiet and smooth. Blood pressure and pulse rate are normal. Muscle tone starts to decrease, which allows for operations on visceral organs;
- *level 3:* the patient is in deep narcosis. The pupilsare dilated, do not react to light, swallow reflex is absent. The skeletal muscles including the intercostal ones are fully relaxed. Breathing is shallow and diaphragmatic. As a result of relaxation of the muscles of the mandible which can hang, the tongue can fall back to block the entrance of the larynx and cause respiratory arrest. To prevent this complication the mandible should be held forward and kept there. The pulse is fast and weak. Blood pressure falls. It is noteworthy that keeping anaesthesia in this condition may be fatal;
- *level 4:* maximal dilation of the pupils with no reaction to light, the cornea is dry. Breathing is shallow, taking place through the movements of the diaphragm since the intercostal muscles are paralysed. Pulse is faint and fast; blood pressure level is low and can hardly be assessed. To deepen anaesthesia to level 4 may be fatal since respiratory and circulatory arrests can easily set in.

Stage of awakening (IV). The moment the supply of the narcotic is stopped, its blood concentration falls, the patient in a reverse way goes through all the stages passed and wakes up.

The following substances are used for inhalation narcosis.

Ether is a colourless liquid with a specific odour and a boiling temperature of 36,5 °C. It dissolves well in fat and alcohol. It should be kept in dark well-cocked bottles since it is oxidized on exposure to light to form a toxic compound. As it is inflammable, it has to be handled with care when used in modern time theatres. Ether is a strong narcotic substance, which causes deep anaesthesia. It is eliminated through the respiratory tract, irritates it and therefore stimulates bronchial secretion. It may also impair hepatic functions.

Halothane (fluothane, narcotan) is a colourless fat-soluble liquid with sweet odour and a boiling temperature of 50,2 °C, which should be kept in dark bottles. It is fire-resistant. Halothane is a potent narcotic: acts fast (within 3–4 minutes), the excitement stage is either very short or does not manifest at all, patients wake up very fast. Transfer from one stage of narcosis to another is very immediate and because of this over dosage can occur. The drug inhibits the cardiovascular system that leads to a reduction in the heartbeat and blood pressure level. The drug is toxic to the liver. It does not irritate the respiratory tract, dilates the bronchi hence can be used for patients with respiratory system diseases. Halothane may increase the sensitivity of cardiac muscles to epinephrine and norepinephrine. Thus, if a patient is under this kind of anaesthesia, such drugs should be avoided.

Methoxyflurane (pentran) is a colourless transparent liquid with a characteristic fruity odour and a boiling temperature of 104 °C. Its narcotic potency is higher than that of ether and chloroform; the narcotic sleep is slow, after 8–10 minutes of its introduction. The excitement stage is more pronounced

and awakening is slow. The drug like halothane can reduce blood pressure and increase the sensitivity of the myocardium to the catecholamines (epinephrine and norepinephrine).

Nitrous oxide, or «laughing gas», is a colourless gas without odour, not explosive, but, if combined with ether and oxygen, it can burn. The gas should be kept in grey metallic cylinders in a liquid form under the pressure of 50 atmospheres. Nitrous oxide is an inert gas, in the body it does not affect functions of any organ, it is eliminated via the lungs unchanged. As a narcotic it is only used in combination with oxygen since pure nitrous oxide is toxic. Nitrous oxide and oxygen are used in the ratio of 1:1, 2:1, 3:1 and 4:1. The latter ratio contains 80% nitrous oxide and 20% oxygen. Decreasing the concentration of oxygen in the compound below 20% is prohibited, otherwise it may cause severe hypoxia. Nitrous oxide causes quick and quiet sleep without the excitement stage. Awakening is immediate, just at the time the anaesthesia is stopped. The disadvantage of nitrous oxide is its low anaesthetic potency: even in its maximum concentration of 80% it gives a slight anaesthetic effect (levels 1–2 of the surgical stage). Muscle relaxation is absent. Nowadays nitrous oxide is used in combination with barbiturates, halothane – in so called «combined anaesthesia».

Cyclopropane is a colourless gas with mild petroleum odour. It is prepared into red cylinders in liquid form under the pressure of 5 atmospheres. It is only used when mixed with oxygen. Its disadvantage is that it is highly inflammable. Cyclopropane is a potent anaesthetic agent: inhalation of only 10–15% of the compound with oxygen causes surgical stage of anaesthesia. Sleep as well as awakening is very fast. It does not irritate the respiratory tract, but its action on the vagus nerve can provoke cardiac arrhythmias. Cyclopropane increases the myocardial sensitivity to epinephrine and norepinephrine, maintains and stabilizes blood pressure and is therefore indicated for bleeding and shock. It does not affect hepatic or renal function.

Preparing the patient for general anaesthesia

The anaesthetist is directly involved in preparing the patient for anaesthesia and operation. The patient should be examined before the operation, history is taken not only of the principal disease that has necessitated the operation, but the details of concurrent conditions as well. If the surgery is scheduled, the patient should be treated of other ailments, and sanitation of the oral cavity should be done. The surgeon has to examine and assess the psychological status of the patient and exclude any possible allergies, previous operations, if any, and the anaesthesia used.

Features of the face, the chest, the type of neck, the nutritive status are evaluated.

All these are essential in making the right choice of anaesthesia and the anaesthetic.

An important measure in preparation of the patient for general anaesthesia is evacuation of the gastrointestinal contents (gastric lavage, cleansing enema).

To suppress the emotional reactions of the patient and depress the functions of the vagus preoperatively, specific preparations (premedication) are used. The patient is given sedatives on the eve of the surgery at night; tranquilizers (seduxen, relanium) are given to patients with neurotic reactions on the day before surgery. 40 minutes prior to the operation a narcotic analgesic is given subcutaneosly or intramuscularly: 1 ml of 1–2% promedol or 1 ml of lexir, 2 ml of fentanyl are given.

To inhibit the vagus and reduce salivation 0,5 ml of 0,1% atropine are given. Patients with allergic conditions are in addition given an antihistamine drug. Immediately before the operation the mouth is inspected and removable teeth prosthesis are taken out.

In emergency, gastric lavage is done and the premedication is given when the patient is on the operating table, the narcotic is given intravenously.

Inhalation general anaesthesia using vapour and gaseous substances is achieved with special apparatus – anaesthetic machine (fig. 17). The main parts of the machine are as follows:

1) cylinder for the gaseous substances (oxygen, nitrous oxide and cyclopropane);

2) vaporiser for steam forming narcotic substances (ether, halothane, pentran);

3) dosimeter;

4) breathing contour.

Oxygen is kept in blue cylinders under the pressure of 150 atmospheres. To reduce the outgoing pressures of nitrous oxide and oxygen, special reducers are used, which bring down the pressure to as low as 3–4 atmospheres. Kept under a lower pres-

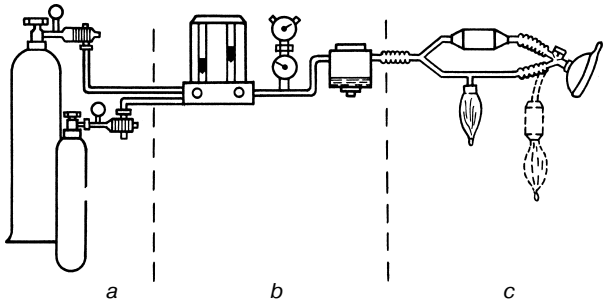

Fig. 17. Anaesthetic machine.
a — gas bags; *b* — dosimeters and evaporators; *c* — ventilators.

sure, cyclopropane can be given directly into the anaesthetic machine.

Vaporisers are necessary for steam forming narcotic substances. Steams of the narcotic are directed through a valve into the contour of the machine, concentration of the steam varies with the surrounding temperature. Dosage is not precise in arbitrary units, especially that of ether whose boiling temperature is 35,6 °C.

Nowadays, vaporisers with thermic compensators are widely used, which allows for a more precise dosage of the narcotic (in their percentage volumes).

Dosimeters are meant for accurate dosage of gaseous anaesthetic drug and oxygen. Rotational dosimeters are often used – the float type. The stream of gas inside the gas tube directs upwards from below. The float dislocation is equal to the amount of gas used in litres per minute.

Breathing contour comprise a breathing bellows (or mechanical ventilator), bag, hose, valves and absorbers. The anaesthetic substance passes through the breathing contour from the vaporijer and dosimeter to the patient, and then through the air-way out – into the machine. There are 4 types of breathing contours: open, partly open, closed and partly closed. The partly closed type is most often used, here inhalation is received from within the machine and exhalation is done partly into the machine and partly into the atmosphere. Exhaled air enters the machine and is purified of its carbon dioxide when it passes through the chemical absorbent.

Inhalation anaesthesia can be achieved using the mask, endotracheal or endobronchial methods. The anaesthetic machine is first put in working condition as follows:

1) open the regulators of the nitrous oxide and oxygen cylinders;

2) check for the presence of gas in the cylinders by the reading on the manometer;

3) connect cylinders to the machine using the tubes;

4) if the anaesthetic drug is a volatile substance (ether, halothane, methoxyflurane), they are poured into the vaporijer;

5) fill the absorber with the chemical absorbent;

6) earth the machine;

7) make sure the machine is airtight.

To use the mask method for general anaesthesia, the anaesthesist stands beside the patient's head to place the facemask on his/her face. A special belt is passed across the head to fix the mask on the face. If it is held manually, it should firmly be pressed to the face. The patient breathes in several times through the mask which is then connected to the machine. Oxygen is given to breathe for 1–2 minutes before the anaesthetic substance is allowed to flow. The dosage of the anaesthetic substance is slowly increased. Simultaneously, oxygen is given at the minimum rate of 1liter per minute. The anaesthetist constantly checks the patient's condition and flow of the anaesthetic. The nurse should permanently check the pulse and blood pressure. The anaesthetist examines the position of the eyeballs and the pupils, checks corneal reflex as well as the breathing pattern. When the surgical stage is attained, no more anaesthetic substance is given. Each patient is examined to determine the individual percentage volume dose of the anaesthetic required for at least the first level of the surgical stage of anaesthesia. If anaesthesia has been deepened to the third level of the surgical stage, the lower jaw has to be withdrawn. To do this, the thumbs are used to press on the angles of the lower jaw and pulled forward, until the lower incisors are placed forward to the upper ones. The 3rd, 4th and 5th fingers are then used to hold the lower jaw in that position. To prevent the jaw from falling back, airwaytubes can be used, these are kept to the root of the tongue to prevent it from falling back. It is noteworthy that giving anaesthesia at the third level of the surgical stage is dangerous in terms of overdose. At the end of the operation, after the anaesthetic drug has been put off, the patient continues to receive oxygen for some time before the mask is removed from the face. After the end of work with the machine, all the ventilators of the anaesthetic and cylinders are closed. The remaining volatile substances are poured out of the vaporijer. The tubes and bag of the anaesthetic machine are removed and sterilized in an antiseptic solution.

Intravenous general anaesthesia

Advantages of intravenous general anaesthesia include a quick set-in of anaesthesia without the excitement stage and favourable nature of the patient's sleep. However, the drugs used for intravenous anaesthesia act for a short period and are therefore not suitable for major operations, if used alone.

Derivatives of barbiturate acid (sodium thiopental and hexenal) produce a fast anaesthetic sleep without the excitement stage. Anaesthesia is maintained for 20 minutes, and awakening is fast. The clinical profiles of sodium thiopental and hexenal are identical, hexenal inhibiting the respiratory system at a lesser degree.

Barbiturates are used prepared *ex tempore:* the content of the vial (1 g of the drug) before the anaesthesia is dissolved in 100 ml of normal saline to prepare 1% the drug. The drug is given slowly at a rate of 1 ml per 10–15 seconds. After giving 3–5 ml for a period of 30 seconds the patient is examined for sensitivity to barbiturates, after which the pro-

cess is continued to induce the surgical stage of anaesthesia. The total dose should not exceed 1,000 mg. During giving the drug the nurse controls the patient's condition (pulse, breathing rate and blood pressure). The anaesthetist checks the state of the pupils, eyeballs and corneal reflexes to assess the depth of anaesthesia.

Suppression of respiration is characteristic of barbiturate anaesthesia, especially that induce by thiopental, which necessitates having a ventilator. With the onset of apnoea artificial respiration is started with the mask of the ventilator. If the drug is given too fast, it can cause hypotension and bradycardia, which requires that the giving of the drug be stopped.

In surgical practice, barbiturate anaesthesia is used for minor operations (10–20 minutes in duration) such as incision and drainage, manipulation of fractures and dislocations and dilatations. Barbiturates are also used to initiate anaesthesia.

Viadryl is used in a dose of 15 mg/kg (average: of 1,000 mg). It induces anaesthesia which is difficult to control and is therefore given only in small doses in combination with nitrous oxide. In high doses the drug can cause hypotension, phlebitis and thrombophlebitis. To prevent these, it is recommended that the drug be given slowly and into the central vein as 2,5% solution. Viadryl is used to initiate anaesthesia or to perform the short-term procedures.

Propanidide (epontol, sombrevin) is available in 10 ml ampoules of 5% solution. The dosage is 7–10 mg/kg given as an intravenous bolus (500 mg within 30 seconds). Sleep is induced instantly, «at the tip of the needle». Anaesthetic sleep lasts for 5–6 minutes. awakening is fast and quiet. Propanidide causes hyperventilation, which sets in immediately after the loss of consciousness. Occasional apnoea may call for the use of the artificial ventilation machine. The disadvantage of this drug is the risk of hypotension that occurs during its injecting. It is mandatory to control the blood pressure and pulse. The drug is used to initiate anaesthesia, for outpatient surgical manipulations **and for momentary surgeries.**

Sodium oxybutyrate is given intravenously and slowly, the average dose being 100–150 mg/kg. The drug produces superficial anaesthesia and is therefore often given in combination with other anaesthetics, for example with barbiturates, propanidide. It is often used to initiate anaesthesia.

Ketamine (ketalar) can be injected either intravenously or intramuscularly. The dose is as high as 2–5 mg/kg. It can be used as a monoanaesthetic or as an initiator. Ketamine gives superficial anaesthesia, stimulates cardiovascular function, elevates blood pressure, accelerates pulse rate. Thus hypertension is a contraindication for the use of ketamine. It is widely used in hypotension and shock. Ketamine may produce hallucinations at the end of anaesthesia when the patient is waking up.

Endotracheal anaesthesia

Endotracheal anaesthesia is the type of anaesthesia in which the anaesthetic enters the body through a tube placed in the trachea. Advantages of this method are as follows:

- provides a free passage of the respiratory tract;
- can be used for operations on the neck, face and head;
- lowers the risk of aspirating vomitus or blood;
- reduces the amount of anaesthetic to be used;
- improves gas metabolism by means of a decrease in the «dead» space.

Indicated for major surgeries, endotracheal anaesthesia is used in the form of polyvalent anaesthesia with muscle relaxation (*combined anaesthesia*). The sum effect of using several anaesthetics in small quantities reduces the toxic effect imposed by each of them separately.

Currently, combined anaesthesia seeks to provide analgesia, unconscious state and relaxation. Analgesia and unconscious state are achieved with one or several anaesthetics (inhalation and non-inhalation). Anaesthesia is maintained at the 1st level of the surgical stage of anaesthesia. Muscle relaxation or relaxation is achieved by fractional injection of muscle relaxants.

There are three stages of anaesthesia:

Stage 1 – *Induction*. To initiate anaesthesia, whichever anaesthetic that can produce adequate narcotic sleep without the excitement stage can be used. Barbiturates, fentanyl combined with sombrevin, or promedol combined with sombrevin, are generally used. Also, sodium thiopental is often used. The drugs are used in the form of 1% solution, given intravenously at a dose of 400–500 mg, maximal one being 1,000 mg. Intubation of the trachea is performed after the muscle relaxant has been given.

Stage 2 – *Maintenance*. For maintenance of general anaesthesia, whichever anaesthetic that can protect the body from the trauma of operation can be used (halothane, cyclopropane, nitrous oxide with oxygen), as well as the neuroleptanalgesics. Anaesthesia is maintained at the 1st and 2nd levels of the surgical stage of anaesthesia, and to prevent muscle resistance, muscle relaxants that cause myoplegia of all the skeletal muscles (including the respiratory ones) are given. This accounts for why an artificial ventilation machine is currently used, which provides rhythmic compressing the bag, or **bellows.**

Nowadays, neuroleptanalgesia is being most widely used: nitrous oxide with oxygen, fentanyl, droperidol and muscle relaxants. Anaesthesia is maintained with nitrous oxide + oxygen in the ratio of 2:1, fractional injection of fentanyl and droperidol 1–2 ml each 15–20 minutes is provided. Tachycardia requires injection of fentanyl, whereas hypertension necessitates administration of droperidol. This type of anaesthesia **is the safest for the patient.**

Stage 3 – *Conclusion*. At the end of anaesthesia the anaesthetist gradually stops giving the anaesthetic and muscle relaxants. The patient regains consciousness, starts to breathe on his/her own and muscle tonus is reestablished. The indices of P_{O_2}, P_{CO_2}, and pH are the indicators of the respiratory adequacy. After the main homeostatic indicators have been restored, the patient can be extubated and transported for further observation in the recovery ward.

Management of anaesthesia

During general anaesthesia the main circulatory parameters should be monitored and assessed. Blood pressure and pulse rate are checked each 10–15 minutes. Permanent monitoring of the heart functions is vital for patients with cardiac and vascular problems as well as in thoracic surgeries. Electroencephalogram can be used to assess the depth of anaesthesia. To monitor pulmonary ventilation and metabolic changes during anaesthesia and operation, it is necessary to evaluate the acid-base balance (P_{O_2}, P_{CO_2}, and pH).

During general anaesthesia, the nurse prepares the patient's anaesthetic chart, which should contain the main homeostatic parameters: pulse rate, blood pressure, the central venous pressure, breathing rate and parameters of the artificial ventilation machine. All the stages of operation and anaesthesia should be recorded. The doses of the anaesthetic substances used and muscle relaxants are also registered. All the drugs given during anaesthesia; the duration of each stage of the operation and **the time medications are given** should be recorded exactly. At the end of operation the total dose of all the drugs given are noted down in the anaesthetic record. All complications that occurred during anaesthesia and the surgery itself are registered. The anaesthetic record should be kept together with the patient's case history.

TESTS

Chapter II. ANAESTHESIA

1. The types of conduction anaesthesia are as follows:
1. Neural trunk anaesthesia.
2. Neural plexus anaesthesia.
3. Paravertebral anaesthesia.
4. Spinal (intradural) anaesthesia.
5. Epidural (extradural) anaesthesia.

Choose the right combination of answers:
A. 1, 2, 3. B. 1, 2, 3, 4. C. 1, 2, 4, 5. D. 1, 2, 5. E. 1, 2, 3, 4, 5.

2. The concentration of novocain used for infiltration anaesthesia should be as follows:
A. 1%.
B. 0,5%.
C. 0,25%.
D. 10%.
E. 5%.

Choose the correct answer.

3. Contraindications for local anaesthesia are which of the following:
1. Marked inflammatory and/or cicatricose tissue changes.
2. Heavy internal haemorrhage.
3. Heavy haemorrhage from superficial veins.
4. Patient's marked agitation.
5. Patient's age under 10 years.

Choose the right combination of answers:
A. 2, 4, 5. B. 1, 3, 5. C. 1, 2, 4, 5. D. 3, 4, 5. E. 1, 3, 4, 5.

4. The types of anaesthesia used for incision in mastitis or paraproctitis:
1. Local infiltration anaesthesia.
2. Intratratracheal general anaesthesia.
3. Intravenous anaesthesia.
4. Mask anaesthesia.
5. Conduction anaesthesia.

Choose the right combination of answers:
A. 1, 4. B. 4, 5. C. 1, 2, 3. D. 3, 4. E. 1, 2, 3, 4, 5.

5. Name conduction types of anaesthesia:
1. Lukashevich-Oberst.
2. Paravertebral.
3. Epidural.
4. Intraspinal.
5. Intercostal.
6. Retromammary.

Choose the right combination of answers:
A. 1, 2, 4, 5. B. 2, 3, 5, 6. C. 1, 2, 4, 6. D. 1, 2, 5, 6. E. 1, 2, 3, 5.

6. Case block is used in:
1. Injury of extremities.
2. Inflammatory disease.
3. Costal fractures.
4. Snake bites.
5. Infiltration anaesthesia.

Choose the right combination of answers:
A. 1, 2, 3, 4. B. 2, 3, 4, 5. C. 1, 3, 4, 5. D. 1, 2, 4, 5. E. 1, 2, 3, 4, 5.

7. For spinal anaesthesia, which of the following are used:
1. 5% novocain.

2. 2% lidocain.
3. 2,5% trimecain.
4. 10% novocain.
5. 0,5% bupivacain.

Choose the right combination of answers:
A. 1, 2. B. 2, 3. C. 1, 4. D. 1, 2, 3, 5. E. 4, 5.

8. The right position during spinal anaesthesia with the solution of sovcain is which of the following:
A. Lowered upper part of the body.
B. Raised upper part of the body.
C. Horizontal position.
D. On the patient's side.
E. Sitting with the trunk bent forward.

Choose he right combination of answer.

9. The late complications of spinal anaesthesia are as follows:
1. Suppurative meningitis.
2. Paresis.
3. Meningism.
4. Headache.
5. Apnoea.

Choose the right combination of answers:
A. 1, 2, 4, 5. B. 2, 3, 4, 5. C. 1, 2, 3, 5. D. 1, 2, 3, 4. E. 1, 2, 3, 4, 5.

10. The aims of premedication are as follows:
1. To prevent vagal effect.
2. To raise sympathetic tone.
3. To depress salivation.
4. To inhibit agitation.
5. To prevent vomiting and gastric regurgutation.

Choose the right combination of answers:
A. 1, 5. B. 1, 4, 5. C. 3, 4. D. 1, 2, 3, 4. E. 1, 2, 3, 4, 5.

11. The general anaesthesia optimal for major abdominal surgeries is one of the following:
A. Ether-oxygen mixture.
B. Halothane-oxygen mixture.
C. Intratracheal general anaesthesia.
D. Neuroleptanalgesia.
E. Fractional ketamine general anaesthesia.

Choose the correct answer.

12. Muscle relaxants are given for which of the following:
1. Enhancement in effect of narcotics.
2. Motor block.
3. Block of autonomous reactions.
4. Stabilization of circulation.
5. Tracheal intubation.

Choose the right combination of answers:
A. 1, 2, 3, 4, 5. B. 1, 3, 4. C. 2, 4, 5. D. 1, 2, 3 E. 2, 5.

13. A 50-year-old man is being operated on for linea alba hernia. He is given halothane-oxygen mixture. His vital signs are as follows: BP 130/60 mm Hg, PR 78 beats/minute and RR 18/minute. The pupil response and corneal reflex are sluggish.
Indicate the stage of general anaesthesia:
A. I.
B. II.
C. III_{1-2}.
D. III_3.

Choose the correct answer.

14. Possible complications of intratracheal general anaesthesia are which of the following:
1. Recurarisation.
2. Vomiting.
3. Vocal ligamental oedema.
4. Asphyxia.
5. Muscle pain.

Choose the right combination of answers:
A. 1, 2. B. 3, 4. C. 2, 3, 4. D. 1, 2, 3. E. 1, 2, 3, 4, 5.

15. Contraindications for intravenous general anaesthesia with ketamine are as follows:
1. History of head injury.
2. Hepatic and renal insufficiency.
3. Seizures.
4. Hypovolaemia and marked blood loss.
5. Hypervolaemia and hypertension.

Choose the right combination of answers:
A. 1, 2. B. 2, 3. C. 1, 3, 5. D. 2, 5. E. 1, 2, 3, 4, 5.

16. Contraindications for intravenous general anaesthesia with barbiturate drugs are as follows:
1. History of anaphylactic reactions.
2. Hypertension.
3. Hypotension.
4. Hepatic insufficiency.
5. Hypovolaemia.

Choose the right combination of answers:
A. 1, 2. B. 3, 4. C. 3, 4, 5. D. 1, 3. E. 1, 2, 3, 4, 5.

17. Which intravenous anaesthetic should be preferred for induction in patients with blood loss above 1,000 ml, hypovolaemia, low BP:
A. Hexenal.
B. Thiopentone sodium.
C. Ketamine.
D. Propanidid.
E. Fentanyl + droperidol.

Choose the correct of answer.

18. Which types of anaesthesia are indicated for reduction of shoulder or femoral dislocation:
1. Intratracheal halothane general anaesthesia.
2. Halothane mask general anaesthesia.
3. Neuroleptanalgesia.
4. Intravenous barbiturate general anaesthesia.
5. Peridural anaesthesia.

Choose the right combination of answers:
A. 1, 2, 4, 5. B. 1, 2. C. 3. D. 2, 4. E. 3, 5.

19. Which types of anaesthesia are preferable in operation for felon:
1. Intravenous general anaesthesia (barbiturate, pronanidid, propofol).
2. Conduction anaesthesia.
3. Ethyl chloride (chlorethyl) anaesthesia.
4. Infiltration anaesthesia.
5. Plexus anaesthesia.

Choose the right combination of answers:
A. 1, 2. B. 3, 4. C. 3, 5. D. 3, 4. E. 1, 2, 3, 4, 5.

20. Prevention of mechanical asphyxia due to sticking the tongue inside in early post-anaesthetic period requires the following measures:
1. Intravenous injection of proserin, a muscle relaxant antagonist, postoperatively.

2. Insertion of an airway tube.
3. Patient monitoring for about two hours after general anaesthesia.
4. Breathing stimulation with analeptics.
5. Insertion of a gastric tube.

Choose the right combination of answers:
A. 1, 2. B. 2, 4. C. 1, 3, 4. D. 4, 5. E. 2, 3.

21. The agents used in conventional premedication include the following:
1. Hexenal (thiopentone sodium).
2. Atropine sulphate (methacine).
3. Promedol (morphine fentanyl).
4. Strophanthin (corglucon).
5. Calcium gluconate (calcium chloride).

Choose the right combination of answers:
A. 1, 2, 4. B. 3, 4, 5. C. 2, 3. D. 4, 5. E. 1, 3, 4, 5.

22. The cause of oxygen kindling and explosion of gas bags with oxygen is which of the following:
A. Work with electrical appliances.
B. Absence of earth of respiration and general anaesthesia appliances.
C. Contamination of the reductor of a gas bag with oil (e.g. Vaseline).
D. Static electricity.

Choose the correct answer.

23. Using an electrical knife should be avoided in which of the following types of general anaesthesia:
A. Halothane.
B. Ether.
C. Nitrous oxide with oxygen.
D. Neuroleptanalgesia.

Choose the correct answer.

Regional anaesthesia

24. The types of regional anaesthesia are as follows:
1. Neural trunk anaesthesia.
2. Neural plexus anaesthesia.
3. Paravertebral anaesthesia.
4. Spinal anaesthesia.
5. Epidural anaesthesia.

Choose the right combination of answers:
A. 1, 2, 3. B. 1, 2, 3, 4. C. 1, 2, 4, 5. D. 1, 2, 5. E. 1, 2, 3, 4, 5.

25. What is the concentration of novocain used during anaesthesia by A.V. Vishnevsky?
A. 1%.
B. 0,5%.
C. 0,25%.
D. 10%.
E. 5%.

Choose the correct answer.

26. Contraindications for regional anaesthesia are as follows:
1. Pronounced local inflammation and scarring tissues.
2. Persistent massive internal bleeding.
3. Intolerance of anaesthetics.
4. The patient's acute excitation.
5. The patient's age under 10 years.

Choose the right combinations of answers:
A. 2, 4, 5. B. 1, 3, 5. C. 1, 2, 3, 4, 5. D. 3, 4, 5. E. 1, 3, 4, 5.

27. The appropriate types of anaesthesia in surgery for mastitis are as follows:
1. Local infiltration anaesthesia.
2. Endotracheal anaesthesia.
3. Intravenous anaesthesia (barbiturates, sombrevin, kalipsol).
4. Spinal anaesthesia.
5. Intercostal anaesthesia.

Choose the right combination of answers:
B. 1, 2, 3, 4, 5. B. 2, 3, 5. C. 1, 2, 4. D. 1, 2, 5. E. 1, 2, 3, 5.

28. Fascial block is used for:
1. Limb injury.
2. Treatment of inflammatory disease.
3. Rib fracture.
4. Snake bite.
5. As a basis of infiltration anaesthesia.

Choose the right combination of answers:
C. 1, 2, 3, 4. B. 2, 3, 4, 5 C. 1, 3, 4, 5 D. 1, 2, 4, 5 E. 1, 2, 3, 4, 5.

29. The following types of anaesthesia are used during spinal anaesthesia:
1. Novocain 5%.
2. Lidocain 1–2%.
3. Trimecain 0,5–2%.
4. Novocain 10%.
5. Bupivocain 1%.

Choose the right combination of answers:
A. 1, 2. B. 2, 3. C. 1, 4. D. 1, 5. E. 4, 5.

30. The appropriate patient's position during surgery under spinal anaesthesia is one of the following:
A. Trendelenburg's position.
B. With the upper part of the body raised.
C. Horizontal.
D. Horizontal on one's side.
E. Sitting with the trunk bent forward.

Choose the correct answer.

31. Late complications of spinal anaesthesia are as follows:
1. Purulent meningitis.
2. Motor paresis.
3. Meningism.
4. Headache.
5. Respiratory arrest.

Choose the right combination of answers:
A. 1, 2, 4, 5. B. 2, 3, 4, 5. C. 1, 2, 3, 5. D. 1, 2, 3, 4 E. 1, 2, 3, 4, 5.

32. The types of anaesthesia preferable in surgery for felon are as follows:
1. Intravenous anaesthesia (barbiturates and propanidid).
2. Neural trunks anaesthesia (Lukashevich-Oberst's).
3. Chlorethyl.
4. Infiltration anaesthesia.
5. Plexus anaesthesia.

Choose the right combination of answers:
A. 1, 2. B. 3, 4. C. 3, 5. D. 1, 2, 3, 4, 5.