Drogobych Ivan Franko State Pedagogical University

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BASICS OF PREMEDICAL CARE

Educational manual

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The study guide was compiled in accordance with the work program of the discipline "Fundamentals of pre-medical care", approved by the Scientific and Methodological Council of the Ivan Franko State University of Applied Sciences. Contains material for lectures, in an outline of the main provisions that reveal the essence of first aid, as the simplest actions performed directly at the scene of an accident, immediately after an injury. As a rule, it is not carried out by medical professionals, but by persons who, at the time of an accident, emergency or injury, are near the victim or directly on the spot.

Bibliography of 22 sources.

CONTENTS

INTRODUCTION

The course "Fundamentals of First Aid" teaches the basics of providing first aid, forms life-saving skills, and this is a first-rate skill, especially in the conditions of hostilities, when the number of risks to a person's life increases tenfold.

The knowledge you will gain during the course is based on the Tactical Medicine Protocols (TCCC) developed by the American TCCC Committee, which means they are effective and particularly practical.

In 8 lectures, you will learn how to stop bleeding using tamponade, direct pressure, and tourniquets; how to carry out resuscitation actions and call an ambulance; how to act in case of body burns, hypothermia, hard and soft tissue injuries, etc.

We hope that this course will help you quickly navigate emergency situations and provide appropriate assistance to the victim.

It's okay if you don't manage to remember all the tricks at once, but make the most of your efforts and attention – from now on, a person's life is in your hands.

FIRST AID FOR BLEEDING

Lecture plan

1. **Definition, classification and characteristics of bleeding.**
2. **Ways to stop bleeding. Pre-medical assistance in case of external and internal bleeding.**

1. Definition, classification and characteristics of bleeding

The outflow of blood from a damaged vessel into the external environment, tissue or body cavity is called bleeding. In the case of a decrease in blood volume in the vascular system, fluids move from body tissues into the blood. As a result, after bleeding, the amount of blood plasma in the vascular system is restored much faster than the amount of its formative elements. A decrease in the volume of fluid in the vascular system leads to a sharp drop in blood pressure, disruption of blood supply to the brain, heart and other organs. Slow bleeding, which causes the loss of a significant amount of blood, is not as dangerous as rapid (even smaller in volume) blood loss.

A gradual decrease in the number of erythrocytes four times less than normal (that is, the loss of 3/4 of all erythrocytes) does not directly lead to death. But a rapid loss of 1/3–1/2 of the amount of blood causes death.

The human body can tolerate the loss of only 0.5 liters of blood without general complications. Loss of 1 liter of blood is already dangerous, and more than 1 liter is life-threatening. If more than 2 liters of blood have been lost, life can be saved only with an urgent transfusion of blood and blood substitutes. Therefore, any bleeding should be stopped immediately, despite other injuries or traumatic conditions. Compensation for blood loss depends on the amount of blood lost and the time of its outflow [2].

Moreover, the following main compensatory mechanisms begin to act:

- contraction of small arteries and veins and mobilization of blood from blood depots,
- which is combined with tachycardia and acceleration of blood flow;
- rapid influx of fluid from tissues into the vessels;
- acceleration of breathing.

The latter mechanism causes an increase in pulmonary ventilation and absorption of oxygen by blood hemoglobin in the lungs, which to some extent contributes to the compensation of oxygen starvation. The causes of bleeding can be: violation of the integrity or permeability of the vessel wall, changes in blood pressure, changes in the chemical composition of blood (reduced ability to clot), injuries, etc. Traumatic damage to blood vessels can be the result of domestic, agricultural, industrial, street injuries. Vessels are especially often damaged during hostilities. Violation of the integrity of the vessel wall can be a consequence not only of traumatic injury, but also of its destruction by pathological processes – such as, for example, malignant tumors, chronic inflammatory processes that lead to the disintegration and erosion of the vessel wall. Vessels are also injured during surgical interventions. Therefore, one of the conditions that ensure the favorable results of the operation is the doctor's ability to prevent blood loss.

Bleeding can be caused by increased blood pressure, especially when it occurs suddenly (in case of compression of the chest wall, strong coughing, convulsions, etc.). Under such conditions, hemorrhage can occur in the conjunctival membrane of the eye, mucous membranes of internal organs, etc.

Bleeding is especially common in people with hypertension. In such patients, the vessels are pathologically changed by sclerosis, and therefore, they are destroyed much faster. The most dangerous are ruptures of brain vessels and meninges, which are accompanied by intracerebral bleeding. Bleeding can also occur in case of increased venous pressure in a patient with varicose veins.

Diseases such as hemophilia, cholemia, smallpox, scarlet fever, phosphorus poisoning, gasoline and uremia cause a change in the composition of the blood, which can also cause bleeding.

Hemophilia is a congenital disease characterized by insufficient production of enzymes necessary for blood clotting. Such patients are prone to bleeding. Capillary bleeding in them can appear arbitrarily and periodically, but in the case of injury to the vessels, it will be long-lasting and significant.

Cholemia occurs in case of liver diseases, which are accompanied by jaundice, with a sharp decrease in the ability of blood to clot. Such patients have postoperative bleeding (subcutaneous, nasal, intestinal). This type of bleeding is associated with changes in the permeability of the vessel wall.

Depending on the nature of the vessel damage, bleeding can be of the following types: arterial, venous, capillary and mixed (parenchymal) [12].

Fig. 1. Types of external bleeding

Arterial bleeding is the most dangerous due to the significant pressure in these vessels (there is a rapid loss of a significant volume of blood). The latter has a bright red color (from oversaturation with oxygen); blood flow – fountain-like or pulsating. If the damaged vessel has no collaterals, blood will flow only from its central end, if they are present – from two.

Venous bleeding involves the continuous flow of dark-colored blood. In the case of high venous pressure, such bleeding will be particularly strong. Venous blood flows from the peripheral end of the damaged vessel. Blood can flow from the central venous end in the absence of valves in the veins, their insufficiency, atony of the vessel wall or influx into the central segment of the blood vessel from other parts of the body (through anastomoses). Bleeding from the vein synchronous with the pulse is observed under conditions of pathological connection of the vein with the artery. In the case of bleeding from veins located close to the heart, during inhalation due to the vacuum action of the chest, bleeding decreases, and during exhalation – increases.

Capillary bleeding is defined as the release of blood over the entire surface of the damaged tissue as a result of shallow skin cuts, bruises, damage to small vessels. Capillary blood has a light red color and flows out in uniform drops.

Mixed (parenchymal) bleeding is extremely dangerous. It is most often observed during damage to internal organs that do not have a cavity (liver, lungs, kidneys, spleen). It is like mixed bleeding from arteries, veins, capillaries. Blood flows from the entire surface of the organ wound. Stopping such bleeding requires immediate surgical intervention.

Depending on the place of bleeding, bleeding is divided into external (through the wound) and internal (in the tissue of an organ or cavity). External bleeding is often accompanied by internal bleeding.

Such bleeding is considered external, in which blood flows into the external environment through wounds or natural openings (for example, uterine or from the end sections of the intestines). Such bleeding can be detected quite easily.

The clinical picture during external bleeding depends on the overall severity of the damage and the caliber and nature of the mechanics of the vessel damage.

Internal bleeding, the symptoms of which may be hidden, never occurs as the main pathology. They are caused either by the main disease, injury, or a number of accompanying circumstances [4].

Causes of internal bleeding can be:

- open and closed injuries of the abdomen, which can damage internal organs (small intestine, spleen, liver);
- ruptured ovary or pelvic cyst;
- traumatic injuries to the lower back;
- intestinal and stomach ulcers;
- varicose veins of the stomach or esophagus;
- dissection of the aorta (in case of an aneurysm);
- malignant tumors of the stomach, intestines in the stage of decay;
- damage to the esophagus.

Depending on the cavity into which the blood flows, hemorrhages can be of the following types:

- hemoperitoneum (bleeding into the abdominal cavity);
- hemothorax (bleeding into the chest cavity);
- hemarthrosis (bleeding into the joint cavity).

In case of uniform blood impregnation of tissues, a bruise occurs. If the blood concentrates in the tissues, in particular forming a cavity filled with blood, this type of hemorrhage is called a hematoma.

The main signs of internal bleeding are:

- occurrence of a bruise at the site of injury;
- soft tissues above the injury site are sensitive to pain, swollen, hard to the touch (for example, a "hard stomach" in case of internal bleeding in the abdominal cavity);
- accelerated weak pulse;
- rapid breathing;
- pale, cool to the touch skin;
- nausea, vomiting;
- thirst;
- bleeding from natural openings of the body (mouth, nose, rectum, blood in urine, etc.).

Internal bleeding can be caused by anemia and symptoms associated with compression of organs (lungs, brain, heart). Acute anemia is accompanied by signs of collapse and anemia. In the most difficult

cases, drowsiness, convulsions, loss of consciousness, involuntary discharge of urine and feces are observed. If internal bleeding lasts for several days (chronic), it can cause a change in skin color, fainting of the victim during a sudden change in body position.

Bleeding can be primary (resulting from a violation of the integrity of blood vessels) and secondary (occurring after a certain time after receiving an injury). Secondary bleeding can be early or late. Bleeding that occurs a second time within the first two days is called early secondary; late – from the third day to several weeks after the injury. Secondary bleeding occurs mostly in the case of gunshot injuries and the development of infections in the wound.

The most common causes of secondary bleeding are:

- insufficient stopping of bleeding during surgical treatment of the wound (poorly or incorrectly tied knots, slipping of ligatures);
- increased blood pressure;
- frequent bandages, bedsores, the presence of bones and metal that damage the vessel;
- changes in the chemical composition of the blood, increased enzymatic processes, vitamin deficiency, decreased blood clotting ability;
- septic condition of the victim (anaerobic infection);
- purulent melting of blood clots, disintegration tumors.

Acute circulatory failure and oxygen starvation primarily cause changes in the functional state of the central nervous system, which regulates the body's vital activities. The faster the blood is lost, the more dangerous the bleeding is. The heart and blood vessels cannot quickly adapt to the decrease in blood mass, as a result of which blood pressure drops and collapse develops [5].

Blood pressure of 70–80/115–140 mm Hg is considered normal. Art. (in adults), 60–65/90–110 mm Hg. Art. (in teenagers) and 40–50/65–80 mm Hg. Art. (in newborns). If the pressure indicator in an adult is below 100 mm Hg. Art., to ensure normal metabolism, compensatory mechanisms begin to act – strengthening and acceleration of cardiac activity, breathing, contraction of blood vessels, etc. Thanks to this, the

pressure is usually compensated up to 80 mm Hg. Art. Its significant drop causes significant disorders of the body's activity, which become irreversible and lead to death. Therefore, the maximum blood pressure level is 80 mm Hg. Art. called critical.

Bleeding also involves another danger that does not directly depend on blood loss, but is closely related to it. Thus, in the case of injuries to large veins, air can enter the vessel and cause an air embolism. Air entering the vein leads to stretching of the wall of the right side of the heart, insufficiency of the tricuspid valve, and paralysis of cardiac activity.

2. Ways to stop bleeding. Pre-medical assistance in case of external and internal bleeding

Bleeding can stop on its own in case of damage to small vessels with a small diameter of their lumen and capillaries. Under these conditions, the stop occurs due to the formation of a thrombus, which closes the opening in the vessel. Hemostasis (stoppage of bleeding) can be temporary or permanent. Temporary, or preliminary, stopping of bleeding has the character of emergency care. This help can be provided directly by the victim or by any non-medical worker. Under all conditions, a police officer must act quickly and carefully. His task is to stop the bleeding as quickly and easily as possible without moving the victim excessively. When approaching the victim, the policeman should pay attention to the possible presence of critical bleeding from the limbs or neck.

The following signs may indicate the presence of critical (massive) bleeding:

- blood pulsating and/or rapidly flowing from the wound;
- a blood stain on clothes that spreads quickly;
- a pool of blood around the victim;
- limb amputation;
- open bone fractures.

In the presence of any of these signs, the wound site should be clamped urgently.

There are the following methods of preliminary stopping of external bleeding:

elevated position of the limb (elevation). It should be done so that the injury site is located higher than the level of the heart, which helps to stop bleeding or reduce its intensity. This method must be used in case of injury to the limb (if there is no fracture) in combination with other methods specified below;

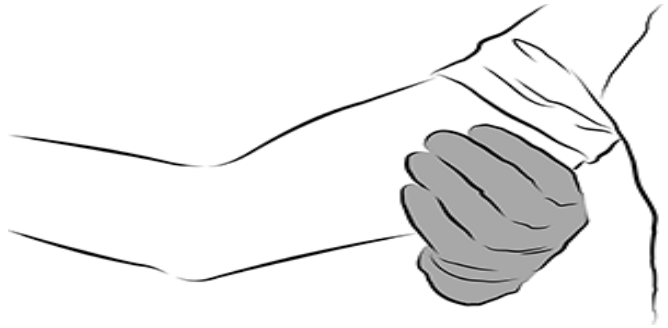


Fig. 2. Stopping bleeding by lifting the limb

maximum flexion of the limb in the joint, which is used to temporarily stop bleeding. The method consists in bending the limb as much as possible in the joint above the wound (in this way, the main vessel is compressed), then the limb is fixed in this position with a bandage, tape or other material at hand. In the bend of the joint, a roller made of a bandage or other material is preliminarily placed (you can use a rolled up sleeve or trouser leg). This method of stopping bleeding should be used in case of injury to the popliteal, femoral and brachial arteries. In this way, the limb is bent in the knee, hip, elbow, and shoulder joints;

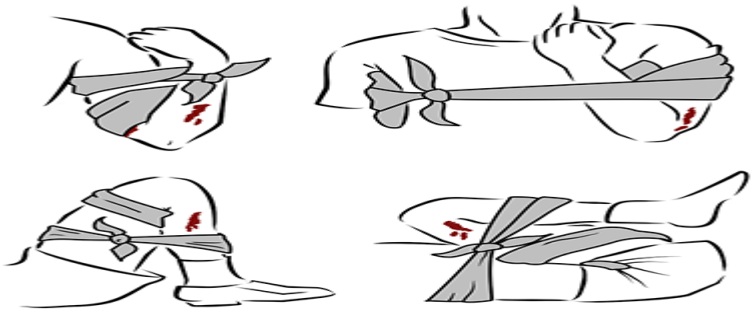


Fig. 3. Stopping of bleeding by the method of maximum bending of the limbs

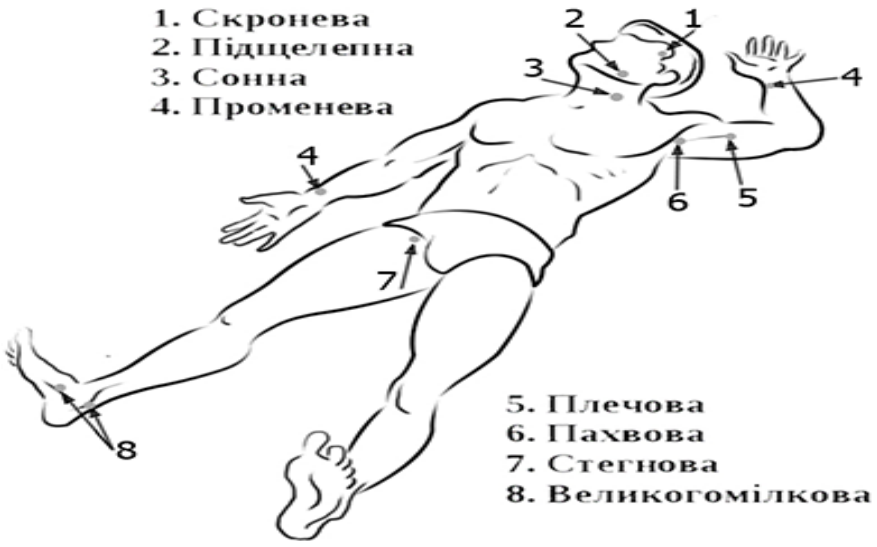


Fig. 4. Places of compression of large arteries

pressing the vessel to the bone. The artery is pressed to the bone in places anatomically convenient for this manipulation – where it passes close to the bone and is available for pressing. Knowing the places where it is necessary to clamp the relevant artery, you can quickly stop the arterial bleeding and save time to apply a more reliable method of hemostasis. Thus, in case of damage to the carotid artery or its branches, it can be pressed on the inner edge of the sternoclavicular-mammary muscle to the transverse processes of the cervical vertebrae at the level of the sixth cervical vertebra. The abdominal aorta can be pressed with a fist to the vertebral column, the axillary artery – to the head of the humerus on the front border of the axillary fossa with the arm retracted, the subclavian artery – to the first rib in the supraclavicular area outside the beginning of the sternoclavicular-mammary muscle; femoral – to the horizontal branch of the pubic bone under the axillary ligament in the middle of it; brachial artery – to the humerus on the inner side of the biceps;

compression of the vessel in the wound, in which the damaged vessel is compressed by denser surrounding tissues by pressing directly into the wound. This manipulation is performed after applying napkins, a bandage or a clean handkerchief to the wound, pressing them with the

palm of the hand. This method cannot be used in the case of an open fracture and in the presence of a foreign object in the wound;

Fig. 5. Compression of a vessel

applying a compressive bandage, which increases tissue pressure and compresses the cavity of the damaged vessel. Most often, this method is used after the bleeding has been stopped by any other method. A compressive bandage is applied with the help of a bandage, napkins and an object that presses. The dressing material is tightly fixed on the wound with a bandage or a scarf. If the bandage quickly becomes wet from blood, it cannot be changed. It is only allowed to bandage from above, increasing its pressure. With the help of a compression bandage, you can stop almost any bleeding;

applying the Israeli bandage is carried out with the same purpose and according to the same principles as the compression bandage. It allows you to apply the bandage with one hand and does not require additional compression elements, elastic bandage, fixator, or pins to fix the end of the bandage;

application of the harness (twisting). This method is used in extreme cases, if bleeding cannot be stopped by other means (for example, in case of traumatic amputation) [14].

Fig. 6. Application of the Israeli bandage

Applying a tourniquet is not as simple and safe a method of stopping bleeding as it may seem at first glance. An excessively tight rubber tourniquet can compress the radial nerve and cause its permanent paresis (with impaired function of the hand and fingers). Nerve damage is more likely when the tourniquet was placed in the middle third of the shoulder and in the popliteal fossa area. Very strong pain often occurs at the place of application of the tourniquet, as a result of which the victims try to relieve it on their own. Also, one should not forget about a sufficiently high risk of necrosis of tissues located below the application of the harness. That is why the tourniquet is allowed to be applied only in case of extreme need, when there is a real threat to the victim's life due to significant blood loss.

Inside of the limb: the end of the harness is grasped with one hand, and its middle part is grasped with the other so that one hand is above and the other is below the damaged limb. The tourniquet is stretched (the first round is important to stretch as much as possible), wrapped around the limb and tightened until the bleeding from the wound stops and the pulse on the periphery of the limb disappears. The next round is applied with less, and the last ones with minimal tension. All circular tours are placed next to each other, leaving no gaps between them (to avoid compression of the skin) [8].

Fig. 7. Applying the Esmarch tourniquet

The time of application of the tourniquet (date, hours and minutes) is recorded on the victim's forehead with a marker (blood) so that the medical worker can see it.

Under the conditions of a properly applied tourniquet (twist), the limb becomes pale, the pulse on it is not determined, and the bleeding stops. If the tourniquet was applied too weakly, the injured limb begins to turn blue (this means that only the veins were squeezed), and the bleeding increases.

The use of a turnstile necessarily requires compliance with the following rules:

- stop bleeding without excessive compression of tissues;
- always attach a note with the exact time of its application to the turnstile;
- only medical personnel can remove the tourniquet (tourniquet).

To apply the tourniquet, pass the limb through the harness's Velcro loop or wrap the Velcro around the limb and pass the end through the buckle. Pull the free end (red/white) of the harness tape through the entire buckle (as on a regular belt). If there is a wound on the hand, pull the free end (red/white) of the harness tape through the nearest half-ring of the buckle. Place the tourniquet as high as possible on the injured limb. Pull the harness tape tightly around the limb and secure it as tightly as possible [7]. Tighten the free end of the velcro tape and securely stick it to the velcro (if the harness placed on the hand). If the tourniquet is applied to the leg, you should pass the tape through both buckle holes

and stick it to the velcro of the rest of the tourniquet (this will prevent the tourniquet from unraveling when twisting). The twist should be rotated until the bleeding stops. Next, you need to fasten the turnbuckle in the fastener.

The officer must ensure that there is no distal pulse. If a pulse is still present, another tourniquet should be applied above (proximal) the first tourniquet. It is necessary to tighten it and again check the presence of a pulse.

In addition to the tourniquet, you can use an improvised tourniquet. Handy tools are used to apply an improvised twist harness: strips of fabric, straps from bags, handkerchiefs, etc., and short sticks, metal rods, pieces of thick wire are used to make a turnbuckle. It is not recommended to use electric and telephone cables, various wires, thin laces and ropes to make an improvised harness, because they excessively squeeze and injure the vascular-nerve bundles of the limbs (dry hands).

From the material used as a tourniquet, a knot is made in such a way that a twist can be inserted between the surface of the limb and the knot and several turns of twisting can be made with it (until the bleeding stops). To prevent unwinding, the twist is fixed by attaching to the limb. It is impossible to twist this tool too tightly, so as not to injure soft tissues [7].

Fig. 8. Turnstiles of SAT and Sich **Fig. 9. Improvised harness**

After applying the tourniquet, the wound is closed with a bandage. To prevent slipping of the tourniquet and the occurrence of repeated bleeding, the limb is immobilized. In addition, the limb with the applied tourniquet should be warmed (as well as the victim itself).

Wounded people with a tourniquet or twist need special care. The tourniquet should be clearly visible and should not be covered by bandages or clothing. In the cold season, when blankets (jackets) are used to warm the victim, to comply with this rule, tags should be used – scraps of bandage or white cloth soaked in red paint (blood).

Internal bleeding occurs as a result of a penetrating wound, closed damage to the organs of body cavities (rupture of internal organs without damage to the skin due to a strong blow, fall, compression), diseases of the liver, stomach, intestines, lungs, heart, etc. The danger lies in the concealment of bleeding, the impossibility of determining its volume and intensity. In this case, the amount of blood circulating in the body decreases sharply, the patient complains of acute pain, dizziness, general weakness, flickering in the eyes. The victim has a weak pulse, is unconscious, his skin is pale.

In case of suspicion of bleeding into the chest cavity (signs of which are increased shortness of breath, pale skin, expectoration of foam with blood), it is necessary to put the victim in a semi-sitting position, put a cold compress on his chest, and in no case allow him to eat or drink. If bleeding into the abdominal cavity is suspected (abdominal pain appears after injuries in this area and shock intensifies), the victim should be placed on his back, a cold compress should be applied to the abdomen, and food or liquid should not be given.

At the same time, it should be remembered that in case of suspicion of internal bleeding, it is necessary to immediately call for emergency medical assistance or transport the victim to the hospital independently.

Injuries accompanied by bleeding inside the tissues are accompanied by hematomas. In this case, the limb must be immobilized, and a cold compress should be applied to the injured part of the body [3].

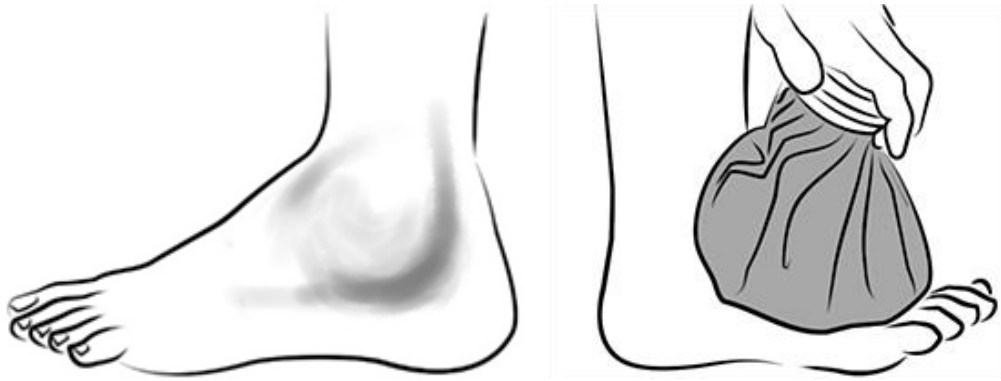


Fig. 10. First aid in case of injuries with hematomas

In order to stop nosebleeds, it is necessary to provide the victim with air access, unbutton the collar of the shirt, sit down with the head slightly tilted forward, and apply a cold compress (for example, a handkerchief soaked in cold water) to the nose and bridge of the nose.

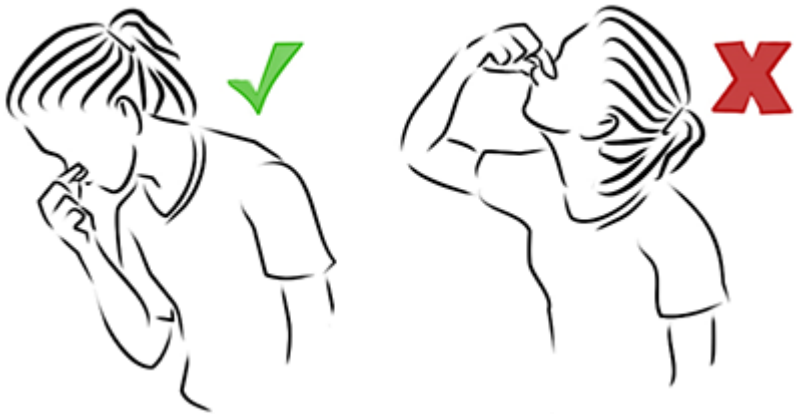


Fig. 11. Stopping nosebleeds

The victim should press both halves of the nose to the nasal membrane for 10–15 minutes and breathe through the mouth, carefully spitting out the blood that gets to him, without changing the position of the head. During these manipulations, you cannot move, talk, cough, or sneeze. Help will be more effective if cold compresses are applied to the back of the head and chest in the area of the victim's heart.

Control questions

1. *What types of bleeding do you know?*
2. *What is meant by temporary stoppage of bleeding?*
3. *Point out the typical places and rules for finger pressure of arteries on the human body.*
4. *Indicate the requirements for harness application.*
5. *What is included in the individual dressing package? Its purpose.*
6. *The order of measures for providing emergency aid in case of massive blood loss.*

Situational tasks

Situation 1.

At school, during a physical education lesson, a teenager tripped and fell. There was severe bleeding from the nose.

Answer the question:

1) what is emergency care for nosebleeds?

2) what are the methods of providing emergency care for nosebleeds?

Situation 2.

During a fight between young people with the use of a cold weapon (knife), one of the participants in the fight was stabbed in the upper third of the shoulder. A fountain of red blood began to flow from the wound.

Answer the question:

1) name the type of bleeding;

2) in what order should emergency aid be provided?

TRAUMAS, THEIR TYPES, AND COMPLICATIONS. FIRST PREMEDICAL CARE FOR INJURIES OF SOFT AND HARD TISSUES. TRAUMATIC SHOCK

Lecture plan

1. The concept of injuries and their classification.

2. Mechanical injury. First aid in case of traumatic shock.

3. Types of bone injuries. The concept of fractures, their signs and classification. Pre-medical help in case of fractures of different localization.

4. Provision of first aid in case of injury to the head, chest or abdomen.

1. The concept of injuries and their classification

One of the most important sections of medical science is traumatology (Greek trauma – wound, logos – doctrine) – the doctrine of injuries.

Physical injury, or trauma, is a violation of the anatomical integrity and/or physiological function of cells, organs, and systems that occur as a result of environmental factors (mechanical, chemical, biological, and mental). Due to the number and variety of injuries, they are classified depending on the active factors, properties, consequences, etc. According to the nature of environmental factors, all damages are divided into physical, chemical, biological and mental.

1. Injuries caused by physical factors include:

- mechanical trauma caused by blunt, sharp objects, tools, firearms, as well as all types of mechanical asphyxiation;
- thermal injury from exposure to high and low temperatures;
- electrical injury received as a result of atmospheric and technical electricity;
- radiation injury from the action of ionizing radiation;
- barometric trauma from sudden changes in atmospheric pressure.

2. Damages caused by chemical factors include chemical burns and poisoning.

3. Damages that are the result of the influence of biological factors (causing agents of infections, bacterial toxins) under the conditions of their introduction by artificial means, as well as the forcible deprivation of food and water, resulting in ill health or death.

4. Damages that are the result of mental factors (fear, fright, strong excitement).

The local response to trauma depends on many factors, including the nature and characteristics of the source of trauma. The local manifestations of the injury are mostly pain, swelling, and an increase in temperature at the site of the injury [9].

The general reaction of the body to the impact of the source of injury mostly depends on individual characteristics and severity of the injury. The more complicated the injury, the more pronounced are the general symptoms and signs of complications, which include an increase in temperature, disturbances in metabolic processes, and disturbances in the activity of the cardiovascular and nervous systems. Severe injuries are often accompanied by complications, such as traumatic shock, dysfunction of internal organs, and massive blood loss.

Depending on the number of influencing factors, injuries can be simple or combined. A simple injury occurs as a result of the action of a single factor. Combined trauma is the result of the action of several factors in a short period of time. Given the nature of injuries, the following injuries are distinguished: single or isolated (one organ is damaged); multiple (a series of injuries of the same type of limbs, trunk, head, for example, fractures of two or more bone segments) and combined (several body organs are damaged, for example, a fracture of the femur and a brain injury in a victim of a car accident).

Depending on the degree of severity, injuries are divided into light (friction, blows, sprains), medium (dislocations, fractures), severe (brain contusion, vertebral column damage, open hip fracture).

According to the place of injury, injuries are divided into industrial and non-industrial. Industrial injuries can be industrial or agricultural.

Non-industrial injuries include transport, domestic, sports, military, etc. Depending on the type of activity of the victim, injuries are divided into professional and non-professional.

Damage, depending on the place of application of force, is divided into direct and indirect. Direct injuries are defined as injury to tissues at the point of application of force (blow with a blunt object, cut of soft tissues with a sharp object, etc.). In the case of indirect trauma, destruction of the tissue structure of the human body occurs at a distance from the impact (for example, during a fall from a height to the lower limbs, a fracture of the pelvis, vertebrae, and base of the skull may occur). A number of medical measures and physiological acts can also be accompanied by trauma (birth trauma and various surgical interventions).

Depending on the properties of injuries, they are divided into anatomical (wounds, sores, bruises, bone fractures, damage to internal organs, division of the body into parts) and functional (pain, shock, concussion of the brain, heart).

Injuries are combined and multiple. When determining the severity of an injury, it is necessary to take into account its mechanism of formation, anatomical and physiological features of the damaged organs, their anatomical structure, pathological and physiological state, as well as the type of environmental factor.

The scale of influence of a mechanical force depends on the direction and angle of its action, as well as on the speed and duration of the influence of the factor. The area and depth of the injury, the occurrence of complications depend on the individual protection of the body.

Depending on the consequences, injuries can be fatal or non-fatal. Fatal injuries lead to the death of a person, and non-fatal injuries are divided into severe, moderate and light injuries (in accordance with Articles 121, 122, 126 of the Criminal Code of Ukraine) [11].

Types of traumatism: combat, household, street, sports, etc.

Types of soft tissue damage: bruises, wounds, tears and sprains of ligaments and tendons, burns, frostbite. Types of bone and joint injuries:

fractures, dislocations and sub-dislocations. More than 60% of these types of injuries account for damage to the bones of the limbs. Bone fractures of the upper limb occur twice as often as those of the lower limb.

Injuries caused by blunt hard objects are most often observed in medical practice due to the variety of such objects (stick, hammer, ax butt, log, clod of earth, piece of iron, etc.), in connection with which they can be used at any time for protection or for attack in everyday life.

There are four types of mechanism of action of blunt objects: impact, compression, stretching, friction.

A blow is an impulse that occurs as a result of a short-term impact of a blunt object on the human body at a right or close to right angle. Depending on the force of the impact, bruises, cuts, wounds, bone fractures, and ruptures of internal organs may occur. If the blow is struck with considerable force, there is a shock to the body or its parts (brain, heart), ruptures of internal organs, hemorrhages in its cavities, etc.

Compression occurs when the force of action of blunt objects is directed towards each other during injury. Compression can cause deformation of a part of the body (for example, the head when a wheel of a truck rolls over it), damage to internal organs, bones.

In the case of stretching, the force of objects that injure the human body is directed in opposite directions. As a result, cracks, tears in the skin, lacerations, detachment of parts of the body and limbs occur.

Friction is the result of a body sliding over an object or at an angle to it. In such cases, caustic, shallow wounds appear. In the case of long-term dragging of the body, areas of abrasion or "sawing" of the skin and soft tissues, even to the bones, may form.

Mechanical asphyxia is an acute oxygen starvation and rapid accumulation of carbon dioxide in the body, which occurs as a result of an external mechanical obstacle to the entry of air into the respiratory tract (hanging, drowning, squeezing in a crowd, etc.).

2. Mechanical injury. First aid in case of traumatic shock

Various wounds are the result of mechanical injuries.

A wound is an injury characterized by a violation of the integrity of the skin, mucous membranes, and sometimes tissues located deeper, accompanied by pain, bleeding, and gaping.

Classification of wounds:

1. Depending on the formation mechanism:

- cut – inflicted by the sliding movement of a thin, sharp object (the width of the wound is greater than its depth);
- puncture wounds – the result of the action of an object with a small cross-section (the depth of the wound is greater than its width);
- stab-cut – inflicted by sharp objects with cutting edges and a sharp point;
- torn – occur as a result of tissue overstretching;
- bitten – inflicted by the teeth of an animal or a person (but not necessarily as a result of a bite);
- chopped – caused by a heavy, sharp object;
- crushed – defined by crushing and tearing of tissues;
- scored – formed as a result of an impact with a blunt flat object;
- scalped – wounds with complete or almost complete separation of the skin flap from the adjacent tissues;
- operative (surgical) – formed during a surgical operation;
- poisoned – wounds containing poison that entered the wound as a result of an animal (insect) bite or human activity;
- combined – formed as a result of a combination of different types of action of factors (torn-bitten, stabbed-cut, etc.) [11].

2. According to the degree of contamination, the wounds can be:

- clean;
- conditionally clean;
- conditionally infected;
- infected (purulent wounds).

Bruised, crushed, torn, patchy, and bitten wounds with characteristic properties caused by the mechanism of action of the traumatic object can occur from the action of blunt hard objects. A blunt or crushed wound is inflicted with a large kinetic energy by a blunt object of a significant plane. It is characterized by extensive destruction of body tissues, bleeding and painful shock [8].

A laceration is the result of an impact with a sharp object with considerable force. It is characterized by significant tissue damage, bleeding and pain syndrome.

A bite wound is caused by the teeth of a person, an animal or the jaws of a large insect. Has a tooth mark, is always infected and may show signs of decay.

Sharp objects cause cut, chopped, punctured and stab-cut wounds.

A cut wound is inflicted with a cutting object. This wound is usually spindle-shaped, it has a smooth edge and sharp ends; its length is greater than its depth. The cut wound bleeds profusely and is characterized by pronounced moderate pain.

A stab wound is inflicted with a prickly object with a sharp tip. It is characterized by minor skin damage, but the wound channel sometimes exceeds the length of the blade of a prickly object. Moreover, internal organs may be damaged (internal bleeding occurs).

A cut wound is inflicted with an ax or a weapon. Depending on the weight of the tool, force and angle of impact, these injuries are quite significant (with bone fractures and painful shock).

Gunshot wounds are caused by firearms (bullets, shrapnel, shot) and can be of the following types:

- spherical;
- fragmentary (fragmentary);
- arrow-shaped;
- ball (fractional);
- secondary-fragmentary (when the bullet hits the bones);
- mines and explosives.

It consists of a ball channel, inlet, and sometimes outlet holes. If the weapon damaged only the soft tissues of the body, this wound is

considered non-penetrating, and if it reached the body cavities, it is considered penetrating.

In case of damage to several parts of the body, there may be multiple and combined injuries.

According to the depth of wounds, they are divided into: superficial wounds and those that penetrate into the cavity of the skull, chest and abdominal cavity – penetrating.

Wounds can be complicated:

- traumatic shock;
- damage to important blood vessels and nerve trunks;
- necrosis (death of tissues).

The technique of providing aid in the presence of a wound requires compliance with the following rules:

- cover small cuts and sores with a bactericidal patch;
- do not remove foreign objects or dirt from the wound, because in this way you can damage the vessels and cause additional bleeding (the object should be fixed in the wound and a bandage should be applied, which will keep it more or less immobile);
- to bandage the wound, use a dressing bag, bandage or other material, fixing it with a handkerchief or adhesive tape;
- if internal organs, brain or tendons are visible in the wound, it is forbidden to exercise them. A bandage should be carefully applied to the wound, having additionally covered it with a sterile material (if available) [15].

If the area of the wound is more than 1–2 cm2, you should contact a surgeon as soon as possible to resolve the issue of suturing the wound. Sutures speed up the healing process, reduce the likelihood of infection, and prevent the formation of rough (keloid) scars.

Shock is a severe general condition of the body, caused by the actions of a strong irritant and characterized by acute blood circulation insufficiency and disturbances of vital functions. It occurs in case of severe injuries with critical bleeding, burns and/or a combination of other injuries. This leads to a decrease in the volume of blood circulating in the body, which is why the supply of oxygen to vital organs is

reduced. Shock is the result of a discrepancy between the need for oxygen and the volume of its supply to the tissue.

Signs of shock are as follows: pale, cold and moist skin, weakness, restlessness, dry mouth, thirst, weak rapid pulse, frequent breathing, confusion, fainting.

During the development of shock symptoms, two phases are distinguished: excitation and inhibition. During the excitement phase, consciousness remains under conditions of motor and speech excitement, redness of the skin of the face and mucous membranes, frequent breathing. Pulse and blood pressure remain unchanged. This phase lasts for several minutes and quickly transitions into the braking phase. The latter is accompanied by unconsciousness, but complete indifference to what is happening around. The skin becomes pale and cold, covered with spots and sticky sweat, the face may have a grayish or bluish tint. The pulse becomes weak, accelerated, breathing is frequent and shallow, the pupils are dilated. In addition, body temperature and blood pressure decrease, vomiting may occur. Eventually fainting occurs.

Types of shock:

- cardiogenic – is a consequence of myocardial infarction, arrhythmias, heart valve diseases;
- hypovolemic – occurs as a result of bleeding, burns, dehydration of the body;
- redistributive – is a consequence of anaphylaxis, sepsis or neurogenic origin (spinal);
- obstructive (extracardiac) – occurs as a result of pneumothorax, cardiac tamponade, etc.

Cardiogenic shock has the following clinical signs: cold sweat, tachycardia (rapid heartbeat), thread-like (weak) pulse, hypotension (lower blood pressure), dyspnea (reduced breathing rate), chest pain The first aid algorithm is as follows:

- provide the victim with absolute rest and provide him with an anti-shock position (lying with his legs raised at an angle of 30°);

- warm the victim by covering him with outer clothing (thermal blanket);
- use an oxygen mask (if available);
- constantly supervise the victim and monitor his vital functions;
- transport the victim to the nearest medical facility as soon as possible.

Hypovolemic shock is indicated by the following symptoms: pale skin, cold sweat, slowing of capillary filling time (more than 2 s), gradual decrease in blood pressure, tachycardia, threadlike pulse, strong thirst. First aid involves the following sequence of actions:

- stop bleeding;
- use an oxygen mask (if available);
- do not let the victim drink (you can only wet the lips);
- constantly supervise the victim and monitor his vital functions;
- warm the victim by covering him with outer clothing (thermal blanket);
- immediately hospitalize the victim (in an anti-shock position) to the nearest medical facility.

Redistributive shock has the following clinical signs: tachycardia, thread-like pulse, hypotension, reddening of the skin, feeling of heat, tinnitus, anxiety. The first aid algorithm is as follows:

- isolate the victim from the dangerous environment and stop his contact with the allergen;
- use an oxygen mask (if available);
- constantly supervise the victim and monitor his vital functions;
- transport the victim to the nearest medical facility as soon as possible.

Clinical signs of obstructive shock: dyspnea, cyanosis (blueing) of the lips and limbs, hypotension, tachycardia, threadlike pulse, capillary filling time exceeds 2 seconds, pale skin and cold sweat. First aid includes the following actions:

- ensure the victim is completely calm and give him a semi-sitting position;

- apply an oxygen mask (if available);
- warm the victim by covering him with outer clothing (thermal blanket);
- constantly supervise the victim and monitor his vital functions;
- hospitalize the victim immediately.

The sequence of actions during the provision of first aid to victims in case of suspected shock:

1) make sure there is no danger;

2) carry out an examination of the victim, determine the presence of consciousness, breathing;

3) call an emergency (ambulance) medical team;

4) if the victim is not breathing, begin cardiopulmonary resuscitation;

5) eliminate the cause of the shock state (stop bleeding, immobilize the fracture, etc.);

6) provide the victim with an anti-shock position:

- put it horizontally;
- put a box, a roll of clothes, etc. under the feet of the victim in such a way that the feet are at the level of his chin;
- put clothes or a pillow under the victim's head;
- cover the victim with a thermal blanket;

7) carry out constant supervision of the victim until the arrival of emergency medical assistance;

8) in case of deterioration of the victim's condition, call the emergency medical dispatcher again before the arrival of the emergency (ambulance) medical team [6].

3. Types of bone injuries. The concept of fractures, their signs and classification. Pre-medical assistance in case of fractures of various localization

Dislocation is a displacement of the normal anatomical relationships in the joint between the supporting bone and the joint bed, which is quite often accompanied by a rupture or stretching of the ligaments. The rules

for providing first aid in the case of dislocations are the same as in the case of fractures.

A fracture is a violation of the integrity of a bone, in which its fragments can remain on the bone (fracture without displacement) or move, forming a curvature of the limbs (fracture with displacement).

Types of fractures:

- closed (the integrity of the skin is not violated) and open (there is a wound at the fracture site);
- without displacement and with displacement of bone fragments;
- single (there are only two fragments) and multiple (there are more than two fragments or several bones are damaged);
- complete (the entire thickness of the bone is damaged) and incomplete (a crack has formed);
- combined (with burns, radiation damage, etc.).

Fig. 12. Types of bone fractures

Signs of a fracture are: sharp pain, swelling, bruising, impaired mobility of the injured part of the body. In the case of a fracture with displacement, there is a curvature of the limb, pathological mobility outside the joint, sometimes a crunching sound at the site of the injury. An open fracture is indicated by the fact that bone fragments are visible in the wound. A sign of skull fractures is bleeding from the nose and ears. In the case of rib fractures, the victim experiences sharp pain

during breathing. This type of injury is characterized by crepitation (crunching sound) at the fracture site.

In no case should you specifically change the position of the limb to reveal these signs. Minimal displacement of bone fragments associated with rough manipulation can lead to increased pain, damage to nerves, vessels and soft tissues.

When determining the presence of a fracture, two types of signs are taken into account – probable and reliable.

Probable signs of a fracture:

- pain (spontaneous or in a certain area), which increases during palpation, movements or load;
- functional limitation of the affected limb;
- deformation and swelling of the suspected fracture site;
- hematomas;
- local increase in temperature.

Reliable signs of a fracture:

- pathological bone mobility;
- bone crepitation (crunch);
- impaired mobility of the distal segment of the bone;
- obvious violation of bone integrity (during inspection and palpation).

If a fracture is suspected, pre-medical care should be provided in the same amount as in the case of an obvious fracture. The specified actions involve urgent immobilization of the injured part of the body.

Temporary immobilization of fractures involves the avoidance of complications and the prevention of further displacement of fragments, injury to the surrounding tissues. This is a technique that provides the injured part of the body with a calm position.

Immobilization is a mandatory component of emergency first aid in the event of an injury. The main goal of immobilization is to achieve bone immobility at the fracture site. In addition to fractures, transport immobilization is also carried out in case of damage to joints, main vessels and nerve trunks, significant damage to soft tissues. Any

immobilization bandages consist of three parts – a tire, a pad and a fixing bandage [1].

General principles of immobilization:

- carry it out as soon as possible;
- there is usually no need to remove clothes and shoes from the victim;
- in case of damage to any segment of the limb, immobilize two adjacent joints, and in case of injuries to the femur and hip joint – all the main joints of the lower limb (hip, knee and ankle);
- before applying the splint, model it on the intact limb in accordance with the shape and position of the main segments of the damaged limb;
- put a tire on top of a cotton-gauze pad or clothes;
- fix the fixing means on the damaged limb with the help of a bandage, scarf, rope, belt, etc.;
- fasten the tire securely, fixing the fracture area well;
- in the absence of immobilization means, the broken arm can be fixed by tying it to the body, the broken leg to the healthy leg (with the help of a scarf, clothes, bandage);
- in the case of an open fracture, first treat the wound and apply a bandage, and only then immobilize the limb.
- immobilization should be carried out mostly by two police officers: one will hold the limb in a stationary position, and the other will fix the bone fragments.

Before and after fixation of the limb, it is necessary to check its capillary filling. This is done by pressing on the nail bed of the finger of the affected limb and setting the speed of restoration of the color of its color: less than or equal to 2 s – the norm; more than 2 seconds – violation of blood circulation in the limb.

Standard immobilization splints are used for immobilization, including metal ladder and mesh splints, plywood splints, special splints (for example, Dieterichs splint), and improvised means (plywood, thin boards, newspapers, blankets, etc.).

In the case of fractures of the bones of the hand and fingers, a dense lump of cotton wool wrapped in gauze or a bandage is placed in the victim's palm (to give the fingers a half-bent position). A bandage is placed on the forearm, hand and fingers, and the hand is suspended on a scarf. The splint should be applied tightly, but not too tight, so as not to disturb blood circulation in the hand. If the fingers turn blue and become cold to the touch or the victim feels tingling in the tips of the fingers, the bandage should be loosened.

In case of a fracture of the forearm bones, the hand should be carefully fixed in the elbow joint at a right angle, with the palm turned to the chest, and in this position fixed with a splint (from the base of the fingers to the upper third of the shoulder) in order to immobilize the elbow and carpal joints. If there is no material that can be applied as a splint, you can use a handkerchief or fix the injured arm with the help of the turned up hem of the jacket.

In case of injury of the shoulder joint and fracture of the humerus, the splint is modeled in such a way that it passes from the healthy scapula through the upper arm of the injured limb to the shoulder and forearm to the fingers. If it is not possible to make a splint for immobilization, the hand is hung on a scarf or bandaged to the body.

A clavicle fracture mostly occurs with displacement (indirect injury). The position used for its temporary immobilization involves pulling back and raising the shoulder up, bending the arm at the elbow joint and bandaging it to the body.

Fig. 13. Immobilization of the clavicle

In case of fracture of the bones of the foot and damage to the ankle joint, the splint is modeled in such a way that it can be placed on the sole of the foot and the back surface of the lower leg up to its upper third. An indentation is made for the heel, in which cotton wool is inserted to avoid excessive pressure on the calcaneus. The foot should be fixed at a right angle to the lower leg. Under the conditions of using improvised means, they are placed on the outside and inside of the leg, fixing the foot well. A cotton pad is placed in the places where the handy tool fits the bony protrusions. A modern vacuum (pneumatic) tire can be used to fix the ankle joint.

Immobilization in the case of tibial bone fractures involves fixation of the knee and ankle joints. The splint is applied from the foot to the upper third of the thigh. In the absence of immobilization means, the injured limb can be bandaged to a healthy one or immobilized with the help of a roller or an improvised pillow [14].

Injuries to the knee are immobilized with the help of a pillow or blanket, which is placed under the knee and fixed to the leg with bandages. You can also bandage the affected limb to a healthy one with an elastic or ordinary bandage. The victim should be placed on a hard, flat surface.

In case of fractures of the hip bones, special Dietrichs splints can be used. This tire consists of two wooden sliding slats of different lengths, a plywood sole and a twist stick. Its outer bar is longer than the inner one. Using a tire, the bars are pushed to the required length (so that the inner rests against the crotch, and the outer rests against the axilla, and so that they are 3 cm longer than the limb). A plywood sole is bandaged to the foot. The lower ends of both slats are inserted into the wire brackets of the sole, after which the lower end of the outer slat is inserted into the groove of the transverse slat connected to the inner one. Slats of the tire are bandaged to the limb and trunk. The limb is pulled out with a twist.

A modern model used for the same purpose is the pendrick immobilization splint.

Fig. 14. Immobilization of the femur

Fractures of the pelvic bones are often accompanied by heavy bleeding from the large blood vessels located in this area. These injuries occur as a result of significant mechanical trauma (for example, in the case of a car accident in which the victim was not wearing a seat belt, his knee turns on the dashboard and the impact is transmitted along the thigh to the pelvic bones).

Fig. 15. Formation mechanism and position for immobilization in case of fracture of pelvic bones

If a fracture of the pelvic bones is suspected, the victim should remain more or less motionless: it is forbidden to turn him over or re-examine him. The victim should be placed on a hard, flat surface (plywood, boards) and fixed in the "frog" position while lying on his back. To do this, the legs should be bent at the knees and spread to the sides, and a roller should be placed under the knees. In addition to using the above-mentioned means, immobilization of the pelvis is carried out with the help of a pelvic belt or a vacuum mattress.

Fig. 16. Application of the pelvic girdle

The key rule of fixing the pelvis with improvised means is to use a fixing element with a width of more than 10 cm to strengthen the pelvic ring. It is important to constantly consider the possibility of bone fragments being pressed in, so all manipulations should be carried out with the utmost care.

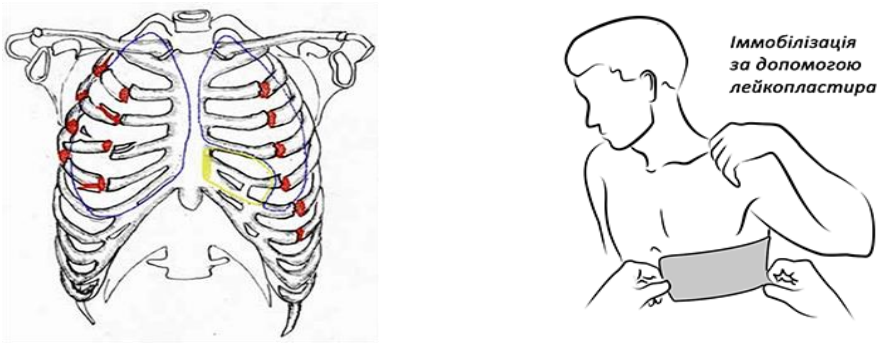


Fig. 17. Places of rib fractures and their immobilization

The fracture site is immobilized with an adhesive plaster or other material. Such a victim is transported in a sitting position.

Spinal trauma indicates the presence of damage to the spine and spinal cord. It ranks third after tubular bone injuries, craniocerebral injury and accounts for about 2–3% of all injuries. In the case of a spinal fracture, every third victim has signs of spinal cord damage. The main cause of this injury is traffic accidents (60% of all injuries in this category). Its signs are pain that can appear below the injured place, loss of sensitivity in the limbs or a tingling sensation in them [7].

In the case of a fracture in the cervical spine, there is severe pain and the inability to move the head. If the spinal cord is damaged, partial or complete paralysis of the arms and legs occurs.

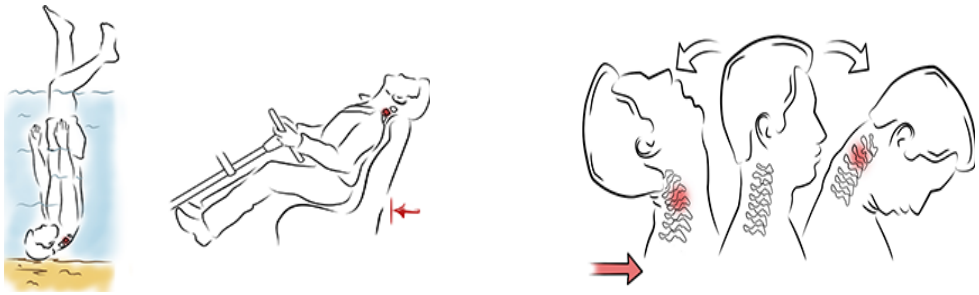


Fig. 18. Mechanism of formation of neck fractures

Manipulation of the victim under such circumstances can be carried out only in the case of a real threat to a person's life, an urgent need for cardiopulmonary resuscitation, and if it is impossible to call rescue services. Before that, it is necessary to fix the cervical part of the spine – put on a special regular or self-made cotton-gauze neck collar (when using the latter, the neck is wrapped in cotton wool and carefully bandaged).

To transport such a victim, it is necessary to transfer him to a shield or a wide board and fix his head with a bandage for the lower jaw or cover it with plastic bags with sand, earth, water. These manipulations are performed using a Spine boar board, Galo hard stretchers, a vacuum mattress or a regular hard shield.

It is necessary to raise the victim in a horizontal position, fixing the body with hands in the area of the neck, back, pelvis, lower leg and foot (on the count of "one, two, three"). Actions should be performed carefully, smoothly and synchronously.

It is also necessary to carefully provide assistance to a victim with fractures in other parts of the spine. A slight displacement of the vertebrae can lead to injury to the spinal cord, even to its rupture, which is why it is strictly forbidden to sit the victim or put him on his feet.

If the victim is conscious, his clothing should be loosened and the spine fixed in a neutral position, trying to minimize the victim's movements.

The unconscious victim should be placed on his side, keeping his neck and spine in a neutral position (to prevent them from twisting or arching) and ensure that his airway is open.

If the tactical situation does not make it possible to lift the victim, it is necessary to place a wide board under him.

4. Provision of first aid in case of injury to the head, chest or abdomen

A head injury is always a serious and dangerous condition that can be complicated by brain damage (concussion, concussion). It is usually easy to recognize an open brain injury (it is visible from the outside). It is somewhat more difficult to establish a closed skull injury.

Most often, under such circumstances, the police officer must assess the victim's state of consciousness. Disorders of consciousness are classified as follows.

Clear consciousness is complete preservation of consciousness, adequate perception of oneself and the environment. Disorders of consciousness can be of certain types, which we will consider in more detail.

Stunning is a partial suppression of consciousness, as a result of which the ability to pay attention decreases. The ability to speak is preserved, but the patient's responses are slow and monosyllabic. After hearing the question, he opens his eyes, executes commands correctly, but somewhat slowly. There is increased fatigue, lethargy, partial impoverishment of facial expressions and drowsiness. Control over the functions of the pelvic organs is maintained. The victim is not sufficiently oriented in time and space.

Sopor is marked by the following symptoms: the victim is indifferent, his eyes are closed, speech contact with him is impossible, he does not follow commands. The person does not move or performs automated reflex movements. In case of painful irritations, the victim

shows defensive hand movements. Pupillary, corneal, tendon and other reflexes are usually present. Control over the functions of the pelvic organs in the victim is impaired.

A light coma in the victim is indicated by the following symptoms: consciousness and independent movements are absent; he does not answer questions; protective reactions are adequate; corneal and tendon reflexes and pupil reaction to light are preserved, but may be reduced; respiratory and circulatory functions are not disturbed.

A moderate coma is characterized by the absence of a reaction to any external stimuli. In response to very strong painful stimuli, the victim has movements in the limbs, tonic convulsions with a tendency to generalization. Defensive motor reactions in the victim are uncoordinated, psychomotor excitement, automated gesticulation are possible. Often there is a unilateral violation of muscle tone and reflexes in the paralyzed limbs. Pupillary reflexes can be preserved, but swallowing is quite difficult. Control over the functions of the pelvic organs in the victim is impaired. There is also a violation of visceral functions (increased blood pressure, tachycardia, breathing disorders, increased body temperature, etc.).

Deep coma is the victim's lack of reactions to any stimuli. It is about the complete absence of spontaneous movements and various changes in muscle tone, narrowing of the pupils, lack of their reaction to light. There is a deep disorder of vegetative reactions, breathing disorders, a decrease in blood pressure, and a violation of the rhythm of cardiac activity [13].

The main signs indicating the presence of a brain injury can be the following:

- severe drowsiness;
- development of general weakness;
- severe headache;
- sudden fainting;
- dizziness;
- nausea and/or vomiting;
- amnesia for a long period;

- paralysis (in case of severe forms).

The reasons for calling an ambulance as quickly as possible are the following signs of a brain injury:

- lack of signs of breathing;
- confusion of consciousness;
- fainting for more than a few seconds;
- obvious disturbances of balance;
- sharp weakness in arms, legs, inability to move limbs;
- repeated, rather abundant vomiting;
- severe convulsions;
- slurred speech;
- heavy bleeding from a head wound;
- bleeding from the ears or nose;
- severe headache;
- a bruise behind the ear and the symptom of "raccoon eyes" (suspected fracture of the base of the skull);
- the presence of any variant of an open form of craniocerebral injury.

The following manifestations of craniocerebral trauma are considered to be the grounds for calling an ambulance as quickly as possible:

- complete absence of signs of breathing;
- noticeable confusion of consciousness;
- fainting (more than a few seconds);
- obvious disturbances of balance;
- sharp weakness in arms, legs, immobilization of limbs;
- repeated profuse vomiting;
- severe convulsions;
- slurred speech;
- heavy bleeding from a head wound;
- bleeding from the victim's ears or nose;
- severe headache;

- a bruise behind the ear and the symptom of "raccoon eyes" (suspected fracture of the base of the skull);
- the presence of any variant of an open form of craniocerebral injury.

Pre-medical assistance in the event of a craniocerebral injury involves the following algorithm of actions:

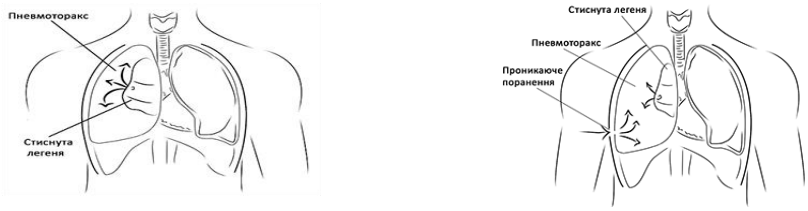
- lay the victim on his back;
- constantly monitor his condition (consciousness and breathing);
- give the unconscious victim a stable lateral position;
- apply a sterile bandage directly to the open wound (open craniocerebral injuries usually require tight covering of all its edges with sterile bandages);
- put a bandage on the head.

Even under the condition that the victim is in a fairly good state of health (as he himself believes), after providing him with pre-medical care in the case of a brain injury, it is necessary to insist on such a person's referral to a doctor.

During transportation of a victim with skull fractures, the person is placed on a stretcher with his stomach down, and a cotton-gauze circle is placed under his face. In case of damage to the jaws, a sling-like bandage is applied to the victim, and his head is turned to the side (to avoid the tongue from sinking in).

Injuries to the chest are divided into closed (bruising, crushing, fractured ribs) and open (wounds). Wounds, respectively, can be permeable (accompanied by a violation of the integrity of the wall layer of the pleura) and non-permeable (without a violation of the integrity of the pleura). Damage to the chest can be accompanied by injury to the internal organs of the chest cavity (lungs, heart, etc.).

In the case of penetrating wounds and ruptures of the lungs, pneumothorax occurs, and under the conditions of damage to the vessels of the chest wall or lungs and the occurrence of bleeding in the pleural cavity, hemothorax occurs [20].



A **B**

Fig. 19. Mechanism of formation of closed (a) a nd open (b) pneumothorax

Types of pneumothorax:

- closed (the air that has entered the pleural cavity does not connect with the atmospheric air and subsequently disappears);
- open (air fills the pleural cavity at the moment of inhalation, and leaves it at the moment of exhalation);
- valvular (air enters the pleural cavity at the moment of inhalation, but during exhalation, due to the shift of tissues in the wound and its closure, it does not go outside). In this case, a tense pneumothorax occurs, which leads to compression of the main vessels and the heart.

Signs of pneumothorax:

- sudden onset;
- shortness of breath, coughing attack;
- pallor;
- the chest is more voluminous on the affected side and does not participate in the breathing process.

In the case of an open pneumothorax, pre-medical assistance consists in applying an airtight bandage to the wound, which prevents air from entering the pleural cavity. For this, materials that do not allow air to pass through are used – cellophane, a cover of an individual dressing package, napkins well soaked with petroleum jelly, which should tightly cover the wound. This material is fixed to the victim's skin with adhesive strips on three sides (the fourth side remains open, allowing the bandage to function as a valve). The victim should be in a semi-sitting position, or lying down on the affected side.

Signs of abdominal injury:

- forced position of the victim on the back or on the side with the knees pulled to the stomach (changing this position leads to increased pain);
- restriction of respiratory movements and tension of the muscles of the anterior abdominal wall;
- constant pain in the abdomen (the intensity of pain does not depend on the severity of damage to internal organs);
- profuse vomiting;
- in the presence of internal bleeding – a decrease in blood pressure, paleness of the skin;
- in case of infectious complications (peritonitis) – abdominal distension;
- under conditions of injury to the kidneys and urinary tract – blood in the urine, urinary retention.

Penetrating abdominal injury can be with or without organ loss.

Fig. 20. Providing assistance in case of penetrating abdominal injury

Providing assistance in the event of an open injury of the abdominal cavity without loss of organs involves the following algorithm of actions:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- put a napkin on the wound (at least four layers of bandage) so that it completely covers the wound area;

- apply a tight, but not tight, circular bandage around the abdominal cavity.

The sequence of actions to provide assistance in the event of an open trauma of the abdominal cavity with loss of organs should be as follows:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- organs that have fallen out, do not exercise, seal or put pressure on them;
- it is desirable to put a sterile gauze bandage on the organs that have fallen out (at least four layers of bandage);
- put a roller (from a bandage or clothes) around the internal organs to prevent compression;
- put a tight (but not tight) circular bandage on the wound.

Providing assistance in the event of an injury to the abdominal cavity with a foreign object protruding from the wound involves the following algorithm of actions:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- do not remove a foreign object from the wound. It is strictly forbidden to do this;
- put a roller (from a bandage or clothing) around the object protruding from the wound, which will allow you to fix this object;
- carefully apply a bandage around the wound without displacing a foreign object;
- after applying the bandage, fasten it on the healthy side as far as possible from the wound [3].

The victim should be placed in a semi-sitting position or placed on his back or side with his legs half-bent and brought to his stomach. In this case, it is forbidden to drink – you can only wet your lips with

water. If internal bleeding is suspected, cold can be applied to the injury site (an ice pack wrapped in a cloth).

As a result of accidents, a part of the human body (usually limbs) can be compressed for a long time by any object of considerable weight – under the debris of destroyed buildings, in mine collapses, in the case of traffic accidents, etc. **Prolonged compression syndrome** is one of the most severe traumatic injuries to the body. It is natural that the people who are at the scene of the incident first of all try to free the victim from being crushed, not suspecting that in this way they only complicate his condition. Thus, in the squeezed parts of the body, the supply of oxygen to the tissues is disrupted, venous congestion occurs, nerve trunks are injured, and soft tissues are destroyed with subsequent formation of toxic metabolic products. After the limbs are freed from compression, substances from the damaged muscles enter the circulatory system, leading to serious consequences, the most dangerous of which is kidney failure.

Immediately after removal of compression, the general condition of most victims is satisfactory. There are complaints of pain, restriction of movement in the damaged parts of the body. During the examination of the damaged limb, attention is drawn to paleness or bluishness of the skin, deformation of tissues in the areas of greatest crushing. Vascular pulsation on the extremities is weakened. During the next few hours, swelling of the limb increases, which gradually acquires a wooden hardness. Edema spreads beyond the injured tissues. Blisters appear in places of the greatest crushing, the limb becomes cold, pulsation of blood vessels disappears, active movements are sharply limited, sensitivity decreases. The victim's general condition worsens, weakness, dizziness, and nausea appear. Crushing limbs for more than 6 hours can lead to death.

The sequence of actions during the provision of first aid to the victim in case of positional compression of soft tissues should be as follows:

- carry out an examination of the victim, establish consciousness, breathing;

- in the absence of breathing, start cardiopulmonary resuscitation.
- If the victim is conscious, the following set of actions should be performed:
- fix the cervical spine;
- find out the time of compression of the body part;
- if less than 10 minutes have passed since the moment of compression, release the compressed part of the body;
- if possible, treat wounds, immobilize the injured limb and perform other manipulations depending on the existing injuries;
- if there are signs of shock, give the victim an anti-shock position (with the legs raised) and warm him;
- if more than 10 minutes have passed since the moment of compression, wait for the emergency (ambulance) medical team to arrive;
- ensure constant supervision of the victim until the arrival of the emergency (ambulance) medical team;
- support the victim psychologically.

If the victim is unconscious, but he is breathing properly and it is not known how much time has passed since the moment of compression, it should be assumed that more than 10 minutes have passed. In the case when it is necessary to urgently evacuate the victim, but more than 10 minutes have passed since the moment of compression, a tourniquet can be applied before releasing the injured limb. The victim should be urgently transported to the hospital. Before that, it is necessary to immobilize the injured limb and take possible anti-shock measures [21].

Control questions

1. *Point out the main signs of a fracture and describe their types.*
2. *What is a dislocation? What is pre-medical assistance?*
3. *What refers to means of transport immobilization?*
4. *What types of tires do you know and the rules for fitting them.*
5. *What is transport immobilization for head, neck and spine injuries.*

6. *What is the transport immobilization for sternum and rib injuries.*
7. *What is the transport immobilization for injuries of the shoulder girdle and upper limbs.*
8. *What is the transport immobilization for pelvic and lower limb injuries.*
9. *Transportation immobilization with the help of improvised means.*

Situational tasks

Situation 1

The driver of the car after the accident (collision with another car) felt a sharp pain in the chest. Upon examination, a huge bruise is observed on the front chest wall, the victim's skin is pale and cold, breathing is accelerated and difficult. There was a single vomiting with blood.

Task: What will be your actions in this situation?

Situation 2

As a result of the collapse of the wall of the house, the victim was trapped under the rubble for several hours. His lower limbs are covered with earth and debris. He complains of weakness, nausea, headache, vomiting. The extremities are cold to the touch, purple-bluish in color, covered with blisters with transparent contents.

Task: What will be your actions in this situation?

DESMURGY. METHODS OF APPLYING BANDAGES AND IMMOBILIZING SPLINTS

Lecture plan

1. The concept of desmurgy. Basic rules for applying bandages.
2. Applying bandages to different parts of the body.

1. The concept of desmurgy. Basic rules for applying bandages

Desmurgia is a branch of medicine that studies the types of bandages, their application and methods of application.

A bandage is a tool designed to hold and fix a diseased part of the body in the position required for treatment or to support the dressing material. The bandage contains the dressing material, which is applied directly to the wound, and the outer part that holds it.

Fig. 21. Dressing material

Bandaging is the process of applying or changing a bandage. Bandages are most often applied to the wound to keep medications on the wound, to prevent contamination, and as warming compresses.

Bandages, which are used to fix the dressing material, are called fastening. They are adhesive, handkerchief and bandage.

According to their purpose, bandages are divided into compressive (applied to compress a certain part of the body, most often to stop small venous or capillary bleeding) and immobilizing (used to support, fix the damaged part of the body for transportation or treatment).

For immobilization, fixed bandages are used – tire, plaster, glue and starch. Hard bandages (plaster, splint, starch) are mainly intended for immobilization during the treatment of bone fractures. Soft (glue, handkerchief, bandage) – hold and fasten the dressing material.

Corrective bandages are used to correct the position of a part of the body (limbs, spine, etc.), and occlusive bandages are used to hermetically close cavities.

Bandages are the most common and are applied to any part of the body to support the dressing material and temporarily stop bleeding. Bandages of different widths (5–20 cm) and lengths (5–7 m) are made of gauze. Narrow bandages (5 cm wide) are used to bandage the fingers; on the head, shoulder, forearm and lower leg – of medium size (7–9 cm); for bandaging the thigh and trunk – wide bandages (16–20 cm).

In case of accidents, if there is no dressing material, you can use the material at hand (pieces of gauze, sheet, handkerchief, pieces of shirt, T-shirts, handkerchiefs, etc.). However, gauze bandages are more convenient, because they easily take the shape of the bandaged part of the body, contribute to the evaporation of secretions from the wound, and are the cheapest. The twisted part of the bandage is called the head, the free end is called the beginning. For some bandages, a bandage twisted at both ends is used [17].

Elastic tubular bandages are used to fix the dressing material in case of injuries to the head, limbs and trunk. They are made of kapron threads. Elastic tubular bandages have a mesh structure, they are put on the damaged part of the body on top of the bandage. They come in seven sizes in rolls of 5 and 20 m. Bandage No. 1 is most often used to hold the bandage on the fingers and hand in adults and on the thigh in children; No. 2 – on the hand, foot, forearm, in the area of the elbow, wrist and ankle joints in adults and on the shoulder and in the area of the knee joint in children; No. 3–4 – on the forearm, shoulder, shin and in the area of the knee joint in adults and on the head and thigh in children; No. 5–6 – on the head and thigh in adults and the chest, abdomen, pelvic region in children; No. 7 – on the chest, abdomen, pelvis, perineum in adults.

Fig. 22. Elastic tubular bandages **Fig. 16. Elastic bandage**

The individual dressing package and the Israeli bandage are used to provide self- or mutual aid at the scene of an accident. The package consists of a bandage, two cotton-gauze pads. One of the pillows is firmly attached to the bandage, the other is movable. The package is covered with shells – outer (made of polymer or rubberized fabric) and inner (consists of three layers of parchment). There is an English pin in the folds of the parchment paper. Instructions on the method of opening the package and its use are contained on the outer shell. The outer polymer or rubberized shell of the bag and elastic bandage can be used to apply an airtight bandage in case of penetrating lesions of the chest.

Adhesive bandages are used to protect the wound from the influence of the external environment and secondary infection. They are made of cleol, collodion, sticky plaster.

Plaster bandages. Strips of sticky plaster wound on coils are used to support the dressing material. Its inner surface is covered with a special adhesive solution. The dressing material is fixed with narrow strips of adhesive plaster, which are applied parallel or crosswise. The strips should be long enough to capture the dressing material and adhere tightly to the skin. The disadvantage of such bandages is irritation of the skin under the patch, wetting of the bandage as a result of seepage of its secretions from the wound. In addition, they cannot be used on hairy parts of the body. It should also be taken into account that replacing plaster bandages causes painful sensations, because small hairs of the body are pulled out [12].

Handkerchief bandages are applied using a triangular piece of fabric or a handkerchief, folded corner to corner. Its longest side is called the base, the corner opposite to the base is called the top, and the other two corners are called the ends. The handkerchief is used for immobilizing bandages in case of damage to the upper limbs. She is brought under the arm, bent at the elbow at a right angle. One of the long ends of the scarf is carried above the collarbone, and the other – in front of the forearm and further up – on the forearm of the healthy side. At the back of the neck, both ends of the handkerchief are tied so that the arm is bent at a right angle at the elbow joint and is freely held by the handkerchief. The top of the scarf is fixed in front of the elbow. If there are no bandages, a handkerchief can be successfully used to apply dressings to wounds regardless of their location.

General rules for applying bandages:

1) the victim is given a comfortable position in order to have free access to the body surface that needs to be bandaged, from all sides. The part of the body to be bandaged must be completely immobile;

2) the part of the body that is bandaged is given a functionally advantageous position, in which the muscles are maximally relaxed – the fingers of the hand are placed in a position of slight bending with the opposition of the first and fifth fingers; the forearms are bent at a right angle to the shoulder, and the shoulder is moved forward from the body; the lower limb is slightly removed and bent at the knee joint; the foot is placed at a right angle to the lower leg (if the victim is unable to keep the bandaged part of the body in the right position, then this is done by an assistant);

3) the police officer stands in front of the victim and observes his facial expression; after applying a bandage, asks if the victim does not feel discomfort;

4) to apply the bandage, take the head of the bandage in the right hand, and the end in the left; the back of the head of the bandage should be turned towards the bandage surface, and the abdomen should be turned outward (bandaging should be done with both hands: one should unfold the bandage, and the other should model the bandage);

5) the end of the bandage is fixed above or below the area of damage (but not directly on the wound) with two or three circular strokes, placed tighter than other parts of the bandage;

6) usually bandage in one direction – from left to right, from bottom to top, gradually covering the entire bandaged surface according to a certain method, depending on the shape of the bandaged area and its function; each subsequent round of the bandage should cover the previous one by 1/2 or 2/3 of its width; the bandage strip should fit evenly to the bandaged surface, without forming folds, and in the case of applying a fixing bandage – not to create compressions;

7) after applying the bandage, the end of the bandage is fixed in that c to the area where its beginning was fixed (so that the location of the node does not correspond to the localization of the pathological focus and does not cause inconvenience to the victim). For this, three methods are used: a) the cut end of the bandage is circled around the bandaged part of the body and tied with a knot (this is how the ends of the bandage are usually fixed on areas of small diameter); b) the beginning of the bandage is left uncovered until the end of applying the bandage, then the end of the bandage is brought to the beginning and tied on a knot (sometimes the end of the bandage is fixed to its adjacent rounds); c) the end of the bandage is fixed by hemming or fixing to the previous rounds with a safety pin;

8) the applied bandage must meet the following requirements: firmly hold the dressing material and not interfere with the blood supply of the injured part of the body and movements (if possible) [10].

After applying the bandage, you should definitely pay attention to the color of the skin and the presence of vascular pulsation.

2. Applying bandages to different parts of the body

A circular circular bandage is applied by fixing the end of the bandage in one of the above ways with rounds that completely or almost completely cover the previous ones. The ends of the bandage are fixed on the opposite side from the place of damage. This bandage is used to fix the dressing material on the upper and lower limbs and trunk.

Fig. 23. Circular bandage on the hand

Spiral bandage. The end of the bandage is fixed in the usual way below or above the place of damage. Bandage courses, slightly deviated from circular ones, are applied diagonally (spiral course) so that each subsequent course covers the previous one by 1/2 or 2/3 of its width.

During the application of the ascending bandage, the end of the bandage is fixed distal to the area of its damage in a spiral-like motion, rising from the bottom to the top, gradually covering the affected area, and the end of the bandage is fixed proximal to the damage. In the process of covering the bandaged surface in the opposite direction (from the center to the periphery) with the fixation of the end of the bandage in the distal area, a descending spiral bandage is formed.

Bends are made on the cone-shaped surfaces so that the bandage fits tightly and holds firmly (spiral bandage with bends). Moreover, the course of the bandage should be deflected at a greater angle than usual, tightly pressing it to the bandaged surface. With the thumb of the left hand, placed obliquely, fix the upper edge of the bandage, and with the right hand, turn the head of the bandage around the axis by 180° so that its belly turns to the bandaged surface. After that, they make a circular move, and depending on the slope of the cone-shaped surface, they repeat the turns after each move or alternate them after a certain number of circular moves. You should try to make bends on one side and on one line. A descending bandage is better supported, however, it is optimal to apply an ascending spiral bandage to the limbs, especially in case of

impaired blood and lymph circulation. This type of bandaging is also appropriate when applying a compression bandage.

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The creeping bandage is similar to the previous one in the application technique. The end of the bandage is fixed with several circular moves, and then, as a result of the spiral movement, the direction of the bandage is deflected so that each round does not touch the previous ones. Such a bandage can be both ascending and descending. The end of the bandage is fixed in the usual way. This bandage is used to fix the dressing material on the upper and lower limbs, trunk during burns, wounds that cover a significant area of the body [9].

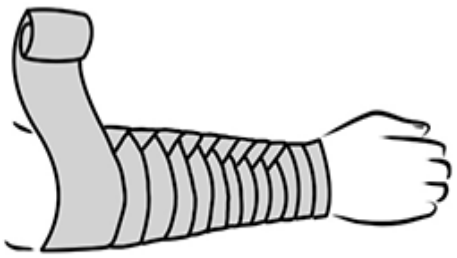

Fig. 24. Spiral bandage with folds

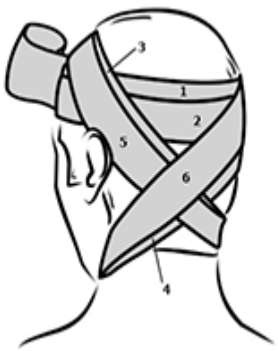

Fig. 25. Cross bandage

Cross bandage. The end of the bandage is fixed with the usual circular motions. After that, the course of the bandage is directed diagonally to another area, where it is turned and directed perpendicularly to the opposite side. Having reached the same surface, the bandage is directed diagonally, bending the previous course, and having reached the place of the first circular courses, a semicircle is made across. All further moves alternately repeat the previous ones.

A turtle-shaped bandage (descent and eastern) is applied to the knee and elbow joints. For a diverging turtle-shaped bandage, the end of the bandage is fixed on the upper third of the forearm (shin) or the lower third of the shoulder (thigh), make a circular motion through the kneecap or ulnar process, then perform similar motions above and below the previous one. Thus, repeating the figure-of-eight moves of the bandage, cover the entire joint area. The end of the bandage is fixed in the same area as the beginning.

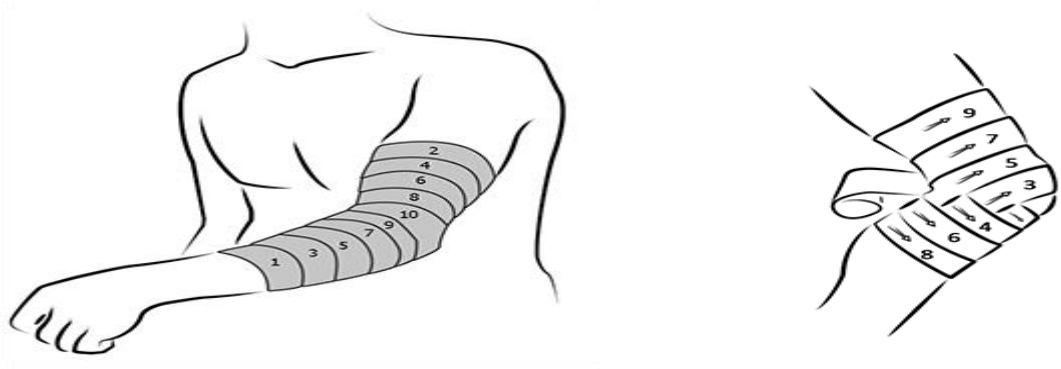

Fig. 26. Tortoiseshell eastern and diverging bandage

When applying an oriental turtle-shaped bandage, the joint is covered with strokes in the form of a figure of eight, but they go from the periphery to the center, that is, to the kneecap or ulna, where the end of the bandage is already fixed. This type of bandage does not hold so tightly, so it is rarely used in practice.

A spike-shaped bandage is applied to the shoulder area: the end of the bandage is fixed on the upper third of the shoulder, then the course of the bandage is directed along the front surface of the chest to the

inguinal fossa of the healthy side, and, turning on the back, it is led across the back parallel to the previous course. After a circular motion around the shoulder along its outer surface, the bandage is guided so that it bends over the previous motion, and again on the front surface of the chest, and then along the back to the shoulder, gradually moving up, covering the entire joint area.

A rotating bandage is placed on the head and stump of the limb. The bandage is applied in circular motions to the frontal and occipital zones of the head or the base of the stump. Bends are made in the sagittal plane and the bandage is directed obliquely so that on the lateral surface it can cover the circular course by 1/2 of its width. Having reached the opposite place of the fold, make the next fold, after which the previous fold is fixed in a circular motion and the fold is made again and, directing the bandage diagonally, cover the previous fold by 1/2 the width of the bandage [15].

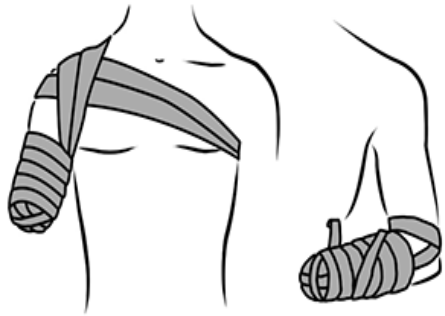

Fig. 27. Swivel bandage

Before the circular stroke, a bend is made, which is then finished with a circular securing stroke. Alternating reverse moves with circular moves, gradually cover the entire convex part of the head or stump.

Sling bandages. A piece of gauze with cut ends is called a sling. The middle part of the sling is used to cover the damaged parts of the body, its ends are crossed and tied. A sling-shaped bandage is placed on the nose, chin, lower jaw and head.

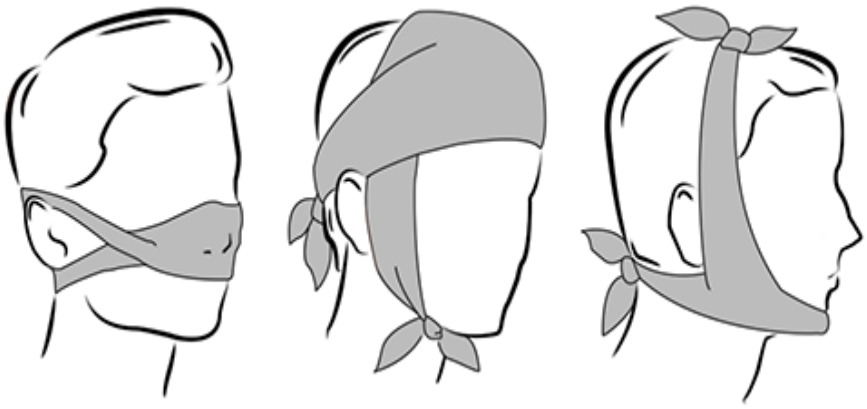

Fig. 28. Sling-shaped bandages

A T-shaped bandage is used to apply bandages on the perineum. For this, two pieces of gauze or segments of a wide bandage are sewn together in the form of the letter "t". The horizontal part of the bandage is fastened around the belt, and the vertical part is pulled through the crotch and attached to the horizontal part, having previously made a hole or incision in front for free urination.

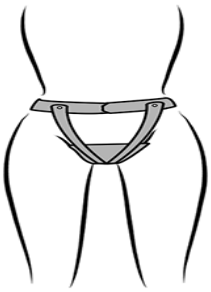

Fig. 29. Applying bandages on the perineum

A simple bandage (cap) is placed on the head, which is rotatable and covers the entire vault of the skull. First, two circular strokes are made around the head through the area of the forehead and the back of the head, then the bandage is bent from the front and back, covering the side surfaces of the head and secured with circular strokes. After that, two oblique turning strokes are repeated again and, fixing them, gradually cover the lateral surfaces of the skull vault. The bandage is finished with a circular motion of the bandage and fixed. Such a bandage is loose and slips easily, so it is rarely used.

The "Hippocratic cap" bandage is applied using a double-headed bandage or two separate bandages. To do this, one head is taken with one hand, and the second with the other, the free part of the bandage between the two heads is placed on the occipital hump. Both bandages are placed facing each other, capturing the forehead humps, and cross each other in the middle of the forehead. The head of the bandage, which is held in the right hand, is made in circular motions, all the time fixing another bandage, which is held in the left hand, and making reverse revolutions with it. Moreover, each reverse turn of the bandage should cover the previous one by 1/2 or 2/3 of its part until the bulge of the skull is completely closed. This headband holds more firmly on the head than a simple one.

When applying a "cap" bandage, a piece of bandage 60–80 cm long is used, which is placed in the middle on the crown of the head, and its ends are lowered in front of the ears to the bottom, keeping them taut. The first horizontal stroke is made around the head, then the bandage is wrapped around the bandage and led diagonally, covering the back of the head, and then – wrapped from the opposite part of the bandage and covering the forehead area. By repeating the described steps, close the entire vault of the skull. The bandage is finished in a circular motion, tying the bandage in front or attaching it to a vertical tape, the ends of which are tied under the chin.

The blindfold begins to be applied in a circular motion around the head, then the bandage is lowered from behind, placed under the right ear and then from the bottom up, covering the right eye. After that, the bandage is passed around the occipital area diagonally – from top to bottom, covering the left eye. Thus, alternating diagonal strokes of the bandage, a bandage is applied to both eyes. They fasten it in horizontal strokes around the head [15].

Bandage with a "bridle" is used in case of fractures of the lower jaw, as well as after reduction of its dislocation. To do this, apply two circular horizontal strokes around the head, then on the back of the head, the bandage is directed obliquely – to the lateral surface of the neck under the lower jaw, covering it, and turn the bandage of the front part of

the left ear to the crown. A small number of vertical strokes are applied, after which the bandage is led from the chin to the opposite side of the neck obliquely to the back of the head, and the previous ones are fixed in a circular motion. Vertical and horizontal moves are repeated again.

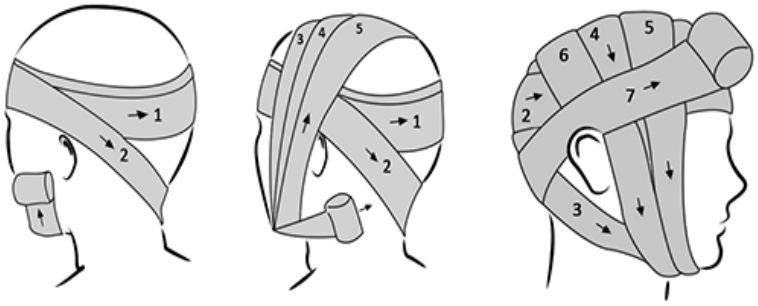

Fig. 30. Applying a "bridle" bandage on the head

Putting a bandage on the neck. If there is a need to bandage the upper part of the neck, a cross-shaped bandage of the back of the head is used, alternating its moves with circular ones. During bandaging of the lower part or the entire neck, circular movements are made, supplementing them with movements of the eight-shaped bandage of the back of the head or the cross-shaped bandage of the back, passing through the armpit area. The bandage should not squeeze the neck. The eight-shaped bandage is placed on the back of the head and the back of the neck in the following sequence: make two moves back to the left diagonally down, go around the neck from the right and front and go from the back of the neck to the head. Next, the bandage is passed over the left ear diagonally down to the nape of the neck, then around the neck and diagonally up to the head. Alternately perform the previous and last course of the bandage. The bandage is fixed around the head.

To apply a spiral bandage on the chest, take a piece of bandage about 1.5–2.0 m long, place its middle on one of the upper arms, and fasten the end of the bandage in a circular motion in the lower parts of the chest. The ascending spiral bandage is used to cover the entire chest to the armpits, the end is secured in a circular motion, and the ends of

the bandage, which hang freely, are thrown over the second upper arm and tied with a knot.

Fig. 31. Applying bandages on the chest (spiral and cross-shaped), mammary glands

Cross-shaped or eight-shaped bandage. There are two types of such bandages: with horizontal and vertical placement of bandage courses. A bandage with a horizontal placement of the bandage moves is applied as follows: after fixing the end of the bandage in a circular motion on the chest and taking the bandage out of the armpit, direct it obliquely to one of the supraclavicular areas, and then, moving it to the back, lead it horizontally to the opposite supraclavicular area with with an oblique stroke on the chest, crossing the previous one. All moves are repeated several times in turn, after which the end of the bandage is fixed in a circular motion. Such a bandage can be applied to the back. Moreover, horizontal moves are placed on the chest in front, and cross-shaped moves are placed behind.

When applying a cross-shaped bandage on the chest with vertical strokes, after passing the oblique course of the bandage through the upper arm, the course of the bandage on the back is not made horizontally, but vertically (from the supraclavicular zone to the axillary zone of the same side), after which these moves are repeated, as well as during the application of the previous bandage. In this way, you can put a bandage on your back – vertical strokes are placed on the front surface of the chest.

To apply a bandage on the mammary glands, the end of the bandage is fixed on the chest below the base of the mammary glands. Starting

from the axillary line of the injured side, the course of the bandage is directed obliquely upwards, simultaneously as if lifting the mammary gland and turning it outwards. Next, the bandage is passed through the supraclavicular area of the opposite side, then – obliquely along the back, turning into the damaged armpit, then – obliquely along the outer surface of the chest, covering and lifting the mammary gland to the middle and up. The steps of the bandage are applied alternately, gradually rising up and covering the entire mammary gland with a bandage [7].

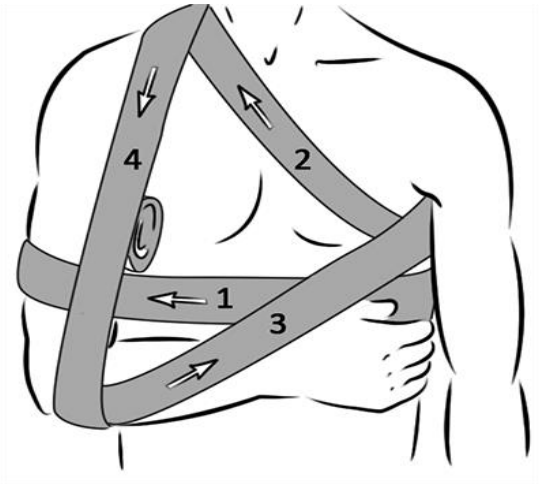

Fig. 32. Applying a Deso bandage

Deso's bandage is used to immobilize the clavicle and the bones of the shoulder girdle. A 5-cm-thick pad of soft fabric is placed in the armpit of the injured side. The shoulder is bandaged to the body in circular motions that pass through the lower third of the shoulder, and the forearm is bent at the elbow joint at a right angle. After that, from the axillary fossa of the healthy side, the bandage is directed to the upper arm of the patient, then it goes back through the upper arm and descends down the back surface of the shoulder, covering the elbow. Then the bandage is placed diagonally across the back on the injured upper arm, turned down in front of the shoulder, covering the elbow from below. After a transverse move through the back, all moves are repeated.

A hermetic bandage is applied in case of penetrating wounds of the chest to eliminate an open pneumothorax and transfer it to a closed one. A rubberized wrap from an individual dressing bag, a polyethylene film or a hermetic patch, i.e. a fabric that does not allow air to pass through, is applied to the wound.

Fig. 33. Applying an airtight bandage in case of pneumothorax

Putting a bandage on the thumb and other fingers of the upper limb. A spike-shaped bandage is applied to the zone of the metacarpal-phalangeal joint and the main phalanx. The end of the bandage is fixed in a circular motion in the area of the radiocarpal joint. After that, the course of the bandage is directed obliquely, encircling the metacarpal-phalangeal joint from the radial side, passes to the surface of the palm, covering it obliquely and bending the previous course from the radial side, returns to the zone of the radiocarpal joint, makes a circular course. After that, the steps of the bandage are repeated, gradually rising up. Sometimes this bandage is supplemented with several circular or spiral courses in the area of the main phalanx and interphalangeal joint. Covering the tip of the finger, after several rounds of the spike-shaped bandage, a reverse course is made, fixing it in an ascending spiral, and then a circular course is made and the bandage is fixed in a circular course in the area of the radiocarpal joint.

Applying a spiral bandage on the fingers. This bandage is sometimes called a "knight's glove" (if all fingers are covered). The end of the bandage is fixed in the radiocarpal joint area. At the first stage, the thumb is covered according to the method described above. Then, in the

area of the radiocarpal joint, make a semicircular motion of the bandage, passing from the palm to the back side, the bandage is led diagonally to the base of the index finger, covering it from the elbow side, make a motion to the top and cover it with a reverse stroke. Then the entire finger is covered with a spiral bandage and, encircling its base from the radial side, they go obliquely through the back of the hand to the ulnar edge of the radiocarpal joint, make a semicircle on the palm side of this joint, and after moving back, direct the bandage to the base of the next finger. These rotations cover all the fingers of the brush. The end of the bandage is fixed in the radiocarpal joint area [3].

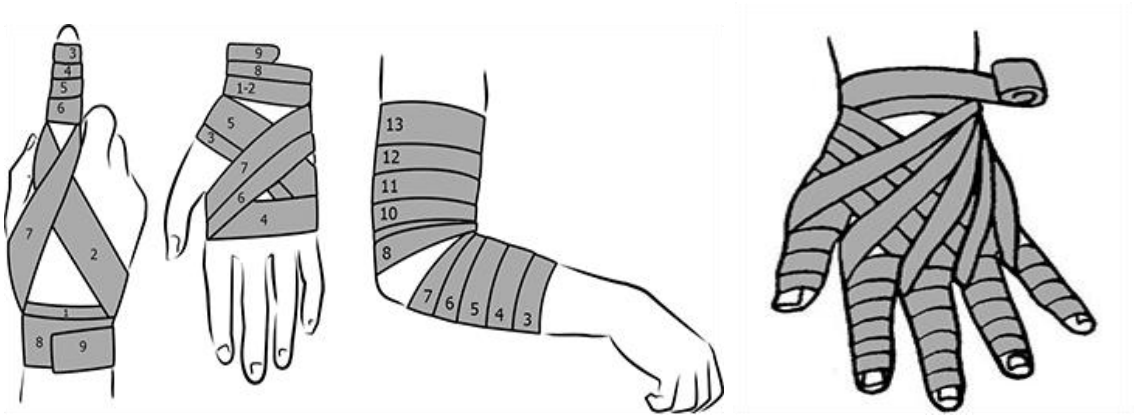

Fig. 34. Putting bandages on the hand and fingers

A cross-shaped bandage is placed on the back of the hand, a spiral bandage on the forearm and shoulder, and a spike-shaped bandage on the elbow joint.

A spike-shaped bandage is applied to the hip joint area, a spiral bandage is applied to the thigh and lower leg, and a turtle-shaped bandage is applied to the knee joint.

A cross-shaped bandage is placed on the foot starting from a circular motion above the ankle, going down diagonally through the back of the foot. Then make a move around the foot, rising with the back of the foot up to the shin, bend the second move. These moves cover the entire back of the foot.

Putting a bandage on the heel. This area can be closed with a turtle-shaped bandage. Since it is weak, its steps are fixed with an oblique step

that goes from the Achilles tendon to the plantar surface, crossing the entire sole perpendicularly. Then the bandage, having brought the feet to the back, is led obliquely. Bypassing the ankle joint, this move is repeated, but on the other side. Alternating moves through the heel hump with fixing moves, completely cover the heel. Bandages are applied to the foot and fingers using the same technique as on the hand.

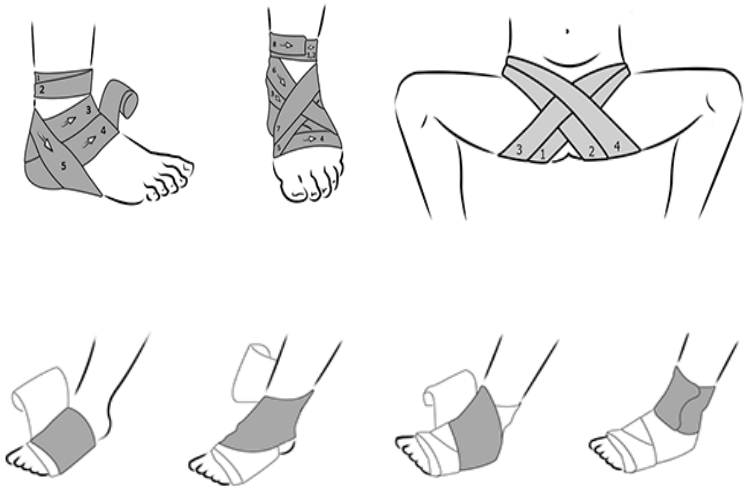

Fig. 35. Applying bandages on the foot, ankle joint and groin

Applying a spiral bandage to the big toe. The bandage is fixed around the ankle joint, after which it is directed with the back surface of the foot to the first toe, the finger is closed in circular motions, the bandage is turned with the back surface of the foot to the ankle joint, where it is fixed.

Application of a rotating bandage on the foot. If it is necessary to close the entire foot with the fingers, then, after making a circular motion near the bones, the bandage is continued in longitudinal motions from the heel to the big toe of the lateral surface of the foot. These strokes are applied without tension. After making several such moves, the bandage is wrapped around the foot and fixed above the bones.

A spike-shaped bandage is applied to the armpit area in a circular motion around the abdomen. The bandage is passed along the front surface of the abdomen through the left groin, then the first passes of the spike-shaped bandage are made, after passing behind the left inguinal

fossa, the first turns of the spike-shaped bandage of the right groin are applied. After going around the back, the bandage is brought to the left groin, turned around and brought back to the right groin. The bandage is fixed in circular motions around the abdomen.

A bandage for the entire lower limb consists of a combination of the bandages described above.

Control questions

1. What is desmurgia?
2. What is a bandage??
3. How are bandages classified?
4. Basic rules for applying bandages.
5. Rules for applying adhesive bandages.

Situational tasks

Situation 1.

During a physical education lesson, the girl fell and hit her elbow hard on a sports equipment. There were closed wounds, there is no bleeding.

Question. What will be your first aid response? What type of bandage should be applied?

Situation 2.

A 46-year-old man felt a sharp pain in the cervical spine while jumping into a shallow pond upside down. He got out of the water on his own. During the examination, attention is drawn to the forced position – the head is brought to the right upper arm. Pronounced palpable tenderness of the spinous processes of the cervical vertebrae. The patient feels slight numbness in the upper limbs.

Question. What injury should be suspected in the victim? How to carry out transport immobilization in this case?

FIRST AID FOR WOUNDS

Lecture plan

1. Characteristics and types of wounds by the nature ofinjured tissues: incised, splitter, hacks, closed, broken, chopped, bitten, and bullet ones.

2. Asepsis and antisepsis. Classification of antiseptic means.

3. Tetanus. Passive and active immunization against tetanus.

4. Anaerobic and aerobic infections.

5. First aid for injured abdomen andorgans of the abdominal cavity.

1. Characteristics and types of wounds by the nature ofinjured tissues: incised, splitter, hacks, closed, broken, chopped, bitten, and bullet ones

A wound is an injury characterized by a violation of the integrity of the skin, mucous membranes, and sometimes tissues located deeper, accompanied by pain, bleeding, and gaping.

Classification of wounds:

1. Depending on the formation mechanism:

- cut – inflicted by the sliding movement of a thin, sharp object (the width of the wound is greater than its depth);
- puncture wounds – the result of the action of an object with a small cross-section (the depth of the wound is greater than its width);
- stab-cut – inflicted by sharp objects with cutting edges and a sharp point;
- torn – occur as a result of tissue overstretching;
- bitten – inflicted by the teeth of an animal or a person (but not necessarily as a result of a bite);
- chopped – caused by a heavy, sharp object;
- crushed – defined by crushing and tearing of tissues;
- scored – formed as a result of an impact with a blunt flat object;

- scalped – wounds with complete or almost complete separation of the skin flap from the adjacent tissues;
- operative (surgical) – formed during a surgical operation;
- poisoned – wounds containing poison that entered the wound as a result of an animal (insect) bite or human activity;
- combined – formed as a result of a combination of different types of action of factors (torn-bitten, stabbed-cut, etc.).

2. According to the degree of contamination, the wounds can be:

- clean;
- conditionally clean;
- conditionally infected;
- infected (purulent wounds).

Bruised, crushed, torn, patchy, and bitten wounds with characteristic properties caused by the mechanism of action of the traumatic object can occur from the action of blunt hard objects [14].

A blunt or crushed wound is inflicted with a large kinetic energy by a blunt object of a large plane. It is characterized by extensive destruction of body tissues, bleeding and painful shock.

A laceration is the result of an impact with a sharp object with considerable force. It is characterized by significant tissue damage, bleeding and pain syndrome.

A bite wound is caused by the teeth of a person, an animal or the jaws of a large insect. Has a tooth mark, is always infected and may show signs of decay.

Sharp objects cause cut, chopped, punctured and stab-cut wounds.

A cut wound is inflicted with a cutting object. This wound is usually spindle-shaped, it has a smooth edge and sharp ends; its length is greater than its depth. The cut wound bleeds profusely and is characterized by pronounced moderate pain.

A stab wound is inflicted with a prickly object with a sharp tip. It is characterized by minor skin damage, but the wound channel sometimes exceeds the length of the blade of a prickly object. Moreover, internal organs may be damaged (internal bleeding occurs).

A cut wound is inflicted with an ax or a weapon. Depending on the weight of the tool, force and angle of impact, these injuries are quite significant (with bone fractures and painful shock).

Gunshot wounds are caused by firearms (bullets, shrapnel, shot) and can be of the following types:

- spherical;
- fragmentary (fragmentary);
- arrow-shaped;
- ball (fractional);
- secondary-fragmentary (when the bullet hits the bones);
- mines and explosives.

It consists of a ball channel, inlet, and sometimes outlet holes. If the weapon damaged only the soft tissues of the body, this wound is considered non-penetrating, and if it reached the body cavities, it is considered penetrating.

In case of damage to several parts of the body, there may be multiple and combined injuries.

According to the depth of wounds, they are divided into: superficial wounds and those that penetrate into the cavity of the skull, chest and abdominal cavity – penetrating.

Wounds can be complicated:

- traumatic shock;
- damage to important blood vessels and nerve trunks;
- necrosis (death of tissues).

The technique of providing aid in the presence of a wound requires compliance with the following rules:

- cover small cuts and sores with a bactericidal patch;
- do not remove foreign objects or dirt from the wound, because in this way you can damage the vessels and cause additional bleeding (the object should be fixed in the wound and a bandage should be applied, which will keep it more or less immobile);
- to bandage the wound, use a dressing bag, bandage or other material, fixing it with a handkerchief or adhesive tape;

- if internal organs, brain or tendons are visible in the wound, it is forbidden to exercise them. A bandage should be carefully applied to the wound, having additionally covered it with a sterile material (if available).

If the area of the wound is more than 1–2 cm2, you should contact a surgeon as soon as possible to resolve the issue of suturing the wound. Sutures speed up the healing process, reduce the likelihood of infection, and prevent the formation of rough (keloid) scars.

2. Asepsis and antisepsis. Classification of antiseptic means

Antiseptic is a complex of means and measures aimed at destroying potential pathogens in the wound (or in the tissues / cavities surrounding it), in the pathological focusm or in the body as a whole.

Disinfection (decontamination) – destruction on (c) objects of the external environment pathogenic and opportunistic microorganisms. In the narrower sense, in the context of surgery, the term "disinfection" is understood the use of chemical methods (means) to destroy microorganisms and their spores, and this applies only to inanimate objects, and in relation to people – the term is used "antisepsis".

Microorganisms that remained alive after the action of antiseptics do not cause diseases due to insufficient infectious dose and reduced virulence and further neutralized by factors of the immune system. A disinfecting agent is an active substance that ensures the destruction of pathogenic and opportunistic microorganisms on (c) objects of the external environment (Table 4).

Decontamination – reduction of the number of microorganisms on external objects environment. Sterilization is a process that ensures the death of vegetative and spore forms pathogenic and non-pathogenic microorganisms.

Groups of disinfectants:

1) Disinfectants – used for sterilization (bactericidal effect; inherent toxic or irritating action);

2) Antiseptics – used for local disinfection (bactericidal or bacteriostatic effect) of the skin, mucous membranes, serous membranes.

The following types of antiseptics are distinguished:

1) mechanical

2) physical

3) chemical

4) biological (action on a microorganism; action on a macroorganism)

5) mixed (combined) [16].

Mechanical antiseptics include: opening of abscesses; toilet (washing) wounds; necrectomy; primary / secondary surgical treatment of wounds; the use of drains (passive).

Drainage is a medical method that consists in removing the liquid contents to the outside (tissue breakdown products and microbial toxins) from wounds, abscesses, and contents hollow organs, natural or pathological cavities through use rubber graduates or tubes (rubber, polyvinyl chloride, silicone) or others materials.

According to the methods of ensuring the outflow of pathological contents, drainage is divided into: passive (flow under the influence of gravity); active (creating negative pressure in the drainage system); flow-washing (active injection of the solution into the double-lumen tube) and osmodraining (use of gauze, including with hypertonic solutions).

Physical antiseptics include: active drainage (flushing and vacuum drainage); use of hypertonic solutions; hygroscopic materials; sorbents; UFO and laser irradiation; ultrasonic cavitation of wounds; drying the wound.

Chemical antiseptics include the use of chemicals with various mechanisms of antimicrobial action (destructive, oxidative, membrane-damaging, antimetabolic and antienzymatic, etc.).

The main groups of chemical antiseptics:

- haloids (halide-containing)
- oxidizing agents

- dyes
- aldehyde-containing
- surfactants (detergents)
- guanide-containing
- alcoholic
- containing phenol
- acids / bases
- salts of heavy metals.

There is also a group of chemotherapeutic agents used for destruction of pathogens in the pathological focus of the patient and are administered parenterally or enterally (nitrofurans, fluoroquinolones, sulfonamide drugs, nitroimidazole derivatives, quinoxaline, etc.).

Chemotherapy (and chemoprophylaxis) are measures aimed at direct neutralization or suppression of pathogens in the internal environment of the macroorganism for the purpose of treatment (or prevention) of infectious or parasitic diseases [2].

Biological antiseptics include:

- effects on microorganisms: antibiotics, enzymes, serums, antitoxins, gammaglobulins, hyperimmune plasma, serums, bacteriophages;
- effects on the macroorganism: stimulators of specific immunity (vaccines, toxoids) and of non-specific immunity – immunocorrectors and immunostimulators, interferons, thymalin, vitamins, pyrimidine bases (methyluracil).

Complications of antibacterial therapy:

1) allergic reactions (local and systemic);

2) toxic effect on the body (nephro-/hepatotoxic, cardiotoxic, ototoxic, hematotoxic, etc.);

3) endogenous hypovitaminosis;

4) candidamycosis of mucous membranes/organs;

5) intestinal dysbiosis;

6) antibiotic-associated colitis

7) (pseudomembranous colitis);

8) superinfection.

The basis of mixed antiseptics is the combined use of various methods of antiseptics, which is widely used in practice today.

Preparation and treatment of the hands of medical personnel is an important measure of contact prevention infection Caring for the skin of the staff's hands involves the following set of actions:

- preventive hand protection (personal hygiene, hygienic hand washing; use of rubber gloves glove);
- hygienic antiseptic (disinfection);
- surgical disinfection (surgical treatment of hands).

Preventive protection of the skin of the hands.

If it is not possible to prevent the contact of substances with the skin of the hands, it is necessary use gloves, but in practice it is still necessary frequent hand washing and their antiseptic treatment.

With:

- to clean hands, use cold (or room temperature) water and special means that do not contain soap and alkalis (water at a temperature above 35^{o}C and ordinary soap degreases the skin);
- lubricate the skin of the hands several times a day with special emulsions for prevention of microtraumatic skin injuries.

Hygienic disinfection – reduction of the number of microorganisms that are on hands after contact with the patient or is part of the normal microflora. As antiseptics, it is advisable to use modern alcohol-containing preparations (do not act allergens, are not resorbed, do not change the pH of the skin) [5].

Surgical Disinfection – Treatment of hands prior to surgery for removal/destruction transient microflora and a decrease in the number of resident microflora of the skin.

3. Tetanus. Passive and active immunization against tetanus

The cause of tetanus is infection of a cut or wound with spores of the bacterium Clostridium tetani, and in most cases the disease develops within 14 days after infection. Tetanus can be prevented by immunization with vaccines containing tetanus toxoid. At the same time,

people who have suffered the disease do not develop natural immunity, so they can be infected again.

Most reported cases of tetanus are related to childbirth and occur among newborns and mothers who have not been adequately vaccinated against tetanus.

Bacteria produce a significant amount of toxins that are distributed throughout the body by the circulatory and lymphatic systems.

Toxins affect the central nervous system (CNS), affecting part of the peripheral nervous system and the spinal cord. Tetanus toxins cause typical clinical manifestations by interfering with the release of neurotransmitters and blocking inhibitory impulses, which in turn leads to uncontrollable muscle contractions and spasms. Convulsions may appear, and the autonomic nervous system may also be disturbed.

Risk groups Almost all cases of tetanus occur among people who have never been vaccinated against tetanus. Most of the registered cases are noted among the adult population. Between 2009 and 2017, more than 60% of the 264 cases occurred in people aged 20 to 64. In addition, a quarter of these cases were in the cohort of people aged 65 years and older. The latter is a risk group for mortality from tetanus.

Diabetes, immunosuppression, and injection drug use are also risk factors for the development of tetanus. 13% of all registered cases of the disease were among people with diabetes, and 7% among people with drug addiction.

Diagnosis and clinical signs. Tetanus is a clinical syndrome, the characteristic symptoms of which are painful muscle contractions, first of all, masticatory and cervical muscles along with trunk muscles. A common initial sign of the disease in older children and adults is abdominal muscle stiffness, although sometimes the stiffness is limited to the affected area. The development of generalized convulsions, which are often caused by sensory stimuli, is noted. The incubation period lasts from 3 to 21 days, on average – about 10 days. Usually, the further the damaged area is from the central nervous system, the longer the incubation period lasts. A short incubation period is associated with a severe course of the disease, the development of complications and a

higher risk of mortality. In infants, symptoms usually appear within 4–14 days after birth, with an average of 7 days [10].

There are three clinical forms of tetanus:

- generalized;
- localized;
- cephalic (Brunner's tetanus).

Generalized form of tetanus. The generalized form of tetanus is the most common clinical form, accounting for more than 80% of cases. The most frequent and early sign is a spasm of the jaw muscles. Other signs are painful spasms of other muscle groups, for example, cervical, as well as trunk and limb muscles; in severe cases – convulsions. The generalized form of tetanus can be accompanied by the occurrence of abnormalities on the part of the nervous system, as well as various complications associated with severe spasm and prolonged hospitalization [8].

The clinical course of the generalized form depends on:

- previous immune status of a person;
- amount of toxins;
- age and general health of the patient.

It should be noted that even with modern methods of intensive therapy, the generalized form of tetanus is associated with a mortality rate of 10–20%.

Localized form of tetanus. This form occurs quite rarely and consists in spasm of the muscles of a limited area near the injured place. A localized form can turn into a generalized one.

Bruner's tetanus. The least common is the form of tetanus associated with lesions of the head and face, as well as with otitis media. The incubation period lasts only a few days. Unlike other forms of tetanus, the cephalic, or bulbar, form causes paralysis of the cranial nerves. A spasm of the jaws may also occur. Like the localized form of tetanus, cephalic can turn into generalized.

Complications of tetanus

- laryngospasm;
- hypertension;

- bone fractures;
- development of nosocomial infections;
- pulmonary embolism;
- aspiration pneumonia;
- death.

Treatment of tetanus requires urgent medical care, namely:

- hospitalization;
- immediate administration of anti-tetanus immunoglobulin;
- use of muscle relaxants;
- use of antibiotics;
- administration of tetanus toxoid.

In the absence of tetanus immunoglobulin, clinicians may use intravenous immunoglobulin. Treatment of tetanus with the use of anti-tetanus immunoglobulin. Experts recommend using 500 international units (IU) as the optimal therapeutic dose for the treatment of tetanus. Higher doses can also be used: from 3,000 to 6,000 IU administered intramuscularly. Some medical experts suggest circling the affected area with immunoglobulin, but the effectiveness of this measure remains unproven. As mentioned above, if there is no anti-tetanus immunoglobulin, it is possible to use immunoglobulins intravenously in a dosage of 200 to 400 mg/kg of body weight. However, we note that the US Food and Drug Administration (FDA) has not approved their use [6].

Treatment of affected areas as prevention of tetanus. The risk of tetanus depends, first of all, on the type and condition of the wound, as well as the immune status of the person. It is necessary to take measures to prevent tetanus. Assess the type of wound and provide appropriate care. Contaminated wounds carry an increased risk of developing tetanus. A contaminated wound is considered to be one that is contaminated with soil, excrement, or saliva (such as saliva from animal or human bites). Penetrating and puncture wounds are automatically considered contaminated. Wounds containing dead tissue (necrotic or gangrenous wounds), with signs of frostbite, crushed wounds, avulsions,

burns especially cause the proliferation of tetani. Clinicians are required to clean the wound, remove dirt/foreign material with necrotic tissue.

Assess the patient's immune status. Unvaccinated individuals should receive an age-appropriate dose of tetanus immunoglobulin.

4. Anaerobic and aerobic infections

Anaerobic gangrene (synonyms: anaerobic infection, gas infection, gas gangrene, anaerobic myositis; old names – Anthony's fire, mephitic gangrene (MI Pirogov)) is the most serious and dangerous of infectious diseases complications of wounds, especially gunshot wounds. It happens in peacetime relatively rare, while during a warrior is the most common cause of death wounded In the First World War, the frequency of anaerobic gangrene in firearms injuries in different armies ranged from 2 to 12%, and the death rate reached 75%; during the Second World War – about 2% of all, respectively cases of gunshot wounds and 20–50%, i.e. one in six of those who received gunshot wounds, died of an anaerobic infection. Anaerobic infection is an acute severe wound infection caused by anaerobic microorganisms.

Concept of anaerobic infection, pathogens, their classification. The term "anaerobiosis" (more precisely, anoxybiosis; life without air (oxygen)) proposed by L. Pasteur in 1861.

Two groups of anaerobes are known:

1. Strict, obligate, cannot live in the presence of oxygen, vegetative forms in these conditions die or form spores, capsules that are quite resistant to the influence of environmental factors, in particular oxygen:

a) clostridia (perfringens, oedematiens, septica, histolyticus, tetani, botulinus, etc.);
b) bacteroids (fragilis, etc.) (for more detailed characteristics, see below);
c) fatty acid microorganisms.

2. Conditional, facultative – capable of living as in anoxic conditions environment, as well as in the presence of oxygen:

a) Escherichia coli;
b) protein;

c) ciliates;

d) some strains of staphylococci.

Classification by pathogenicity of anaerobes:

- 1st group – the most pathogenic: clostridia, perfringens, septicum, edema, tetany, botulinus;
- 2nd group – less pathogenic: clostridia, histolyticus, fellax, tertium; group of bacteroides;
- 3rd group – conditionally pathogenic: sporogenus, putrificum, proteus, E. coli, staphylococcus.

Sources and mechanism of contamination. Microbes enter the body through a wound, most often with pieces clothes, shoes, foreign bodies, soil. Earth, after the introduction of organic matter fertilizers, always contains clostridia, because under normal conditions they are anaerobeswidely represented in the intestines of animals and humans. Colon and rectum are endogenous sources of anaerobic contamination intestine (open and closed injuries; accompanying diseases destruction of the wall of the cat). It has been proven that anaerobic gangrene is observed much more often in overpopulated theaters of military operations. However, during hostilities in the desert areas not contaminated by human and domestic animal feces, this complications occur much less often [11].

Contamination of wounds with soil occurs especially intensively in the summer-autumn period and in rainy weather, which is accompanied by an increase in frequency anaerobic gangrene. Gas gangrene, clinic, diagnosis, treatment and prevention Anaerobic (gas) gangrene is a severe wound infection with a predominant damage to the connective tissue caused by strict anaerobes. Gas phlegmon and gas gangrene are a special type of putrefaction anaerobic infection caused by specific pathogens: Cl. perfringens, Cl. oedematiens maligni, Vibrion septicus and Cl. histolyticus.

The indicated anaerobic bacteria are very common – they can be found everywhere: fertilized land, in the land of settlements when it is polluted by human and animal feces, which are the source of infection. WITH dust spreads bacteria and contaminates skin and clothes, infection

can occur penetrate into the wound from contaminated skin and various objects. In peacetime, anaerobic infection is rare, although that soil samples taken in different places revealed contamination in 95% of cases anaerobic microbes. This is explained by the fact that the bacteria that get into wound, do not always find favorable conditions for their development, as well as those that the initial treatment of wounds and the correct method of their treatment contribute the death of bacteria that entered the wound and eliminate the conditions that contribute their development. Cl. perfringens is also detected in acute appendicitis, phlegmon of the floor of the mouth, paraproctitis, etc. Anaerobic infection develops mainly with mechanical injuries genesis, but a number of cases were described when it developed as a result subcutaneous injection of drugs, serums, physiological solution.

In addition to the exogenous one, there is an endogenous way of gas generation phlegmons and gangrene (happens much less often). In the human intestine always contains many pathogenic anaerobic bacteria that can sometimes during "clean" operations on the stomach, intestines, biliary tract, lungs cause phlegmon or gangrene of an anaerobic or mixed nature.

The presence of other anaerobes in the intestines enhances the effect of bacteria and conditions development of mixed forms of infection.

Anaerobic infection is more common during hostilities because in the case of gunshot wounds, there are a number of factors that contribute to its development.

It is known that in the pre-antiseptic period even after simple operations, many patients died from anaerobic infection (hospital gangrene, malignant edema), but even more of them died from this one infections during wartime.

Gas gangrene was known to doctors in ancient times. He mentioned her Hippocrates, doctors of the Middle Ages. However, the causes of this injury the complication and its causative agent were unknown.

First described gas infection based on many personal observations, with a full analysis of the reasons for the development of the process, in 1864 M.I. Pirogov He was the first to suggest that the cause of this

complication is a living thing causative agent and indicated that the development of the disease is associated with severe damage to muscles and bones, presupposes the presence of appropriate conditions.

Description of the clinical picture of gas gangrene, made by M.I. Pirogov, fully corresponds to its modern definition: the formation of gas (cracking felt under the skin), tissue swelling, skin changes, etc. The classification according to which there are two forms of gangrene – suprafascial and subfascial, rapid and acute, is recognized as the best. After a few years after M.I. Pirogov described this traumatic complication, its causative agents were discovered.

The percentage of gas infection complications depends on a number of factors: soil contamination by excreta, especially during positional warfare, and contamination of soldiers' clothing by germs, etc. Atmospheric conditions also play a rather large role: a dry climate (heat) prevents the development of bacteria; rains, melting snow, high humidity, on the contrary, increase its spread.

The incubation period is short: in 76% of cases, anaerobic phlegmon was observed in the period from 2 to 4 days after the injury and in more than 19% – in the first six days. Rarely, anaerobic infection is observed in the first 24 hours and later on the 7th day.

More often, anaerobic infection develops when wounded by fragments of artillery shells, especially if these wounds are accompanied by ruptures of muscles and other soft tissues.

Exciter. All four causative agents of anaerobic infection have many common among themselves, but each of them is characterized by certain features regarding the development of the pathological process, which give a specific character to the pathological changes in the tissues [3].

Cl. perfringens is the most widespread immobile microorganism in nature. It is found in large quantities in the intestines of humans, animals and in the ground. Forms spores. Its peculiarity is the rapid formation of toxins and gases. It spreads quickly by lymphogenous and hematogenous means. No later than 6 hours, often – already 10–20 minutes after the injury, it spreads throughout the body in the lymphatic channels a few centimeters beyond the wound. The toxin of this

microorganism consists of hemolysin, myotoxin and neurotoxin. These features lead to the manifestation of the toxic action of bacteria by hemolysis, necrosis and swelling of tissues, especially muscles, and damage to the nervous system. Systems. The muscles acquire a gray color. When they decay, gases are formed, which raise the tissues, just as it happens with cadaveric changes.

The stench of the pus is not caused by the pathogen itself, but by the presence of a mixed infection. It is important to note that the effect of toxin Cl. porfringens is not inhibited, but, on the contrary, is enhanced by toxins and enzymes of other bacteria.

Cl. oedematiens maligni is a mobile spore-bearing microorganism containing hemolysin and exotoxin. Its pathological effect is manifested by the formation of limited gelatinous swelling of the skin, subcutaneous tissue, then muscles. Vibrion septicus is a septic vibrio characterized by a large mobility. Its characteristic feature is that when developing in the tissues, it causes swelling that spreads quickly, serous and serous-hemorrhagic impregnation of muscles, death of muscles and subcutaneous fibers The toxin of this microorganism has a negative effect on leukocytes, causes paralysis of blood vessels, increases exudation and reduces phagocytosis. Getting into the blood, the toxin leads to a rapid decrease in blood pressure.

Cl. histolyticus – a spore-bearing motile microorganism found in the human intestine; with the development of gas phlegmon and gangrene, it is observed much less often than other pathogens. Forms fibrolysin, which causes necrosis, histolysis, melting of tissues, especially already necrotized ones: melting connective tissue, muscles, blood vessels, bones are exposed, self-amputation may occur.

All microorganisms that cause gas gangrene develop only in the absence of oxygen. In open wounds accessible to the action of air, the conditions for the development of anaerobic infection are unfavorable, while in closed wounds, for example, blind bullet and especially shrapnel wounds, in the presence of pockets, cavities, etc., the most favorable conditions for the development of infection are created. The presence of a mixed infection in the wound further promotes the

development of anaerobic bacteria, since aerobes, absorbing oxygen, improve living conditions of anaerobes, so tamponade of such fresh wounds or suturing them tightly is not recommended.

Preferred localization

- Lower limbs – 70%;
- upper limbs – 20%;
- other parts of the body – 10%.

The mortality rate according to the materials of the Second World War is 60–70%.

Etiology

Clostridia:

- perfringence – 50–90%;
- edema – 20–50%;
- setlikum – 10–15%;
- other clostridia – 5–6%.

Pathogenesis.

The incubation period in 90% of patients is 2–7 days, in 10% it is 8 or more days.

Factors contributing to the development of gas gangrene.

1. Microbial associations.

In 80–90% of patients, the disease develops due to the penetration of two or more types of microorganisms (anaerobes and aerobes).

Features of the disease depending on microbial associations

1.1. The clostridial monoinfectious process proceeds more easily than in the case of its combination with aerobes [18].

1.2. Two anaerobes cause a more severe course of the disease than an anaerobe in combination with an aerobe.

1.3. Two or more anaerobes in combination with aerobes cause a disease with an extremely severe course.

Microflora of the wound in different phases of the development of anaerobic gangrene.

The first phase (up to 24 hours) – anaerobes and aerobes are seeded from the wound ratios 1:10, 1:20.

The second phase (48 or more hours) – anaerobes are sown.

The third phase (recovery) – aerobes are sown.

2. Local factors:

2.1. Blind shrapnel injuries in the area of powerful muscle layers.

2.2. The presence of foreign bodies contaminated with soil in the wound.

2.3. Open, especially gunshot and splinter fractures.

2.4. Deep wound channel, wound cavity, which are bad communicate with the external environment.

2.5. Poor transport immobilization.

2.6. Excessive glycogen content in muscles is a good environment for the development of clostridia.

2.7. Tight tamponade of wounds, tight bandage and poor initial treatment of wounds.

3. Factors contributing to the reduction of body resistance:

3.1. Acute blood loss.

3.2. Traumatic shock.

3.3. Hypovitaminosis.

3.4. Hypothermia.

3.5. Chronic anemia.

Changes in the focus of damage

1. Necrosis of muscles and connective tissue.
2. Significant swelling and gas formation in tissues (ammonia, hydrogen sulfide, carbon dioxide).
3. Disintegration (melting) of necrotic tissues.
4. Spread of the inflammatory process to large vessels, development of thrombosis (vein, artery).
5. Spread of soft tissue necrosis, limb gangrene.
6. The reproduction of gas gangrene pathogens is accompanied formation of exotoxins (hemolysins, neurotoxins, etc.), which leads to death, hemolysis of muscles (formation of myoglobin) [19].

General changes in the body. A rapidly progressing local process in the wound area is accompanied by massive resorption of microbial toxins and extracellular products tissue decay, as a result of which

endogenous intoxication develops and the functions of vital organs and systems are disturbed.

The phenomena of intoxication are supplemented by sharp disturbances in water-electrolyte metabolism caused by significant exudation in the area of damage.

As a result of intoxication and dehydration of the body, death occurs.

Stages of the process:

1. Limited gas phlegmon.
2. Widespread gas phlegmon.
3. Gas gangrene.
4. Sepsis.

Depending on the topography of the infectious process, the following forms of gas gangrene are distinguished:

a) epifascial (superficial) – the skin is damaged and subcutaneous fat (anaerobic cellulite);
b) subfascial – the most typical, affected muscles (anaerobic myositis).

Depending on the speed of progression, the following are distinguished:

a) lightning form;
b) rapidly progressing form;
c) slowly progressing form;

Depending on the microflora and reactivity of the body, the following forms of anaerobic infection are distinguished:

1. Nabryakov
2. Displaced
3. Emphysematous
4. Necrotic
5. Phlegmonous
6. Fabric melting

Clinical picture.

I. The stage of limited gas phlegmon

1. Mental excitement, expressed general weakness, feeling brokenness against the background of subfebrile temperature.
2. Bursting pains in the wound.
3. Rapidly progressing swelling in the area of the wound, a feeling of tightness of the applied bandage.
4. Tachycardia (110–120 beats/min), shortness of breath.
5. Revision of the wound: dirty-gray plaque, unpleasant, sometimes sweetish smell, no signs of acute purulent inflammation.
6. Swelling and crepitation of the tissues are determined by palpation limit the wound channel.
7. Melnikov's positive symptom (symptom of a ligature – a silk thread tied around the limb near the wound, after 1.5–2.0 hours due to the increase in swelling, it sinks into the skin).
8. X-ray: gas bubbles in the tissues surrounding the wound [6].

II. The stage of widespread gas phlegmon

1. The patient's condition is severe, high temperature, excitement.
2. Pains of a distending nature spread to in the proximal direction from the wound, sharp swelling of the limb. The skin is pale with a bluish pattern of veins that shine through.
3. BP is low, pulse is 120–130 beats/min, weak filling.
4. Revision of the wound: the edges of the wound are turned over the surface of the skin, secretions are insignificant, bloody-brown in color, unpleasant specific (acetone) smell.
5. Widespread crepitation (presence of gas in the tissues) is determined by palpation.
6. X-ray: gas bubbles in tissues are determined [4].

III. Stage of gas gangrene

1. The patient's condition is severe or extremely severe, consciousness is clouded, delirium, motor excitement, high temperature.
2. The pain is intense in the whole limb, but especially in the distal ones departments (fingers, foot).

3. Blood pressure is reduced, pulse 120–140 beats/min, weak filling.
4. The tip is pale, sometimes with a blue or brown tint. Sharp edema, the affected limb is 3–4 times larger than the healthy one, blisters with hemorrhagic or brown contents are observed on the skin. The limb is cold to the touch, there is no sensitivity in its distal parts, a significant decrease in active movements, no pulsation of blood vessels on the periphery.

The wound is painful, the damaged muscles burst from the wound, their color is "dirty", gray-brown, the discharge is bloody, dark in color with an unpleasant, sometimes foul smell.

5. Palpatory: crepitation around the wound.
6. X-ray: accumulation of gases in the damaged limb [5].

IV. Stage of sepsis

The clinical picture is described in the corresponding lecture.

Prevention of anaerobic gangrene

1. Early surgical treatment of open injuries, wide drainage of the wound with tubular drains and flowing washing (continuous or fractional) with solutions that release oxygen when interacting with tissues (potassium permanganate, hydrogen peroxide), immobilization.
2. Administration of large doses of antibiotics: penicillin (2–3 million 6–8 times a day), semi-synthetic penicillins (ampicillin, oxacillin, methicillin – 6–8 g per day); lincomycin in a dose of 1.8–2.0 g.
3. Introduction of polyvalent anti-gangrenous serum, diluted 4–5 times, prophylactic dose – 30 thousand IU (10 thousand IU each against perfringence, edema and septicum): intramuscularly, under anesthesia, drip.
4. Application of anaerobic bacteriophage and diphage (staphylo- and streptococcal) in a dose of 100 ml and 100 ml of 0.5% novocaine solution for infiltration of tissues around the wound [20].

Characteristics of the main non-clostridial pathogens anaerobic infection.

Among the causative agents of purulent-inflammatory diseases and complications after surgical interventions, in addition to facultatively anaerobic microorganisms (staphylococci, streptococci, Escherichia coli, etc.), anaerobic bacteria (clostridia), strict non-clostridial anaerobes and bacteroids, fusobacteria are increasingly isolated from wound contents in recent years, peptococci, etc.

Bacteroidetes are gram-negative rod-shaped bacteria that live on the mucous membranes of the oral cavity, upper respiratory tract, female genital organs and, especially, in the intestines. More than 40 varieties are known.

Most often, bacteroids are distinguished, conditionally united in a group based on a number of characteristics.

Fusobacteria are rod-shaped, gram-negative, strict anaerobes. Vegetate in the same place as bacteroids. They differ from bacteroids in cultural, morphological and biochemical properties, as well as in sensitivity to antimicrobial drugs.

Peptococci are gram-positive cocci-like bacteria, morphologically similar to staphylococci. Peptostreptococci are Gram-positive cocci, forming chains, obligate anaerobes. Vegetate on the skin, mucous membrane of the mouth, nasopharynx, female genital organs, etc.

Clinical manifestations of non-clostridial anaerobic infection are diverse.

The following factors contribute to the development of anaerobic infection:

- immunodeficiency states;
- irrational antibiotic therapy;
- diseases associated with metabolic disorders (diabetes, etc.);
- long surgical interventions on organs of the abdominal cavity, bile ducts;
- the length of stay of drains in the abdominal cavity is longer than necessary.

The main signs of non-clostridial anaerobic infection:

1. Severe course of the inflammatory process with pronounced intoxication, high temperature, tachycardia, the clinical picture resembles septic shock.
2. Scanty, unpleasant-smelling secretions from wounds and drains.
3. Necrotic changes in tissues.
4. Moderate gas formation in tissues and cavities.
5. Coloration of exudate in dark brown or black color.
6. Negative results of sowing material in aerobic conditions.
7. Hypercoagulation of blood in connection with the production of heparinase by some species of these bacteria.
8. Individual signs of liver failure (hepatorgia).

Putrefactive infection.

Severe infection, manifested by putrid decay of tissues.

Etiology: conditionally pathogenic (sporogenus, putrificum, group of bacteroides) and facultative (proteus, Escherichia coli, some strains of staphylococci) anaerobes.

They appear as a wound infection – in conditions of widespread tissue necrosis or as a focus of inflammation in the case of damage to the colon or rectum.

Due to the predominance of tissue necrosis and melting, the process takes on the character of a phlegmon or a progressive abscess with the formation of purulent-hemorrhagic exudate with an unpleasant odor.

Clinic: Putrefactive infection proceeds with the phenomena of severe infectious toxicosis, resembling sepsis [17].

Locally putrefactive wound infection is similar to gas gangrene, but its course is not so turbulent, there are no regional blood circulation disorders and excessive necrosis: in the case of abscesses of the abdominal cavity, the peritoneum is involved in the process; the content of the abscess is purulent-hemorrhagic or dirty-green in color with an unpleasant smell.

General treatment

1. Detoxification.
2. Suppression of infection.
3. Activation of the body's defenses.

4. Correction of homeostasis disorders.

Local treatment

1. Wide opening of the focus of inflammation.
2. Excision of necrotic tissues.
3. Active drainage with irrigation (continuous or fractional) of the cavity with antibiotics: oxygen-giving solutions (potassium permanganate, hydrogen peroxide).
4. Immobilization (if possible).

5. First aid for injured abdomen andorgans of the abdominal cavity

Abdominal injuries can be closed or open. Abdominal wall punctures and injuries to the organs of the abdominal cavity and extraperitoneal space (liver, spleen, pancreas, kidneys, etc.) are distinguished among closed injuries. Damage to the hollow organs of the abdomen in the case of a closed injury often leads to the development of shock.

Signs of abdominal injury:

- forced position of the victim on the back or on the side with the knees pulled to the stomach (changing this position leads to increased pain);
- restriction of respiratory movements and tension of the muscles of the anterior abdominal wall;
- constant pain in the abdomen (the intensity of pain does not depend on the severity of damage to internal organs);
- profuse vomiting;
- in the presence of internal bleeding – a decrease in blood pressure, paleness of the skin;
- in case of infectious complications (peritonitis) – abdominal distension;
- under conditions of injury to the kidneys and urinary tract – blood in the urine, urinary retention.

Penetrating abdominal injury can be with or without organ loss.

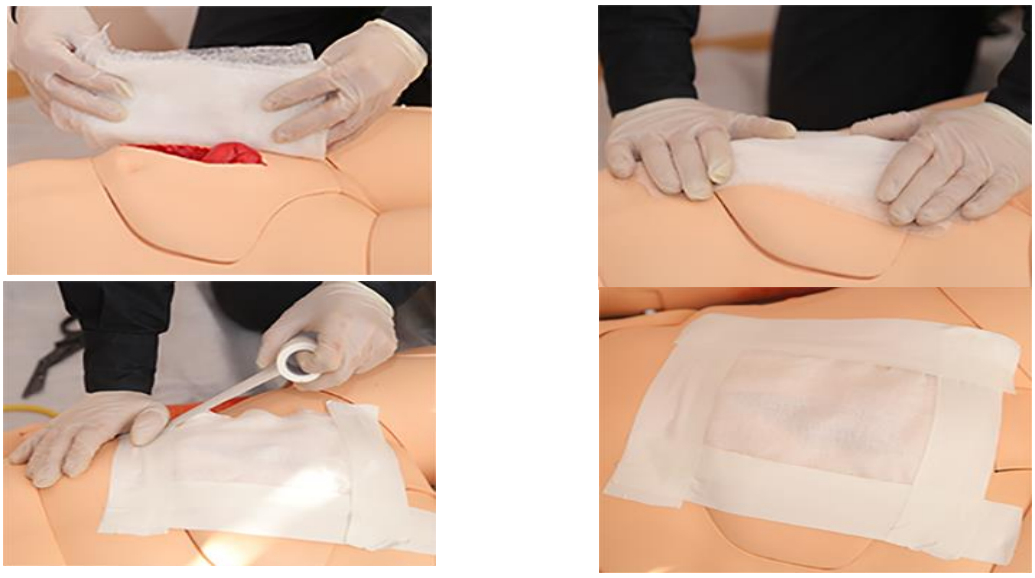

Fig. 37. Assistance in case of penetrating abdominal injury

Providing assistance in the event of an open injury of the abdominal cavity without loss of organs involves the following algorithm of actions:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- put a napkin on the wound (at least four layers of bandage) so that it completely covers the wound area;
- apply a tight, but not tight, circular bandage around the abdominal cavity.

The sequence of actions to provide assistance in the event of an open trauma of the abdominal cavity with loss of organs should be as follows:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- organs that have fallen out, do not exercise, seal or put pressure on them;
- it is desirable to put a sterile gauze bandage on the organs that have fallen out (at least four layers of bandage);

- put a roller (from a bandage or clothes) around the internal organs to prevent compression;
- put a tight (but not tight) circular bandage on the wound [21].

Providing assistance in the event of an injury to the abdominal cavity with a foreign object protruding from the wound involves the following algorithm of actions:

- provide the victim with a comfortable position (on the back);
- carefully remove the clothing around the wound (if it is tight – it is forbidden to remove it);
- do not remove a foreign object from the wound. It is strictly forbidden to do this;
- put a roller (from a bandage or clothing) around the object protruding from the wound, which will allow you to fix this object;
- carefully apply a bandage around the wound without displacing a foreign object;
- after applying the bandage, fasten it on the healthy side as far as possible from the wound.

The victim should be placed in a semi-sitting position or placed on his back or side with his legs half-bent and brought to his stomach. In this case, it is forbidden to drink – you can only wet your lips with water. If internal bleeding is suspected, cold can be applied to the injury site (an ice pack wrapped in a cloth).

Control questions

1. *What is paradise?*
2. *What two stages of wound development do you know?*
3. *Describe the classification and characteristics of wounds.*
4. *What do you know about the main complications of wounds.*
5. *Early infection. Types of wound infection.*
6. *What are asepsis and antiseptics, their characteristics.*
7. *Point out the basic principles of wound treatment.*
8. *What are tetanus and gas gangrene, their symptoms and prevention methods.*

Situational tasks

Situation 1.

A schoolboy, skating in winter, fell on the ice and injured his knee joint. There was a closed wound with a little bleeding.

Question. Your first aid actions?

Situation 2.

A dog suddenly pounced on a teenager returning from school in the yard of his house and bit him in the lower leg. There was a deep wound and heavy bleeding at the site of the bite.

Question. The procedure for providing emergency care?

FIRST PREMEDICAL CARE FOR BURNS AND FROSTBITE

1. Signs and mechanism of the effect of extreme temperatures on the human body, pre-medical measures help.

2. The main signs of hypothermia, pre-medical measures help.

1. Signs and mechanism of the effect of extreme temperatures on the human body, pre-medical measures help

A burn is an injury to human body tissues (skin, mucous membranes, etc.) caused by heat, electricity, chemicals, or radiation. In view of the above, they are divided into the following types:

- thermal – from the action of light radiation, flame, boiling water, hot steam, etc.;
- chemical – as a result of the influence of acids and alkalis. In addition, chemicals cause not only local damage, but also general poisoning of the body;
- electric – from the action of electric current (technical and natural origin);
- radiation – in case of contact with the skin and mucous membranes of various radioactive substances.

According to statistical data, today 90% of burns are the result of exposure to thermal energy on the human body.

The human body has a perfect mechanism of thermoregulation, which is able to maintain a constant body temperature during significant fluctuations in the ambient temperature. The general effect of high temperature on the body leads to its general overheating, local – to burns and burn disease.

An increase in tissue temperature above +500 C leads to the death of cells and the development of coagulation necrosis. Thermal burns can be caused by flame, hot liquid (above +600 C) or boiling liquid, burning resins (napalm, bitumen), various heated bodies, water vapor, hot gases.

Depending on the depth of the impression, four degrees of burns are distinguished. In the case of light burns (I degree), redness of the damaged areas occurs. Burns of the II degree are accompanied by the

appearance of blisters on the skin filled with a translucent liquid, of the III and IV degrees – the death of the skin and soft tissues located deeper, and in severe cases – also the bones (charring) [17].

I degree II degree III degree IV degree

Fig. 38. Degrees of burns

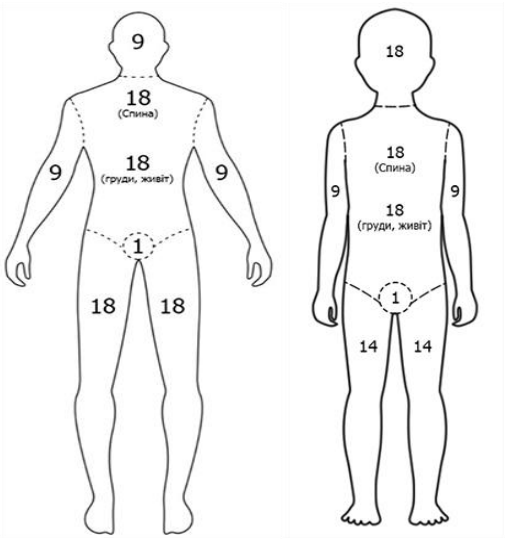

Fig. 39. Application of Wallace's rule to determine the burn area in an adult and a child

The general condition of the victim depends not only on the degree of burn, but also on the area of the burned surface of the human body. This area is measured relative to the area of the total surface of the skin. So, in adults, the surface of the head and neck is 9%; the surface of the upper limb – 9%; the surface of the chest and abdomen – 18%; back surface of the body – 18%; the surface of one lower limb – 18%; the surface of the perineum and external genitalia – 1% (Wallace's "nine"

rule). For newborns, Wallace's rule has certain features. In the case of significant (over 10–15% of the body surface area) II–III degree burns, a severe general damage to the body occurs – burn disease.

When providing assistance, the factor that caused the burn should first be eliminated. Clothing that is on fire should be removed quickly, and if this is not possible, extinguish the fire by blocking the access of air to the fire. To do this, you need to cover the burning place with a blanket, cover it with snow, earth or immerse it in water.

Inflammable mixtures (for example, gasoline, napalm, pyrogel) can only be extinguished by blocking access to the air fire. Do not try to knock down the flames with your hands or improvised means. This leads only to smearing the mixture on the skin and increasing the burn area.

After eliminating the source of high temperature, the victim must be transported to a safe place. If the person is not breathing, cardiopulmonary resuscitation should be started immediately.

Before the examination, it is necessary to remove the victim's clothes (provided that they are not attached to the person's body). To avoid additional damage, clothing can be cut.

A cold compress should be applied to the burn site – cold water in a bottle or plastic bag. In no case should you touch the burn with your hands, puncture the blisters, tear off pieces of clothing stuck to the affected area, lubricate the surface of the burn with any oil or cover it with powders – this contributes to the penetration of the infection into the wound and complicates its subsequent surgical treatment. Ice should also not be placed directly on a person's skin.

If there are signs of shock, the victim should be given an anti-shock position. A dry, sterile bandage should be applied to the burned parts of the body.

In the case of eye burns, first aid consists in applying bandages to them and immediate hospitalization of the victim. If the condition worsens, it is necessary to call the emergency medical dispatcher again and perform cardiopulmonary resuscitation (if necessary) [18].

The victim should be provided with constant supervision. If his condition worsens, it is necessary to call the emergency medical dispatcher again and, if necessary, perform cardiopulmonary resuscitation.

Overheating consists in disturbed thermal balance: the body can no longer maintain the temperature of the skin within the limits of a comfortable thermal sensation. Under these conditions, a significant loss of water and salts occurs during sweating, which causes a state of exhaustion.

Overheating of the body is caused by staying in regions with a hot climate, intense muscle work, the presence of airtight clothing, and a decrease in fluid intake. The degree and speed of overheating also depend on the individual characteristics of the body – the presence of cardiovascular or endocrine diseases, metabolic disorders (obesity).

Heatstroke is a serious condition caused by general overheating of the body. A severe impression of the central nervous system caused by intense or prolonged exposure to direct sunlight on the head indicates sunstroke.

Symptoms of a mild form of heatstroke or sunstroke are general weakness, drowsiness, sluggishness, headache, dizziness, nausea.

Signs of a moderate condition are unsteady movements, intense headache, nausea, vomiting, short-term fainting, wet and red skin, intense sweating, increased body temperature, increased pulse and breathing.

Symptoms of a severe form are delirium, hallucinations, excitement, convulsions. This state can change with a short-term, and then a long-term loss of consciousness.

Breathing becomes shallow, accelerated, irregular. The pulse accelerates and weakens sharply; redness of the face is replaced by paleness and bluishness; the skin becomes dry and hot or covered with sticky sweat; body temperature rises sharply (up to 41°C). As a result of sunstroke, the victim may also experience tinnitus and visual disturbances.

When providing first aid in case of general overheating of the body, you should:

- move the person from the overheating zone to a cool place, in the shade, make a canopy from the sun, ensure sufficient ventilation;
- lay down the victim, slightly raising the head and removing outer clothing;
- wet the victim's face and head with cold water, put cold compresses on the chest, head, face (you can wrap it in a damp sheet);
- if the victim is unconscious, drink cold water (preferably mineral) or water with salt: 1 teaspoon per 1 liter of water;
- in case of unconsciousness, the victim should be given a stable lateral position to ensure free passage of air through his respiratory tract;
- under conditions of respiratory arrest, it is necessary to immediately start artificial ventilation of the lungs and indirect heart massage;
- call an ambulance or transport the injured person to a medical facility [22].

2. The main signs of hypothermia, first aid for it

The occurrence and degree of manifestation of general and local reactions in case of hypothermia depend on the temperature of the environment, the speed of air movement, its humidity, the state of thermal protection of the body (the nature of clothing), the degree of hydration of the skin, individual characteristics and the state of the body. Sick, exhausted, old people and children are the most vulnerable to the effects of cold. Rapid hypothermia of the body is facilitated by anemia, trauma, overfatigue, and emotional excitement. Ethyl alcohol plays a special role, because in case of intoxication, the peripheral blood vessels expand, and therefore, the heat transfer of the body increases. In addition, the state of alcohol intoxication, distorting the subjective assessment of events, deprives a person of the opportunity to perceive the danger of cooling. Cooling of the body is possible even in case of

exposure to temperatures above 0°C (for example, in newborns – +5–8°C). However, low temperature does not kill living cells, which consist mainly of protein. Living cells can tolerate cooling down to -170°C, that is, there is no such limit for a low temperature as for a high one.

The local effect of low temperature (frostbite) is associated with a long-term decrease in the tissue temperature of individual parts of the body under the conditions of maintaining the temperature of its tissues and organs. Peripheral parts of the limbs are usually injured – toes and hands, protruding parts of the face (nose, ears, cheeks). Most often, the first toe is affected, and the third, fourth and fifth toes are affected on the hands.

There are two periods of frostbite: latent (pre-reactive) and reactive. The hidden period corresponds to the period of decrease in the local tissue temperature. The reactive period occurs after warming the frostbitten parts of the body (only then can the depth of the lesion be accurately determined, depending on which the degree of frostbite is distinguished).

Initially, under the influence of cold, there is tingling, burning, then the skin becomes pale, acquires a bluish color and loses sensitivity. The true plane of damage is determined after the termination of the effect of the impacting factor. Sometimes swelling, redness or necrosis (death of tissue) occurs in the frostbitten area after only a few days.

There are four degrees of frostbite:

- I degree – the victim's skin at the site of injury has a pale color, slight swelling, sensitivity is reduced or completely absent;
- II degree – in the area of frostbite, blisters filled with transparent or white liquid are formed, its temperature rises;
- III degree – necrosis of the skin (blisters appear on it, filled with dark red or dark brown liquid); an inflammatory shaft (line of demarcation) develops around the dead area. Signs of the development of intoxication of the victim are his cooling, sweating, significant deterioration of well-being, apathy;
- IV degree – the appearance of blisters filled with black liquid on the skin, the presence of signs of shock in the victim.

When providing first aid in case of frostbite, the victim should first be moved to a warm room and wet clothes should be removed from him. Shoes and clothes should be removed carefully, without excessive effort, so as not to damage the affected parts of the body (it is better to cut them) [13].

If the victim is unconscious, general warming should be started – for this, non-alcoholic hot drinks should be used. It is not recommended to carry out intensive rubbing and massage of the frozen part of the body, especially using snow. Such manipulation damages the skin, causing infection. It is necessary to put a clean bandage on the damaged area and ensure immobility of hypothermic fingers, hands and feet. If necessary, immobilization should be carried out with the help of improvised or standard tires.

Fig. 40. Providing assistance in case of hypothermia

If the victim is unconscious, but he is breathing normally, he should be given a stable lateral position and covered with a blanket. Do not lubricate the affected body parts with fat or ointments.

Important practical measures to prevent frostbite are prevention of sweaty feet, loose and dry shoes and clothes, as well as active movements (walking, running), hot tea and food. In winter, to protect against the cold, it is necessary to take mandatory measures to dry clothes and shoes. In trucks with an open top, you need to sit with your back to the direction of travel. During car stops, you should get out of it and do physical exercises. At low temperatures, frostbite can occur as a

result of touching metal parts of appliances, weapons and tools with bare hands. To avoid this, you need to perform all actions in gloves. Providing assistance to the victim with a combination of frostbite and hypothermia of the body, the policeman must first direct his efforts to the general warming of the victim.

Control questions

1. *How many degrees of burn are there according to the depth of the lesion?*
2. *What is the purpose of first aid for burns?*
3. *Name emergency measures for frostbite.*
4. *Indicate the etiology of burns and frostbite.*
5. *What pathological changes occur in tissues during burns and frostbite.*
6. *Describe the methods of determining the depth and area of burns.*

Situational tasks

Situation 1.

In the park, you saw an unconscious victim with all the signs of hypothermia.

Task: What should be the algorithm of actions when providing pre-medical care in this case?

Situation 2.

After a long stay in the city square on a hot sunny day, the teenager felt weak, headache, dizziness, thirst.

Task: Determine what can cause this condition, does the teenager need help, if so, what kind?

FIRST PREMEDICAL AID
IN ACUTE EXOGENOUS POISONING

Lecture plan

1. First aid in case of injury powerful poisonous substances.

2. First aid in case of poisoning by products of plant and animal origin.

1. First aid in case of injury powerful poisonous substances

In everyday life, we often have to observe the influence of chemical factors that cause health disorders and often lead to death. Toxicology (Greek: toxykon – poison, logos – teaching) is the study of poison and poisoning.

A poison is a substance that, after entering the body in minimal doses (acting chemically or physico-chemically), causes health disorders or death under certain conditions. Poisoning is considered to be the reaction of the body (illness or death) that occurs as a result of the introduction of poison.

The number of accidental and intentional poisonings in various countries of the world is constantly increasing. According to the data of scientific studies, this cause of violent death ranks second, second only to mechanical damage in terms of frequency [9].

The destructive effect of poisonous substances is revealed only under certain conditions. The most important conditions for the action of the poison are: dose, solubility, form of administration (physical state), concentration, nature of accompanying substances, duration of preservation, methods of administration and individual characteristics of the organism.

It is known that a substance acquires poisonous properties only in a certain (lethal) dose, which is different for each poison. Solubility under these conditions is essential.

The form of introduction (physical state) of the poison also has a certain significance for the human body. Substances in the form of

powders act more slowly than their solutions, which are absorbed faster. Poisons dissolved in alcohol are absorbed faster than those dissolved in fats. Gaseous poisons are absorbed particularly quickly.

The concentration of the poison also plays an important role. Concentrated acids and alkalis usually act more intensively than diluted ones. The nature of the action of accompanying substances with which the poison enters the body is also important. For example, glucose weakens their toxic effect, and sometimes completely neutralizes it [6].

The methods of administering the poison also play an important role. If it is ingested through the mouth (the most common method), it is absorbed from the stomach into the blood and already then manifests its general effect. In case of injection under the skin, the effectiveness of the poison increases significantly. An even greater effect is observed in the case of intravenous administration. It is possible to absorb poisons through the bladder or skin (boron, sulema, carbolic acid), lungs (carbon monoxide, boron). The action of poisons also depends on the individual characteristics of the body.

There is a distinction between primary and secondary (sequential) effects of poison. Primary is a direct effect on any organ or tissue, secondary is a disorder of the functions of other organs and tissues as a result of primary damage.

Fig. 41. Causes of household poisoning

Poisons that have entered the body are partially neutralized, oxidized, regenerated, combine with other substances and are partially removed from the body through various organs, in which pathological changes occur as a result. First of all, the removal of poison is carried out by the kidneys with a violation of their function and degeneration of the kidney tissue, which leads to a decrease in the excretory function of the kidneys and an increase in poisoning. Excretion of poisons, especially salts of heavy metals (bismuth, mercury, arsenic, etc.), occurs through the intestines. Poisons are also secreted by the stomach, pancreas, salivary glands and skin. Some organs (liver, bones, hair) are able to retain poison (arsenic, lead, phosphorus, etc.) for a long time. They can be detected by forensic toxicology after several months and even years.

Certain poisons, in the case of systematic intake, cease to act in normal doses as a result of the body getting used to them. This is especially observed when the taken substances cause pleasant sensations – a state of euphoria. As a result of systemic administration of such drugs (especially narcotics), a pathologically fixed cortical connection, a dynamic stereotype, is formed. At the same time, the sudden withdrawal of the poison causes a mental and physiological state called withdrawal, characterized by malaise, general weakness, depression, and sometimes even collapse [9].

Acute and chronic poisoning are distinguished. Acute poisoning is usually observed, which is characterized by a sudden onset and rapid development of symptoms. Acute poisoning usually leads to death. In the case of chronic poisoning, the poison enters the body in rather small doses, changes in the body occur slowly, over several months or years. Such poisonings are most often associated with a certain profession (mirrors, printers).

In the event of accidents at objects that contain highly toxic substances, people suffer burns and poisoning. The most common are the cases with such powerful poisonous substances: chlorine, ammonia, acids (sulfuric, hydrochloric, etc.), carbon monoxide (carbon monoxide), alkalis and technical fluids.

Ammonia is a colorless gas with a pungent odor. Ammonia is lighter than air, so directly on the surface of the earth its concentration decreases rapidly. Small concentrations cause irritation of the mucous membrane of the eyes and upper respiratory tract. Victims experience nausea, headache, salivation, sneezing, facial redness, sweating, chest pain, urge to urinate. In case of contact with the skin and mucous membranes, ammonia causes severe burns.

During the provision of pre-medical care, you should:

- remove the victim from the affected area;
- in case of poison contact with the skin and eyes, wash the affected areas with water.

Chlorine. In the center of chlorine contamination, its greatest concentration forms on the surface of the earth, creating a cloud that fills the lowlands, basements and lower floors of buildings (1 liter of liquid chlorine produces 463 liters of gas). The chlorine cloud can be neutralized by watering it abundantly with water. The first signs of poisoning are irritation of the eyes and upper respiratory tract – lacrimation, coughing appear, and in more severe cases, pulmonary edema develops.

Carbon monoxide is produced during fires (forest fires, industrial fires, household fires, cars, stove-heated houses, etc.). The poisonous effect of carbon monoxide is due to its ability to react with blood hemoglobin. As a result, oxygen starvation occurs, the activity of all body systems is disrupted. Poisoning occurs imperceptibly. First, there is a headache, tinnitus, redness of the skin with a feeling of compression and blows in the temples; then – nausea, the victim's health deteriorates sharply, which can be accompanied by unmotivated actions, vomiting, sharp muscle weakness; then – all body functions are suppressed, drowsiness, dizziness appear, breathing becomes accelerated and shallow, convulsions begin.

The victim should be taken to fresh air, unbuttoned his clothes, in case of lack of breathing – immediately start cardiopulmonary resuscitation, call an ambulance.

To prevent carbon monoxide poisoning, it is necessary to keep the ventilation in good condition in defensive structures and in residences where it can accumulate. You should also strictly follow the rules for using stoves in private homes, prevent exhaust gases from entering the cabin and body of the machine, and prevent internal combustion engines from operating in closed devices or in rooms where people are present [17].

In case of powder gas poisoning, the victim experiences an excited state (reminiscent of alcohol intoxication), tinnitus, nausea, unsteady gait, then – lethargy, drowsiness and loss of consciousness.

Pre-medical assistance:

- take the victim to fresh air;
- put it in a safe place;
- provide peace and warmth;
- to breathe oxygen (if possible).

Under conditions of respiratory failure and weakness of cardiac activity, the entire complex of cardiopulmonary resuscitation should be performed. Injured you need to be sent to a medical facility urgently.

Acid and alkali poisoning. Poisoning with hydrochloric, sulfuric, nitric, phosphoric, acetic and oxalic acids is most often observed. Caustic soda, slaked lime, potassium hydroxide, etc. cause poisoning among alkalis. These substances cause chemical burns of the skin and mucous membranes and, when absorbed, cause general poisoning of the body.

After ingestion of concentrated acids or alkalis, intense pain occurs in the mouth, throat, abdomen, and behind the sternum. Vomiting with blood, hoarseness or loss of voice is typical.

It is forbidden to induce vomiting and/or to neutralize poisonous substances during first aid measures. It should be remembered that the main task of a police officer is the principle of "do no harm". Therefore, the latter should avoid direct contact with the victim's mouth.

Dichloroethane poisoning. When inhaling its vapors, the following symptoms are observed: pain in the chest and heart area, nausea,

vomiting, headache, dizziness, drowsiness, redness of the mucous membranes of the eyes, visual disturbances.

Getting liquid dichloroethane into the human body causes such symptoms as lacrimation, vomiting bile (sometimes with blood), convulsions, fainting. The air exhaled by the victim has the smell of chloroform.

In this case, the stomach should be washed (if the victim is conscious) and let him breathe oxygen. In the absence of breathing, cardiopulmonary resuscitation should be performed.

Gastric lavage (if possible) should be carried out by the "restaurant" or vomiting method (until clean lavage water is obtained). An adult needs to drink 500–700 ml (two to three glasses) of clean, cold (18°C) water, and then induce vomiting by pressing on the root of the tongue (repeat this manipulation until clean rinsing water is obtained). After washing the stomach, it is necessary to give the victim an enterosorbent (for example, 50 g of activated carbon).

Alcohol poisoning. Among acute domestic poisonings, the most common is poisoning by alcohol and its surrogates. Alcohol is a poison with a narcotic effect, which can lead not only to intoxication of a person, but also to acute poisoning, which is often life-threatening. The lethal dose of ethyl alcohol for an adult is 5–10 ml per kilogram of body weight (more than 500 ml of vodka). Children are particularly sensitive to alcohol, which is why poisoning can occur if even relatively small doses are consumed (the lethal dose of ethyl alcohol for a child is 3 ml per kilogram of body weight) [16].

Signs of ethanol poisoning are preceded by well-known symptoms of intoxication: excitement, impaired coordination of movements and self-control, increased salivation, vomiting. Then dizziness, drowsiness, confusion appear. The skin becomes cold, its redness turns pale. Blood pressure decreases, the pulse becomes frequent and weak. Ethanol mainly affects the brain. A person in a state of heavy intoxication falls asleep, after which his sleep turns into a loss of consciousness. Later, death occurs due to paralysis of the respiratory and circulatory centers.

Given the striking alcoholic smell, it is not difficult to establish a diagnosis of such poisoning.

Methyl alcohol poisoning. Methyl alcohol is actively used as a solvent. It is part of the brake fluid. Most cases of poisoning are associated with its use instead of wine (ethyl) alcohol. Poisoning is also possible if its vapors are inhaled. Consumption of 10–15 g (one to two teaspoons) can cause severe poisoning, and 50–100 g can cause death.

Signs of methyl alcohol poisoning appear one to two hours after its consumption. First, symptoms of alcohol intoxication appear, then – general weakness, vomiting, convulsions, deterioration of vision, which progresses and due to irreversible changes in the retina and optic nerve usually ends in complete blindness. If the victim is not given medical assistance, he dies within the first two days. The algorithm of actions in case of this poisoning is similar to help in case of gasoline poisoning.

Poisoning with hypnotic barbiturates (for example, phenobarbital). Most often it happens as a result of an accident or a suicide attempt. Lethal dose – 4–8 g. The initial stage of poisoning is characterized by lethargy, inhibition and drowsiness, after which a person faints. In the absence of help, death occurs from pulmonary edema and respiratory arrest [12].

Poisoning by narcotic analgesics (opium, morphine, heroin, promedol, etc.) can be accidental or intentional (in drug addicts). The clinical picture of poisoning is characterized by the following signs: facial redness and swelling; itching of the skin; hallucinations (instead of the euphoric phase). Then depression of consciousness or fainting appears, breathing speeds up, pulse slows down, blood pressure drops. The main signs of drug poisoning are the narrowing of the pupils and the loss of their response to light (in severe cases, the pupils dilate). In the absence of timely help, swelling of the lungs, brain and convulsions develop. Death occurs as a result of respiratory arrest.

In the case of chronic intoxication, the delay in drug administration leads to the development of a serious condition – withdrawal, which is characterized by the development of depression, dilated pupils, accelerated pulse, increased blood pressure, redness of the eyeballs,

vomiting, diarrhea, involuntary urination, profuse sweating and profuse sweating, abdominal pain , muscles and joints. Death occurs from shock or myocardial infarction.

Poisoning with ethyl gasoline and antifreeze. Automobile and aviation gasoline are particularly strong poisons. Various impurities to them, in particular tetraethyl lead, increase this toxic effect. Even short-term inhalation of air containing gasoline vapors above 0.3 mg/l causes the initial signs of poisoning: headache, sore throat, cough, eye irritation. In the presence of gasoline vapors in the air at a concentration of 35–40 mg/l, severe poisoning quickly occurs, which can lead to death. When it gets on the skin, gasoline dissolves skin fat – the skin becomes dry, its integrity is disturbed. Microorganisms that cause pustular diseases enter the human body through cracks formed in the skin.

Tetraethyl lead, which is added to gasoline as an anti-detonator, can be absorbed into the blood through intact skin and lead to acute poisoning. Long-term exposure to small concentrations of this substance and gasoline vapors causes chronic poisoning. Headache, insomnia, rapid fatigue and decreased appetite appear.

When antiph gets into the body rice (it is used in engine cooling systems), it also causes severe poisoning. Consumption of 50–70 g of this substance leads to the death of a person. The first signs of antifreeze poisoning are similar to alcohol intoxication, but later there is a sharp disorder in the general condition – vomiting, abdominal pain, fainting. After two or three days, severe damage to the kidneys and liver develops. Under these conditions, the following measures should be taken within the scope of pre-medical care:

- take the victim to fresh air;
- in case of cessation of breathing – perform a set of cardiopulmonary resuscitation measures;
- dry the areas of the skin with leaded gasoline with a cloth and wash with soapy water.

Under the conditions of poisoning by substances that burn (gasoline), and the violation or absence of consciousness, it is forbidden to induce vomiting in the victim.

2. First aid in case of poisoning by products of plant and animal origin

Poisonous mushrooms occupy a special place among poisons of plant origin. Poisoning by pale toadstool and fly agaric often occurs. Pale toadstool is a plate mushroom. Its cap, plates under the cap and a thin leg have a whitish color, sometimes with a weak brownish tint. Pale toadstool contains the strongest poisonous toxins – amanitotoxin (destructive action), which causes symptoms of acute gastritis similar to Asian cholera, and amanitohemolysin (hemolytic action). After 5–6 hours after eating pale snot, the victim develops abdominal pain, vomiting, and becomes comatose. Death usually occurs on the second or third day, sometimes later.

Toadstool is a plate mushroom that has a bright red (most often) cap with whitish spots, a white leg, a white rim and a folded thickening at the bottom of the leg. Poisoning by amanita is rarely observed, because the poisonous properties of this mushroom are widely known. The main cause of amanita poisoning is muscarine. Symptoms of poisoning appear a few hours after eating mushrooms. There is vomiting, abdominal pain, diarrhea with impurities of blood in the stool. As a result of damage to the central nervous system, hallucinations, delusions, and convulsions occur.

Sometimes in everyday life there are cases of poisoning by such plants as spotted hemlock, hemlock, aconitine, etc. In this case, nausea, vomiting, stomach pain, thirst, sometimes – diarrhea with blood, headache and dizziness, in severe cases – delirium, fainting, defecation disorder, convulsions occur.

First aid in case of mushroom and plant poisoning is aimed at removing the poison from the body. Before the arrival of doctors, the victim's stomach and intestines should be washed, activated charcoal should be given (five to ten tablets at the same time), airways should be kept open and resuscitation measures should be performed (if necessary) [19].

Bites of poisonous animals and insects. You can determine whether a person has been bitten by a poisonous snake by the shape of the

wounds from its teeth. Non-venomous snakes leave a zig-zag wound, and after a venomous snake bite, two round wounds are formed, corresponding to the shape of the snake's two teeth.

Among the large number of species of poisonous snakes, attention should be paid to the viper, which is most often found in forest plantations of Ukraine. After its bite, there is a feeling of fear, sharp pain, swelling, redness. The swelling quickly spreads to the entire limb. As intoxication increases, after one or two hours the victim develops nausea, vomiting, headache, abdominal pain, and convulsions. In severe cases, death occurs from respiratory arrest.

Bee and wasp stings are not dangerous for most people. It takes several hundred stings to get a lethal dose of bee venom. But for people with increased sensitivity to the poison of these insects, even a single bite can be fatal. Even single bites in the area of the head, neck or in the oral cavity are particularly dangerous. Acute pain, itching, and swelling occur at the site of the bite. General toxic reactions may appear – dizziness, quickening of the pulse, difficulty breathing and edema, which actively spreads to other parts of the body.

The following measures should be taken within the scope of first aid in case of pet bites:

- isolate the animal;
- examine the victim;
- in the absence of bleeding, wash the wound with a soapy solution and apply a clean sterile bandage;
- stop the bleeding (if necessary) and apply a clean, sterile dressing to the wound.
- first aid measures in case of wild animal bites:
- remember the type of animal and, if possible, photograph it;
- carry out an examination of the victim;
- if the wound is not bleeding, wash it with a soapy solution and apply a clean sterile bandage;
- in the presence of a wound and intense bleeding – stop the bleeding and apply a clean sterile bandage to the wound.

Fig. 43. Bites of poisonous animals

Algorithm of actions in case of bites of poisonous snakes:

- if possible, remember the appearance of the snake that bit (color, size, pattern on its back, etc.);
- ensure the victim is calm and in a lying position;
- if a limb is injured, immobilize it;
- give the victim plenty of fluids (water, tea, etc.);
- apply a clean sterile bandage to the bite site;
- if the policeman is sure that the action of the poison is neurotoxic (causes muscle paralysis), a compression bandage should be applied above the bite site [15].

In no case should you try to remove the poison by cutting and burning the bite site. It is also forbidden to apply a cold compress to the bite site.

In case of bites of poisonous spiders and other poisonous insects, the same algorithm should be used. If the number of bites is significant, after providing first aid, the victim must be transported to a medical facility.

Control questions

1. *Allergic reactions: allergy, anaphylaxis, anaphylactic shock and emergency care for them.*
2. *Classify poisons and poisoning.*
3. *Describe food poisoning, botulism: clinic signs, principles of prevention, first aid.*

4. *Point out the main actions of a neurofunctional poison: the principles of prevention and first aid.*
5. *Poisoning by psychotropic agents: principles of prevention and first aid.*
6. *Poisoning by toxic chemicals, highly toxic substances and carbon monoxide – first aid.*

Situational tasks

Situation 1.

During the preservation of cucumbers, vinegar essence was spilled on the victim's right hand. The skin of the back and palm surface of the right hand is bright red with blisters filled with bloody fluid. The victim complains of pain, moans.

Task: What emergency medical care should be provided?

Situation 2.

During a country walk, a person was bitten by a viper. A sharp pain appeared in the area of the right lower leg, the function was impaired. There is swelling, bruising, and minor bleeding in the area of the bite.

Task: What will be your actions in this situation?

FIRST PREMEDICAL CARE IN ACUTE PATHOLOGICFL AND EMERGENCY CONDITIONS

Lecture plan

1. The main signs of acute diseases of the cardiovascular and respiratory systems. First aid in case of their occurrence.

2. Algorithms for providing pre-medical care in case of convulsions seizures (epilepsy), comatose states of diabetes.

3. "Acute stomach": causes of manifestation, pre-medical diagnosis.

4. First aid for emergency situations.

1. The main signs of acute diseases of the cardiovascular and respiratory systems. First aid in case of their occurrence

Chest pain can be the result of many diseases, including those that threaten a person's life. Cardiovascular diseases today constitute the largest share of the causes of deaths among the adult population of many countries of the world. In practice, such pathologies as angina pectoris, myocardial infarction, hypertension and stroke are mostly observed.

Angina occurs as a result of narrowing of the coronary vessels (vessels that supply blood to the heart and supply the heart with oxygen). Usually, angina attacks occur in the elderly against the background of atherosclerosis, because their blood vessels are narrowed due to the deposition of cholesterol on their walls. A stressful situation or physical exertion provokes an additional spasm of these arteries and a decrease in blood supply with oxygen to the heart muscle. A complete blockage of the coronary arteries leads to a myocardial infarction (death of a part of the heart).

The main symptom of angina pectoris and myocardial infarction is a burning pain behind the sternum (it can radiate to the left arm, shoulder, lower jaw, neck, or back). The victim suddenly has a very strong, almost unbearable feeling of fear, panic, lack of air (suffocation). There are signs of heart rhythm disturbances (arrhythmias), tachypnea (rapid

breathing – more than 30 respiratory movements per minute), cold sweat, nausea, dizziness. It should be taken into account that pain syndrome in the case of angina pectoris and myocardial infarction may not be present at all. Therefore, for any pain in the chest, help is provided in the same way as in the case of suspected heart disease.

Myocardial infarction as an emergency is always a surprise for the victim and his surroundings. Therefore, the police officer must remember that the time of rendering help depends not only on the victim's life expectancy, but also on his future state of health.

Pre-medical care is provided according to the following algorithm:

- to provide the victim with absolute physical rest (do not allow him to move);
- give him a half-sitting position;
- free the chest from tight clothing;
- provide the victim with access to fresh air;
- allow him to take only those medicines that the victim has already taken before (nitroglycerin, aspirin);
- do not give any medication to the victim yourself;
- when calling an ambulance, be sure to report chest pain;
- do not leave the victim unattended, constantly reassure him;
- be prepared for possible complications, including loss of consciousness, vomiting, cardiac arrest (which will require cardiopulmonary resuscitation) [3].

You can give such a victim 160–325 mg of aspirin in the form of a tablet, which he needs to chew and wait until the drug melts in the oral cavity (it is forbidden to swallow the tablet whole or in parts).

Aspirin should be given in the absence of relevant contraindications, in particular under the conditions that:

- the victim had previously taken aspirin;
- he has no signs of bleeding;
- the victim does not suffer from aspirin-dependent bronchial asthma.

A hypertensive crisis occurs in the event of a significant increase in blood pressure. The victim complains of headache, dizziness, tinnitus. If a hypertensive crisis is suspected, he should have his blood pressure measured. If the result is more than 140/90 mm Hg. art., you should call a doctor. Patients suffering from hypertension are usually recommended to use certain medications during a hypertensive crisis. Such a victim should be given a comfortable position (semi-sitting) and helped to drink the medicine.

A stroke (acute cerebrovascular accident) occurs as a result of impaired blood flow to an area of the brain (for example, an ischemic stroke caused by spasm of cerebral vessels) or as a result of a vessel rupture and bleeding into the brain (hemorrhagic stroke). Signs of a stroke are: sudden weakness and/or numbness of the face, arm or leg (on one side); speech disorder; sudden severe headache; anisocoria (different size of the pupils of the eyes); not understanding simple commands or questions; deterioration of vision in one or both eyes; gait disturbance; loss of balance or coordination; dizziness or fainting. Strokes are often painless and the victim may not be aware of the severity of his condition [15].

The time factor is especially important, so it is necessary to detect stroke symptoms as soon as possible. For this, the rule of five "P" should be used:

- "smile" – to ask a person to smile. In case of a stroke, she will not be able to do this (lowered corner of the lips, crooked face, asymmetrical smile);
- "talk" – ask a question to which a clear answer must be given (exact address, what happened, name of the victim). In a person with a stroke, speech will be slurred, slowed down;
- "raise" – ask the victim to raise both hands. A sign of a stroke is a situation in which one arm drops spontaneously, there is a weakening or spasm of the muscles of the face, arms, legs, unexpected difficulty in walking, impaired coordination and balance;

- "look" – the victim may have an unexpected visual impairment, double vision (diplopia);
- "come to your senses" – the victim may lose consciousness.

If a stroke is suspected, you should:

- place the victim in a semi-recumbent position with the head raised at an angle of 30°;
- make sure that the victim can breathe. If there is a violation of breathing, it is necessary to release his respiratory tract, checking the oral cavity for the absence of foreign objects and put the victim on his side;
- call an ambulance as soon as possible (it is necessary to bring the victim to a medical facility no later than 2–3 hours after the start of the attack, otherwise the brain tissue is destroyed by necrosis and it will be impossible to help this person);
- remove tight outer clothing, unbutton top buttons, loosen tie;
- provide the victim with access to fresh air;
- do not allow to take any medicine until the arrival of an ambulance;
- do not allow to drink;
- closely monitor the victim (change in his condition) – monitor vital functions (breathing, heartbeat);
- be prepared for the sudden occurrence of possible complications (fainting, vomiting, convulsions) and the need for emergency assistance [11].

The main causes of respiratory disorders are the ingress of foreign bodies into the upper respiratory tract, bronchial asthma, pneumonia, obstructive bronchitis, trauma to the chest or lungs, anaphylactic shock (extreme severity of an allergic reaction) and poisoning.

Airway obstruction can be partial or complete. Signs of partial obstruction: preserved partial movement of air in the respiratory tract (the victim may cough and try to speak, wheeze, panic, grab the throat or stomach). Signs of complete obstruction: coughing becomes ineffective,

the victim cannot speak (the person can only snort, faints, bluish skin is observed).

First aid in case of partial obstruction of the respiratory tract involves the following algorithm of actions:

- to reassure the victim, to convince him of his ability to provide the necessary assistance;
- recommend the victim to take slow breaths;
- help him lean forward and lean on some object (in the absence of the necessary objects, the support can be the victim's own knees);
- advise him to cough as hard as possible;
- as long as the victim can cough – encourage him to do so.

If the victim is unconscious, you should:

- tilt it forward, hold the body with one hand, and with the other make five thrusts in the area between the shoulder blades with increasing force;
- if this does not give the desired effect – make five pressures on the abdomen (Heimlich technique);
- repeat blows between the shoulder blades and pressure on the abdomen until the foreign object is removed.

If the victim is unconscious:

- try to apply the Heimlich technique for a lying victim: for this, press with two hands on the place between the navel and the rib cage from below – up, trying to create pressure in the chest cavity;
- if such actions are ineffective and the victim remains unconscious, it is necessary to immediately start resuscitation measures and call an ambulance.

2. Algorithms for providing pre-medical care in case of convulsions seizures (epilepsy), comatose states of diabetes

A cramp is an involuntary contraction of a muscle or group of muscles, usually accompanied by sharp pain. Its reasons may be:

- head injuries, drug overdose, abstinence (alcohol or narcotic);

- epilepsy of unknown origin, brain tumors, high fever – hyperthermia (especially in children).

A seizure consists of two stages:

- the first stage is characterized by unconsciousness of the victim, impaired muscle function with signs of increased skeletal muscle tone, tension of the whole body and multidirectional movements of the limbs and head. During this phase, the victim can be seriously injured;
- within the second stage (after a convulsive attack), the victim does not remember the circumstances of the attack or even the actual fact of the attack (total amnesia), there is an involuntary discharge of urine and feces, he gradually falls asleep (comatose – post-epileptic state). At this stage, the victim is at risk of developing asphyxia as a result of obstruction of the upper respiratory tract, caused by the root of the tongue sinking in or saliva, foreign bodies, and vomitus entering the respiratory tract [20].

When providing first aid during the first phase of a seizure, you should:

- hold the victim's head to prevent injuries;
- do not try to forcefully stop seizures;
- remove dangerous objects (to protect the victim from additional injuries, including head injuries);
- remember the time of onset of the seizure;
- do not allow any objects to be inserted into the victim's mouth or forcefully open it.

After a seizure, during the second stage:

- assess the patency of the respiratory tract, carefully examine the victim's oral cavity;
- carry out an initial examination of the victim to exclude the presence of other injuries;
- if the victim is breathing, give him a stable lateral position;
- warm the victim and call professional medical services.

There are many diseases related to metabolism, most of which are caused by pathology of the endocrine glands. First of all, we are talking about diabetes.

For the normal functioning of body cells, sugar is needed as a source of energy. During digestion, the body breaks down food and produces sugar. However, sugar cannot get from the blood to the cells of the body on its own – for this it needs insulin (a hormone produced by the pancreas).

Diabetes occurs due to insufficient production of insulin by the human body. Under these conditions, not only carbohydrate metabolism is disturbed, but also many other types of metabolism, since insulin takes an active part in the metabolism of fats and proteins. The diagnosis of the disease is established on the basis of the presence of high blood sugar (over 5.5 mmol/l).

The main reasons for the development of diabetes are: hereditary predisposition (in almost 30% of cases); viral infection (this applies mostly to children); obesity, in which the disease occurs 10–12 times more often than in people of normal weight; pancreatitis, due to which the inflammatory process spreads to the endocrine part of the pancreas.

Complaints during diabetes are known to many people: strong thirst, dry mouth, increased urination, often itchy body (especially in the perineum). There are two types of diabetes:

- type I, or insulin-dependent (insulin-dependent diabetes, or ICD) is characterized by damage to a large part of the pancreas by an inflammatory process and its necrosis, during which the insular apparatus of the organ ceases to supply the human body with vital hormones.
- type II, or non-insulin-dependent (non-insulin-dependent diabetes mellitus, or INCD), when the activity of the insular apparatus is weakened due to other reasons [9].

In the first case, constant injections of insulin are necessary for the treatment of diabetes, in the second case, the patient needs drugs that stimulate the work of the endocrine department of the pancreas, which are taken orally (for example, maninil, glurenorm and their analogues).

A mandatory condition for treatment is strict adherence to a diet. Patients with diabetes are on permanent dispensary registration with an endocrinologist.

Patients with diabetes have impaired insulin synthesis or assimilation, so such a person, in case of violation of treatment rules, may end up in one of two dangerous states:

- hyperglycemia (with a very low level of insulin in the body, the blood sugar content rises sharply);
- hypoglycemia (with a high level of insulin in the body, the blood sugar content drops sharply).

These two conditions are more common in patients who take insulin injections (insulin-dependent diabetes mellitus).

Signs of an emergency in case of diabetes:

- accelerated pulse;
- rapid breathing;
- frequent urination;
- desire to eat and drink;
- the smell of acetone from the mouth;
- sweating;
- dizziness, drowsiness, confusion and unusual behavior, which is often perceived as a state of alcohol intoxication;
- convulsions and loss of consciousness.

You should not worry that he cannot distinguish between hyperglycemia and hypoglycemia, since the pre-medical assistance in the event of the occurrence of these conditions is practically the same. First of all, you must immediately call an ambulance.

Often people with diabetes know what is happening to them and ask to be given something with sugar content. Some of them can carry sweets and other drugs with them in case of such conditions. If the patient is able to take food or liquid, you can give him something sweet to take. For the most part, candy, fruit juice, and soft drinks are effective because they contain enough sugar. Regular table sugar can also help [3].

If the victim's problem is low blood sugar (hypoglycemia), these products will improve the situation quite quickly. If the blood sugar content is very high (hyperglycemia), an additional amount of sugar for a small period of time will not cause significant harm.

If the victim is in an unconscious state, it is forbidden to give him drinks or food. You should constantly monitor the presence of vital signs in him and, if necessary, be ready to perform cardiopulmonary resuscitation.

3. "Acute stomach": causes of manifestation, pre-medical diagnosis

"Acute abdomen" is a collective term used to denote a number of acute surgical diseases of the abdomen with similar symptoms (gastric or duodenal ulcer, acute cholecystitis, acute pancreatitis, acute intestinal obstruction, acute appendicitis, acute peritonitis, acute inflammation of the uterine appendages, ectopic pregnancy etc.

Each of these conditions requires immediate medical attention. Signs of "acute stomach" are:

- severe pain;
- abdominal muscle tension;
- forced "embryo" pose;
- weakness, chills;
- nausea and vomiting.

Acute appendicitis is one of the most common acute surgical diseases of the abdominal cavity. The prevalence of appendicitis among the population is extremely high, which is a significant social problem [16].

When this pathology occurs, pain in the upper abdomen first occurs (sharp spasms in the navel or stomach area). When walking, coughing, sneezing or laughing, as well as bending over, the pain increases. Within a few hours, it is localized in the area where the appendix is directly located. Nausea and vomiting are also symptoms of acute appendicitis. These signs do not precede the appearance of pain, but accompany it. Another sign of the disease is hyperthermia. Its parameters most often do not exceed 380C. There are cases when the temperature does not rise

at all, but when its indicator exceeds 380C, it should be perceived as a serious threat of the inflammatory process. One of the symptoms of acute appendicitis is a wet tongue coated with white plaque: the further the inflammation spreads, the more dry the mouth becomes. Other signs of acute appendicitis may be lack of appetite, sleep disturbances (due to constant pain), sometimes constipation or diarrhea [13].

Cholecystitis is an inflammation of the gallbladder, which mostly occurs due to blockage of the bile duct of the liver. In most cases (90%), the cause of the disease is stones in the ducts of the gallbladder (calculous cholecystitis), and the rest (10%) are cases when cholecystitis develops as a result of bile stasis, exhaustion, the effects of trauma, sepsis, long-term use of parenteral nutrition, etc. Such cholecystitis is called stoneless. It should be taken into account that cholecystitis in any form is an extremely dangerous disease, especially if it begins acutely.

Symptoms of cholecystitis:

- strong, constant pain in the upper part of the abdomen on the right;
- nausea;
- vomiting;
- a blow to the back or right shoulder;
- sweating, chills;
- high temperature;
- flatulence;
- yellowing of the whites of the eyes and skin (jaundice).

These symptoms mainly occur after eating food (especially fatty food). The pain in the case of cholecystitis is similar to the pain that occurs during biliary colic, but it is stronger and lasts more than 6–12 hours, worsening every 15–20 minutes. A third of patients with acute cholecystitis have a high temperature. Usually relief comes after two or three days, and the attack stops completely after a week. Repeated acute attacks signal the occurrence of serious complications. The appearance of symptoms of jaundice, light-colored stools and darkening of the urine means that the common bile duct has been blocked by a stone that has

caused the accumulation of reserve bile in the liver (cholestasis). In this case, inflammation of the pancreas (pancreatitis) often develops.

Pancreatitis is an inflammatory-degenerative process in the pancreas. Symptoms and treatment of this disease directly depend on its severity and degree of inflammation. Despite the fact that the pancreas is a rather small organ, it performs the most important functions in the human body, the most important of which is the secretion of food enzymes for normal digestion and the production of insulin (its lack leads to such a serious disease as diabetes).

People prone to overeating, consuming fatty foods and alcohol most often suffer from pancreatitis. Under the action of certain provoking factors in the pancreas, the production of proteolytic enzymes is activated, which cause the development of inflammatory processes. In most cases, acute pancreatitis (98% of cases) is associated with alcohol abuse or gallstone disease.

During acute pancreatitis, pathological symptoms develop as in the case of severe poisoning of the body. Pancreatic enzymes remain in it and begin to destroy the gland itself, and when they get into the blood, they cause signs of general intoxication of the body. Pain in the case of pancreatitis is usually intense and has a constant character (patients describe it as cutting, "dagger"). In the case of untimely provision of qualified medical assistance, the victim may experience painful shock. The rapid development of the inflammatory process causes an active deterioration of his well-being. Hyperthermia quickly occurs, blood pressure decreases or increases. The victim's facial features sharpen, the skin of the body becomes pale, and the complexion acquires a grayish tint [15].

Symptoms of pancreatitis include dry mouth, hiccups, belching and nausea. Vomiting (with impurities of bile) does not contribute to the relief of the victim's condition.

Due to instability high blood pressure, there is a violation of the activity of the cardiovascular system, the victim is disturbed by constant shortness of breath, sticky sweat, an abundant whitish coating appears on the tongue. During an attack, the stomach and intestines do not

function, therefore, there is a strong swelling of the abdomen, and during palpation – tension of its muscles. Bluish spots appear around the navel or on the lower back, which give the skin a marble shade. In the groin area, the skin color may acquire a blue-green tint. This is explained by the fact that the blood from the affected part of the gland gets under the skin of the abdomen.

Stomach ulcer is a dangerous disease that develops as a result of damage to the walls of this organ. Gastritis can precede the disease. Perforation of a stomach ulcer is a dangerous complication of this disease, which causes bleeding and a total infectious process in the abdominal cavity (pancreatitis).

Pain in the upper abdomen is the most common symptom of this pathological condition. The pain is sudden, usually after eating. Victims with duodenal ulcers often complain of sudden awakening in the middle of the night. About 50–80% of patients with small intestinal ulcers suffer from pain in the epigastrium at night, which can spread to the back. Victims in whom the obstruction of a part of the stomach due to the formation of an ulcer begins, may complain of a feeling of fullness in the stomach and flatulence.

Typical symptoms of gastric ulcer:

- belching, bloating and inability to eat fatty food;
- heartburn, chest discomfort;
- melena – black stools due to gastrointestinal bleeding;
- prolonged bleeding leads to the development of anemia (its symptoms are fatigue, shortness of breath and pale skin).

Within the scope of providing pre-medical care, in the presence of any signs of "acute abdomen", you should:

- call an ambulance urgently;
- provide the patient with a position that will be convenient for him;
- put cold on the stomach.

Applying cold helps reduce pain and slows down the development of the inflammatory process. You can use a special bubble with ice; ice from the freezer, wrapped in a plastic bag and a towel; a hot water bottle

with cold water, etc. You need to keep the cold for 15 minutes, then remove it for 5 minutes, replace it with a new one and put it on your stomach again [14].

The victim is strictly prohibited from:

- take any painkillers and laxatives, alcohol;
- apply a heating pad to the sore spot;
- wash the stomach;
- clyster;
- consume water or food.

4. First aid for emergency situations

Electrocution is local and general damage to the human body, which occurs as a result of the impact of an electric current of considerable force or a discharge of atmospheric electricity (lightning).

Unlike other environmental factors that cause damage during direct contact, electric current can affect the body even when there is no direct contact with its source. Yes, it can strike a person at a distance – due to arc contact and step voltage.

Current of any voltage is dangerous to life. Alternating current is more dangerous for a person than direct current, which is due to the effect on cells of electrons, which move in one direction or another depending on the number of periods of current fluctuations. At the same time, high-voltage direct current is used as a therapeutic agent during physiotherapeutic procedures.

A current that exceeds the voltage of 60 V and strength is dangerous to life 0.08–1.0 A. Electric shock necessarily occurs when a current of 5 A is passed through the body. If the current is more than 10 A, the victim usually cannot free himself from the wires. In the case of such injuries, electric injuries occur, a quarter of which end in the death of the victim.

The severity of electrocution also depends on biological factors. Children, the elderly, patients with cardiovascular diseases, and those who are in a state of intoxication are more severely injured by electric current. Anesthesia and sleep reduce the effect of the current. Some

authors state the so-called readiness factor: that is, in the case of waiting for the action of an electric current, it becomes less vulnerable to a person.

Electrical energy is easily converted into other forms of energy and can cause mechanical, chemical and thermal damage. In connection with the mechanism of action of the current, the policeman should remember that there is always a possibility of damage to the cervical spine of the victim.

Electric current damages tissues not only at the point of contact, but also on the way through the body. Therefore, the police officer must find the points of entry and exit of electricity. They can be located both on the surface and inside the body. This point is quite important, as it provides information about the path of the current through the victim's body and his internal organs. If the current damages large vessels, the victim develops gangrene; if its path crosses the heart, significant disturbances of cardiac activity and even death occur. The latter can occur instantly (instant death) and have an asphyxial character [15].

There are light, medium and severe forms of electric shock. In the case of light injuries, the victim will faint. Medium-degree electric injuries cause general muscle spasms, fainting, breathing disorders and heart activity. In the case of severe injuries, the victim's breathing and cardiac activity are so suppressed that they cannot be restored by conventional methods (he is in a state of clinical death).

During the provision of first aid in case of electrical injuries, you must observe all personal safety measures. The algorithm of its actions should be as follows: immediately free the victim from the effect of electric current (quickly disconnect, and if this is not possible, throw away the electric wire using a dry pole or stick); perform cardiopulmonary resuscitation.

Fig. 44. Help in case of electrical injuries

When the victim regains consciousness, he should be given plenty of fluids (but not alcohol and coffee), covered with outer clothing or a blanket (warm) and a clean bandage applied to the burn site. In no case should the victim be sent home without a doctor's examination. Calling an ambulance is mandatory.

Measures to prevent lightning strikes in the event of an approaching thunderstorm:

- hide indoors or be in a car and close the windows completely;
- under the conditions of being in the water (directly or in a boat) – try to reach the shore as soon as possible;
- do not use the phone;
- do not approach telegraph poles or tall trees;
- try not to be on the tops of hills;
- do not approach agricultural machinery and small vehicles (motorcycles, bicycles);
- do not stand next to an iron fence, high voltage lines, steel pipes and rails, as well as near other electrical conductors;
- if there are many people, you should keep a distance from each other and try not to stand, but lie on the ground.

Drowning is one of the types of mechanical asphyxia, in which the mechanical factor is any liquid (water, wine, oil, etc.) that enters the respiratory tract.

As a result, liquid enters the victim's bronchi and lungs, due to which breathing stops, acute oxygen starvation develops and cardiac activity stops.

In order for a person to die from drowning, it is not necessary for his whole body to be completely submerged in water. She can drown even in a puddle, basin, tub, etc. This is possible, for example, when a person in a state of significant alcohol intoxication or during an epileptic attack (unconscious) falls face down into a puddle of water [21].

There are three types of drowning:

- reflex stoppage of breathing and heart activity due to sudden hypothermia due to drowning in cold water: drowning happens quite quickly (the lungs do not have time to fill with water); the drowning man's skin is pale, foamy masses are not released from the upper respiratory tract; bringing the victim out of the state of clinical death is possible even after 10 minutes of his stay in the water;
- the victim sinks slowly: water enters the lungs; the skin acquires a bluish tint, neck veins swell; foamy masses (sometimes pink in color) are released from the mouth;
- drowning during alcohol intoxication, epileptic seizure, brain concussion: the glottis closes at the beginning of drowning and a small amount of water enters the lungs; the drowning man has pronounced moderate bluishness of the skin; white or yellowish foam is released from the upper respiratory tract.

In the second and third options, resuscitation measures are effective if the victim was in this state for no more than 3–5 minutes.

To rescue a drowning person, you need to use rescue equipment – circles, balls, etc. It should not be forgotten that she acts unconsciously and instinctively. Even if the victim is a child, a friend, or a loved one, he can hold onto the rescuer tightly and pull him under the water. In this

case, the policeman will not only be unable to help, but will also die himself.

To comply with the rules of personal safety, when swimming to the victim, you should use a life jacket or other means that allow you to stay afloat (lifebuoy, inflatable mattress, etc.). If you approach the victim, you should ask him to calm down and explain that you are able to help him.

You should approach the drowning person with extreme caution, holding any object in your hands so that a person can grab onto it. If such an object is not at hand, swim to the injured person from his back and take him by the hair or under the armpits (then his head will be above the surface of the water and he will not be able to harm the policeman). If the victim has no signs of consciousness, turn him on his back and check for breathing; if he is breathing, transport him to the shore, preventing him from grabbing you.

When pulling the victim out of the water (if possible), it is advisable to involve two or three people to fix his cervical spine. Directly on the shore, it is necessary to restore the patency of the respiratory tract and check the presence of breathing of the drowning person. There is no need to clear his respiratory tract of water (a small amount of it reaches the lungs). Therefore, it is not necessary to apply pressure on the victim's stomach or turn him upside down to remove water from the lungs.

If the victim is not breathing, take five breaths (to relieve the spasm of mechanical asphyxiation) and re-check for signs of life. In their absence, start cardiopulmonary resuscitation (if possible, use a defibrillator as quickly as possible). In the event of the appearance of signs of life, the patency of the victim's airways should be ensured by giving him a stable lateral position.

Under the conditions of such a pathological condition, it is necessary to take into account the possibility of complications, namely:

- hypothermia (if the water temperature is below 25°C);
- spine injuries;
- vomiting;
- the presence of foreign bodies in the oral cavity [10].

Regardless of whether the water was fresh or sea, the drowning person should be urgently hospitalized.

To avoid accidents on the water, you should not swim alone and jump into the water in unfamiliar places. When you feel tired while swimming, you need to rest while lying on your back, and then, without hurrying, swim to the shore. In case of sudden muscle spasms, you should lie on your back and rub them. Once caught in a fast current, you should not try to overcome it – it is necessary to swim to the shore downstream [12].

In winter, the thickness and strength of the ice cover on the reservoir can be determined depending on the color:

- blue – the strongest;
- white – half as strong;
- gray – available water.

Providing assistance to a person who has fallen under the ice is an extremely dangerous business. To help the victim and not to die yourself, you should follow these rules:

- do not go out on the ice unnecessarily;
- in case of extreme need to go out on the ice – you should lie down on it and crawl along its surface, pushing the rescue tool in front of you;
- extend a long pole, rope, ski pole, etc. to the victim (in no case not your hand);
- pull the victim ashore to a safe place and provide him with the assistance provided in case of general freezing.

Control questions

1. *What are the general tasks and principles of pre-medical care. Specify the mechanisms of the development of dizziness.*
2. *What is the first aid for dizziness, fainting, collapse.*
3. *Acute stroke, causes of development, signs, first aid.*
4. *Acute heart attack, causes of development, signs, first aid.*
5. *Drowning and its types. Medical aid in case of drowning.*

6. *Local and general signs of electric injury. The sequence of providing pre-medical care for electric injuries.*
7. *The easiest ways to remove solid and liquid substances from the upper respiratory tract.*

Situational tasks

Situation 1.

During a meeting with a friend, he had an epileptic seizure. How should you act?

Task: What will be your actions in this situation?

Situation 2.

An elderly man asked you for help on the street. He complains of unbearable pain in the chest, a terrible feeling of death, dizziness. He asks to give the medicine, which is in the left pocket of his jacket.

Task: What pathological condition can be suspected in a person? What algorithm of pre-medical care should be used in this case?

RESUSCITATION: PRINCIPLES AND METHODS

Lecture plan

1. General idea about death. Characteristics of the terminal state, clinical and biological death.

2. Concept of cardiopulmonary resuscitation, its general rules.

1. General idea about death. Characteristics of the terminal state, clinical and biological death

The final stage of the individual existence of an organism is death, as a result of which its vital activity ceases.

The development and manifestations of a terminal condition (Latin terminum – the end) are significantly influenced by the pathological process that caused it. Thus, in case of injuries incompatible with life – multiple craniocerebral trauma, dismemberment of the body, rupture of the heart, aneurysm of the aorta – death usually occurs quite quickly.

If dying is prolonged, the terminal state can be conditionally divided into several stages:

- racing;
- terminal pause;
- agony;
- clinical death;
- biological death.

During the preagonal stage, there is a gradual decrease in blood pressure, suppression of consciousness and electrical activity of the brain.

Then there is a terminal pause, during which there is a temporary hold in breathing.

The next stage of dying – agony is defined by the sudden activation of subcortical centers against the background of shutting down the cerebral cortex.

After an agonal increase in vital activity, clinical death occurs. Under these conditions, there is the deepest depression of the central

nervous system, which extends to the medulla oblongata, as well as cessation of blood circulation and breathing.

Clinical death is the reverse stage of dying. Yes, the body as a whole no longer exists, but irreversible changes in the organs have not yet developed. In an environment with a low temperature, which slows down metabolic processes, the stage of clinical death can be longer. With this in mind, timely provision of first aid to a person in such a condition can bring him back to life. The medical study of various aspects of clinical death led to the emergence of the applied science of resuscitation [14].

In contrast to clinical death, cases of so-called imaginary (false) death are possible, during which, for several hours, body functions due to weak manifestations are imperceptible to a person. At this time, a living person resembles a dead person.

Under such conditions, it is quite difficult to detect external signs of life. In case of suspicion of apparent death, the person should be given first aid immediately.

The stage of clinical death after 5–8 minutes passes into the irreversible stage of dying – biological death.

The life of the organism primarily depends on the functioning of the organs of blood circulation, respiratory and nervous systems, which in 1800 Bisha united in the so-called vital (vital) tripod (triangle). Establishing signs of functioning of the heart, lungs and brain makes it possible to establish the presence of life in the human body.

Therefore, the absence of breathing, heart activity, and functioning of the central nervous system are considered probable or indicative signs of death. They are called probable due to the fact that, in the presence of these signs, it is impossible to establish the fact of death. They are often observed under various circumstances, when the course of life processes takes place at a minimal level.

Fig. 45. Signs of clinical death

According to clinical observations, even after a long-term cessation of blood circulation, the activity of the heart can be restored. If resuscitation measures are carried out within the next 4–5 minutes after the cessation of blood circulation, full recovery is possible in the future; if after a longer period, irreversible changes may occur in the higher parts of the central nervous system, although it is possible to restore the heart. So, clinical death is a transitional period between life and death.

The occurrence of irreversible changes in the body makes it possible to state biological death. After the cessation of blood circulation, these changes occur in the cells of the central nervous system, especially in the cerebral cortex (decortication), later cells in other parts of the brain die (decerebration).

Approximate (probable) signs of clinical death include: lack of breathing, signs of cessation of blood circulation and lack of reflex activity of the human body. Signs of cessation of breathing: absence of chest movements, signs of air passing through the nose and mouth. Signs of cessation of blood circulation: lack of pulse on the carotid and femoral arteries, grayish-pale or bluish color of mucous membranes and skin. Signs of lack of reflexes: fainting, pupil dilation and lack of reaction to light.

Obvious (reliable) signs of biological death include: opacification of the cornea and its drying, cadaveric suffocation, and cadaveric spots, which are formed some time after death in the lower parts of the body and differ from bruises in that they do not disappear when pressed. The presence of these signs makes resuscitation impossible. If there are no reliable (obvious) signs of death, under no circumstances can one state its fact and inform relatives and friends about its occurrence.

To ensure proper breathing, coordinated work of the organs of the respiratory system, circulatory system, nervous system and musculoskeletal system is required. Any injuries or diseases that lead to disruption of the functions of these systems can cause disorders of respiratory activity [17].

Stopping breathing makes it impossible to supply the body with oxygen, as a result of which the activity of all its systems stops. In the absence of oxygen within 4–6 minutes, brain cells begin to die. Under conditions of oxygen starvation for 10 minutes or more, irreversible brain damage occurs.

The main causes of respiratory disorders: foreign bodies in the upper respiratory tract, bronchial asthma; heart failure; pneumonia; obstructive bronchitis; electric shock; drowning; head, chest or lung injury; anaphylactic shock (extreme severity of an allergic reaction); poisoning.

In adults, foreign bodies enter the respiratory tract most often during the consumption of food, and in children and infants – as a result of inhaling small objects with which the child plays (buttons, seeds, small parts of toys, etc.).

Violation of airway patency can be complete or incomplete. A sign of incomplete obstruction of the respiratory tract by a foreign body is preservation of speech and breathing, as well as a constant cough. The following signs indicate a complete violation: the victim cannot speak and breathe, wheezes, makes fruitless attempts to cough, faints.

First aid for the presence of a foreign body in the upper respiratory tract involves ensuring their patency as soon as possible.

The algorithm for carrying out deobstruction under conditions of consciousness of the victim is as follows:

1. In case of incomplete obstruction of the respiratory tract:

offer the victim to cough;

if the attempts to cough up were successful, the patency of the respiratory tract is restored, examine the victim, call the emergency (ambulance) medical team;

It is necessary to constantly monitor the condition of the person during the provision of this type of assistance, since a mild form of obstruction can become severe at any moment.

2. With complete obstruction of the respiratory tract:

bend down and give five light strokes between his shoulder blades;

if the obstruction persists, perform five abdominal compressions;

repeatedly repeat blows and abdominal thrusts to normalize breathing.

The Heimlich method is the implementation of sharp thrusts in the stomach of the victim, during which a foreign body is pushed out of the respiratory tract (like a cork from a bottle). This method is prohibited to use in relation to people with significant weight, pregnant women and children under one year of age.

The action algorithm should be as follows:

- stand behind the victim and wrap his arms around his waist;
- clench your hand into a fist;
- press the fist from the side of the thumb to the victim in a place slightly above the navel and below the end of the sternum;
- cover the fist with the palm of the other hand;
- perform a series of four to five sharp thrusts into the abdomen of the victim in the direction from below to above, from the front to the inside [20].

If the victim helps himself, he is recommended to lean over some hard object (the back of a chair, a handrail, or a sink), putting pressure on his stomach.

In the case of severe obstruction of the respiratory tract and lack of breathing function in an unconscious victim, it is necessary to put him on the floor, call an ambulance and start cardiopulmonary resuscitation.

In children older than one year, freeing the respiratory tract from a foreign object is carried out in the same way as in adults.

In the event of a foreign body entering the upper respiratory tract of a conscious infant, the following actions should be taken:

- supporting the baby's head and neck, turn it face down so that the head is lower than the body (for this, put the baby on your forearm or thigh);
- make five energetic pats between the baby's shoulder blades with the base of the palm;
- if the previous measures are ineffective, turn the baby on his back and put him on your lap (the level of his head should be lower than the level of the body);
- place the index and middle fingers on his sternum so that they are at a distance of one finger below the imaginary line passing between the baby's nipples;
- perform a series of five sharp thrusts into the sternum to a depth of about 2 cm;
- repeat consecutive tapping and chest compressions until the moment of normalization of breathing.

If there is a foreign object in the newborn's mouth, it is forbidden to remove this object with your fingers, because it can get deeper into the respiratory tract. The object should be removed by squeezing the sternum. In addition, as mentioned, it is forbidden to perform abdominal compression in infants and newborns – it is replaced by chest compression.

2. Concept of cardiopulmonary resuscitation, its general rules

The presence of signs of cessation of blood circulation or breathing are indications for cardiopulmonary resuscitation.

Cardiopulmonary resuscitation is an urgent medical procedure aimed at restoring the vital activity of the body and bringing it out of the state of clinical death. It includes chest compression (indirect heart massage) and artificial lung ventilation (artificial respiration).

Cardiopulmonary resuscitation should be started as early as possible. Moreover, the presence of two of the three signs of clinical death – fainting and the absence of a pulse – is a sufficient reason for its initiation. The founder of cardiopulmonary resuscitation is considered to

be the Austrian doctor Peter Safari, in whose honor the triple reception of Safari (the method of freeing the respiratory tract) is named [5].

Measures of cardiopulmonary resuscitation include:

- ensuring patency of the respiratory tract;
- checking the presence of respiratory function;
- indirect heart massage;
- artificial lung ventilation by the "mouth-to-mouth" or "mouth-to-nose" method.

Ensuring the patency of the respiratory tract should be carried out according to the following algorithm:

- put the victim on a hard surface with his back down;
- kneel on the side of the victim's neck and shoulders;
- put your palm on the victim's forehead and gently tilt his head back. This manipulation is prohibited in the case of signs of the rule of six "B" (see Topic 4);
- with the other hand, carefully pull his chin forward and push out the lower jaw, pressing on the chin, open his mouth;
- within 10 seconds (however, no more) determine the presence of normal breathing – carefully look to see if the chest moves, try to hear the sound of breathing or feel a breath with your cheek or ear (single sighs cannot be considered normal breathing) [6].

Fig. 46. Chain of survival

If after these manipulations breathing has not been restored, it is necessary to start an indirect massage of the heart.

The sequence of actions during this should be as follows:

- place the victim on a hard surface with his back down;
- free the front chest wall from clothing;

- stand to the left of the victim and place your palms (one on top of the other) on the area between the middle and lower thirds of the sternum;
- press on the sternum with the raised places of the thumb and little finger (the base of the palm) of the policeman's hands;
- without bending your arms at the elbow joints and leaning with your whole body, with your weight (and not only the strength of your hands), press exactly down on the sternum with a frequency of 100–120 times per minute. The front wall of the victim's chest should bend inwards by at least 5–6 cm, that is, by 1/3 of the chest.

If there is information that the victim fainted as a result of a heart attack, and the policeman does not have first aid skills, such a victim should not be given artificial respiration – only indirect heart massage should be performed to restore his blood circulation.

Artificial ventilation of the lungs by the "mouth-to-mouth" method is carried out only after ensuring the patency of the respiratory tract.

The action algorithm should be as follows:

- open the victim's airways, using the technique of "throwing the head with a chin lift";
- insert a mask-valve into the victim's open mouth;
- pinch the victim's nose, take a deep breath, tightly press your lips to the valve to create a seal and breathe air (within one second) into his mouth (the victim's chest should rise);
- open the nose and keep the victim's airways open;
- noticing the movement of the chest, make a second exhalation;
- in the absence of chest movements, repeat the technique of "throwing the head with a chin lift" and make a second exhalation.

Air is inhaled at a rate of 16–18 times per minute until spontaneous breathing occurs. In case of injury to the jaw, artificial respiration should be carried out by the "mouth-to-nose" method (the victim's mouth should be closed).

The correctness of heart massage is controlled by the one who performs artificial lung ventilation, paying attention to the presence of pulsating impulses on the carotid or femoral arteries, synchronous with pressure on the sternum.

After 2 minutes of performing resuscitation measures (five cycles), the police officers change functions. Moreover, each of them remains in their place – only their actions change.

Cardiac massage and artificial ventilation of the lungs should be done continuously until the arrival of the medical assistance team. Cardiopulmonary resuscitation should be stopped before the arrival of an ambulance if the victim regains breathing and motor activity or if there is a real danger to the policeman's life. If reliable signs of biological death appear in the victim, despite correctly carried out resuscitation or signs of clinical death persist, and it is not possible to call a specialized ambulance team (in conditions of a remote area), resuscitation is also stopped [14].

Cardiopulmonary resuscitation of a child is distinguished by certain features.

The release of airways in young children should be carried out as follows: open the airways using a towel or blanket (place them under the head and neck) – the child's head should be in a neutral position; raise her chin and remove foreign bodies from the oral cavity.

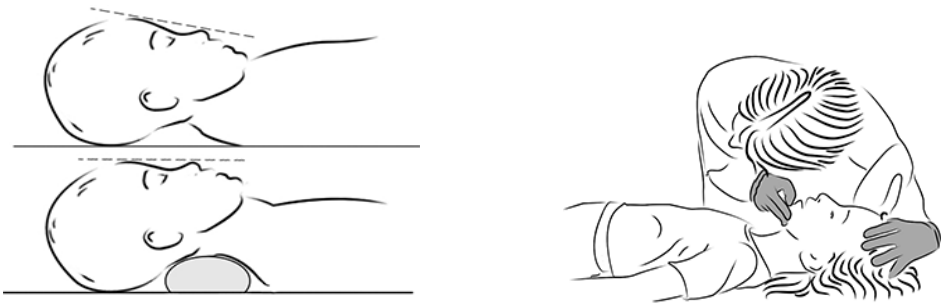

Fig. 46. Checking the patency of the respiratory tract in children

If after that the child coughed and began to breathe, it should be given a stable lateral position and periodically re-checked (every two to three minutes).

The sequence of actions during resuscitation of a child should be as follows:

- perform five mouth-to-mouth or mouth-to-mouth and nose ventilations. To do this, pinch the victim's nostrils with two fingers and take breaths for 1–1.5 seconds (the volume of air should be sufficient to lift his chest);
- open the nose and keep the victim's airways open;
- wait until the chest returns to its previous position (exhalation) before the next inhalation;
- place the palm of one hand in the middle of the child's chest;
- press on the breastbone with the thumb and little finger of the policeman's hand;
- press on the sternum with enough force to move it deep into 1/3 of the chest;
- perform compressions at a rate of at least 100–120 per minute.

Cardiopulmonary resuscitation of an infant up to one year old is carried out in the same sequence as in other age groups. At the same time, the release of the respiratory tract is defined by certain features. Compression of the baby's chest is carried out with the help of two fingers located on the middle part of the chest. The sternum should be pressed deep into 1/3 of the chest. Chest compression should be performed at a rate of at least 120 compressions per minute.

Artificial ventilation of the lungs is carried out by analogy with older children.

For an infant, the ratio of indirect heart massage and artificial lung ventilation is 15:2. Reanimation of an infant is carried out only by one person.

The technique of cardiopulmonary resuscitation of a newborn is very similar to the algorithm of resuscitation of an infant. In this case, resuscitation is also carried out by one person. The release of the airways, the implementation of the first five rescue breaths and the

measures of artificial ventilation of the lungs are similar. Indirect massage of the newborn's heart is specific: for this, the rescuer uses two fingers, which he places on the middle part of the newborn's sternum (two thumbs of both hands can be used). The ratio of indirect massage of the newborn's heart and breaths should be 3:1.

Control questions

1. *What should be understood by the term "resuscitation"?*
2. *What is clinical death? Its signs.*
3. *What is called biological death? What are its signs?*
4. *How is mouth-to-mouth and mouth-to-nose artificial respiration performed?*
5. *Describe the technique of indirect heart massage.*
6. *Point out the peculiarities of resuscitation when it is carried out by one person.*

Situational tasks

Situation 1.

On the territory of the recreation park, you found a person lying on the grass near a bench with no signs of consciousness.

Task: What should be your actions?

Situation 2.

You witnessed an elderly woman who was standing at a bus stop suddenly fall.

Task: What should be your actions?

Situation 3.

During the conversation with the witness, the latter suddenly began to suffocate, intensively gasp for air, lost consciousness.

Task: What should be your actions?

Self-test questions

Answer "yes" or "no" to the following questions:

1. In case of nosebleed, the head is thrown back.

2. The tourniquet is never applied to the thigh and forearm.

3. If a person has turned pale and lost consciousness, a roller should be placed under his feet.

4. The tourniquet is placed directly on the body.

5. If a person hits his head, faints, but quickly recovers, you should not bother the doctor.

6. Cardiopulmonary resuscitation – artificial respiration and indirect heart massage in a ratio of 2:30 with chest compressions to a depth of 4–4.5 cm.

7. Puncture wounds can be considered clean because they have a small surface area

8. Antiseptic measures are carried out to reduce the number of microbes or kill them.

9. During indirect heart massage, you need to bend the sternum as much as possible.

10. By carelessly providing help, you can cause a painful shock to the victim.

11. In order to prevent complications from the wound, it is better to immediately remove the objects or their parts that got into the wound.

12. It is dangerous to talk on the phone during a thunderstorm.

13. Before performing heart massage and artificial respiration, the drowning person must first remove water from the lungs.

14. If the face is pale, a roller is placed under the unconscious person's feet.

Answer keys

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
No	*Yes*	*Yes*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*

Tests for self-control

1. By what signs do they make a conclusion about the degree of severity of internal bleeding?

a) state of consciousness, skin color, blood pressure level;

b) pulse rates, increased body temperature, convulsions;

c) sharp pain, appearance of swelling, loss of consciousness.

2. If you loosen the harness, note:

a) may not be replaced;

b) you can not invest;

c) need to be supplemented.

3. Clean wound:

a) puncture;

b) torn;

c) cut;

d) operating room.

4. Help in case of a spider bite:

a) put a tourniquet;

b) cold to the bite site, alkaline solution, painkiller, hospitalization;

c) grease with petroleum jelly.

5. Blisters appeared as a result of the burn. This is a burn:

a) 1st degree;

b) II degree;

c) III degree.

6. In order to use plants as medicine, they are collected, processed, and dried. Prohibited:

a) dry in a draft;

b) collect in forest clearings;

c) dry in the sun.

7. In case of long-term compression syndrome in the area of the lower leg:

a) apply a tourniquet above the point of compression, and then release the limb;

b) release the limb from compression;

c) release the limb from compression, mobilization.

8. Gas poisoning:

a) stop the effect of gas on the body (put on a gas mask), take the victim out of the cell and remove the outer clothing, as it is soaked with gas;

b) take the victim out of the cell;

c) give to drink.

9. Help in case of nosebleeds:

a) put on the back;

b) in a sitting position, tilt the head forward, cold on the bridge of the nose;

c) tamponade with boric acid solution.

10. What is boric acid used for in a first-aid kit?

a) for preparing solutions for washing the eyes and skin, rinsing the mouth with alkali burns;

b) to stop bleeding from the nose, small wounds and scratches;

c) for the preparation of solutions for washing the eyes and skin, rinsing the mouth in case of acid burns.

11. How should you act when freeing a victim from the effects of electric current: with one hand or with two hands?

a) with one hand;

b) with two hands.

12. What should be the interval between artificial breaths during artificial respiration?

a) 2 seconds.

b) 5 seconds.

c) 8 seconds.

d) 10 seconds.

13. What are the signs of arterial bleeding?

a) blood oozes over the entire surface of the wound, flowing out slowly in drops;

b) bright red blood pours out in a pulsating stream (in time with contractions of the heart muscle);

c) blood flows out slowly, in a steady stream, and has a dark cherry color.

14. What should be the first measure for open fractures of the limbs?

a) stop the bleeding and apply a sterile bandage;

b) put on a tire.

15. What should be done in the event of a fracture or dislocation of the hand and fingers?

a) the hand should be bandaged to a wide splint, which should start at the beginning of the elbow and end at the end of the fingers;

b) the hand should be bandaged to a wide splint, which should start from the middle of the forearm and end at the fingertips;

c) the brush must be bandaged to a wide tire no less than the length of the brush.

16. What is the first aid for thermal and electrical burns of the first or second degree that are small in area?

a) water the affected parts of the body with a stream of cold water for 15–20 minutes;

b) lubricate the burned areas of the skin with ointment, fat, oil or petroleum jelly;

c) sprinkle burnt areas of the skin with baking soda or starch;

d) open blisters.

17. What lotions should be used when the skin is burned with acid?

a) boric acid solution (1 teaspoon of acid per glass of water);

b) a solution of baking soda (1 teaspoon of soda per glass of water).

18. What should be given to a victim of nitrogen oxide poisoning?

a) warm milk with baking soda;

b) hot tea with lemon;

c) ten glasses of water with the addition of acetic acid (one teaspoon per glass of water), inducing vomiting, then give milk to drink;

d) activated charcoal (dissolve two to four tablespoons of charcoal in a glass of water).

19. What is the main thing in providing first aid for frostbite?

a) how quickly hypothermic parts of the body can be warmed up;

b) prevent rapid warming of hypothermic parts of the body.

20. In what case should the heart massage of the victim be stopped immediately?

a) in the event of a pulse during a heart massage break;

b) in case of spontaneous breathing;

c) in case of narrowing of the pupils.

Answer keys

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
a	c	d	b	b	c	a	a	b	a	a	b	b	a	b	a	b	a	b	a

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Електронне навчальне видання

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