



**Federal State Budget Higher Education Institution "North Ossetian State Medical Academy" of the
Ministry of Health of the Russian Federation**

Department of Surgical Diseases No. 1

**EMERGENCY CONDITIONS.
Injury. MECHANICAL DAMAGE.**

*Teaching manual for students, medical interns,
clinical residents and doctors of all specialties*

The training and methodical manual was compiled by the staff of the Department of Surgical Diseases No.1 of the North Ossetian State Medical Academy of the Russian Ministry of Health.

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The training - methodical manual is dedicated to the current problems of surgery. Issues of urgent conditions for various injuries and injuries, their clinical manifestations, methods of diagnosis, treatment and prevention with test control are highlighted.

Recommended for medical students and doctors of all specialties.

Reviewer: D.M., Prof. Dr.Sc.(Econ.) Totikov B.Z.

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Emergency

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Emergency conditions are life-threatening conditions.

Key emergency states:

1. Shock;
2. Fainting;
3. Collapse;
4. Terminal states.

shock

Shock - acutely a critical condition of the body with progressive insufficiency of the life support system, caused by acute circulatory failure, microcirculation and tissue hypoxia.

In shock changes the functions of the cardiovascular system, breathing, kidneys, disrupted processes of microcirculation and metabolism. Shock is a multi-ecological disease. Depending on the cause, the following species are distinguished.

1. Traumatic shock:

- (a) as a result of mechanical trauma (wounds, broken bones, tissue compression, etc.);
- b) burn shock (thermal and chemical burns);
- c) When exposed to low temperature - cold shock;
- d) As a result of electrotrauma - electric shock.

2. Hemorrhagic, or hypovolemic, shock:

- (a) Bleeding, acute blood loss;
- b) acute violation of the water balance - dehydration of the body.

3. Septic (bacterial-toxic) shock (widespread perceptual processes caused by gram-negative or gram-positive microflora).

4. Anaphylactic shock.

5. Cardiogenic shock (myocardial infarction, acute heart failure).

Despite various causes and some features of pathogenesis (start moments), the main in the development of shock are **vasodilation** and, as a result, an increase in **the capacity of the vascular bed**, hypovolemia - a decrease in the **OCC** under the influence of various factors: blood loss, fluid redistribution between blood and tissues or the inconsistency of normal blood volume of the increasing capacity of the vascular bed as a result of vasodilation.

The main pathophysiological process, caused by a microcirculation disorder, develops at the cellular level. Microcirculation disorders, uniting the system of arteriole-capillaries-venollara, lead to serious changes in the body, as it is here that the main function of blood circulation is performed - the metabolism between the cell and blood. Capillaries are the immediate place of

this exchange, and capillary blood flow in turn depends on the level of blood pressure, the tone of arterioles and the viscosity of the blood. Slowing blood flow in capillaries leads to aggregation of formal elements, stagnation of blood in capillaries, increased intracapillar pressure and the transition of plasma from capillaries to interstitial fluid. There is a condensation of blood, which along with the formation of "coin" columns of red blood cells and platelet aggregation leads to an increase in its viscosity and intracapillary clotting with the formation of microtrombosis. As a result, the capillary blood flow is completely stopped. Disruption of microcirculation threatens to disrupt cell functions and even kill them.

In **the** development of traumatic shock, the main pathogenetic moments are **pain factor and blood loss** (plasmoposth), which lead to acute vascular failure with microcirculation disorder and the development of tissue hypoxia.

At the heart of **hemorrhagic shock** is a decrease in the volume of **circulating blood** and, as a result, **a circulatory disorder**.

A feature of **septic shock** pathogenesis is that circulatory disorders under the influence of bacterial toxins leads to the opening of arterio-venous shunts, and the blood bypasses the capillary channel, rushing from arteriole to veduly.

In **anaphylactic shock** under the influence of histamine and other biologically active substances capillaries and veins lose tone, The peripheral vascular channel expands, its capacity increases, which leads to the redistribution of blood - its accumulation (stagnation) in the capillaries and veins, causing disruption of the heart.

Disruption of microcirculation regardless of the mechanism of its occurrence leads to the hypoxia of the cell and a change in oxidative-restorative processes in it. In tissues anaerobic processes begin to prevail over aerobic, metabolic acidosis develops. The accumulation of acidic metabolic products, primarily lactic acid, increases acidosis.

In the development of **cardiogenic shock**, the triggering pathogenetic moment is a decrease in the **pumping function of** the heart followed by a violation of the microcirculation.

Thus, the main pathogenetic factors that determine the development of shock are:

- 1) Reducing the volume of circulating blood - hemorrhagic, hypovolemic shock;
- 2) vasodilation, increase in the capacity of the vascular bed, blood redistribution - anaphylactic, septic shock;
- 3) Violation of pumping heart function - cardiogenic shock.

All disorders of hemodynamics at any kind of shock lead to a change in microcirculation. Regardless of the triggers that determine the development of acute vascular insufficiency, the main ones are the disorder of capillary perfusion, as well as the development of hypoxia and metabolic disorders in various organs.

Inadequate circulation at the level of capillaries in shock leads to changes in metabolism in all organs and systems, which manifests itself in the functions of the heart, lungs, liver, kidneys, nervous system. The degree of insufficiency of organ function depends on the severity of the shock, and this determines its outcome.

Developed circulatory disorder, primarily microcirculation disorder, leads to ischemia of the liver and impaired its functions, which aggravates hypoxia in the severe stages of shock. Detoxifying, protein, glycogen-forming and other liver functions are disrupted. Disorder of the main, regional blood flow, microcirculation in the kidneys causes a violation of both filtration and concentration function of the kidneys with the development of oliguria, up to anuria. As a result, nitrogen slags - urea, creatinine and other toxic metabolic products - accumulate in the body.

Disruption of microcirculation, hypoxia cause a change in the functions of the adrenal cortex and a decrease in the synthesis of corticosteroids (glucocorticoids, mineralocorticoids, androgenic hormones), which exacerbates circulatory and metabolic disorders.

Disruption of blood circulation in the lungs causes a change in the function of external breathing, reduced alveolar metabolism, blood bypass, microthrombosis, resulting in the development of respiratory failure, exacerbating tissue hypoxia.

Factors predisposing to shock

A number of pathological conditions that preceded the effects of shockogenic factors or developed at this moment, reduce the overall resistance of the body, contribute to the appearance of shock and determine its severity. These include chronic diseases that deplete the body - avitaminosis, tuberculosis, anemia, as well as hypothermia, overheating, starvation, blood loss, nervous shocks, exposure to ionizing radiation, insufficient immobilization in the transport of the victim and anesthesia in immobilization and transportation, surgical interventions with extensive injuries, especially in the case of gunshot wounds.

Gravity assessment

When assessing the severity of patients' condition and determining the stage of shock, it is necessary to take into account the general condition of the victim, pulse, blood pressure, respiratory condition (frequency, depth, rhythm), diuresis (the amount of urine released), shock index.

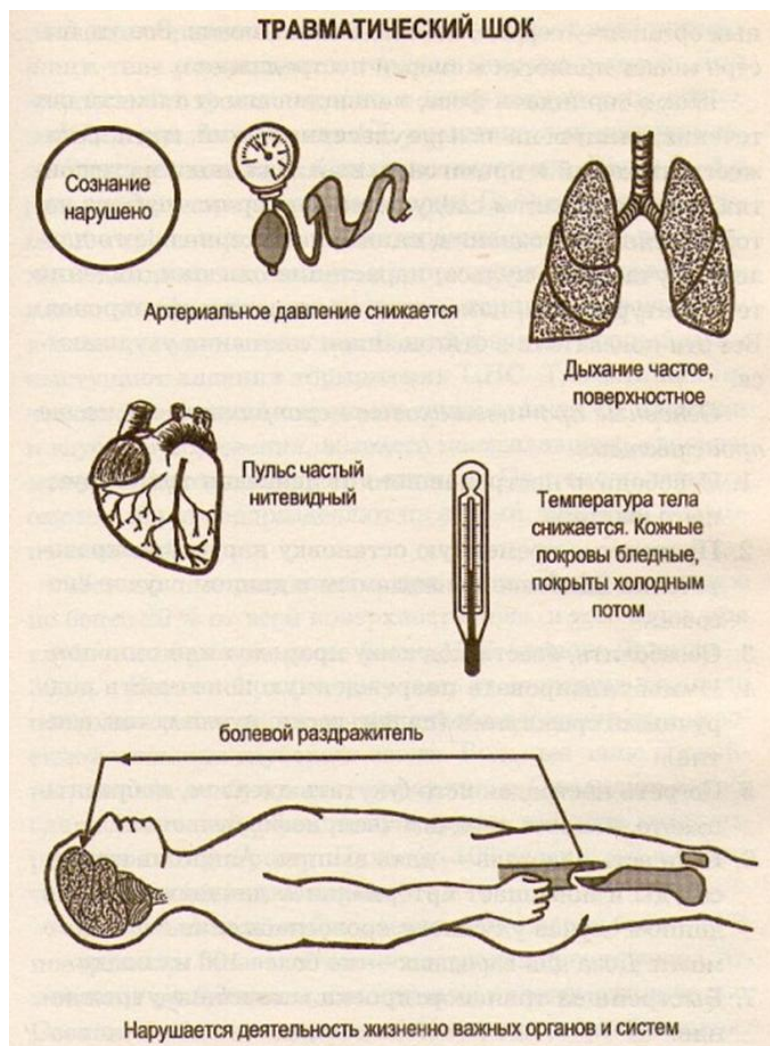
Blood pressure is of great importance in the assessment of the circulatory condition. There is feedback between such indicators as pulse and systolic blood pressure: with the development of shock, the heart rate increases, and systolic blood pressure (SAD) decreases. On this basis, Allover proposed a shock index, determined by the ratio of pulse (per minute) to SAD (in mmHg). Normally, the Allover index is 0.5 (pus 60 per minute: 120 mmHg) when moving from early stage to expressed shock (pulse 100 per minute, SAD 100 mmHg) it is 1.0, and in case of developed shock - 1.5 (120:80). The higher the index, the heavier the shock and the more serious the forecast.

According to the Allover index, you can also judge the amount of blood loss: in an index equal to 1, blood loss is 20-30% of the OCC, with an index of more than 1 - 30-50%.

Based on the main pathogenetic moments, the treatment of shock involves the following actions of the doctor: 1) elimination of the cause that caused shock; 2) restoring vascular tone and reducing the capacity of the vascular riverbed due to this capacity; 3) the restoration of the OCC and its compliance with the capacity of the vascular bed; 4) normalization of microcirculation - capillary blood flow; 5) Elimination of tissue hypoxia; 6) treatment of

complications - liver, renal, respiratory failure, restoration of impaired organs; 7) Elimination of metabolic disorders.

Traumatic shock



In the development of traumatic shock with massive soft tissue damage, traumatic toxicosis, bone fractures, ruptures, organ injuries play the role of pain factor, blood loss, exposure to toxic tissue decay products, the effect of the released tissues of biologically active substances (histamine), activation of callicrein-kinin system.

Blood loss is an important link in the development of traumatic shock. It matters not only the total volume of blood loss, but also the rate of bleeding. With a slow blood loss, a reduction of 20-30% in the OCC causes a marked decrease in blood pressure, while with rapid blood loss it can lead to death of the victim. Reducing CCC (hypovolemia) is the main pathogenetic link of traumatic shock.

There are erectile and torpid shock phases. **The erectile phase** is very short, occurs immediately after the injury, is characterized by the tension of the sympathetic-adrenal system. **The torpid phase of shock** is accompanied by general inhibition, low blood pressure, filamentous pulse.

In the first degree shock, consciousness is preserved, the patient is contacted, slightly inhibited. SAD is lowered to 90 mmHg, the pulse is slightly increased. The skin is pale, sometimes there is a muscle tremor. When you press your finger on the nail bed, the recovery of blood flow is slowed down.

In a Grade II-degree shock, the patient is retarded. The skin is pale, cold, characterized by sticky sweat. Expressed cyanosis of the nail bed, when pressed by the finger blood flow is restored very slowly. SAD downgraded to 90-70 mmHg. Pulse of weak filling, 110-120 per minute. The CVD has been downgraded. Breathing is superficial.

In the third degree shock, the patient's condition is extremely severe: he is adynamic, slowed down, answers questions monosyllabically, does not respond to pain. The skin is pale, cold, with a blue hue. Breathing is superficial, frequent, sometimes rare. The pulse is frequent, up to 130-140 per minute. SAD low - 70-50 mmHg. CVD - 0 or negative. Urinary urination is stopped.

In shock IV degree is noted preagonal state: the skin and mucous membranes pale, with a blue hue, breathing frequent, superficial, pulse frequent, weak filling, SAD - 50 mmHg. Art. and below.

First aid for shock at the pre-hospital stage should include:

- 1) stopping bleeding;
- 2) ensuring the passage of the airways and adequate ventilation of the lungs;
- 3) anesthesia;
- 4) substitution transfusion therapy;
- 5) immobilization in fractures;
- 6) adequate gentle transportation of the victim. Severe traumatic shock is often accompanied by inadequate ventilation of the lungs, one of the most common causes of which is aspiration of vomit, blood, foreign bodies. Then you should throw his head back or bring forward the lower jaw. Possible use of duct - S-shaped tube.

External bleeding stops the imposition of a harness, tight bandage, clamping of the damaged vessel throughout, the imposition of a clamp on the bleeding vessel in the wound. If there is signs of ongoing internal bleeding, the patient should be hospitalized as soon as possible for surgical treatment.

At the same time as the bleeding stops, it is necessary to make up for the CCC. To do this, it is better to use anti-Shoc blood substitutes: dextran (50,000-70,000) mass, dextran . It is possible to use crystalline solutions (Ringer solution, isotonic solution of sodium chloride), 5% solution of dextrose. In the absence of infusion environments to increase the OCC is recommended to put the patient on his back on the couch with the head left (The position of Trendelenburg) - to improve the venous return.

When damage to the lower limbs and pelvis, large blood loss, low blood pressure use pneumatic anti-shock suit with pressure up to 100 mmHg. Squeezing the lower limbs and pelvis helps to stop the bleeding, reduce blood flow to the lower extremities and increase the working OCC by moving the blood.

The anesthesia should be carried out before the imposition of transport tires and the transfer of the patient during transportation. To do this, you can use morphine, trime frontan, sodium metamizol. It should be remembered that the first three of these drugs depress breathing, so they are used with caution in victims with impaired breathing and in the elderly. In such cases, it is better to use sodium methamisole. For anesthesia can be inhaled through the mask of the anesthesia inhaled anesthetic mixtures, more often use dinitrogen oxide with oxygen in concentrations 1:1, 2:1.

Non-drug analgesics, in particular sodium metamizol (4-5 ml 50% of the solution) are effective in treating traumatic shock. It is possible to use tranquilizers (e.g. diazepam) in a dose of 1-2 ml 0.5% solution. All drugs should be administered intravenously, as due to the disturbed peripheral circulation, the absorption of drugs injected into the tissue is slowed down.

The immobilization of damaged limbs with the help of transport tires should be carried out as early as possible. The correct and careful transportation of the patient is of great importance. Careless movement of it increases pain syndrome and exacerbates shock. If the victim is conscious, he is put on a stretcher on his back. In the absence of consciousness to prevent obstruction of the upper respiratory tract (western tongue, leakage in the airways of blood, vomit) the patient is better to put on the side. If the victim is damaged and bleeding from the nose and mouth, the victim is transported in a position on the abdomen, turning his head to the side. Ducts should be used when the language is westerned.

Hemorrhagic shock

The body's reaction to significant acute blood loss is manifested in the form of hemorrhagic shock. The acute loss of 25-30% of the CCC leads to a severe shock. The development of shock and its severity are determined by the volume and speed of blood loss; depending on this, a compensated, uncompensated reversible and decompensated irreversible shock is singled out.

When compensated shock is noted pale skin, cold sweat, small and frequent pulse, blood pressure within the normal or slightly reduced, urination decreases. The skin and mucous membranes are cyanotic, the patient is inhibited, the pulse is small, frequent, blood pressure and CVD decrease, oliguria develops, the Algovier index is elevated, the ECG is marked by a disturbance of myocardial nutrition. There is no near-obstomous shock consciousness, blood pressure is not defined, the skin of the marble species, noted annuria (cessation of urination), the index of Algovier high. To assess the severity of hemorrhagic shock, it is important to determine the CCC, the volume of blood loss.

Treatment of patients with hemorrhagic shock provides for stopping bleeding, the use of infusion therapy for the restoration of the OCC, the use of vasodilators (see Bleeding).

Burn shock

In the development of burn shock, the main role is played by pain factor and massive plasma loss. Features of burn shock - the severity of the erectile phase, the duration of the flow and fast-paced oliguria and anuria (see Burns).

anaphylactic shock

At the heart of anaphylactic shock is the interaction in the body of antigen and antibodies. In surgical practice, anaphylactic shock develops with the use of protein blood substitutes, immune drugs, antibiotics, certain chemical antiseptic agents (iodine drugs), as well as other antigens that cause a reaction in patients suffering from allergic diseases (bronchial asthma, medicinal dermatitis, etc.). The following forms of anaphylactic shock are distinguished:

- 1) cardiovascular form, in which acute circulatory failure develops, manifested by tachycardia, often with heart rhythm disorders, ventricular and atrial fibrillation, lower blood pressure;
- 2) respiratory form, accompanied by acute respiratory failure: shortness of breath, cyanosis, stridorous squeamish breathing, wet wheezing in the lungs; this is due to a violation of capillary circulation, swelling of the pulmonary tissue, larynx, overgord;
- 3) cerebral form caused by hypoxia, microcirculation disorder and swelling of the brain; it manifests itself by a disorder of consciousness, the development of a coma, the occurrence of focal symptoms of central inertia.

By the severity of the current distinguish four degrees of anaphylactic shock: the first degree (light) is characterized by itchy skin, the appearance of rashes, headaches, dizziness, the feeling of high tide to the head; at the second degree (medium severity) to these symptoms are joined by otek Kwinke, tachycardia, lowering of blood pressure, raising the Alover index; The third degree (severe) is manifested by loss of consciousness, acute respiratory and cardiovascular failure (shortness of breath, cyanosis, stridorosis, small frequent pulse, sharp decrease in blood pressure, high Alover index); The IV degree (extremely severe) is accompanied by loss of consciousness, severe cardiovascular failure: the pulse is not determined, blood pressure is low.

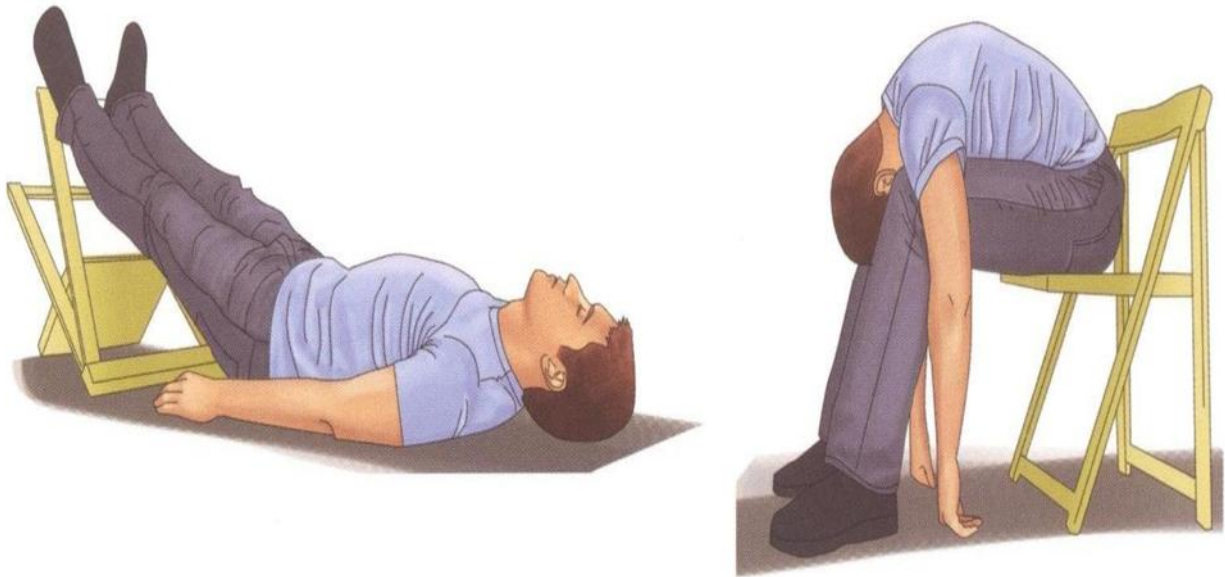
Treatment is carried out on the general principles of shock treatment: restoration of hemodynamics, capillary blood flow, use of vasodryne, epinephrine, norepinephrine), normalization of the OCC and microcirculation (colloidal solutions, dextran. In addition, use drugs inactivating antigen in the human body (e.g. penicillinase or betalaktamasa in shock caused by antibiotics) or the warning effect of antigen on the body (diphenhydramine, chloropiramin, promethazine, large doses of glucocorticoids - prednisone, dexamethasone, hydrocortisone, calcium). They are administered intravenously.

To prevent anaphylactic shock, it is important to identify allergic diseases in history and take this into account when prescribing remedies that can cause an allergic reaction. In the dysfunctional allergological history is shown to conduct samples for sensitivity of the body to the drugs used, such as antibiotics, antiseptic drugs, iodine drugs before angiography, etc.

Acute vascular insufficiency

Among the pathological conditions, which are based on acute vascular insufficiency, **secrete fainting, collapse and coma.**

swoon



Fainting is a short-term loss of consciousness associated with an acute decrease in cerebral circulation. This is the mildest form of acute vascular insufficiency. To fainting lead acute expansion of the vessels of internal organs, innervated by the vagus nerves, and deposition in these blood vessels. Blood redistribution leads to severe brain ischemia.

Fainting can be caused by prolonged standing, rapid rise after a long lie-down, rapid removal of a large amount of ascitic fluid, non-compliance with bed rest after the taking of ganglion blockers.

The cause of fainting may be heart disease (atrio-ventricular blockage, extrasystole, etc.).

Clinical signs - impaired consciousness, pale skin, tachycardia, weak frequent pulse, lower blood pressure, etc.

Treatment - horizontal position of the patient, hot drinking, inhalation of ammonia fumes, vasoconstricting agents.

collapse

Collapse - acute vascular failure due to the rapid deposition of blood in the internal organs, which leads to a decrease in the CO, lower blood pressure and CVD, as well as a minute's volume of the heart.

Collapse develops in acute heart failure - weakness of the heart muscle, heart damage, acute infectious diseases, poisoning. Changes in the body are similar to those in shock, but are not accompanied by changes in other organs and systems. This is a primary reaction to the factors

of influence on the vascular system. The collapse is characterized by pale skin with a gray hue, tachycardia (possibly rhythm disturbance), deafness of cardiac tones, weak frequent pulse, lower blood pressure, increased breathing.

The treatment is aimed at restoring cardiovascular activity taking into account the factor that caused the collapse.

coma

Coma - a severe state of the body, characterized by complete loss of consciousness and oppression of vital functions of the body. The cause of coma can be respiratory failure, hypoxia, brain injury, diabetes mellitus, alcohol intoxication, intoxication, liver failure, kidneys, etc.

Treatment is aimed at maintaining vital functions of the body and eliminating the factor that caused coma.



Terminal states

There are three types of terminal states: **preagonal state, agony, clinical death.**

Preagonal state. . . the patient is inhibited, there is a pronounced shortness of breath, the skin is pale, cyanotic, blood pressure is low (60-70 mmHg) or not determined at all, the pulse is weak frequent.

The deep stage of the dying process, in which there is no consciousness, the pulse is filamentous or disappears altogether, blood pressure is not defined.

Clinical death occurs immediately after the stop of breathing and circulation.

Cardiac arrest can be sudden or gradual - against the background of a long chronic disease, in the latter case it is preceded by a preagonal state and agony. Causes of sudden cardiac arrest

are myocardial infarction, blockage (obstruction) of the upper respiratory tract by foreign bodies, reflex cardiac arrest, heart injury, anaphylactic shock, electrotrauma, drowning, severe metabolic disorders (hyperkalemia, metabolic acidosis).

Signs of cardiac arrest, i.e. the onset of clinical death:

- 1) lack of pulse on the carotid artery;
- 2) the expansion of pupils with the absence of their reaction to light;
- 3) stopping breathing;
- 4) lack of consciousness;
- 5) paleness, less common skin cyanosis;
- 6) lack of pulse on peripheral arteries;
- 7) lack of BLOOD;
- 8) No heart tones.

The time for a diagnosis of clinical death should be extremely short.

Absolute signs: lack of pulse on the carotid artery, stopping breathing, enlargement of pupils with lack of their reaction to light. If there are these signs should immediately begin resuscitation.

Cardio-pulmonaation resuscitation

There are four stages of cardio-pulmonaion resuscitation:

- I - restoration of airway passage;
- II - ИВЛ;
- III - heart massage;
- IV - differential diagnosis, drug therapy, cardiac defibrillation.

The first three stages can be carried out in non-hospital conditions, and not necessarily by medical staff, persons with appropriate resuscitation skills. Stage IV is carried out by paramedics and intensive care units.

Stage I - Restoring Airway Passage

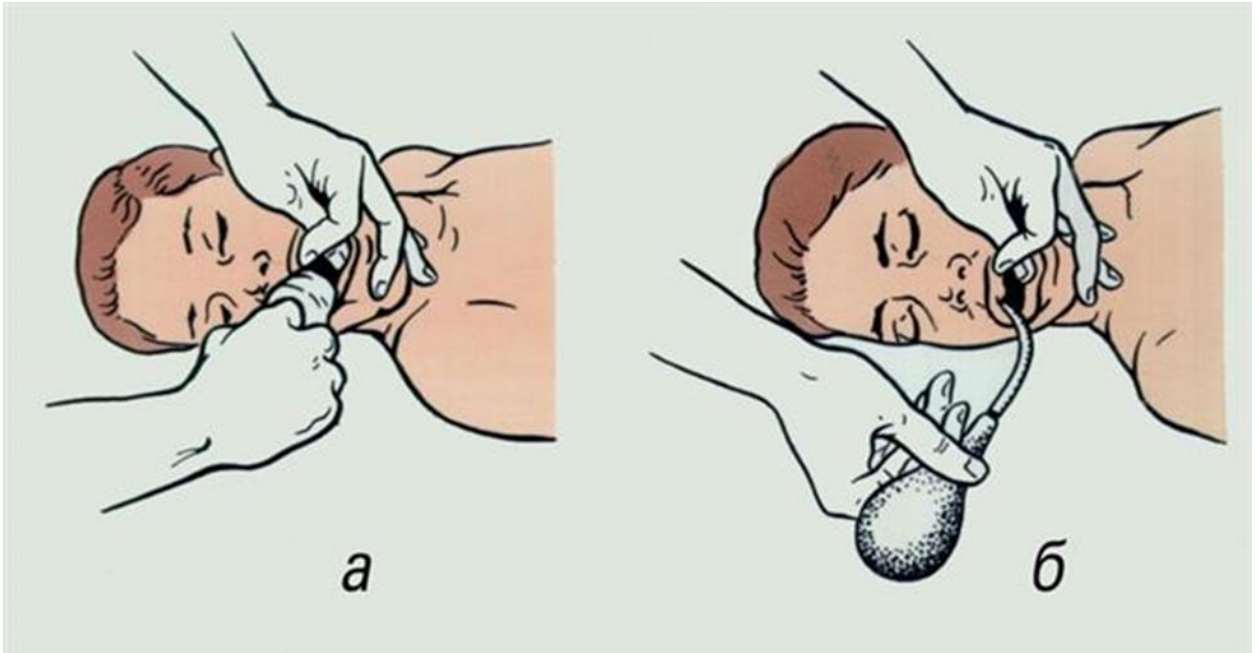
The cause of the violation of the airways can be mucus, sputum, vomit, blood, foreign bodies, western tongue.

The victim or patient must be laid on his back on the hard surface, turning his head to one side, crossed I and II fingers of the left hand to open the mouth and clean the mouth with a handkerchief (tissue) wrapped on the II or III finger of the right hand (Figure 22). Then the head should be turned straight and as much as possible to throw back. At the same time, one hand is located under the neck, the other - on the forehead, fixing the head. When the head is thrown

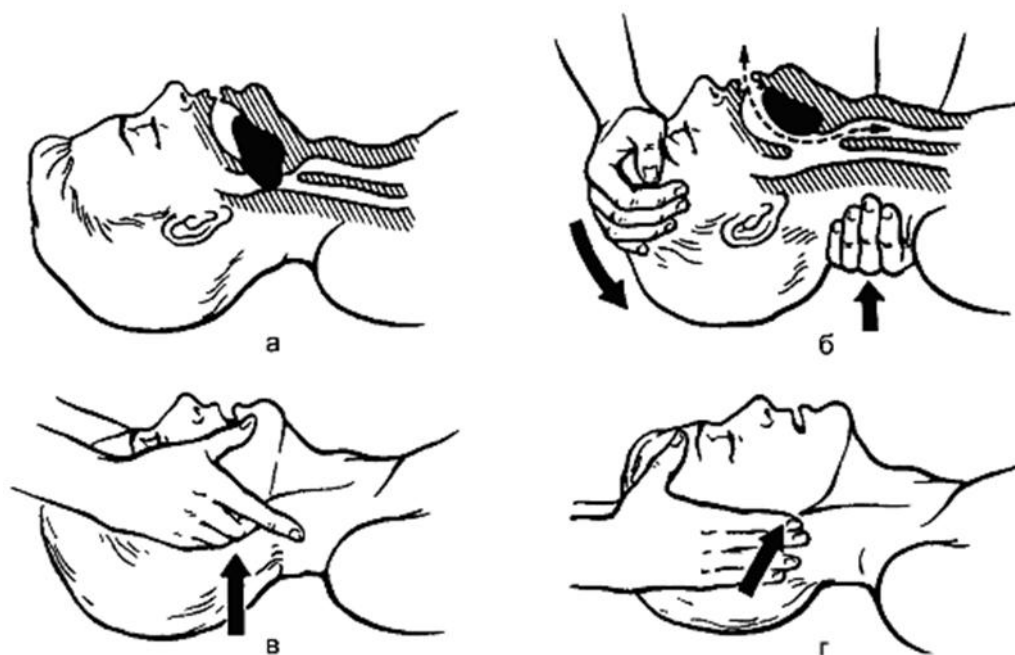
back, the lower jaw is pushed back along with the root of the tongue, as a result, the passage of the airways is restored (Figure 23). ducts (Figure 24) are also used to remove their obstruction.

Stage II - Ventilator

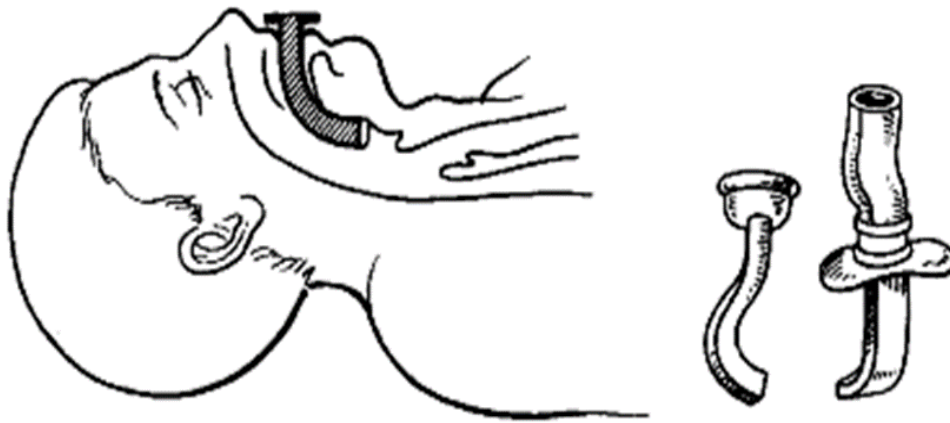
In the first stages of cardio-pulmonaion resuscitation is carried out by methods from mouth to mouth, mouth to nose and from mouth to mouth and nose (Figure 25).



rice. 22. Removal of mucus and foreign contents from the mouth and throat



rice. 23. The western language (a) and its removal by prod by the head (b) or by the nomination of the lower jaw (in, d).



rice. 24. Preventing mechanical asphyxia with ductwork.



nose. The narrow nasal part of the mask is held with the thumb, the lower jaw is raised up by three fingers (III, IV, V). THE second finger fixes the lower part of the mask. Rhythmic compression of the bag with a free hand produce inhalation, passive exhalation is carried out through a special valve into the atmosphere. Oxygen can be brought to the bag.

Stage III - heart massage

Heart compression can artificially create a cardiac output and support blood circulation in the body. In this case, the blood circulation of vital organs is restored: brain, heart, lungs, liver, kidneys. The effectiveness of artificial respiration and circulation is determined by the narrowing of pupils, the presence of pulsation on the sleepy and femoral arteries at chest and heart compression, reduction of paleness and cyanoticness of the skin. There are indirect (closed) and direct (open) heart massage.

At the pre-hospital stage, as a rule, an indirect massage is performed, in which the heart is compressed between the sternum and the spine. Manipulation is carried out, laying the patient on a hard surface or putting a shield under his chest. The palms are applied to each other at right angles, placing them on the lower third of the sternum and retreating to the top from the place of attaching the sword-shaped process to the sternum by 2 cm (Figure 26). Pressing on the sternum with an effort of 8-9 kg, shift it to the spine at 4-5 cm. Heart massage is carried out continuously rhythmic pressure on the sternum with straightened hands with a frequency of 60 per minute.

In children under 10 years of age heart massage perform with one hand with a frequency of 80 pressures per minute. In newborns, external heart massage is performed with two (II and III) fingers, placing them parallel to the sagittal plane of the sternum. The pressure rate is 120 per minute.

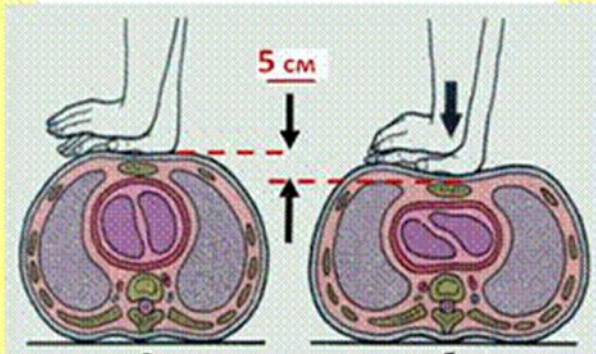
Direct heart massage is used in chest surgery, multiple rib fractures, chest deformities and ineffective indirect massage. For direct massage of the heart, the chest is dissected in the fourth between the ribs on the left. The hand is inserted into the chest cavity, four fingers are brought under the lower surface of the heart, the thumb is placed on its front surface. Massage rhythmic compression of the heart. In operations, when the chest is wide open, heart massage can be carried out with two hands. With a swauada of the heart it is necessary to open the pericardium.

Resuscitation activities can be carried out by one or two people (Figure 27). If one person assists, he becomes on the side of the victim. After the diagnosis of cardiac arrest cleanse the oral cavity and produce 4 blows in the lungs from mouth to mouth or from mouth to nose. Then they alternate 15 pressures on the sternum with 2 blows in the lungs.

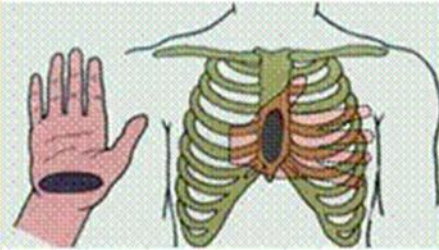
При отсутствии признаков жизни закрытый массаж сердца
проводить до прибытия скорой помощи



100 надавливаний на грудную
клетку в минуту на глубину 5 см



местоположение рук на
грудной клетке больного



Руки
прямые не
согнутые в
локтях



rice. 26. Indirect heart massage.



rice. 27. Heart resuscitation
performed by one (a) and two (b) persons.

If resuscitation activities are carried out by two people, one of them performs a heart massage, the other - ventilator. The ratio between ventilator and indoor massage is 1:5, i.e. one

blow to the lungs is carried out every 5 pressures on the sternum. The ventilator monitors the correctness of heart massage on the carotid artery, as well as monitors the condition of the pupils. Resuscitating periodically change places.

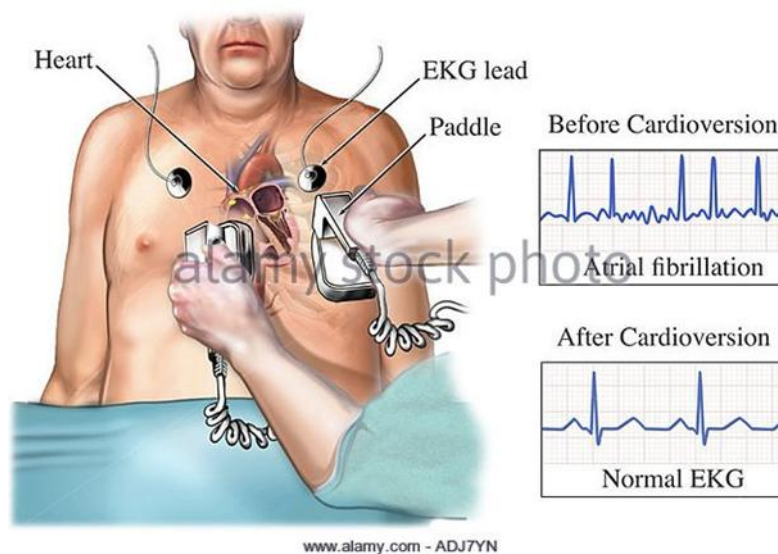
Resuscitation activities in newborns is carried out by one person, who consistently alternates 3 blows in the lungs and 15 pressures on the sternum.

Effective resuscitation is considered to be at the resumption of independent heart contractions, narrowing of pupils and the appearance of their reaction to light, restoration of skin color and blood pressure level not less than 70 mmHg. Resuming self-breathing is not necessary.

The reanimator periodically should monitor the condition of the pupils. Every 2-3 minutes it is necessary to stop heart massage in order to determine the appearance of independent heart contractions on the pulse on the carotid artery. From that moment the heart massage is stopped and continues to ventilate. The indications to stop resuscitation measures in case of their inefficiency are clear signs of biological death.

Stages of cardio-pulmonary resuscitation (restoration of airway passage, ventilator, indirect heart massage) are taught by a wide mass of the population - schoolchildren, workers at work, students, special services (police, traffic police, fire protection, rescue service on the water), average medical staff.

Stage IV - differential diagnosis, drug therapy, cardiac defibrillation



The fourth stage is carried out only by specialist doctors in the intensive care unit or resuscitation vehicle. At this stage, such complex manipulations as ECG study, intravenous or intra-cardiac administration of medicines: 0.1% solution of epinephrine - 1 ml in 10 ml 0.9% solution of sodium chloride; 10% calcium solution chloride - 10 ml; 2% solution of sodium hydrocarbonate - 20 ml. It is permissible to administer epinephrine endotracheal (through an intubation tube or by puncture of the trachea) due to the high suction capacity of the lining of the trachea.

In large-wave fibrillation, recorded by a cardiograph or electrocardiograph, defibrillation (current capacity - starting from 3 kW).

Drowning

The drowning period of clinical death is reduced to 3 minutes. At the same time, when the heart stops begin to indirect his massage, continuing artificial breathing. You should not waste time removing water from the lower airways.

Opportunities for cardio-pulmonaion resuscitation on the shore are greater. When drowning is always overflowing with water stomach, so it is necessary as early as possible to remove water from it. The victim is turned on his side and pressed with his hand on the epigastric area, then cleaned the mouth from mucus, sand, silt and immediately begin resuscitation. If the victim has no cardiac arrest, but no breathing, ventilator is carried out by way from mouth to mouth. In the case of clinical death, complete cardio-pulmonaation resuscitation is carried out (1 or 2 people are involved).

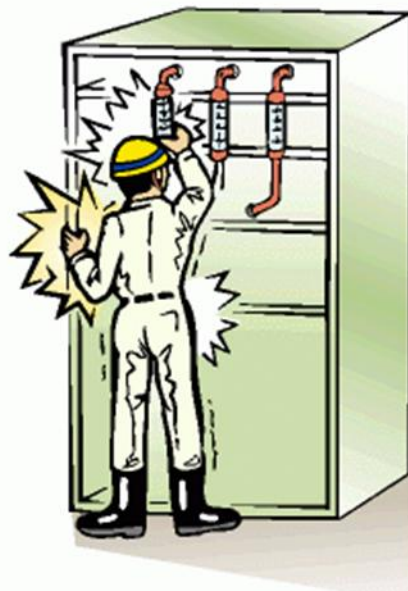
When drowning in fresh water, the osmolarity of which is lower than the osmolarity of the blood, the liquid from the alveoli is quickly absorbed into the blood. Therefore, there is no need to spend time removing water from the trachea and bronchus. When drowning in salt water with a concentration of salt up to 3.5-4% according to the law of osmolarity, the liquid part of the blood (plasma) rushes to the upper respiratory tract. Alveoli, trachea and bronchi can be filled with frothy fluid, which interferes with ventilator. The liquid can be partially removed by lifting the victim behind the lower part of the torso so that the upper part of the torso and head hang down. This manipulation should be carried out very quickly.

When drowning in cold water, the effect of hypothermia is manifested, against which metabolic processes and oxygen consumption by brain cells are reduced. The duration of clinical death is lengthened, and the recovery can be successful even with a long stay of the victim under water (more than 20 minutes).

All victims should be sent for further treatment and observation to the intensive care unit.

Electrotrauma, heat and sunstroke

In most cases, an electric shock can cause a stop of breathing, and then a heart.



In the first aid, first of all, it is necessary to release the victim from the source of current. If there are no fatal defeats, the victim is laid horizontally, providing him with complete peace. In the absence of breathing, you need to immediately start ventilating from mouth to mouth, in the heart is a direct massage.

In heat and sun stroke there is overheating of the body, while the processes of heat production are disrupted. Heat stroke occurs in working in sweltering, poorly ventilated rooms with high air temperature, as well as in people in clothes made of synthetic fabric.



To provide first aid, the patient is transferred to a cool room, take off his clothes, give a cool drink, take measures to cool the body: doused the victim with cool water, on the area of large vessels (neck, groin area) put bubbles with ice. Oxygen therapy is shown in breathing disorders. In severe cases, accompanied by cardiac arrest, immediately carry out cardio-pulmonary resuscitation with further transportation of the patient to the hospital.

Common injury issues. Mechanical damage.

Deaths from injuries in peacetime are ranked 3rd after cardiovascular and cancers and account for 5 cases per 10,000 population. Among men, it is twice as high as that of women.

Injury or injury is called sudden exposure to the human body external factors (mechanical, thermal, electrical, radiation, etc.), disrupting the anatomical integrity of tissues, organs, systems or organisms in general and physiological processes occurring in them.

The severity of the damage and their deposits is due to:

Feature of the external factor that caused the damage (volume, mass, shape);

Damage mechanism (app point, direction of force, speed of impact);

Anatomical and physiological features of tissues and organs exposed to external influences (reducing the plastic reserves of the skin and loss of bone mass in persons of senile age, the degree of filling of the contents of hollow organs);

Concomitant pathological changes in the injured organs or in the body as a whole;

Environmental features (high microbial air insemination in open fracture

Injuries - injuries, naturally repeated in certain contingents (social groups) of the population for a certain period of time.

The concept of injury and its classification is extremely important from the perspective of analysing the causes of recurring injuries, arranging treatment, disability pay related to the effects of trauma, making fundamental decisions to prevent some type of injury at the level of government and health authorities.

Injury classification:

Manufacturing: (a) industrial, b) agricultural;

Non-productive: a) household, b) sporty, c) transport, d) street;

Children's;

Military;

Intentional (murder, suicide, self-mutilation).

The most common 2 theories of injuries:

1. **Psychosomatic theory** explains the causes of injury constitutional predisposition of a person to trauma.
2. **Social theory** explains the causes of injuries by social conditions, i.e. special attention should be paid to the prevention of injuries by strengthening occupational health and safety.

The classification of injuries is the basis of building an unfolding diagnosis of an injury as a basis for further adequate treatment of the injury.

Damages are classified by:

Agent's mind that caused the damage:

Mechanical

Thermal

Chemical

Electric

Radiation.

Damages:

Open and Closed (characterized by the presence or absence of violations of the integrity of the skin and mucous)

Penetrating in the cavities of the chest, abdomen, skull or joint (with damage to the membranes) and **non-irritating**

In recent years, there has been an increase in multiple, combined and combined damage

Multiple injuries mean identical damage to the same anatomical structures (e.g. multiple limb fractures);

Combined damage - trauma of various anatomical structures when exposed to one damaging agent (e.g. a fracture of the tubular bone and a contusion of the brain in mechanical trauma)

Combined damage occurs at the same time as several damaging factors (e.g. fracture-mechanical impact combined with burn-thermal impact)

Direct damage occurs at the site of the trauma agent's impact; **indirect** - in a place far from the impact zone (e.g. cervical vertebra fracture from head impact while diving)

There is also **chronic damage that** occurs with repeated re-effects of the traumatic agent (e.g. changes in the bones of the brush during long training in karate athletes).

Complications occurring directly at the time of injury (in the first hours after injury):

Blood loss;

Traumatic shock, which is hypovolemic.

Disruption of vital organs.

Early complications developing in the first days after injury:

Infectious complications (wound drainage, pleurisy, peritonitis, sepsis, gas gangrene, tetanus, etc.);

Traumatic toxicosis or **long-term compression syndrome.**

Late dangers and complications:

Chronic Infectious Processes (C. Post-Traumatic Osteomyelitis, etc.);

Violation of tissue trophics (trophic ulcers, bedsores and wound exhaustion);

Anatomical and functional defects of damaged organs.

Closed soft tissue damage includes:

concussion (commotio)

contusio

stretching (distorsio)

Gap (ruptura)

compression (compressio)

The main common clinical manifestations of closed soft tissue damage are:

- Spontaneous pain, sharply increased by palpation and movement;
- Gradually increasing swelling without clear boundaries;
- Hematoma, accompanied by imbibias of the skin with blood (blood). The color of the bruising gradually changes due to the disintegration of Hg: at first it is red or crimson gradually by 3-4 days acquires a blue tint, and then by 5-6 day it becomes green or even yellow;
- Violation of functions, determined by changes in the volume of active and passive movements in the joints (excess of normal volume of passive movements - pathological mobility).

Concussion (commotio) - has no characteristic clinical signs, is determined anamnestically.

Contusio - damage to soft tissues or organs without visible violations of their anatomical integrity.

Stretching (distorsio) - damage to tissues while maintaining their anatomical continuity.

Rupture (ruptura)- damage to tissues or organs with impaired anatomical integrity.

Dislocation (luxatio) - a complete permanent displacement of the joint ends of the bones in relation to each other, partial displacement called sublux. Dislocations are accompanied by the rupture of the capsule and the ligament with the exit through the rupture of the capsule of one of the joint surfaces.

Compression (compressio) - in short-term compression there are no characteristic signs, sometimes there are symptoms of injury.

Long-term compression syndrome is a pathological condition caused by prolonged (2 hours or more) compression of the soft tissues of the limbs, which is based on ischemic muscle necrosis.

There are three periods of clinical progress:

Early (period of swelling and vascular insufficiency)

Intermediate (period of acute renal failure)

Late (reconvalescence period)

Treatment of mild soft tissue damage in acute period:

1. local use of cold for the first 24 hours to reduce swelling and prevent extensive hematoma (ice application, chlorinethyl spray);
2. pressing soft bandage to reduce hemorrhage;
3. Immobilization of the limb in the area of its damage;

4. sublime limb position to improve blood and lymphoathy;
5. anesthetization.

Treatment of mild soft tissue damage in the cold:

- thermal physioprocedours to improve circulation in the area of damage and dissolving swelling and hematoma;
- Massage, LFC;
- with significant hematoma and extensive soft tissue damage, it is advisable to evacuate sequestered blood to prevent pation and extensive scarring.
- With more severe soft tissue damage (muscle and ligament ruptures) to restore the anatomical integrity of tissues, sometimes there are indications for surgical treatment.

Treatment for long-term compression syndrome

Immediately after the release from compression, an elastic bandage and a transport splint are imposed on the limb to limit the flow of toxic products into the bloodstream, and then carry out anti-cancer measures: the introduction of narcotic analgesics and infusion of volume-replacement solutions. The limb is cooled with ice. In order to improve microcirculation and relieve pain, it is advisable to carry out a case of novocaine blockade. At the same time, detoxification therapy and surgical treatment of wounds and abrasions are carried out. With the increasing swelling of the limb to create the effect of decompression of muscles is a reasonable operation - lamp incisions with the dissection of fascia. In the phenomena of growing renal failure, a complete sanitization of the limb from necrotic tissues up to amputation of the limb is necessary, as well as the cupping of renal failure phenomena, including extracortical methods (hemodialysis).

Treatment of late complications is carried out according to general principles, depending on the nature of their manifestations.

First aid fordislocation, as with any mechanical damage, is to transport immobilization to prevent complications of dislocation and in the introduction of analgesics to reduce pain syndrome and to relax the muscles that provide movement in the damaged joint.

Treatment of traumatic dislocations consists of 3 stages:

Dislocation

Immobilization of the limb

Restoring function

There are many methods of dislocation, but all of them are modifications based on two basic principles:

Maximum distraction of joint ends by the application of force from the outside or under the influence of the weight of the limb (the correction of the shoulder on the Mot, the correction of the hip on Hippocrates, the correction of the shoulder and hip on Janelidze, etc.);

Repetition of limb movements, committed during dislocation, but in reverse sequence (shoulder and hip correction on Koher, correction of the lower jaw, etc.).

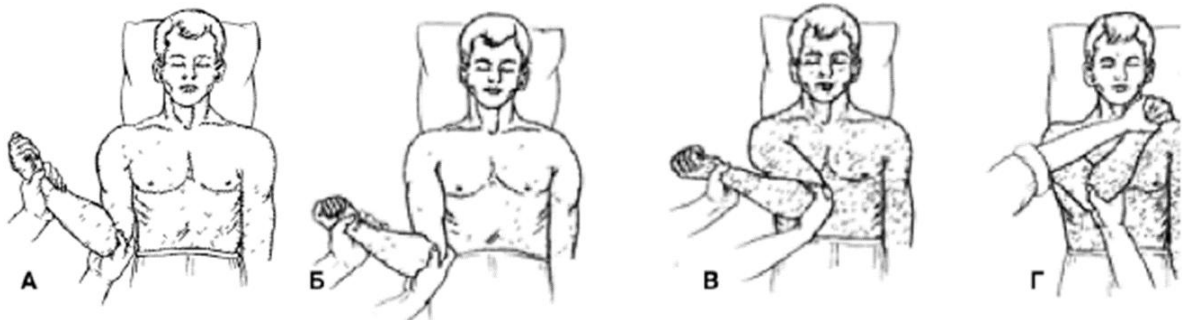


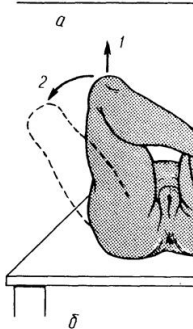
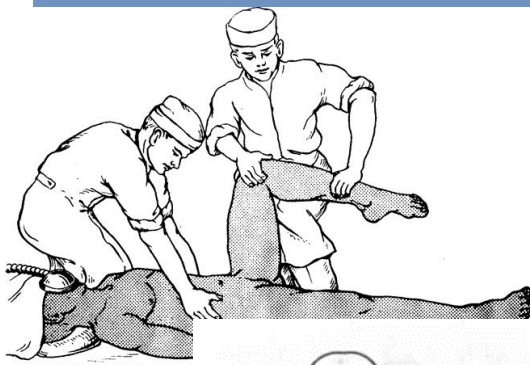
Рисунок 2.7. Техника вправления вывиха плеча по способу Кохера



Рис.1.18. Вправление вывиха плеча по Моту до вправления вывиха (рис. 1.18).

The correction of dislocation by a closed method is carried out with full pain relief and maximum muscle relaxation.

Immobilization is carried out by the imposition of plaster or soft bandages for a period of 2-3 weeks



Вправление вывиха бедра: а—положение больного: переднего вывиха. Цифр: вправления.

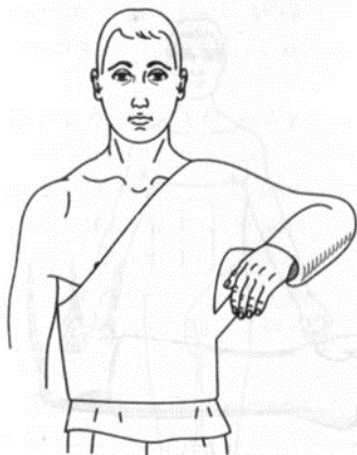


Рис. 5.37. Торакобрахиальная гипсовая повязка

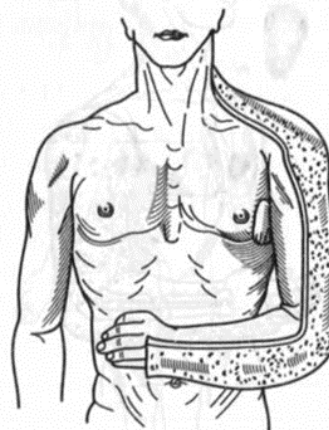
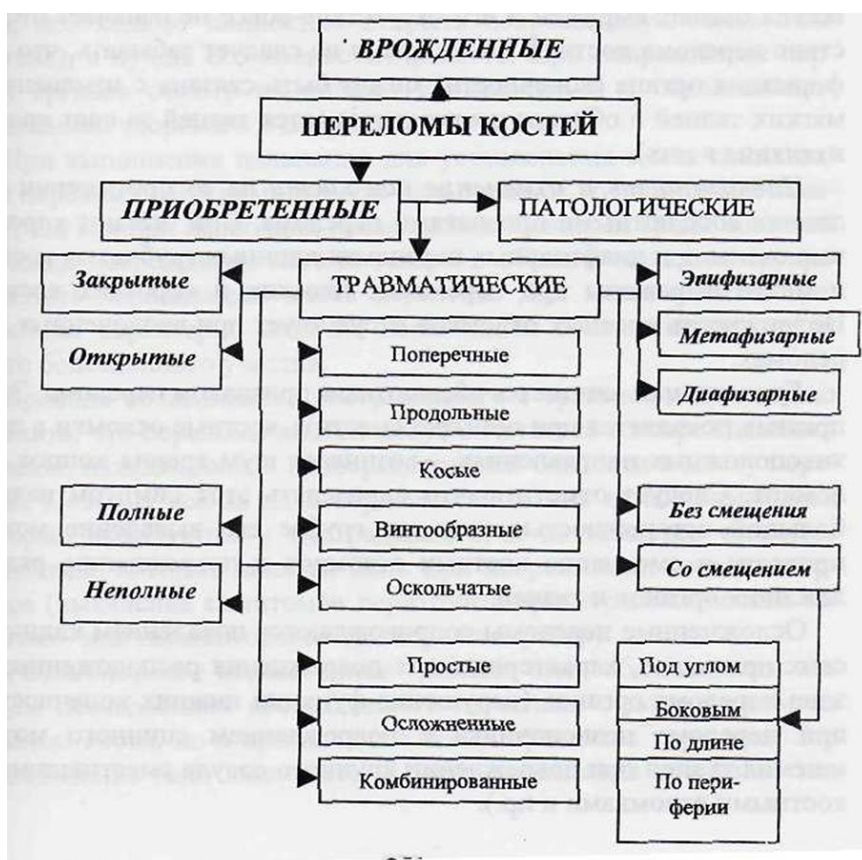


Рис. 5.38. Гипсовая лонгета при переломе плеча в нижней трети (по А. П. Юрихину, 1983)

Recovery of the function actively begin 2-3 weeks after the damage. There are: physical therapy and physiotherapy procedures that improve local circulation (massage, appliques and UHF). Full recovery occurs in 1-1.5 months, and the possibility of full load is reached in 3 months.

Open administration from the branch dislocation is carried out on the following indications: getting into the lumen of the joint of soft tissues or bones, as well as open dislocations.

A fracture is a bone intact disorder that occurs acutely under the influence of violence or pathological process



There are fractures:

- Full
- Incomplete (broken, cracked, hole and edge fractures, like "green twig" and sub-bone, found mainly in the child population).

The time of development is divided into:

- Primary - at the time of trauma under the influence of violence;
- Secondary - are caused by the retraction of muscles attached to the breaks, as well as in the provision of first aid.

The localization distinguishes fractures:

- Diaphysical
- Metaphysical
- Epiphysical (intraarticular)
- Epiphysolysis - fractures along the line of epiphysical cartilage with the detachment of epiphyses (in childhood and adolescence, when the process of ossifying germ zones is not yet over).

Классификация переломов по направлению и форме

- **Поперечные** — линия перелома условно перпендикулярна оси трубчатой кости.
- **Продольные** — линия перелома условно параллельна оси трубчатой кости.
- **Косые** — линия перелома проходит под острым углом к оси трубчатой кости.
- **Винтообразные** — происходит вращение костных отломков, костные отломки «повёрнуты» относительно своего нормального положения.
- **Оскольчатые** — нет единой линии перелома, кость в месте повреждения раздроблена на отдельные отломки.
- **Клиновидные** — как правило возникает при переломах позвоночника, когда одна кость вдавливается в другую, образуя клиновидную деформацию.
- **Вколоченные** — костные отломки смещаются проксимальней по оси трубчатой кости или располагаются вне основной плоскости трубчатой кости.
- **Компрессионные** — костные отломки мелкие, четкой, единой линии перелома нет.

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By the shift of fragments understand any deviation of the dist anywhere's fragment relative to the proximal or relative to each other. The presence of offsets is the most important determinant of consolidation processes and treatment methods for fracture.

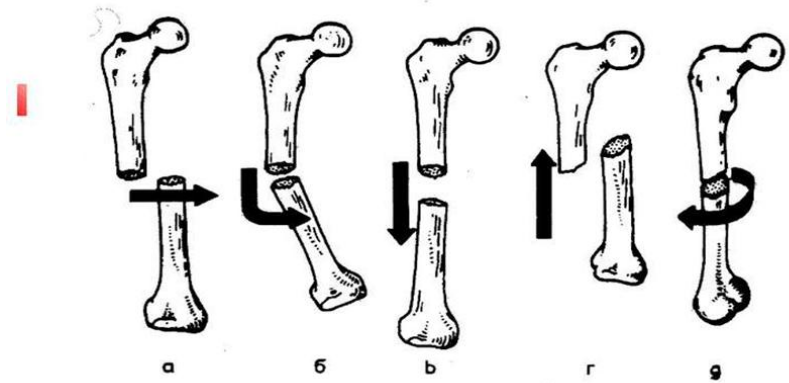
Types of offsets:

Sideways

Length (longitudinal)

At an angle

On the axis (rotational)



ВОЗМОЖНЫЕ ВАРИАНТЫ СМЕЩЕНИЯ КОСТНЫХ ОТЛОМКОВ ПРИ ПЕРЕЛОМАХ: а - БОКОВОЕ СМЕЩЕНИЕ; б - СМЕЩЕНИЕ ПО ОСИ (ПОД УТЛОМ); в - СМЕЩЕНИЕ ПО ДЛИНЕ С УДАЛЕНИЕМ; г - СМЕЩЕНИЕ ПО ДЛИНЕ С УКОРОЧЕНИЕМ; г - РОТАЦИОННОЕ СМЕЩЕНИЕ

Complications of fracture:

Local: damage to the skin or mucous in the fracture zone, damage to the trunk vessels and nerves of the limb, damage to internal organs, interposition

Common: fat embolism (pulmonary, brain and generalized forms), traumatic shock

Consolidation (fused, healing) fractures occurs by regeneration of bone tissue, while formed bone corn, connecting bone breaks.

The regeneration of bone tissue at the site of the fracture comes from 4 sources:

Periosta;

Havers channels;

Endost;

Paraossal soft tissues.

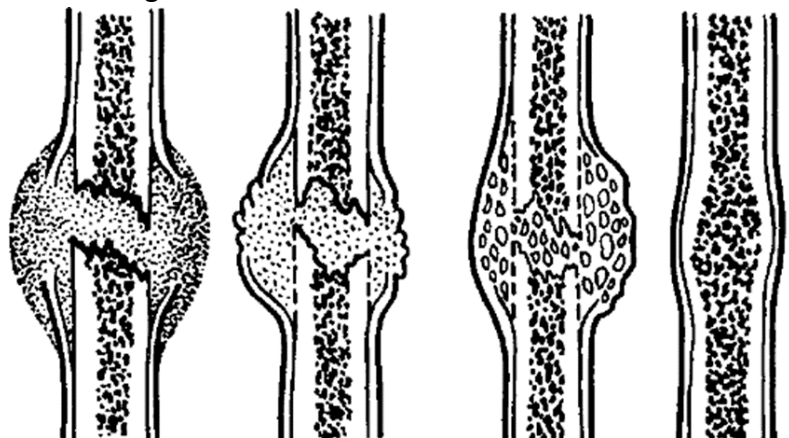
Accordingly, the sources of regeneration distinguish:

Paraossal

Periostatal

Intermedia

Endostasis calluses



The formation of the primary soft bone calluse occurs within 3-6 weeks of the fracture.

In the future, mineralization - calcification of the primary callus, which requires load, takes 5-6 weeks, it is accompanied by architectural reconstruction with the formation of osteons, bone

beams, the formation of bone canal and other elements of normal bone. The complete completion of regeneration takes place in 2-3 years.

Emit:

Primary consolidation, when osteoid tissue immediately turns into bone, bypassing the cartilage stage;

Secondary consolidation, when in the conditions of complete repositioning and fixation formed excess bone corn with the predominance of periostic and periosal components and passes the cartilage stage.

Violation of bone regeneration have 4 forms:

Slow consolidation

Unsold fracture

False joint

Wrongly fused fracture

The reasons for the violation of fracture consolidation are most often local: violations of blood supply to bone breaks, interposition, infection, treatment defects. Among the common causes of consolidation violations are all pathological conditions that disrupt the process of regeneration: avitaminosis, anemia, endocrinopathy, intoxication, exhaustion, metabolic disorders, etc.

The following basic principles must be followed in order to successfully treat fractures:

Repositioning (with fractures with displacement)

Fixing (until full consolidation)

Stimulation of reparative processes

Functional rehabilitation

First aid for fractures consists of mandatory transport immobilization with the use of transport tires or improvised means, stopping bleeding and preventing infection in open fractures (overlay of aseptic bandages), and if possible - anesthesia with analgesics.

For transport immobilization it is best to use modern pneumatic or plastic tires, which are well modeled on the limb, provide good immobilization and visual control of the condition of the limb

NB! Misuse of first aid increases the risk of complications such as traumatic shock, secondary bleeding, secondary displacement and infection. So be careful and careful when providing first aid!

A full clinical and X-ray diagnostics is performed at the stage of specialized care, after which a treatment program is determined. Most fractures in the absence of absolute indications to emergency surgery is treated conservatively or the operation is performed in a delayed

manner, after the normalization of the condition of soft tissues in the fracture zone and the general condition of the patient.

Conservative fracture treatment:

1. Emptying the hematoma (if available) with a needle
2. Anesthesia of the fracture site 2% novocaine solution 30-40 ml
3. Conductor anesthesia or anesthesia is used on the indications
4. Closed repository

A closed repository, depending on the location of the fracture, can be performed:

At once by hand or with the help of devices (with fractures of the bones of the forearm and small bones of the hand and foot)

Long-term with the help of imposed permanent skeletal stretching, which helps to eliminate displacement.

Constant stretching is used for repositioning and fixing fractures of the tibia, hip, shoulder, pelvic bones, etc.

Skeleton stretching

Skin stretching

Compression-distraction extra-ochative osteosynthesis (a type of skeletal extraction)

Skeletal stretching is the most common. To do this, through the bone (heel, upper metaphysics of the tibia) conduct a spoke, for which through the system of blocks is suspended cargo, carrying out stretching on the longitudinal axis of the broken bone. Stretching contributes to the gradual repositioning of fractures, eliminating the displacement of fractures.

A type of skeletal stretching is **compression-distraction extra-ochative osteosynthesis with the help of devices such as Ilizarov, Gudushauri, etc.**

This allows for both gradual repositioning and reliable fixation of the breaks with their dosed compression with special structures fixed on the breaks with the help of spokes carried through them on both sides of the fracture away from it. The method allows to load the limb as early as possible, to perform movements of slow consolidation, ungrown fractures, pseudo-arthritis, traumatic osteomyelitis.

Less often apply **oncut**, in which the pulling load is fixed to a specially cuffed from a sticky patch or zinc-gelatin bandages, pasted on the segment of the limb distal fracture.

Indications for surgical treatment:

Open fractures

Fractures complicated by damage to the main vessels, nerves, vital organs

Interposition

The failure of the closed reposition

Fractures with a large diastasis of fractures

Some different types of fractures (open and minor hip fractures, transverse diaphyseal fractures of the hip, shoulder)

Unstable fractures, wrongly fused fractures, false joints, etc.

Open fractures, fractures, complicated damage to the main vessels, nerves and vital organs require urgent surgery.

At the same time, in cases of open fractures, the main task of the operation is to close wounds in order to prevent infectious complications and hemostasis; intervention at the very turning point may not be performed or limited to a bloody reposition.

Types of surgery for fractures:

Open (bloody) reposition

Classic osteosynthesis: a) extramedullary, b) intramedullary, c) osteosynthesis with spokes and screws

Endoprosthesis of joints (in epiphyseal intraarticular fractures)

Tests

1. Resuscitation is:

1) Science studying the methods of life recovery

2) Practical actions aimed at restoring breathing and circulation in patients in terminal states

3) Special Ambulance Brigade

The maximum duration of clinical death under normal external conditions is:

1) 2-3 minutes

2) 4-5 minutes

3) 5-6 minutes

4) 6-8 minutes

The main signs of clinical death are:

1) A nitid pulse on the carotid artery

2) Expanding pupils

3) No pulse on the carotid artery

4) No pulse on the radial artery

4. Contradictions for cardiopulmonary resuscitation are:

1) Old age

2) Injuries incompatible with life

3) Deliberately incurable diseases, in the last stage of development

4) Alcoholism, mental illness

5. Indications for cardiopulmonary resuscitation are:

1) Only clinical death

2) Agony and preagonal state

3) All suddenly developed terminal states

4) Clinical death and biological death

Early signs of biological death include:

1) Advanced pupils that do not react to the light of pupils

2) Spot stains

3) Muscle stiffness

4) Corneal clouding

5) Deformation of the pupil

The criteria for resuscitation effectiveness are;

1) Pulse on carotid artery during massage

2) Chest tours

3) Reducing pallor and cyanosis

4) Narrowing of pupils

8. By shifting the sternum to the spine with indirect heart massage in an adult should be:

1) 1.5-2 cm

2) 3-4 cm

3) 4-5 cm

4) 7-8 cm

9. Before defibrillation, it is necessary to:

1) Stop the massage for 1-2 minutes and inject adrenaline in the heart

2) To defibrillating the heart without a prior massage and ventilator

3) To achieve the effectiveness of the SLR

The main sign of a coma is:

- 1) Oppression of hemodynamics
- 2) Respiratory depression

3) Suppression of the central nervous system

- 4) The suppression of the peripheral nervous system

The depth of the comatose state is determined by:

- 1) In severity of hemodynamic disorders
- 2) By the degree of oppression of consciousness

3) The degree of oppression of reflexes

12. The severity of the injury (injury) and its complications are determined by the following conditions:

1) A special feature of the external factor that caused the injury (volume, mass, shape, consistency, temperature)

2) The social situation of the victim

3) Damage mechanism

4) Anatomic and physiological features of tissues and organs exposed to traumatic agents (skin, bones and parenchymatous organs, empty and hollow organs, bones in people of different ages)

5) National and racially motivated

6) The presence of pathological changes in the injured organs (stenosis vessels, altered spleen, metastases in the bones)

7) Genetic conditioning

8) Unfavorable environmental conditions (air pollution, air temperature and humidity)

9) The material well-being of the patient

13. Injury classification, reflecting the social aspects of the interaction between the victim and the traumatizing agent includes:

1) Manufacturing

2) Unproductive

3) Thermal

4) Psychic

5) Intentional

6) Native

7) Multiple

8) Chronic

9) Sports

10) Military

14. Classification of injuries by the type of damaging agent includes:

1) Mechanical

2) Physical

3) Thermal

4) Chemical

5) Biological

6) Social

7) Electric

8) Radiation

9) Combined

10) Combined

11) Chronic

15. Signs that develop with long-term compression (traumatic toxicosis) immediately after compression is eliminated:

1) Rapidly increasing local swelling with the formation of bubbles filled with serous or hemorrhagic fluid

2) Muscle atrophy

3) Traumatic neurons

4) Severe limb pain, compression

5) Joint contractures in the area of damage

6) Appearance in urine bun, myoglobin, red blood cells and cylinders

7) Acute renal failure

8) The tendency to hypotension followed by hypovolemic shock

9) Development of phlegmona in damaged areas of the body

10) Gangrene of the damaged body area

16. What are the therapeutic interventions carried out for soft tissue injuries in the acute period?

1) Pressure bandage on the area of injury

2) Cold on the area of injury

3) Heat on the cloudwith injury

4) Injury area massage

5) Restriction of the movements of the bruised limb

6) LFC bruised organ

7) Antibiotic use

17. What are the therapeutic interventions of soft tissue injuries in the cold?

1) Pressure bandage on the area of injury

2) Cold on the area of injury

3) Heat on the area of injury

4) Injury area massage

5) Restriction of the movements of the bruised limb

6) LFC

7) Antibiotic use

18. What are the main conditions for successful dislocation?

1) Administering is carried out only in hospital conditions

2) The management of dislocation is advisable to conduct only a traumatologist

3) The dislocation is administered only in conditions of complete anesthesia

4) Application of all methods of dislocation only if knowledge of biomechanism dislocation

5) The correction is carried out only if the muscles are completely relaxed

6) Dislocation is administered only in the presence of muscle relaxants

19. The method of shoulder control, based on physiological relaxation of shoulder muscles, is the following: (a) Kocher method; b) Hippocratic method; **c) Janelidze's method;** d) Mota's method; (d) All existing methods.