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Department of Surgical Diseases No. 1

Aboutdreams of damage surgery
educational and methodical guide for students of medical universities

Compilers:
employees of the Department of Surgical Diseases No. 1 of the North Ossetian State Medical Academy.
Head of the department Associate Professor U. S. Beslekoev, prof. Khutiev Ts. S., Associate Professor Vakhotsky V. V., Associate Professor Ardasenov T. B., ass. Naniev B. L., acc. Dzakhov V. R.

Reviewers:

Head of the Department of Surgical Diseases No. 2

professor**Totikov V. Z.**

Professor of the Department of Faculty Surgery

FSBO HE ChSU Aishkhanov S. K.

ISSUES COVERED

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- Повреждения Breast injuries
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GENERAL INJURY ISSUES

Injuries rank 3rd in the overall morbidity structure after acute respiratory and cardiovascular diseases, and their mortality rate is 5 cases per 10,000 population.

Traumaor **damage is** the impact on the human body of external factors (mechanical, thermal, electrical, radiation, etc.) that cause a violationанатомической of the anatomical integrityof tissues, organs, systems or the body as a whole and the physiologicalx processesовоccurringx in them.

Theseverity of injuries and their complications is determined by the following conditions:

1. Feature of the external agentthat caused the damage (size, weight, shape);
2. Mechanism of injury (place of application, direction and speed of impact of the factor);
3. Anatomically and physiologicallye important features of tissues and organs exposed to external influences (changes in the plastic properties of the skin and a decrease in bone mass in senile individuals, the degree of filling with the contents of hollow organs);
4. Concomitante pathologicaleprocesses in damaged organs (stenosis or dilatedие vesselов, changesin internal organs, bones, etc.д.);
5. Featuresof theexternal environment (high humidity in case of electric trauma, frostbite, etc.).

Traumatismom refers to injuries that are regularly repeated in a certaincontingent of people over a certain period of time.

Classification of injuries

1. Non-industrial: a) transport; b) household; c) sports; d) street.
2. Production: a) industrial; b) agricultural.
3. Child.
4. Military.
5. Premeditated (murder, suicide, self-harm).

Classification of injuries

1. **By the type of damaging agent**: a) mechanicalие; b) chemical; c) thermal; d) electricalие; д;е) radiation .
2. **In relation to the external environment:** a) open or closed trauma (depending on the preservation or violation of the integrity of the skin and mucous membranes); b) penetrating into the chest, abdomen, joint or skull (with damage соответственноto the parietal pleura, parietal peritoneum, synovial membrane or dura mater, respectively) and non-penetrating.

By their nature, they distinguishsimple , множественныplural, combinede, and combinede injuriesя.

Simple injuries – damage to one organ.

Muralножественные- characterized by identicalми injuriesми to the same anatomical structures (for example, multiple soft tissue bruises).

СочетанныеContoured – injury caused by a single damaging agent of various anatomical structures (for example, rib fracture and lung rupture).

Combined – occur when several traumatic factors are simultaneously exposed (for example, a hip fracture and frostbite of the feet).

Injuries can be **direct**, i.e. they occur at the site of exposure to the damaging agent, and **indirect**-in the areafarй from the place of application of force (for example, a fracture of the cervical vertebra from a headbutt during diving).

There are also **acute** (occur with a sudden single exposure to a traumatic factor) and **chronic injuries** (develop as a result of prolonged repeated exposure to a damaging agent (calluses, etc.).

ОсложненияDamage complications

I. **Immediatecomplications**that occurat the time of the injury or in the first hours after it:
   1. Bloodflow.
   2. Traumatic shock.
   3. Violation of the functions of vital organs.

II. **Early complications,**развиваютhat develop in the first days after an injury:
   1. Infectious complications (wound suppuration, pleurisy, peritonitis, sepsis, tetanus, etc.);

2. Traumatic toxicosis.

III. **Late complications,**detected at a time remotefrom the damage:

1. Chronicaяpurulent infection;
2. Violation of trophic tissues (trophic ulcers, contracture, etc.);
3. Anatomical and functional defects of damaged organs and tissues.

WOUNDS

Wound (vulnus) – mechanical damage to tissues, accompanied by a violation of the integrity of the skin or mucous membranes.

The maine signs of the wound are pain, bleeding, and a gaping defect in the integumentary tissues.

In the wound allocate:

- The entrance hole.
- The edges of the wound.
- The wound channel or wound cavity.
- Wound walls.
- Bottom of the wound (blind wounds).
- Exit hole (through wounds).

The contents of the wound can be: 1) exudate, 2) blood clots, 3) destroyed tissues, 4) microbial cells, 5) foreign bodies.

Classification of wounds

I. By origin, surgical (operational) and accidental (traumatic) wounds are distinguished.

II. Depending on the type of traumatic agent and the nature of the damage: cut, stabbed, chopped, bruised, crushed, torn, bitten, poisoned, gunshot, mixed.

Sh. According to the degree of infection: aseptic, freshly infected and purulent.

IV. By the nature of the wound channel: through, blind, tangent.

V. In relation to body cavities: penetrating (into the cavity of the chest, abdomen, skull, joint, etc.) with or without damage to internal organs and non-penetrating.

VI. By location: wounds to the head, chest, hip, etc.

VI. By the number of wounds: single, multiple.

Characteristics of the Russian Academy of Sciences

A cut wound is applied with a sharp cutting object (knife, razor, glass). It is characterized by smooth edges, a minimum amount of non-viable tissues. The degree of bleeding and gaping depends on the location and relationship of the wound axis and Langer lines. Blood supply to the walls and bottom of the wound is not disturbed, the infection rate of cut wounds is moderate.

Kolotuyu woundsfrom (trauma acute piercing objects – an awl, a knife, a needle, bayonet), distinguished by the discrepancy between the often small entrance gate and the severity of possible damage to important anatomical structures (internal organs, large vessels and nerves, etc.). A gaping wound is missing, external bleeding may not be, however, the formation of hematomas in the course of the wound channel. There is a high risk of infection, including anaerobic.

Chopped wound (blow with an axe, saber)it has smooth edges and is characterized by deep tissue damage, sometimes to bones and internal organs. In the wound cavity there are deep necrosis, soaking the walls with blood. There is a high probability of suppuration of the wound.

A bruised wound (blunt object impact) has an irregular shape. In the circumference of the wound there is a wide zone of crushing of tissues with the formation of massive necrosis, hematomas and bruises. The microcirculation of blood in the wound tissues is significantly disrupted due to rapid thrombosis of damaged vessels. The combination of impaired blood supply to tissues and a high degree of infection often leads to the development of purulent inflammation.

A lacerated wound (injury caused by moving parts of machinery, a saw, or blunt objects at an acute angle to the body surface) is similar to a bruised one, but it is characterized by a more significant tissue defect and a significant area of detachment (scalping) мягкотканого лоскутasoft-woven flapый that can necrotize.

With **crushed wounds**, the degree of soft tissue damage is maximal, the tissues are crushed on the underlying bones, which часто ломаюare often broken. There is a significant contamination of microflora, which, against the background of the existing massive necrotic areas, leads to severe purulent inflammation.

Bitten wounds(human or animal bite)they are similar to torn and crushed ones, but more often they have a small necrosis zone, butit is significantlyы seeded with microflora, including pathogens of tetanus and rabies.

Poisoned wounds occur when bitten by poisonous snakes and insects, as well as when toxic substances of domestic, industrial and military origin enter the wound. These injuries are characterized by local changes (tissue necrosis in the bite area) and pronounced general disorders (intoxication), often very severe, which can lead to the death of the victim.

A gunshot wound (bullets, shell fragments, grenades, etc.) is distinguished from other wounds:

- cfalse anatomical nature of the injury ("unpredictable" course of the wound channel – a change in the direction of movement of the wounding projectile when meeting different tissue densities);
- thepresence of three damage zones;
- вhigh infection rate.

When a projectile hits, a section of tissue compression occurs, spreadingout to the sides in the form of a shock wave, as a result of which a pulsating cavity is formed, the tissues are compressed, stratified and mutually displaced at high speed. This is due to the formation **of three damage zones** in a gunshot wound: 1) the wound channel, 2) the zone of direct traumatic necrosis, 3) the zone of molecular concussion.

The wound channel occurs due to the destructionя of tissues from the direct impact of a wounding projectile on them, more often occurs in the form of a broken line, has an alternation of narrow places with wide cavities, may contain foreign bodies (wounding projectile, scraps of clothing, etc.), and is significantly infected. Rapidly developing tissue edema leads to the formation of closed cavities containing spilled blood. There is a high probability of suppuration of the wound and the development of anaerobic infection. The entrance opening of the wound channel is always smaller than the exit one.

The zone of direct traumatic necrosis occurs under the influence of kinetic energy transferred from the projectile to the tissues. It contains non-viable tissues soaked in blood.

The zone of molecular concussion develops due to sharp oscillatory movements of the tissue during the passage of a wounding projectile. As a result of oscillatory movements, the metabolism is disrupted and the cellular structure is damaged. Under unfavorable conditions (reduced perfusion, oxygenation, infection), the tissues of this area can become necrotic at various times after injuryмогут некротизироваться, which significantly complicates the treatment of gunshot wounds.

The course of the wound process

The wound process is acombination of various biological changes, that consistently develop in the wound. The general reaction of the body,which occurs in response to injury, is called the adaptation syndrome, which has 2 phases of the course:

IPhase I (1-4 days) is characterized by the excitation of the sympathetic nervous system, the release of hormones of the adrenal medulla, insulin, ACTH, glucocorticoids into the blood, as a result of which the body's metabolism increases, protein, fat and glycogen breakdown occurs, and body temperature rises.

IIPhase II (4-10days after injury) - general reactions are caused by the predominant influence of the parasympathetic part of the autonomic nervous system. In this phase, the main value is acquired by somatotropic hormone, aldosterone, acetylcholine, etc., which contributes to the normalization of protein metabolism, strengthening of reparative processes in the wound and the body as a whole, body temperature decreases, pain subsides.

Phases of wound healing

I. The inflammatory phase (day 1-5) includes the period of vascular changes and the period of cleaning the wound from necrotic tissues.

Period of vascular changes. In response to trauma, microcirculatory disorders occur in the tissues in the wound area, due to: 1) vascular damage at the time of injury, 2) short – term spasm (several minutes), and then persistent expansion of capillaries and venules, 3) increased permeability of the vascular wall (under the action of biogenic amines-bradykinin, serotonin, histamine) and the release of the liquid part of the blood outside the bloodstream, which leads to blood clot and slowing down blood flow, 4) blood clot and slowing down blood flow contributes to thrombosis of capillaries and venules.

As a result of microcirculation disorders, tissue oxygen saturation decreases, acidosis develops, and carbohydrate and protein metabolism are disrupted. When cellular proteins break down from destroyed cells, K+ and Na+ ions are released, which leads to an increase in osmotic pressure in tissues and water retention. Tissue edema (hydration) develops.

Under the influence of prostaglandins and bradykinin, a pyrogenic reaction and pain in the wound area develop.

The period of cleaning the wound from necrotic tissues. From the very first day, white blood cells appear in the tissues surrounding the wound, and on the 2nd–3rd day – lymphocytes, macrophages and other cells. Neutrophilic leukocytes phagocytize microflora and nonviable tissues. Macrophages cause phagocytosis of bacterial decay products and necrotic tissues. Lymphocytes contribute to the immune response to the wound microflora. With an uncomplicated course–, the wound is cleared of microorganisms and necrosis by 5 – 6 days, and the inflammatory reaction is stopped.

II. Regeneration phase (day 6-14).

In this phase, 3 processes run in parallel: 1) collagenization of the wound, 2) intensive growth of blood and lymphatic vessels, 3) epithelization of the wound.

Collagenization of the wound. In wound healing, the main role belongs to connective tissue-fibroblasts that appear in the wound after injury. They are involved in the synthesis of connective tissue components, the construction of collagen and elastic fibers, which leads to the elimination of a tissue defect and a strong scar formation.

Growth of blood and lymphatic vessels. At the same time, recanalization and active growth of new blood and lymphatic vessels occur, which provides blood supply to newly formed tissues.

Wound epithelialization. In thecase of minor cleanincised wounds, epithelial growth begins 1 day after the wound, and complete epithelialization occurs in 3–to 5days. In deep and large-area wounds, epithelial growth is noted after 3–to 5 days. As they grow, epithelial cells migrate from the edges of the wound to its surface. The rate of movement of the epithelium is about 1 mm for 7–to 10days from the edge of the wound to the center. When the width of the epithelial rim reaches 15 mm (regardless of the size of the wound), the growth rate of the epithelium slows down significantly, and under unfavorable conditions, epithelialization stops. A wound with a deficit area of more$^{\text{than 50 cm2}}$ is not able to close with epithelium. In these cases, surgical intervention should be planned.

III. Phase of scar formation and reorganization (from 15 days to 6 months).

In this phase, the synthetic activity of fibroblasts and other cells stops. Collagen fibers are displaced in relation to each other and intertwine with each other, a scar is formed, which gradually shrinks (retraction). Most new capillaries regress and disappear. The strength of the scar in the absence of complications becomes maximum 4 months after the injury (Fig. 1).

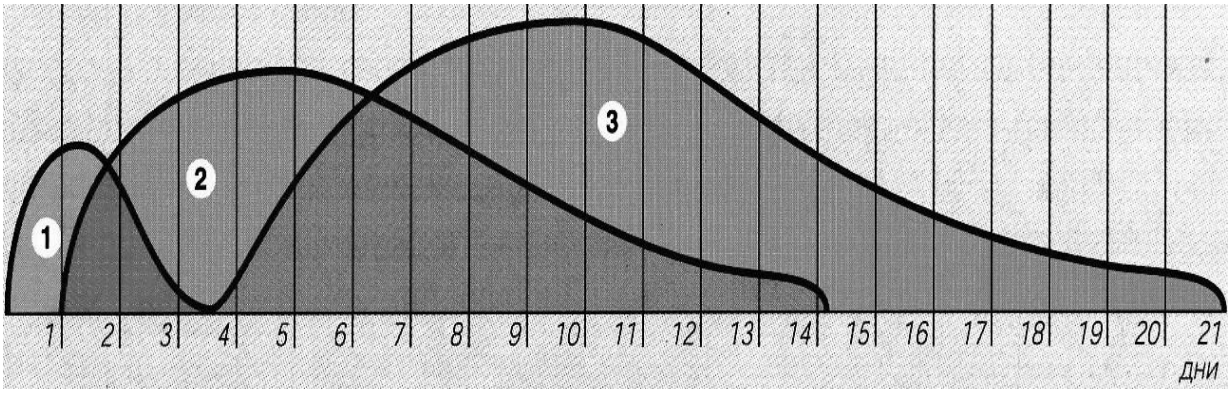


Figure 1. *Schematic representation of the temporal relationship of the wound healing phases: a) the inflammatory phase; b) the regeneration phase; c) the scar formation and reorganization phase.*

Types of wound healing

The duration of wound healing depends on its size, the number of necrotic tissues, the virulence of microorganisms trapped in the wound, and the state of the macroorganism.

Thereare three classic types of wound healing (Fig. 2): 1) primary tension healing, 2) secondary tension healing, and 3) healing under a scab.

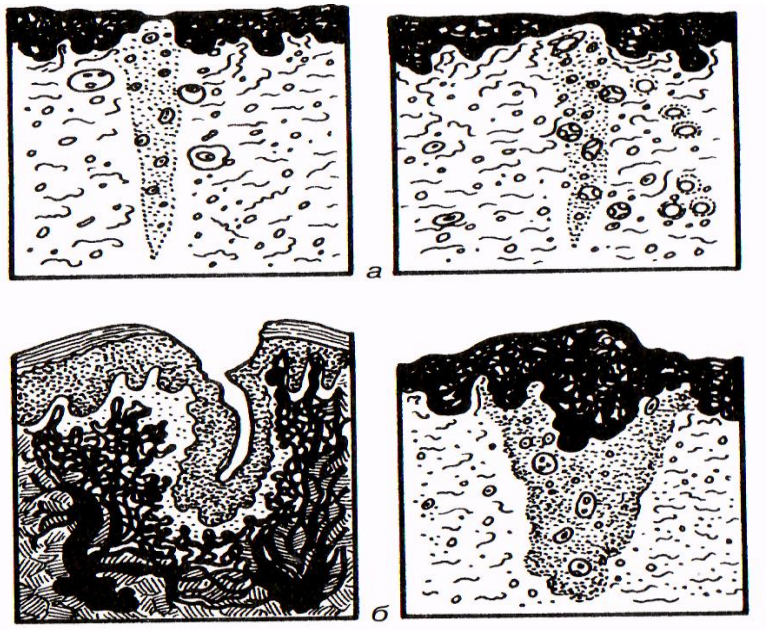


Figure 2 .. *Types of wound healing: a) primary; b) secondary.*

ЗаживWound healing by primary tensionявляетсяis the most favorable, characterized by fusion of the wound edges without visible intermediate tissue. соединительно-тканнConnective tissue organizationя of the wound canal occurs anda thinscarий рубец is formed in a relatively short time.

The necessary conditions for primary wound tension are:1) tight contact of the wound edges; 2) absence of necrotic tissues in the wound; 3) absence of hematoma in the wound; 4) absence of foreign bodies and purulent inflammation in the wound.

During wound healing by primary tension, after the inflammation subsides and the wound is cleared of necrotic tissues(phase I of the wound process), a thin connective tissue layer forms between the walls of the wound cavity (II phase II of the wound process), which sprouts vessels. Then these vessels grow into the opposite wall of the wound. Connective tissue turns into scar tissue (III phase III of the wound process), at the same time epithelialization of the wound occurs.

During **wound healing by secondary tension,** after stopping inflammatory phenomena, **in the second phase of the wound process**, the wound canal is filled with granulation tissue (granulum – grain) – a special type of connective tissue that develops in the body only in the presence of a wound defect. The growth of blood vessels is observed in the direction of the wound cavity, then the vessels do not find the opposite wall, make a loop, turn sharply back and grow into the place from which they appeared. Connective tissue cells settle on these capillary loops, forming granules that connect together to form granulation tissue. Granulation tissue is characterized by a fine-grained structure, pink or crimson color, and contact bleeding. The surface layer of granulations consists of a large number of white blood cells and macrophages, which prevents the infection from spreading deeper. Gradually, the granulation tissue is transformed into a coarse-fibrous connective **tissue (III phase III of the wound process)** and a scar is formed. Simultaneously with the development of granulations, epithelial growth occurs.

Healing of the wound under the scab occurs with small superficial wounds such as abrasions and scratches. Healing begins with the formation of a scab (crust) from clotted blood, lymph, and tissue fluid. The scab performs a protective function, under it there is a rapid epithelization of the wound, then the scab is rejected.

Complications of wound healing include:

1. Development of non-specific purulent, anaerobic andspecific infections.
2. Bleeding.
3. Divergence (diastasis) of the wound edges. Especially dangerous is the divergence of the sutures of aponeurosis, as it can lead to the exitду of internal organs (eventration), which requires emergency surgery.

Wound management

First aid for injuries includes anesthesia, stopping bleeding, applying a bandage and, if necessary, transport immobilization.

At the hospital stage, the direction of treatment measures largely depends on the stage of the wound process. So, in **the phase of inflammation** (the period of vascular changes), anti-inflammatory therapy is carried out, as well as prevention of wound infection. During the period of wound cleansing, therapeutic measures should be aimed at rejecting necrotic tissues.

In **the regeneration stage**, granulation growth needs to be stimulated.

In **the phase of scar formation**, therapeutic measures are used to achieve the earliest completion of epithelialization, or the wound defect is closed surgically. Necrectomy and wound closure by various methods with appropriate indications are performed at any stage of the wound process, which accelerates healing.

Surgical treatment of wounds

Surgical intervention plays a leading role in the complex treatment of wounds.

Surgical treatment of the wound consists in excising the edges, walls and bottom of the wound in order to create optimal conditions for its healing.

There are radical and non-radical, primary (early, delayed, late) and secondary surgical treatment of the wound.

Radical surgical treatment involves excision of necrotic and infected tissues. Due to the ability of microorganisms to penetrate deep into the tissues, even with non-purulent wounds, the walls and bottom of the wound channel should be excised to a depth of at least 5 mm. Only with radical surgical intervention, suturing of the wound is possible.

Non-radical surgical treatment of the wound is performed in case of possible damage to important anatomical formations (main vessels and nerves, etc.), in such situations they are limited to economical necrectomy, adequate drainage of the wound, and it is not sewn up.

Primary surgical treatment of the wound

Primary surgical treatment (PHO) **is** the first surgical treatmentof a wound performed under anesthesia. The indication for it is the presence of an accidental wound. PHO is not performed for abrasions, small incised and stab wounds, as well as incised wounds of the face and fingers of the hand in the absence of necrosis. Contraindications to PHO are shock or terminal condition of the victim, in these situations PHO wounds are made immediately after the patient is brought out of shock.

PHO Stages:

- dissection of the wound;
- revision of the wound channel;
- excision of the edges, walls, and bottom of the wound;
- stopping the bleeding;
- restoration of the anatomical integrity of the damaged tissue (sometimes not fully performed according to indications).

Early PHO is performed in the first 24 hoursa from the moment after the wound is applied, while there are the most favorable conditions for wound healing. Often, the intervention is completed by applying a primary suture (Fig. 3).

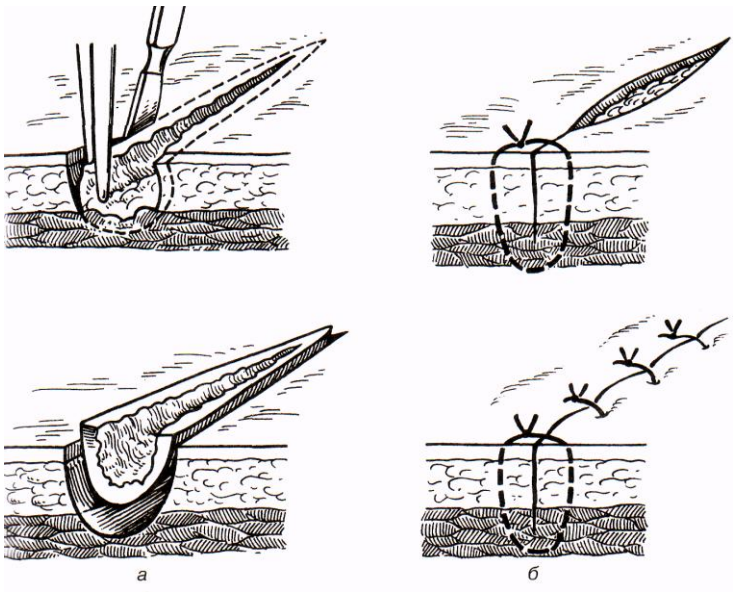


Figure 3 .. *Primary surgical treatment of the wound: a) excision of the walls and bottom of the wound; b) primary suture of the wound.*

Delayed PHO is performed within 24-48 hours after the wound, and the wound must be drained without suturing.

Late PHO is performed 48 hours cafter the injury, and there is a high risk of suppuration of the wound. It must be drained and not stitched.

Secondary surgical treatment of the wound

Any surgical treatment of a wound that follows the primary one is called **secondary surgical treatment.** It is performed with the progression of purulent inflammation with the formation of necrosis and purulent congestion, as well as before applying a secondary suture.

Wound drainage is carried out when: 1) it is necessary to remove the discharge and products of tissue decay from the wound canal; 2) high infection of the wound.

Principles of operation of drainage systems:

1. Capillary drainage is performed using gauze swabs, turundum, etc., which have hygroscopicity. The disadvantage of this method is the need for frequent dressings (3-4times a day) due to the short duration of the action of gauze drains.

2. Passive drainage – the outflow of fluid under the influence of gravity. Use drains in the form of rubber strips (rubber), PVC or silicone tubes.

3. Activedrainage is carried out in 2 ways.

1) constantой aspirationof the wound discharge through a tubular drainage system using an electric pump or "accordion" (straightening out after compression, a plastic corrugated container creates a vacuum);

2) flow-flushingым drainageof m– mechanicalим removalof m contents when washing the wound with antiseptic solutions.

Wound Suture

Distinguish between:

1. Primary suture.
2. Primary-delayed suture.
3. Secondary suture (early and late).

Primary suture-applied immediately after surgery or PHO in the absence of a risk of suppuration of the wound. **Contraindications:** 1) gunshot wounds; 2) anaerobic infection; 3) non-radical surgical treatment of the wound; 4) high risk of suppuration of the wound; 5) inability to bring the edges of the wound closer together.

Primary-delayed suture due to the threat of suppuration is applied not immediately after surgical treatment of the wound, but during the next 5 days-before the appearance of granulations in the wound and in the absence of purulent inflammation. A variant of a primary-delayed suture is **a provisional one,** when threads are passed through the wound, but the edges of the wound are not brought together. Tie the threads after a few days, in the absence of suppuration.

A secondary suture is applied to cleaned granulating wounds that heal by secondary tension in order to bring the wound walls closer together and accelerate healing. Allocate **early** (imposed on the 6th-21st day)and **поздний** a late (21 days after surgery) secondary suture. When applying late secondary stitches, it is necessary to "refresh" (excise) the edges of the wound before they come together.

Plastic wound closure

It is used for large skin defects in the wound area in the absence of purulent inflammation.

Types of skin grafting:

1. local tissues, when the skin defect is covered with tissues forming the edges of the wound;

2. free flap surgery-transplantation of a completely separated skin flap taken from the donor site away from the wound;

3. plasty with a displaced flap from areas of the body remote from the wound. To do this, a flap is cut out for the entire thickness of the skin, more often with subcutaneous fat, and sometimes with deeper tissues. The selected flap is not completely separated from the donor site to preserve nutrition or restore its blood supply by forming vascular anastomoses.

Local conservative treatment

After surgical treatment and suturing the wound, a bandage with alcohol is applied to it, and physiotherapy is prescribed. With a favorable course of the wound process, the sutures are removed on average 7-10–days after the operation.

In case of suppuration of the wound, it is necessary to remove the sutures, dilute its edges, thus ensuring an adequate outflow of wound contents. Local treatment is carried out taking into account the phase of the wound process.

In **the inflammatory phase**, bandages are performed daily. The wound is washed with a 3% solution of hydrogen peroxide and other antiseptics. In **the stage of vascular changes**, dressings with water-soluble ointments (levosin, levomecol, dioxicol, sulfamecol) are used. These ointments have a necrolytic effect, are able to reduce tissue edema, stimulate regeneration processes. At **the stage of wound cleansing**, ointments based on water-soluble substances are used, as well as proteolytic enzymes (trypsin, chymotrypsin, chymopsin, etc.) that lysenecrotic tissues, as well as enhance the effect of antibiotics. In the inflammatory phase, hypertonic solutions (10% sodium chloride solution) and solutions of various antiseptics (1% dioxidin solution, 0.02% aqueous solution of chlorhexidine bigluconate, etc.) are also widely used. A good effect in this phase is provided by the use of physiotherapy methods of treatment (UHF, UVF,electrophoresis and phonophoresis).

At **the beginning of the regeneration phase**, fat-based antibacterial ointments are used (gentamicin, tetracycline, etc.). When stopping inflammation, regeneration-stimulating agents are used (5% and 10% methyluracyl ointment, solcoseryl ointment and gel, vinilin, preparations containing sea buckthorn or rosehip oil, etc.), physiotherapy methods of treatment.

In **the third phase of the wound process**местно используют, dressings with indifferent and stimulating ointments (dioxomethyltetrahydropyrimidine, etc.) are used locally.), UFOs and laser irradiation.

General treatment

General treatment for wounds has several directions:

1. Antibacterial therapy: a) antibiotics, b) antibacterial chemotherapeutic drugs.
2. Detoxification (detoxifying blood substitutes, forcing diuresis, extracorporeal detoxification methods, etc.).
3. Correction of immune system reactivity (T-activin, levamizole, immunoglobulin, etc.)
4. Correction of protein and water-electrolyte metabolism, acid-base state.
5. Symptomatic therapy (pain relief, antipyretics, etc.).

In case of any accidental wound, emergency tetanus prevention is necessary (see acc. section).

TRAUMATIC–BRAIN INJURY

Craniocerebral trauma is allocated to a special group of injuries due to the peculiarities of the reactionй, the peculiarity of clinical manifestations and the special danger to the life of the victim. There are closed and open injuries of the skull.

Zacrytyminjuries includeотносят:

a) craniocerebral injuries without violating the integrity of the skin of the head;

b) brain damage caused by soft tissue injury, butwith the preservation of the integrity of the skull bones.

Среди **открытых травм** Open injuries includebothют **penetrating** (with damage to the dura mater) and **non-penetrating** (without damage to the dura mater) injuries.Open trauma also includes fractures of the bones of the base of the skull, accompanied by liquorrhea. Injuries to the soft tissues of the head in their clinical course and treatmentdo not differfrom injuries of other localization. Significant differences occur when the brain is damaged. Damage to the brain tissue (concussion, bruise and compression of the brain) is possible with the penetratingnature of the wound, as well as with a closed skull injury. The brain substance can be affected both in the area of direct impact of the damaging factor, and on the opposite side of the brain, which is called an anti-shock. As a result , there is a violation of the connection of various structures of the central nervoussystem, ischemia and hemorrhages occur in the brain substance or in extracerebral structures, brain edema. This is manifested byacuteми neurologicalsymptoms, the possibility of brain insertion into the large occipital foramen. In fractures of the skull bones and damage to large vessels, the clinical manifestationsof I are associated with compression of the brain tissue by the resulting hematoma. Violation of the integrity of the meninges is manifested by the leakage of spinalнfluid through the nose (rhinoliquorrhea) or through the ear (otoliquorrhea**).**A skull base fracture is characterized by bleeding in the eyelid area (a symptom of glasses), bleeding from the nose, mouth, and ear passages.

Concussion of the brain

Concussion of the brain (commotioncerebri) is more common than other brain injuries, accompanied by functional disorders.The essence of the changes that occur in this type of injury is a concussionof the tender brain substance and a violation of cell relationships. Clinical signs of concussion include loss of consciousness (lasting from a few minutes to several days, depending on the severity of the concussion); retrograde amnesia (loss of memory for events, preceding the injury), and vomiting that occurs after the injury. Pupillary reactions and other stem functions are not impaired, focal symptoms are not observed, that is, brain-wide symptoms prevail with concussion. Thereare mild, moderate, and severe concussions головного мозга.

Treatment of patients with concussion of the brainis carried out by yt in a hospital. It includes providinge rest (bed rest lasting**2-4**weeks, depending on the severity of the concussion) and carrying oute measures that reduce brain edema, for which purpose it is necessary to introduce hypertensive solutions, diuretics. In case of severe headaches caused by sharply increased intracranial pressure, выполняют спинномозговую пункциа spinal puncture is performed with aspiration–of 3-5 ml of cerebrospinal fluid. This, on the one hand, improves the patient's condition, on the other hand, it allowsет to exclude subarachnoid bleeding.

Brain contusion

Contusion of the brain (contusiocerebri) is accompanied by a violation of the integrity of brain tissuein a limited area and is more serious thanой injuriesой. Brain damage can be in the form of small hemorrhages or softening, it can be combined with a wound to the soft tissues of the head, a depressed fracture of the base or vault of the skull. At the same time, there are general brain symptoms – loss of consciousness, headaches, dizziness, vomiting and focal symptomsмы – as wellasdisruption of vital organs and loss of function. There are three degrees of severity of brain compression – mild, moderate and severe, which are characterized by different severity and duration of clinical manifestations. A lumbar puncture can detect blood in the cerebrospinal fluid. Coma, hemiplegia, one-sided or bilateral dilation and areactivity of the pupils, and respiratory rhythm disturbances may indicate a brain wedge and require emergency measures.

Treatment for brain contusion is the same as for concussion, including longer bed rest, dehydration therapy, and the appointment of antibacterial drugs to prevent meningitis and encephalitis.

Brain compression

In severe craniocerebral injuries, acute **epidural, subdural or intracerebral hematomas can form as a result of damage to blood vessels,** which lead to **compression** головного of the brain and, along with brain edema, are the most common causes of death.

The site of the most frequent localization of epidural hematomas is височнthe temporal regionь, with detachment of the dura mater from the skull bones and compression of the brain. Clinically, it is manifestedголовныby progressiveheadachesями, impaired consciousness, motor disorders, and changes in pupillary reflexes. An emergency CT scan, magnetic resonance imaging, or angiography is indicated if medulla oblongata is suspected (progression of general brain and focal symptoms, depression of consciousness, impaired motor activity, mydriasis , lack of response to light, bradypnea, and coma)компьютерная томография, магнитно-резонансная томография. In the absence of the possibility of performing these studies, it is necessary to immediately applya diagnosticx milledx holeй in the cranial vault,which allows decompression of the cranial cavity.

Withubduralx hematomasof the ach, a longer "light interval" is observed (symptoms develop more slowly), the presence of meningeal symptoms and bloodь in the cerebrospinal fluid.

Treatment for the development of symptoms of brain compression consists in cranial trepanation, removal of hematoma or compressive bone fragments, and hemostasis. In the postoperative period, rest and dehydration measures are necessary.

Some time after the injury может , post-comotional syndrome may developголовокружением, including dizzinessми, headachesями,еммemory impairment, depressionand apathy, and post-traumatic epilepsy.

BREAST INJURIES

Chest injuries are divided into **closed** ones (while maintaining the integrity of the skin).)and **open**(with its violation)**.**

Среди **Closed** chest injuries include**bruises, concussions, and compression**. With closed injuries, ruptures of the intrathoracic organs are possible (pis. 4).

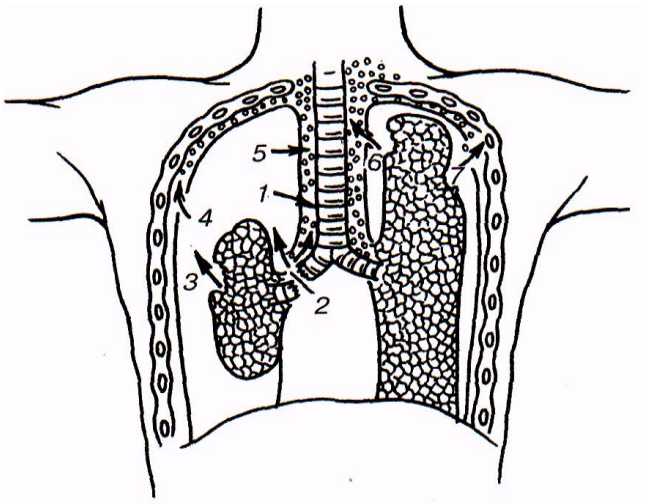


Figure 4 .. *Closed injuries of the pleura and lungs (scheme): 1-rupture of the trachea; 2-separation of the main bronchus; 3-rupture of the lung; 4-damage to the parietal pleura; 5, 6 - damage to the mediastinal pleura with the development of mediastinal emphysema; 7 - damage to the chest. Arrows indicate the movement of air.*

Bruising and compression of the chest can be accompanied by broken ribs, rupture of blood vessels, pleura and lung with the developmentof pneumothorax and hemothorax.

A rib fractureis manifested by pain at the site of the injury, which increases with breathing. On examination, there may be bruising, palpation-soreness and bone crepitation can be determined.

СотрясениеChest shaking is characterized by a pronounced drop in heart activity and respiratory disorders (pallor ofthe skin, cyanosis, coldй sweat, hypotension, shortnessof breath).

Treatmentfor closed chest injuries includes rest, analgesia, including novocaine blockages of the corresponding intercostal spaces or paravertebral blockages, oxygen therapy, respiratory gymnastics, and prevention of post-traumatic pneumonia. In case of cardiac dysfunction, the introduction of cardiotonic agents is indicated.

Open chest injuries,as well as closed ones, can be accompanied by the development of pneumothorax.

PNEUMOTHORAX

There are open, closed and valvular pneumothorax.

With **an open pneumothorax**, air entering the pleural cavity affects the extensive receptor zones of the pleuralmembrane and leads to a deterioration in breathing and blood circulation. The accumulation of gas in the pleural cavity leads to a declinea(collapse) легкогоin значительнothisconnection,ая поверхностthe respiratory surface and, accordingly, the vital capacity of the lungs are significantlyreduced . Thus, а на стороне повреждения positive pressure is established in the pleural cavity on the damaged side, while on the healthy side it remains below atmospheric pressure. This explains the displacement of the mediastinum towards the intact lung, and the maximum displacement is observed when inhaling. The resulting vibrations of the mediastinum during inhalation prevent the free expansion of a healthy lung, and during exhalation its necessary compression, as a result of which the function of the intact lung also suffers. The severity of respiratory changes is related to the size of the defect in the chest wall and, accordingly, the rate of air entry into the pleural cavity and lungcollapse . Gradually falling down the lung continues to participate in breathing, and therefore, oxygen metabolism suffers slightly. The presence of a large chest defect leads to rapid collapse of the lung and significant displacement of the mediastinum.

The clinical picture of pneumothorax is characterized by pain at the site of injury, which increases with breathing, pronounced shortness of breath (shallow breathing), physical agitation or adynamia, pallor or cyanosis of the face, restriction of respiratory excursions and smoothness of the intercostal spaces of the affected side of the chest, rapid and weak pulse. Dilated neck veins may indicate difficulty in venous outflow to the heart. Blood pressure may initiallyrise and then fall, indicating an increase in hypoxia and shock.During percussion of the chestand on the side of the lesion, a box sound is detected, auscultation-a sharp weakening orгlack of breathing. Radiological signs of pneumothorax are: displacement of the mediastinum to the healthy side and its oscillatory movements, restriction of mobility of the diaphragm dome, and subsidence of the lung.

Clinical manifestations **of closed pneumothorax** (excluding valvular) are less pronounced, due to the fact that during inhalation and exhalation, the amount of air entering the pleural cavity does not change, and mediastinal displacement and its fluctuations are insignificant.A small intake of gas into the pleural cavity and its termination leads to air resorption.

Valvular pneumothorax develops with flap ruptures of the lung, large bronchi and chest wall, when air enters the pleural cavity during inhalation due to negative intrathoracic pressure, and when exhaling, the wound edges close and prevent эвакуациигas evacuation. With each subsequent breath, the amount of air in the pleural cavity increases, the pressure increases, which leads to a strained pneumothoraxthat requires emergency measures.Spreading through the fiber (subcutaneous emphysema)the air compresses the heart and large blood vessels, which causes very severeerespiratory and circulatory disorders.

Pneumothorax can be combined with hemothorax.

HEMOTHORAX

Hemothorax – accumulation of blood in the chest, can be one-or two-sided. There are three degrees of hemothorax: 1. small-the blood level to the lower corner of the scapula;2. medium – up to the middle of the scapula; 3. large – the level of blood accumulated in the pleural cavity above the middle of the scapula.. A small unilateral hemothorax does not cause severe disorders, significant accumulations of blood in the pleural cavity are accompanied by rapid symptoms: the development of acute anemia and respiratory disorders. When examining patients, shortness of breath, pallor or cyanosis of the skin, tachycardia and hypotension are determined. Percussion – you can detect a dull sound in the lower parts of the chest, auscultation in these parts there is no breathing.

Theradiographic sign of hemothorax is darkening in the lower parts of the lung with a horizontal fluid level.

Injuries to the heartare extremely serious injuries, as well as injuries to large vessels of the lung root, often ending in the death of the victim at the scene. The source of bleeding in wounds of the heart can be large vessels at its base, coronary vessels and vessels of the heart muscles. Clinical manifestations of heart injuries include symptoms of acute anemia. With these bleeds,especially with small wounds in the pericardium, tamponade of the heart is possible, accompanied by its arrest,

Treatment

First aid is limited to the application of an aseptic bandage, toilet of the upper respiratory tract, if necessary, the introduction of cardiac agents. With an open pneumothorax, an occlusive dressing is indicated, which prevents further air flow into the pleural cavity. When the clinical picture of valvular pneumothorax increases, measures are shown that help turn the pneumothorax into an open one. The exit of air from the pleural cavity can be ensured by inserting a sufficiently thickой needles or trocarainto it . In case of bilateral pneumothorax, tracheal intubation with mechanical ventilation is indicated.

Л**ITreatment of**wiresят in stationary conditions. In the absence of a strained pneumothorax or a large hemothorax after primary surgical treatment of the wound, a wait-and-see approach is possible. Specific prevention of tetanus is carried out, antibiotics are administered. Pneumo-or hemothorax can be tried to eliminate by puncture, but the best option is constant drainage of the pleural cavity. In hemothorax, puncture is performed in the seventh or eighthintercostal space along the posterior submuscular line, in pneumothorax-in the second or thirdintercostal space along the midclavicular line. The drain must be connected to an electric pump or a Bulau system must be installed. The effectiveness of drainage is evaluated by clinical and radiological data.

Increasing hemothorax is an indication for emergency thoracotomy with an anterior-lateral incision in the fourth or fifth intercostalspace . The detected damage is eliminated: wounds of the lung and heart are sutured, small-caliber bronchi are stitched and bandaged. The operation is completed by draining the pleural cavity in the eighth intercostalspace, with a layer-by-layer sealed suture of the wound.In the postoperative period, treatment is carried out aimed at improving breathing and blood

circulation, correcting anemia. After complete expansion of the lung, confirmed radiologically (2-3 days), the drains are removed.

Combinedtrachoabdominal injuries are characterized by even more pronounced respiratory disorders due to the shutdown of not only the lung, but also the main respiratory muscle – the diaphragm.

CLOSED ABDOMINAL INJURIES

The cause ofакрытыabdominal injuries is blunt traumato the abdomen or lowerparts of the chest. Depending on the injured organ, the syndrome of damage to the sexualoroor parenchymaloro organa develops.

Injuries tohollow organs

Rupture of hollow organs (esophagus, stomach, intestines, gallbladder and bladder) is accompanied by the release of the contents of the damaged organ into the free abdominal cavity, which leads to inflammation of the peritoneum – peritonitis. The disease is manifested by pronounced local (sharp abdominal pain, muscle tension of the anterior abdominal wall, dyspeptic disorders) and general symptoms (intoxication, leading to suppression of the activity of vital organs and body systems). If anorgan containing gas is damaged by percussion above the liver, a box sound is detected, and the presence of fluid in the free abdominal cavity is characterized by a dulling of the percussion sound in the sloping places of the abdomen (lateral channels).Auscultation is marked by a sharp weakening of peristalsis up to its absence (a symptom of "deathly silence"). Instrumental diagnostics includesean overview X-ray examination of the abdominal cavity for "free gas" (if a stomach and intestinal injury is suspected), a study with contrast (cystography – if the bladder is damaged). Laparoscopy is also performed for diagnostic purposes.

Diseases ofparenchymalorgans

The leading symptoms of liver, kidney, and spleen damage are general manifestations of blood loss (general weakness, dizziness, pallor of the skin, tachycardia, and hypotension), as well as irritation of the peritoneum (pain and tension in the abdominal muscles). Percussion is characterized by blunting of sound in sloping areas of the abdomen, auscultation-a sharp suppression of intestinal motility. During the examination, in addition to laboratory confirmation of signs of blood loss, freefluid is detected during ultrasound and the presence of blood in the abdominal cavity during laparoscopy. обратитьSpecial attention should be paid to subcapsular ruptures of parenchymal organs, when «светлогопромежутка»втечениенесколькихчасовилиднейа sharp deterioration of the condition associated with rupture of the organ capsule and bleeding occurs against the background of a "light interval" within a few hours or days after the injurусразрывомкапсулыоргана.

Treatment

If the abdominal organs are damaged, emergency surgery is indicated. The scope of surgical intervention depends on the location and nature of the injury, the severity of inflammatory changes in the abdominal cavity. The hollow organ is sutured or resected, bleeding from the damaged parenchymal organ is stopped by stitching the vessel or the organ (kidney, spleen) is removed.

CLOSED SOFT TISSUE INJURIES

Contusion (contusio) – closed mechanical damage to softtissues and organs without visible violation of their anatomicalintegrity.

Bruises are the most common injuries. They canoccur both independently and accompany other more serious injuries (fractures, injuries to internal organs, etc.).

The mechanism of occurrence of a bruise is usually associated with a fall from a small height or with a blow with a blunt object with low kinetic energy.

The severity of the injury is determined by: 1) the nature of the traumatic object (its mass, speed, point of application and direction of force); 2) the type of tissue that was affected (skin, subcutaneous tissue, muscles) and their condition (filling and tone).

Superficially located softtissues, such as the skin and subcutaneous tissue, are most often bruised. Bruisingof internal organs (brain, heart, lungs) is very dangerous (see acc. sections).

Clinical picture. The main clinical manifestations of a bruise are pain, tissue edema, hematoma with имбибициейskin imbibition (bruising) and impaired function of the damaged organ.

Pain occurs immediately at the time of injury and can be very significant, which is associated with damage to a large number of pain receptors.

Almost immediately after the injury, the swelling becomes noticeable, painful on palpation, without clear boundaries, gradually spreading.

The time of manifestation of a hematoma (hemorrhage) depends on its depth. When bruising superficially located tissues (skin and subcutaneous tissue), the hematoma becomes noticeable almost immediately. In case of injury to deeper tissues, the hematoma canmanifest itself only in the form of a bruise on the 2nd–3rd day. Discoloration of the bruise is associated with the breakdown of hemoglobin. A fresh bruise is red, then it turns purple, and after 3–to 4 days it turns blue. After 5–to 6 days, the bruise turns green, then turns yellow, and then gradually disappears. Based on this, the color of the bruise can be assumed to be the age of the injury.

As the hematoma and edema increase, there is a violation of function – restriction of active movements due to severe pain, while passive movements can be preserved, although they are also painful. This distinguishes bruises from fractures and dislocations, in which a violation of the volume of movement occurs immediately after the injury and concerns both active and passive movements.

Treatment. In the acute period, to reduce the development of hematoma and traumatic edemaместно, cold (ice pack) should be applied topically as early as possible, with interruptions during the first day.

To reduce movement in case of bruises in the joints, a pressure bandage is applied. To reduce edema, an elevated position of the limb is used.

From 2–to 3 days (cold period), thermal procedures (hot water bottle, ultraviolet radiation, UHF therapy) are used to accelerate the resorption of the hematoma and stop tissue edema.

When large hematomas are formed, especially deep ones, they are punctured, and then a pressure bandage is applied. Evacuation of such hematomas is necessary because of the danger of their infection and organization.

Растяжение (Distorsio–damage to tissues with partial rupture while maintaining their anatomical continuity.

A sprain usually occurs when there is a sharp, sudden movement. Ligaments of the joints, especially the ankle, are more often damaged.

The clinical picture when stretched resembles a bruise with localization in the joints. There is also pain, swelling, hematoma, and a violation of joint function is even more pronounced than with a bruise.

Treatment consists of cooling the injury site and applying a pressure bandage to reduce the amount of movement and increase the hematoma. From the 3rd day, thermal procedures begin to reduce edema and gradually restore the load.

Rupture (ruptura) – damage to tissues or organs with a violation of their anatomical integrity. The mechanism of rupture is similar to stretching. Ruptures can affect muscles, ligaments, and tendons.

Muscle ruptures are usually observed when they are overly stressed (gravity, rapid strong contraction, a strong blow to the reducedmuscle).

The clinical picture is characterized by severe pain, edema and hematoma, and complete loss of muscle function. The most common ruptures are the biceps brachii, quadriceps femoris, and calf muscles.

In **case of incomplete**rupture, there is a hematoma and severe painin the area of damage. **Treatment** consists of cooling (day 1) and ensuring rest of the damaged area for 2 weeks (gypsum splint).

Starting from 3 days, physiotherapy procedures are required.

A complete rupture is characterized by a palpable определяемым defect ("dip", "sinking") in the muscle in the injury zone, due to contraction of the torn ends of the muscles.

Treatment for complete lacerationsax is operative, it is associated with stitching the damaged muscle and immobilizing it in a relaxed position for 2–to 3 weeks.

A torn ligament can be either an independent injury or accompany more severe injuries (dislocation or fracture). Most often, there is a rupture of the ligaments of the ankle and knee joints.

There is marked pain, swelling and hematoma, as well as a pronounced violation of joint function. Rupture of the ligaments of the knee joint is most often accompanied by the development of hemarthrosis. The presence of blood in the joint cavity is diagnosed by the symptom of balloting of the patella (they cover the joint with their hands, while the I fingers of both hands press on the patella and palpation feels its floating-springy displacement), during X-ray examination (expansion of the joint gap), and ultrasound examination.

Treatment for torn ligaments consists of cooling during the first day and providing rest (tight bandaging, plaster cast). After2-33 weeks, they begin to move cautiously.

With hemarthrosis, joint puncture and blood evacuation are indicated, з, and then the joint must be immobilized.

With some ligament tears (cruciate ligaments of the knee joint), surgical interventions are resorted to.

Tendon rupture is similar in mechanism to muscle rupture. Tendon rupture occurs both at the site of attachment to the bone and at the site of the muscle-to-tendon transition.The extensor tendons of the fingers of the hand, the Achilles tendon, and the long head of the biceps brachii muscle are more often affected by ruptures.

The clinical picture is characterized by pain, swelling and complete loss of function of the corresponding musclewhile maintaining passive movements.

Treatment for tendon ruptures is operative, tendon suture is performed with immobilization in the muscle relaxation position for 2– to 3 weeks, after whichrehabilitation is performedю.

Concussion (commotio) – mechanical impact on the tissues, leading to a violation of their function without obviousanatomical damage. Often repeated concussions are the cause of vibration sickness. In the long-term period, soft tissue fibrosis is observed.

PROLONGED COMPRESSION SYNDROME

Prolonged compression syndrome (traumatic toxicosis, crash syndrome) - a pathological condition based on ischemic necrosis of the soft tissues of the extremities обусловленнcaused byprolonged (more than 2 hours) their compression.

Traumatic toxicosis develops after the elimination of compression of the limb due to the ingress of a large number of decay products of damaged tissues into the general bloodstream. The following pathogenetic mechanisms play a role in the development of the syndrome: 1) pain irritation, 2) toxemia due to absorption of tissue breakdown products, 3) plasmaand blood loss.

In the clinical course of crash syndrome, there are 3 periods::

I.The period of increasing edema and vascular insufficiency or the early period (duration–1-4 days). There are strong bursting pains in the area of the damaged limb, inability to move. Edema of the damaged limb, purplish-cyanotic staining develops rapidly, necrosis areas appear, blisters with serous and hemorrhagic contents, and signs of arterial circulatory disorders (small and medium-sized vascular thrombosis) are noted. The general condition suffers significantly – weakness, chills and fever, tachycardia and hypotension appear. Later, hypovolemic shock develops (relative hypovolemia due to pain syndrome and absolute hypovolemia due to massive edema).

II. The period of acute renal failure or an intermediate period (duration-1-2 weeks). There is necrosis of damaged muscles and the breakdown of muscle molecules to myoglobin, which settles in the renal glomeruli. Membranous edema and impaired filtration processes develop, which leads to acute renal failure , oliguriais observed, and then и anuria. In the urine, protein, red blood cells, cylinders and myoglobin are detected. Urea and creatinine levels increase in the blood креатинина. At the same time, acute liver failure also progresses, jaundice occurs. Intoxication also leads to the progression of acute cardiovascular failure.

III. Convalescence period or late period. With a favorable course of the disease and the effectiveness of treatment (restoration of kidney and liver function), a gradual recovery occurs. This period is characterized by the development of late complicationsй (areas of soft tissue necrosis with their rejection, purulent-inflammatory processes, muscle atrophy, тугоподвижностьjoint stiffness).

Treatment

Immediately after release from compression, the injured limb is tightly bandaged with an elastic bandage and immobilized with a transport tire to limit the flow of toxic substances into the bloodstream, after which anti-shock measures are

taken (administration of narcotic analgesics and infusion of volume-substituting solutions). After the patient is delivered to the hospital, powerful detoxification (including extracorporeal detoxification methods – hemodialysis) and antibacterial therapy are performed. Thewound is treatedwith MRI , a case of novocaine blockade, and the limb is cooled with ice. With increasing edema of soft tissues, lampas incisions are made with dissection of the fascia. In severe cases, with an increase in renal failure that threatens the patient's life, amputation of the limb is indicated. In case ofри latecomplications , the treatment проводwas carried out according to general principles.

DISLOCATIONS

Dislocation (luxatio) – a complete permanent displacement of the articular surfaces of the bones in relation to each other, partial or incomplete displacement is called a subluxation. Dislocations are called by the distal bone or by the distal segment of the limb that make up the joint (in the shoulder joint – dislocation of the shoulder, in the hip joint – dislocation of the hip, etc.). Dislocations are accompanied by a rupture of the joint capsule and ligamentous apparatus with the passage of one of the articular surfaces through the capsule rupture.

Classification of dislocations:

By origin:

- **c-born dislocations,** are caused by a violation of the development of the articular ends of the bones (their displacementoccurs in the intrauterine period);
- **Acquireddislocations,** are divided into **traumatic** ones caused by the action of a traumatic agent and **pathological,** ones associated with the destruction of the articular surfaces of bones (tumors, osteomyelitis and tuberculosis).

Traumatic dislocations can be **open** (communication of the wound with the joint cavity) and **closed.**

According to the time that has passed since the injury, dislocations are distinguished **between fresh** (up to 2–3 days), **stale** (up to 3–4 weeks) and **old** (more than 4 weeks).

Nonrecoverable-dislocations accompanied by soft tissue interposition (require surgical intervention).

ПривычнымиDislocations that are constantly repeated in one joint are called habitual (if the joint capsule is not fully restored after вправления the dislocation is corrected, then dislocations can be repeated with minor provoking factors).

Theclinical picture is due toобусловлена:

- bolevym syndromeom;
- deformityof the joint (the articular end of the bone can be palpated in an unusual place for it) (Fig. 5, Fig. 6);
- forcedым, specificим for each dislocation positionm of the limb;
- the absenceof m active and sharpим restrictionof m passive movements in the limb, with passive movements there is a "springyresistance", that is, the distal segment returns to its original pathological position;
- changein m relative limb length, more often shorteningof m.

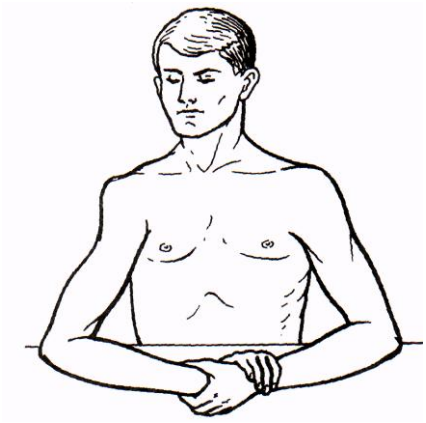


Figure 5 .. *Dislocated shoulder*

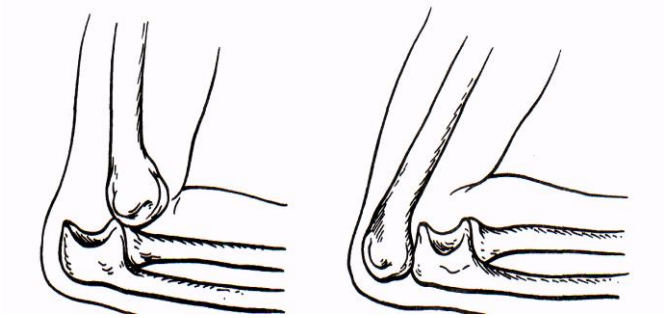


Figure 6 .. *Dislocation of the forearm.*

X-ray examination of the area of the altered joint allows you to confirm the diagnosis, establish the position of the articular surfaces and detect the presence of fractures of the articular ends of the bones.

Treatment fortraumatic dislocationsax consists of 3 stages:

1. reduction of dislocation,
2. immobilization of the limb,
3. restoring the function.

First aid for dislocationsax consistsof transport immobilization, which prevents the development of dislocation complications, and adequate anesthesia , including for muscle relaxation, necessary for successful reduction of the dislocation.

Reduction of dislocation by the closed methodof YT wire with complete anesthesia and maximum muscle relaxation. Anesthesia can be local (20 ml of 1% or 2% novocaine solution directly into the joint cavity) or general (rauschanesthesia with barbiturates or combined anesthesia with muscle relaxants). Muscle relaxation helps to quickly and easily match the joint surfaces. There are many methods of correcting dislocations, but all of them are modifications based on 2 basic principles:

a) maximum distraction of the articular ends by applying force from outside or under the influence of the weight of the limb (shoulder reduction according to Motu, hip reduction according to Hippocrates, hip and shoulder reduction according toJanelidze et al.);

b) repeating the movements of the limb performed during dislocation, but in the reverse sequence (shoulder and hip reduction according to the following procedure).Kocheru, reduction of the lower jaw, etc.) (pis. 7, fig. 8, fig. 9).

Immobilizationюis carried out by applying a plaster cast for a period of 2–to 3 weeks, after this period it is usually replaced by means of soft immobilization.

Restoration ofосстановлению function is started 2–to 3 weeks after receiving the injury. They perform physicaltherapy физкультуру and physiotherapy procedures that improve local blood circulation (massage, UHF). Andbleeding occurs in 11-1.5 months, and the full load of the patient is allowed in 22-3months.

K**Surgical treatment** is used for:

1. open dislocations,
2. soft tissue interpositions,
3. old dislocations,
4. habitual dislocations.

The essence of the operation is to eliminate the dislocation, to restore and strengthen the ligamentous apparatus and the joint capsule.

BONE FRACTURES

A fracture (fractura) is a violation of the integrity of the bone caused by mechanical action or a pathological process.

Incomplete fracture, a type of injury in which the surface of the fracture does not pass through the entire diameter of the bone (a fracture or crack of the bone like a "green twig" in fractures in children).

Classification of fractures

- **According to the origin and causes of development**, fractures are **congenitalми**(intrauterineми) and **acquiredми.** The latter are divided into **traumatic,** which occur in a healthy bone under the influence of a traumatic action, the strength of which exceeds the strength of the bone, and **pathological,** in which the bone is broken, affected by a pathological process that sharply reduces its strength. A characteristic feature of a pathological fracture is the discrepancy between the external force and the damage caused (a fracture of the long t-rib bone can occur during normal movements, for example, when turning in bed). Pathological fractures are caused by changes in the bone in tumors, osteomyelitis, tuberculosis, echinococcosis, bone syphilis, and osteoporosis of various origins.
- **By localization** , there **are diaphyseal, metaphyseal** (periarticular) and **epiphyseal** (intraarticular) fractures.
- **By their nature** , there arecomplete fractures**полные**, in which the fragments are completely separated from each other , and **incomplete**ones, in which the bone or periosteal connection is preserved between the fragments. Incomplete fractures include cracks, sub-periosteal fractures in children, "green twig" type fractures, perforated, and marginalones .

- Depending on **the condition of the integumentary tissues** at the site of damageвыделяют**, closede** (without damage to the skin or mucous membranes) and **opene** (with their damage) are distinguished.) fractures.
- **In the direction of the fracture line** – transverse, oblique, longitudinal, comminuted, helical, tear-off, compression, hammered, chipped fractures.
- **Accordingto the position of bone fragments** relative to each otherвозможны, fractures **with** and **without displacement are possible.**According **to the time of development**, there are:

  primarydisplacement – возникаоccurs at the time of injury under the influence of the damaging factorthat caused the fracture.

  secondary displacement – causedby a contraction of the muscles attached to the fragments, as well as by improper medical care to the victim.

Известны Four types of displacement of bone fragments are known (Fig.:

1. **by width** (side);
2. **along the length** (longitudinal), in which fragments are displaced along the axis of the limb (diverge or go behind each other);
3. **at an angle**at which the longitudinal axes of bone fragments form an angle with the apex at the site of the fracture;
4. **on the axis** (rotational) - rotation of the peripheral fragment around the longitudinal axis.

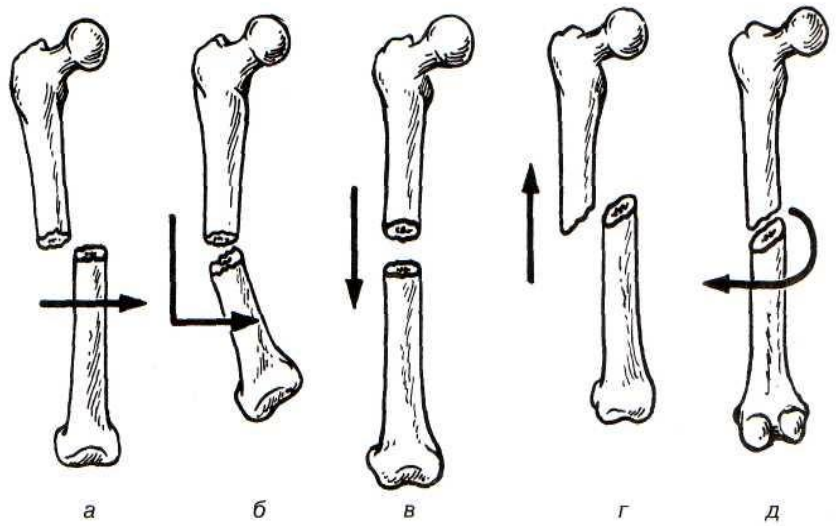


Figure 10 .. *Types of displacement of bone fragments in fractures: a-lateral displacement (in width); b-axial displacement (at an angle); c-length displacement with elongation; d - length displacement with shortening; e-rotational*

Displacement of bone fragments is accompanied by deformity of the limb, which has a characteristic appearance with a particular displacement: thickening and increase in the circumference with lateral displacement, violation of the axis - with angular displacement, shortening or elongation – with displacement along the length.

Complications of fractures

Fractures can lead to the development of localx and generalx complicationsйthat significantlyx affect the process of сращения bone fusion (consolidation) and the tactics of treatment of patients.

With openых fractures, there is a high probability of exogenous **infection** with the development of a purulent process, which can lead to post-traumatic osteomyelitis. It should be bornein mind that a violation of the integrityof soft tissues can occur both at the time of injuryand during treatment of the patient due to secondary displacement of fragments, as well as with the development of soft tissue edema , which often forms a large part of the body.the resulting blisters, open and effectively turna closed fracture into an open one.

Dangerous местнымconsequences and осложненисomplications свежихпереломof freshfracturesюare **damage to internal organs, main vessels, and nerves**. The development of these complicationsis possible both under the influence of the force that led to the fracture, and as a result of injury by bone fragments.

With open and closed fractures, accompanied by damage to large blood vessels, **bleeding occurs**, which can lead to severe anemia.

MeA local complicationof fractures is **interposition** – the penetration of foreign tissues (soft tissues or bone fragments, etc.) between fragments, which prevents closed reposition and disrupts the consolidation of the fracture.

With fractures of long tubular bones, it is possible to develop **a fat embolism,** the ingress of fat fragments into gaping blood vessels. There are three forms of fat embolism – pulmonary, cerebral and generalized, manifested by petechialми hemorrhagesmi,ом pulmonary edema om, comaom, vascularми changesmi in the fundus, the presencем of small drops of fat in the urine. Treatment for thesем complicationsи should be aimed at restoring microcirculation.

Traumatic shock canoccur with fractures of large bones (hip, pelvic bones), multiple fractures, when there is a pronounced pain syndrome and significant blood loss. Treatment includes adequate analgesia, correction of hypovolemia, and only after removing the patient from shock should local therapeutic measures be carried out in the area of the fracture (with the exception of hemostatic and analgesic manipulations).

Bone regeneration (fracture consolidation)

Consolidation (healing, cpahealing) of fractures occurs due to the regeneration of bone tissue, and a callus is formed that connects the fragments. The source of bone tissue formation is cells of the periosteum, endosteum, connective tissue surrounding the fracture site, haversov channels, and bone marrow.

The regenerate formed in the fracture zone, is called **a bone callus**. There are periostal (external), endostal (internal), intermediate and parossal callus. In the process of subsiding of acute inflammatory phenomena in the fracture area, resorption of hematoma, edema, necrotic tissues, active proliferation of cells of the cambial layer of the periosteum , young endosteal cellsэндоста, haversov systems of the compact layer, young connective tissue and endothelial cells of damaged paraossal soft tissues is observed. The more severe the soft tissue damage, the more pronounced the paraffin layer of regenerate is.

The formed soft-tissueная callus solders bone fragments, it вней differentiates cellular structures, with the formation of chondroid and osteoid tissue. The formation of a soft callus occurs within 3–to 6 weeks from the moment of fracture, and then it calcifies. Ossification of the corn, which occurs within 5-6 weeks, is accompanied by its architectural restructuring with the formation of osteons, bone beams, the formation of a bone marrow canal and other elements of normal bone. Complete regeneration occurs in 2-3 years (Fig. 11).

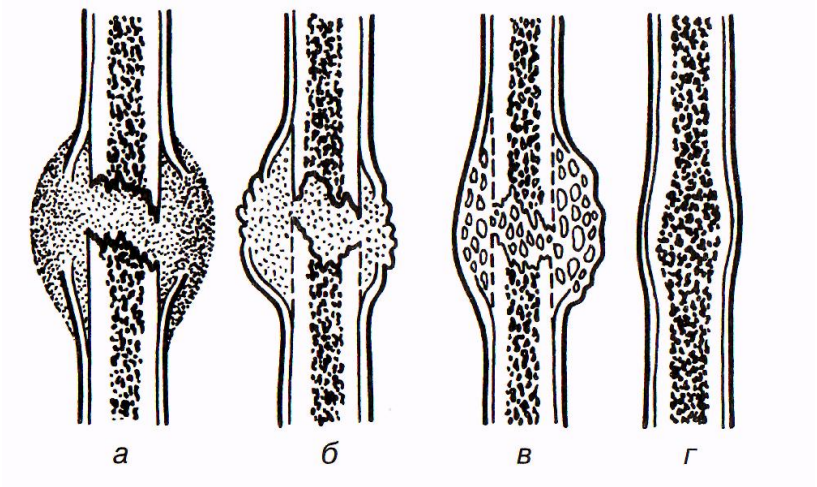


Figure 11. *Formation of a bone callus, a-hematoma located between bone fragments; b - granulation callus; c-fibro-bone callus; d - final bone callus.*

The formation of a bone callus can occur differently depending on local conditions. With perfect juxtaposition and close contact, callus formation occurs at the expense of elements of the endosteum and haversoid systems, almost without the participation of paraossal tissues and periosteum. In this case, osteoid tissue immediately turns into bone, bypassing the fibro-

cartilage stage. Such healing of a fracture is called **primary** and is observed mainly with surgical treatment of fractures that provides the necessary conditions.

In the case of continued mobility of bone fragments, traumatization and violation of microcirculation of the emerging regenerate occur. Under these conditions, the regenerate is replaced first by cartilage, and then by bone. This type of fusion of fragments is called **secondary** healing of the fracture.

Primary fracture healing is the mostadvancedм typeof consolidation, providingм the best anatomical-, physiological and cosmetic results of treatment in a short time.

ПIUnder unfavorable conditions (reduced blood supply to bone fragments, interposition, infection, metabolic disorders, treatment errors)могутнаблюдатьсянfailure to heal fractures may occur:

- **замедленнslow fusion,** characterized by a significant increase in the time of callus formation.
- **non-enlargedfracture** – absence of clinical and radiological signs of consolidation and callus formation.
- **лthe left joint** is the formation of anatomical changes in the area of an ungrown fracture that are characteristic of the joint.
- **apoorly fused fracture** is a rough displacement of fused fragments.

КлиниClinical picture and diagnostics

Clinical signs of fractures include pain, swelling (due to hemorrhage, hematoma, tissue edema, impaired bloodand lymphcirculation), deformity of the limb in the fracture zone, impaired function, abnormal mobility and bone crepitation. Among these symptoms**, absolute ones are distinguished**, i.e. the detection of at least one of them indicates the presence of a fracture (with the exception of driven-in fractures and flat bone fractures) - **deformity at the fracture**site, **abnormal mobility** and **crepitation of bone fragments**.

Radiography is a mandatory component of diagnostics, which allows obtaining accuratedata on the location, nature of the fracture, the presence and types of displacement of fragments, and suggesting possible local complications, which is necessary to determine the rational treatment strategy. Radiography should be performed in 2 projections-strict straight and strict lateral, capturing both adjacent joints.

Treatment

Treatment ofthose who have suffered includes:

- **pervuyu assistance at the scene of the accident;**
- **accesstovalidated care in a medical facility** (emergency room or hospital).

First aid

Timely and correctly provided first aid is an important link in the treatmentof the victim, as it allows you to avoid excessive blood loss, additional displacement of bone fragments.

At **the prehospital stage**, the following procedures are performed::

1. **stopping external bleeding** – for open fractures accompanied by ongoing bleeding, temporary methods of stopping bleeding are used (pressure dressing, applying a hemostatic tourniquet, etc.);
2. **pain** relief – non-narcotic and narcotic analgesics are administered to patients for the prevention and treatment of traumatic shock;
3. **aseptic dressing** is applied to prevent infection in open fractures;
4. **transport immobilization** (by busKramer, Dieterichs, etc.) - is performed for all victims with fractures (Fig. 12, Fig. 13).

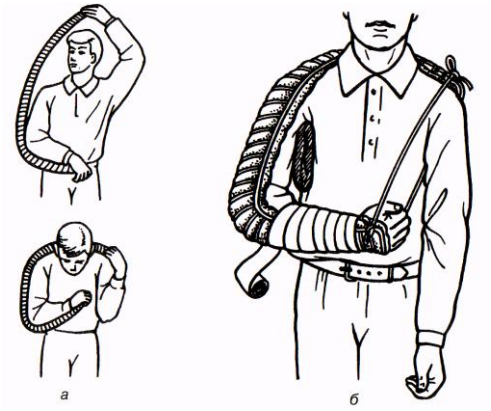


Figure 12 .. *Immobilization of the upper limb with a ladder splint: a) modeling the splintKramer; b) type of superimposed tire.*

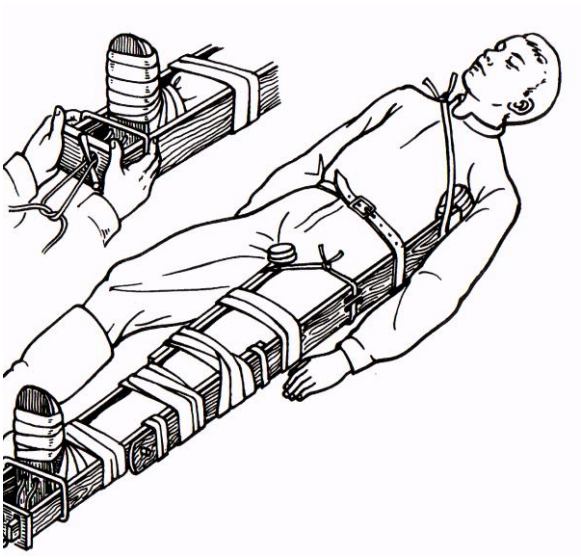


Figure 13 . *Bus OverlayDieterichs.*

For transport immobilization, we also use pneumatic (Fig.1-4) or plastic tires, which are well modeled on the limb, provide sufficient immobilization and visual monitoring of ее itsемcondition .

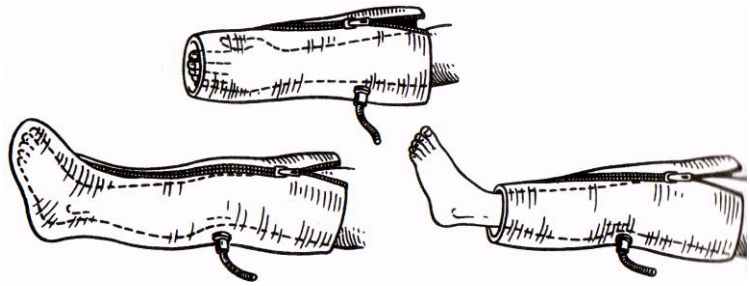


Figure 1-4 .4. *Medical pneumatic tires.*

Rules for transport immobilization:

- use as early as possible,
- splint placement on clothing and shoes,
- giving the limb a mid-physiological position,
- splint application with adjacent joints gripping,
- use of cotton-gauze pads in places of bone protrusions,
- ensuring availability of the hemostaticего tourniqueta.

The immobilization zone should include at least 2 joints adjacent to the fracture area, and if possible, give the limb a mid-physiological position in which the traction forces of the antagonist muscles are balanced, as well as eliminate the gross rotational and angular displacement visible to the eye.

Specialized assistance

At the stage of providing specialized care, a complete clinical and radiological diagnosis is carried out, after which the patient's treatment program is determined.

For successful treatment of fracturesах должны быть соблюдены, the following basic principles must be observed::

1. preposition (comparison of bone fragments) in dislocated fractures;

2. фconsolidation (until full consolidation));

3. cregulationof regenerative processes;

4. 4. functional rehabilitation.ункциональная реабилитация.

Most patients with fracturesами in the absence of absolute indications for emergency surgery are treatedат conservatively orperform surgeryю in a delayed manner (after stopping post-traumatic soft tissue changes in the fracture area and improving their general condition).

Conservative treatment

Before setting the fracture, it is necessary to adequately anesthetize the patient, for which в гематому a 2% solution of novocaine – 30 – 40 ml is injected into the hematoma in the fracture zone–40 мл, after emptying the hematoma through a needle. If indicated, other types of anesthesia can also be used (conduction anesthesia or anesthesia).

Depending on the location of the fractureосуществить **, closedrepositioning репозицию** can **beo –** performed simultaneously manually (Fig.1-5), with the help of apparatuses**, oro –** постояннby gradual and constant skeletaltraction.

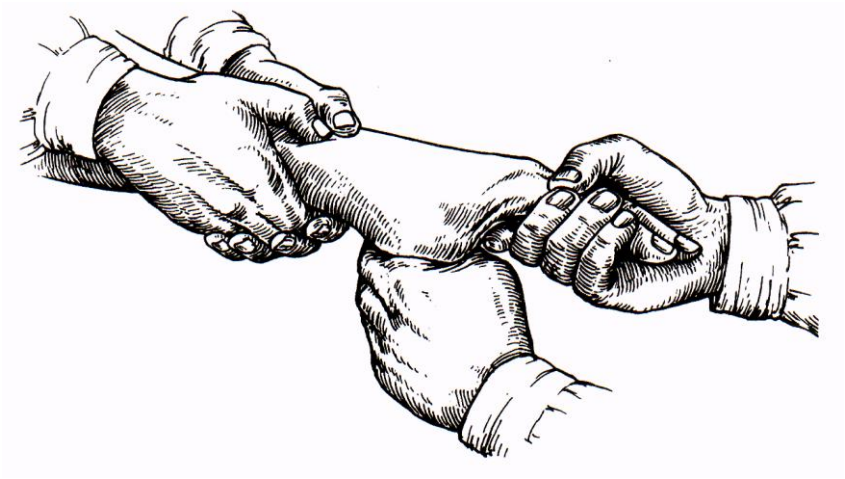
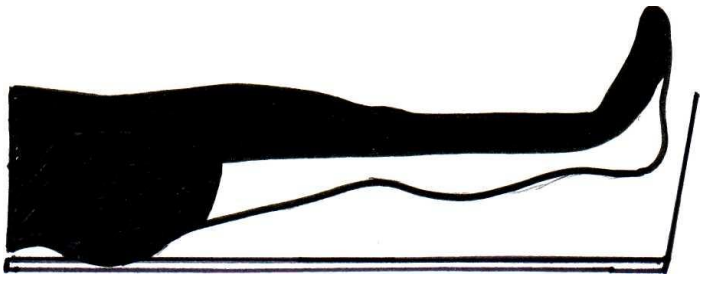


Figure 15 .. *Manual reposition of a radius fracture.*

ПоAfter X-ray control of the reposition, it is necessary to immobilize the bone fragments. Use the following commit methods: 1) plaster cast; 2)traction; 3) surgery.

Plaster bandages. There arelonget , circular, longet-circular, terminal, bridge-like, leaf-shaped plaster dressings (Fig. 16).



b in g

but

Rules for applying plaster casts

- the limb should be in a physiological position
- the bandage should cover adjacent joints
- the distal parts of the limb (fingertips) should remain open.

It should be remembered that you should not apply a blind circular bandage for a fresh fracture, especially after reposition, as возможнseverecirculatoryx disorders in the limb may develop due to the increase in edema. Longetny and dissected circular plaster bandages after the elimination of edema of the limb are replaced with deaf circular ones, which are kept until the fracture is consolidated. The average duration of fixation is 3-6 weeks for fractures of small bones (hand, forearm, foot)

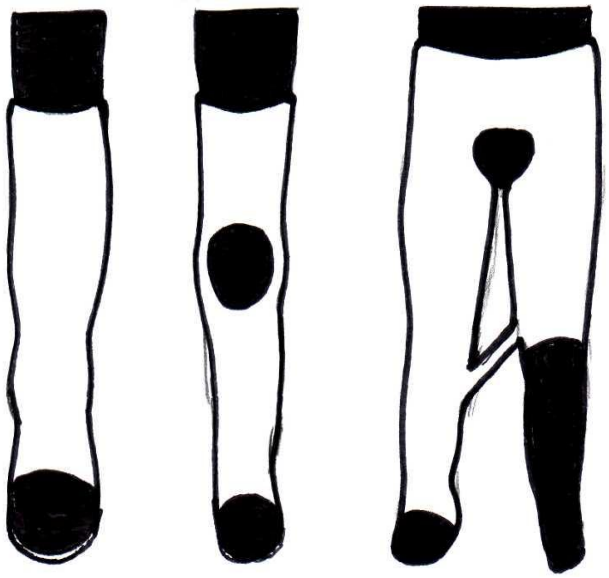


Figure 16. *The main types of plaster dressings: a) longcast ; b) circular; c) bridge-like; d) coxite*

and 12-16 weeks for fractures of large bones (shin, thigh). During treatmentпроводят , X-ray monitoring of the position of fragments and the development of bone callus is carried out.

Gradual stretching is used to reposition and fix fragments in fracturesax of the hip, lower leg, shoulder, pelvic bones, etc. **Skeletal traction is most often used,** which is called a functional method of treatment, since it is based on gradual relaxation of the muscles of the injured limb and the ability to dose the load to compare bone fragments.

The technique of skeletal traction. Aspoke is drawn through the bone (depending on the location of the fracture – calcaneal, tibial tuberosity, надмыщелкиfemoral epicondyle, ulnar process), a special bracket is fixed to it, for which a load is pulled along the longitudinal axis of the broken bone through a system of blocks. Stretching contributes to the gradual reposition of fragments, and later performs the function их of fixing them. Traction treatment is carried out on special medical tires (tire1-7 (рис. 17) - for the lower limb, abduction splint-for the treatment of shoulder fractures). The average value of the load at the stage of gradual reposition with a hip fracture is 1/7 of the body weight (6-12kg), shin bones-1/14 of the body weight (4-7kg), shoulder-3-5 kg, with a 2-fold decrease at the fixation stage.

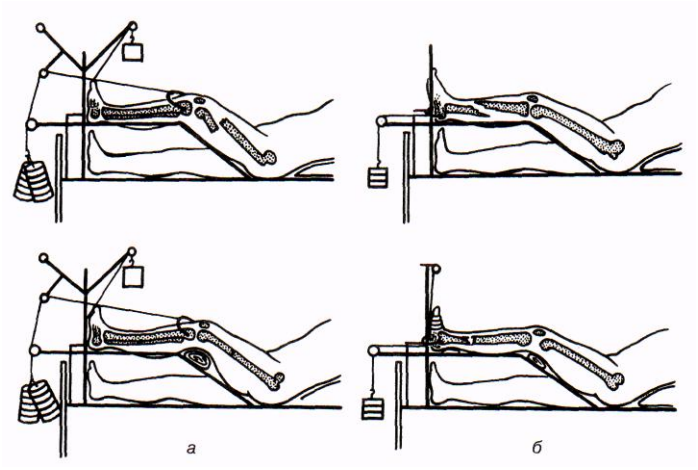


Figure 17 .. *Skeletal traction on the tireBelera in case of fracture of: a) hip bones; b) lower leg bones.*

Cutaneous traction is used less frequently and mainly at the stage of fracture fixation, since a special cuff made of sticky plaster or zinc-gelatin bandages does not withstand the attached large load required at the reposition stage.

In some fractures of the sce, flight traction can be performed using devices such asIlizarov (Fig.1-8),Gudushauri et al. KCompression-distraction extrafocal osteosynthesis пallows simultaneous gradual reposition and good fixation of fragments, which makes it possible to perform early loads and movements in all joints. This method is successfully used to treat patients with delayedом fusion, non-fused fracturesaxof the ach, pseudoarthrosisof the ach, and traumaticм osteomyelitise.

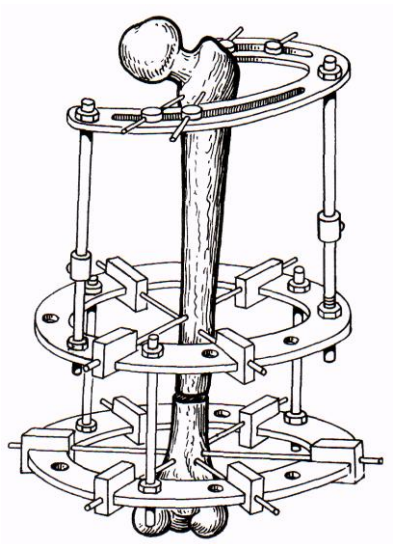


Figure 18 .. *Hip osteosynthesis using the deviceIlizarovaStreet .*

The disadvantages of skeletal traction are invasiveness (the possibility of developing spoke osteomyelitis, detached fractures, vascular and nerve damage), the need for inpatient treatment and forced long-term bed rest.

Surgical treatment

Indications for surgical interventionin fractures are divided into абсолютные absolute and relative:

Absolute readings:

- open fractures;
- bone fragments damage the main vessels, nerves and internal organs (brain and spinal cord, thoracic and abdominal cavities).);
- soft tissue interposition;
- false joint;
- purulent-inflammatory complications at the fracture site;
- improperly fused fractures with severe functional impairment.

Relative indications:

- failed attempts at a closed reposition;
- transverse fractures of long tubular bones when repositioned bone fragments cannot be fixed;
- medial femoral neck fractures (violation of blood supplytothe femoral head);
- improperly fused fractures with minor functional impairments;
- patellar fractures;
- large diastasis of bone fragments.

At the same time, only open fractures and fractures complicated by damage to the main vessels, nerves and vital organs require urgent operations. The main task of treatment for open fracturesax is primary surgical treatment of the wound,уюпроизводwhich is performed in order to prevent infectious complications and stop bleeding (intervention on костяхthe bonescan not be performed or limited to only bloody reposition).

Types of surgical interventions for fractures:

1. **An open (bloody) reposition**.

2. **Classical osteosynthesis,** which consists in using various methods and materials, most often metal, to fix the matched bone fragments.

There is a distinction **between extramedullary** osteosynthesis, in which fixing structures (most often plates) are applied to the bone from the periosteum and fixed to it, and **intramedullary,** performedют by inserting pins into the medullary canal. Osteosynthesis is also widely used with knitting needles and screws, which are inserted into the bone in different directions to fix fragments (Fig.1-9, Fig. 20, fig. 21).

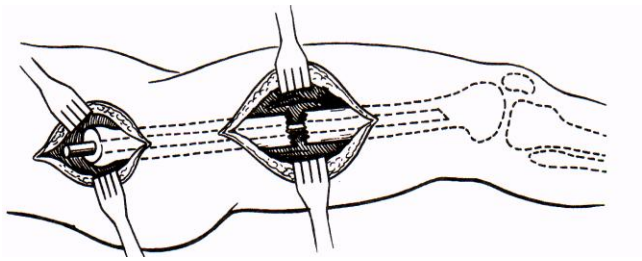


Figure 19 .. *Intramedullary osteosynthesis using a metal rod for hip fracture.*

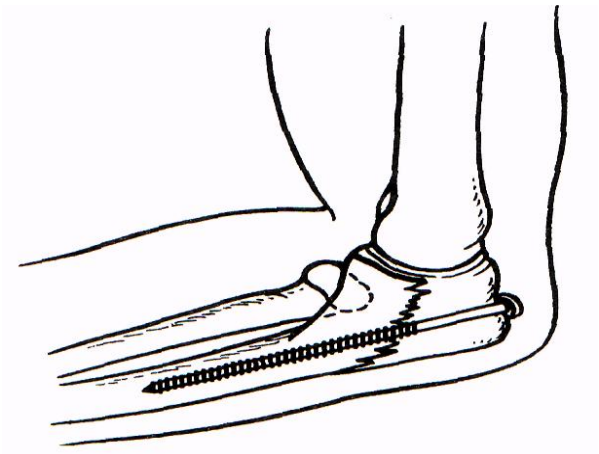


Figure 20 .. *Extramedullary osteosynthesis of a fragment of the ulnar process using a screw.*

Figure 21 .. *Fixation of humerus fragments with a plate and screws.*

3. **Endoprosthetics of joints** are used for intra-articular fractures of the epiphysis of the bone (medialй fracture of the femoralneck). This allows you to quickly activate patients and load the broken limb.

The disadvantages of surgical intervention for fractures are:

- risk of anesthesia and surgery;
- additional trauma in the fracture area;
- possibility of infection of the fracture area;
- bone marrow damage in intramedullary osteosynthesis;
- the need for repeated operation to remove the fixing structure.

BURNS

Burn (combustio) – повреждениеtissue damage caused by the local action of high temperature, chemicals, electric current and ionizing radiation.

According to the etiological feature, thermal, chemical, electrical and radiation burns are distinguished.

THERMAL BURNS

Thermal burns are the most common, accounting for 6% of all peacetime injuries.

The severity of damage caused by thermal burns depends on the temperature of exposure, the thermal conductivity of the traumatic object, the time of contact with it, and the humidity of the environment. Of great importance is the condition of the integumentary tissues and the general condition of the victim's body. The most severe burns are caused by flammable liquids.

The severityofburns is determined by the depth and area of thewound.

DepthA of damage

The most widespread classification of burns in our country was adopted at the XXVII Congress of surgeons in 1961классификацияожогов, which includes **4 degrees of damage depth** (Fig. 22)**.**

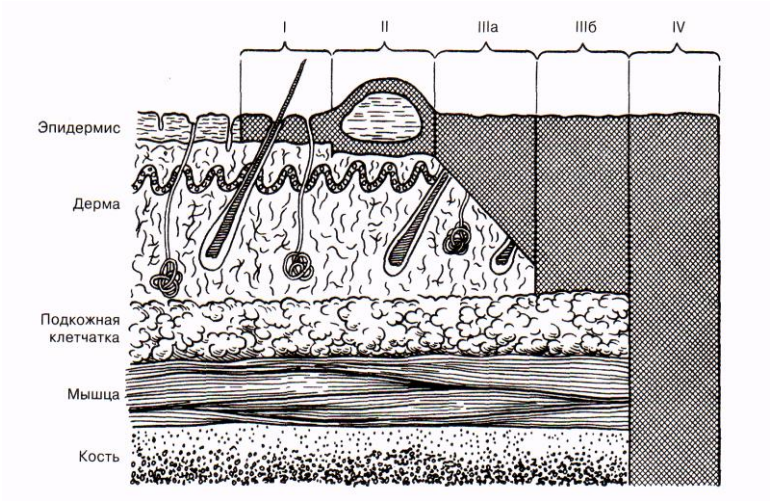


Figure 22. *Degree of burn.*

IGrade I – damage to the epidermis, clinically manifested by hyperemia and edema of the skin.

IIGrade II –damage to the entire epithelium – in addition to hyperemia and edemaпоявляются, blisters appearи, fillede with serous fluid. The bottom of the burnны wound is shiny pink moist with increased pain sensitivity.

IIIa degree- necrosis of the epidermis and underlying skin to the germ layer. The sebaceous and sweat glands located in the subcutaneous adipose tissue remain viable. There is hyperemia and swelling of the skin, blisters with yellowish jelly-like contents. The bottom of the bubble is pink and moist, and bol sensitivity is preserved.

IIIb degree-necrosis of all skin layers – blisterswith hemorrhagic contents, brown scab. When opening the blisters and removing the epidermis, a dull and pale bottom of the wound with small-point hemorrhages is found. Pain sensitivity is completely absent.

IVGrade IV-necrosis of the skin and underlying tissues (subcutaneous tissue, fascia, muscles, bones). ФормируетсяА denseый darkscab струп, is formedаруш, and the functionsof damaged anatomical structures are disrupted.

Burns **of I, II, and IIIa** degrees are classified **as superficial**, while burns **of IIIb** and **IV** degrees are classified **as deep**.

In other countries**, the 5-power classification is more common** Kraybicha, in whichIV and V degrees of damage correspond to III b and IV degrees of the above classification.

In the **2–power classification**, burns are divided into superficial(I–IIIa degrees), when the preserved part of the dermis elements is the basis for spontaneous epithelialization, and deep (IIIb and IV degrees), when полностьюисключаетthe possibility of spontaneous regeneration is completely excludedи and показанаautodermoplastya is indicated. With superficial burns, the area of damage is wet, shiny, swollenя ("plus-cloth"). In deep burns, the affected area, covered with a dark, dense scab, is located below the level of the surrounding tissues ("minus-tissue").

Methods for diagnosing tissue damage in deep burns include:: a) thermographic method (using infrared rays); b) method of activation of oxidative enzymes (in the presence of them, blue dye stains only viable tissue); c) method of composter biopsy of the burn area (determines the depthy of damage, as well as the nature of infection).

Площадь Affected area

The areaof the burn surface ois measured as a percentage of the entire surface of the victim's body. There are many methods for determining the burn area, butаибольшее pacthecамые fastest and simplest ones are widely used.

Method A. Wallace's "rule of nines". According to this method, the entire surface of the body consists of multiple parts 9: head and neck –9%, the front surface of a trunk – 18%, posterior surface of the trunk – 18%, upper konechnostand – by 9%, lowercompared to konechnostand – at 18%, crotch and the genitals of 1% (Fig. 23).

The I.I. method Glumova – "the palm rule". It is used for limited burns, especially those located on various parts of the body. The area of the burn is compared with the area of the victim's palm, which is about 1% of the surface of his body (pis. 23).

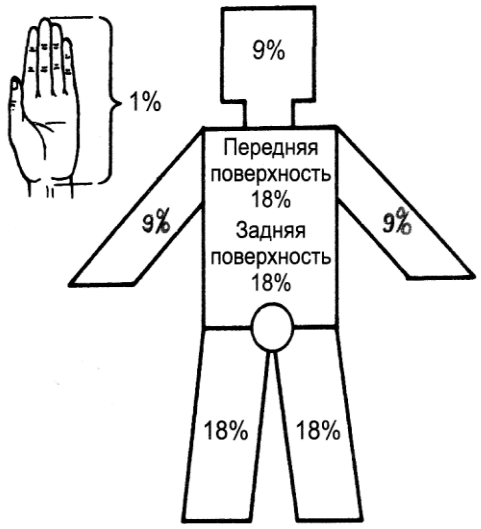


Figure 23 .. *Determination of the burn area ("palm rule", "rule of nines").*

The B.N. method Postnikov. К ожоговой поверхности прикладывают cAsterile cellophane or gauze is applied to the burn surface, on which the burn contours are applied. After that, the cut-out sheets are applied to millimeter paper, the absolute area of damage is calculated, which is then converted into a percentage expression.

Predicting the severity of burn damage

The depth and area of the burn lesion give only a relative indication of the severity of the injury. Therefore, when predicting the outcome of a burn injury используют , special methods are used. The simplest of these are the Franc index and the "hundreds" rule.

The Franc index takes into account:

1) burn surface area (grade I, II, and 111a burns),ую expressed as a percentage;

2) the area of the burn surface (burn 111b and IV degrees),ую expressed as a percentage andmultiplied by a factor of 3;

3) burn of the respiratory tract, amounting to 30 units. the index.

For example: the victim has a burn of II-IIIb degree is 40%, and the burn of IIIb degree is 15%, and there is also a burn of the respiratory tract. Franc Index = (40-15) + (15x3) + 30 = 100 units.

If thendex of the Franc is less than 30 units – the forecast is favorable;

I**[rognosis is** favorable if IT11

Franc index = 31-60 units – the forecast is relatively favorable;

Franc index = 61-90 units. - the forecast is questionable;

Franc index > 90 units. - the prognosis is unfavorable.

Pravilo "hundreds" (age index of severity of damage-VITP). Add the patient's age and burn area, expressed as a percentage.

For example: the victim is 80 years old, and the area of burnsa is 20%. VITP = 80+20 = 100 units.

EIf the VITP is less than 60 units – the forecast is favorable;

VITP =61-80units – the forecast is relatively favorable;

VITP = 81-100 units. - the forecast is questionable;

VITP > 100 units. - the prognosis is unfavorable.

With small burns, damage occurs with a predominance of local phenomena, with a larger area of damage (more than 15% for superficial burns and more than 10% for deep burns)**, burn disease develops**.

BURN DISEASE

Burn disease is a complex of clinical syndromes that occur as a result of thermal damage to the skin and underlying tissues. At each stage of burn disease, certainpathogenetic mechanisms prevail. Burn disease includes four periods:

The first period – **burn shock**-is caused by neuro-reflex and neuro -endocrine reactions, accompanied bythe release of a large number of inflammatory mediators. Vasoactive substances lead to a violation of the central кровообращения и микроциркуляции, blood circulation and microcirculation,aethe permeability of vascular and cellular membranesincreases, the liquid part of the blood leaves the vascular bed into the tissues, which leads to interstitial edema and hypovolemia, changes in the water-electrolyte and acid -base balance, impaired liver, kidney, and heartactivity . A decrease in BCC is also associated with plasma loss through a burn wound and massive hemolysis. Hemolysis causes an increase in the potassium content in the blood and the movement of sodium due to damage to the cell membranes inside the cell, which causes intracellular edema.

The releaseof fluids from the vascular bed to theinterstitial space is observed for 12 or more hours, so the drop in blood pressure in burnshock does not occur immediately after injury, as in a typical traumaticone . In this regard, a normal blood pressure level is not an indicator of a favorable prognosis.

The main features ofburn shock are the prolonged course of its erectile phase, which determines relatively stable hemodynamics. With adequate treatment, the duration of the burn shock period can reach 3 days. Therefore, along with hemoconcentration and other indicators of homeostasis disorders,the main criteria for assessing the severity of burn shock are the area and depth of damage.

I degree of severity – burn surface no more than 20%, including deep burns up to 10%. Hemoconcentration: Hb up to 170 g / l, Ht up to 50%. The diuresis is not disturbed.

II degree of severity – the burn area is not more than 40%, of which up to 20% are deep. Hemoconcentration: Hb up to 200 g / l, Ht up 7to 7.0%. Hourly diuresis is below 30.0.

III degree of severity – burn surface more than 40%, deep more than 20%. Hemoconcentration: Hb up to 240 g / l, Ht up to 80%. Severe oliguria is observed and anuria is possible (less than 50.0 urine per day).

IIPeriod II-acute burn toxemia-begins with normalization of hemodynamics and lasts for 10-15 days. It occurs due to the rapidro absorptionя of fluid along with toxins from the edema area. Intoxication iзнтоксикация clinically manifested by a disorder of the central nervous system function (заторможенностlethargy, ADPя, delirium, intoxication delirium). Hyperthermiais typical up to 39-40 °C with slight daily fluctuations. At the same time, the clinical picture of toxic damage to the heart (deafness of tones, tachycardia, arrhythmia and a tendency to hypotension), liver (its increase, dysproteinemia and increased transaminase levels), kidneys (oliguria, proteinuria, cylindruria, microhematuria) is rapidly increasing. Significant changes can occur in the gastrointestinal tract: at the first stage, dyspepsia develops, and later gastrostasis, intestinal paresis increasевозможны , acute stress ulcers of the stomach and proximal intestines are possible, complicated by bleeding and perforation. At the same time, as hemodilution progresses, hemoconcentration is gradually replaced by anemia and hypoproteinemia, as well as leukocytosis, a shift in the leukocyte formula to the left and an increase in the level of MSM (medium-weight molecules).

IIIPeriod III – **septicotoxemia**-usually begins from 10-14 days after the burn, but it may also develop earlier. After rejection of the necrotic scab, suppuration of the wound occurs. At the same time, a high body temperature persists прогрессирует, anemia and hypoproteinemia progress. БоMore dangerous are the accompanying infectious complications-pneumonia, as well as intestinal paresis, stress ulcers of the gastrointestinal tract and their complications. If burn exhaustion develops, the wounds do not heal, maintaining constant intoxication, hypoproteinemia (loss of protein with wound discharge). Against this background, resistance to infection is significantly reduced, and generalization of infection is possible – **burn sepsis**.

Diagnosis of sepsis includes гистологическohistological and quantitativee bacteriologicale studies – composter biopsyю (заборtissue sampling to the full depth of the lesion). A composter biopsy can determine whether the microflora is localized within the affected tissue (non-invasive infection of the burn wound) or extends beyond it (invasive infection of the burn wound), as well as give a quantitative characteristic of the infection.

At the current level, there is an objective laboratory criterion for the diagnosis of sepsis at an early stage – a decrease in the superoxide index on the surface of polymorphonuclear blood leukocytes (N=2.7 nmol/^{106} cells). In sepsis, NADP-N oxidase decreases and disappears, without which superoxide is not produced, and white blood cells lose their ability to destroy microorganisms.

The IV period – **convalescence**-begins after the burnwound is closed with its own epidermis and is characterized by functional residual disorders, insufficient compensatory ability of the cardiovascular system, and impaired renal function (pyelonephritis, amyloidosis, and urolithiasis).

In **case of airway burn**, 3 consecutive periods are observed: I) bronchospasm; II) airway edema; and III) a period of infectious complications.

Treatment

Treating burn victims is not an easy task. Special difficulties arise with large-area deep burns. The key to good treatment results for this category of patients is the availability of special conditions – an abacterial environment and a certain microclimate of the wards, the possibility of skin transplantation and massive infusion therapy. In this regard, treatment of burn patients проводятwas carried out in specialized burn hospitals.

First aid

The results of treatment of burn victims depend on the correctness and speed of first aid. It includes:

- termination of the effect of the thermal agent on the fabric – removal of the victim fromthe fire and removal from the surface of his body of objects that support the heating of fabrics (clothing, jewelry, etc.);
- cooling the burned areas of the body to room temperature (cold water, snow, ice for10-15minutes) - reduces swelling, reduces pain, prevents damage to deep-lying tissues.;
- applying an asepticой dressing;
- adequate anesthesia and anti-shock measures.

After providing first aid, it is necessary to quickly hospitalize the patient in a medical facility.

Local treatment

Local treatment of burn victims, regardless of the severity of the injury, consists of primary surgical treatment (PHO) of the burn wound. PHO includes обработкtreating the skin around the burn with an antiseptic solution and dressing the wound (after the introduction of painkillers). The burn wound is washed with a 0.5% solution of ammonia or a 3% solution of hydrogen peroxide, the exfoliated epidermis and foreign bodies are removed. In case of burn shock, they are limited to applying an aseptic dressing, and wound treatment is carried out after the patient is brought out of shock. Further treatmentяwas carried out by a closed or open method.

Local treatmentfor superficial burns is carried out by a closed method according tothe general principles of wound treatment: if there are no signs of suppuration in the burn wound, then emulsion dressings (syntomycin, streptocide) or emulsion aerosol preparations (olazol, hypozol) are used. With suppurationиспользуют, wet-drying dressings are used, which contribute to the formation of a thin scabconsisting of necrotic skin layers and fibrin. The formation of such a scab is promoted by iodide preparations (1% solution of iodopirone or iodovidone). When the scab softens, it should be removed. To completely eliminate exudative-inflammatory processes, ointments based on water-soluble polyethylene glycol are used (levosin, levecol dioxicol, etc.). And as the exudative-inflammatory phenomena subside after rejection or removal of the scab, they switch to oil-balsamic dressings.

The main purpose **of local treatment for deep burnsax** is to quickly clean burn wounds from necrotic tissues and skin plasticsurgery . Treatment for deep burnsax can be carried out both in a closed and open way. In the first methodна рану ,

bandages or various plastic materials are applied to the wound. In втором – формируthe second case, a dryscabis formed , which, in fact,is a "biological dressingой". At the present stage, open treatment of a burn wound is carried out in a controlled abacterial environment. Tents with a laminar flow of sterile air heated to 30-34 °C are used, as well as boxed wards with a directed source of infrared radiation and an air purifier. Importantadvantages of open treatment of deep burns are: a) rapid formation of a dry scab and reduction of intoxication; b) the possibility of constant monitoring of changes in changes in the wound. Disadvantages of this method: a) the complexity of care; b) the need for special equipment.

Management of a burn wound for spontaneous rejection of necrotic tissues is justified for deep burns of more than 40% of the body surface against the background of extremely severero generalro conditions ofpatients. Advanced age and severe concomitantие diseases make невозможным early surgical intervention impossible. In these cases, the tasks of localro treatmentя are the rapid formation of a dry burn scab and the preventiona of infection, which is achieved by placing the patient in anabacterial environmenty (gnotobiological chambers and isolators). Contribute to the formation of a dry scab 1% solution of iodipiron, iodovidone and "Naxol". To accelerate the rejection of a necrotic scab, ae proteolytic enzymes (trypsin, chymopsin, chymotrypsin, terrilitin and an ointment – based preparation-travaza), 40% benzoic acid solution and 40% salicylic ointment are used. After the scab melts, it is removed acutely.

Некротомию Ecrotomy (dissection ofthe scab to its full depth) is performed, if the scab, like a shell, covers a significant part of the body surface, disrupting its blood circulation. Necrotomy restores blood circulatione and accelerates the rejectionof necrotic masses.

Early necrectomy with autodermoplasty for deep burnsax is currently considered the method of choice.

Advantages tactics early excision of necrosis with the closure of wounds: a) necrectomy eliminated toxicity and cause developmentment of pathogenic microorganisms; b) has reduced plasmapureI; in) of Karachiindicates the course of burn disease, prevents paper Board warpiYull its complicationsI, accelerate the healing time of wounds and, accordingly, reduced the length of hospital stay; d) the conditions for RUNNher of activitatiand patients; d) eliminates the need for frequent painful dressings; e) decreases the likelihood of a rough RUBof EAI.

Contraindications to early necrectomy: a) the state of burn shock; b) severe concomitant lesions of the central nervous system, liver and kidneys; c) widespread burns of the face and neck with damage tothe respiratory organs; d) massive wound infection; e) senileage.

Early necrectomy should preferably be performed within 3 to 5 days. For 1 reception, non-viable tissues that make up no more than 20% of the entire body surface are removed. There are several methods of early necrectomy:

1. Tangential necrectomy – dissection of necrotic tissues to capillaryлbleeding, followed by removal of surface layers. When bleeding, necrosis excision is stopped and switched to a conservative method. If the depth of necrosis is large, a different necrectomy method should be used.
2. Sequential necrectomy – layer-by-layer (skin, subcutaneous tissue, etc.) removal of necrosis to the full depth.
3. Necrectomy to fascia – removal of necrosis within healthy tissues with mandatory closure of the wound.
4. Amputation of a limb is провода YT procedure for necrosis of all layers of the limb, joints, and main vessels.

Methods of closing a burn wound:

1. Alloplasty for temporary wound closure.

a) Skin graft.
b) Embryo membranes.
c) Collagen films.
d) Fibrin films.
e) Dressings with cultured fibroblasts (Vishnevsky Institute, 1970).

2. Xenoplasty for temporary wound closure.

a) Pork skin.
b) Kombutek-animal collagen in the form of films and meshes.
c) Stage–1 dressings – are a highly porous cow collagen polymer.

3. Temporary closure of wounds with synthetic materials.

a) Single-layer film-forming synthetic materials (algipor, polycaprolactone, etc.).

b) Double-layer synthetic materials ("synthetic leather").

The inner layer of these materials has hygroscopicproperties, and the outer layer in the form of a film isolates the wound from the external environment. These materials include: hydron, debrisan, epigard, syncaver, and others.

4. Autodermoplasty at the final closure of the granulatingwound.

a) Plasty with local tissues (mobilization of wound edges, laxative incisions, counter triangles, etc.).

b) Loose skin plastic surgery. The optimal method of free skin grafting is a split flap transplant, when thenipple layer partially remains in the donor site (most often the anterior one-the outer surface of the thigh, lower leg, and side surface of the abdomen) and is a sourceof skin regeneration. The surface layer transplanted to a burn wound is also a source of epidermal overgrowth. To increase the graft area, dermoperforation with a special device of the same name is used. The areaof the split flap to be transplanted increases2-4times. In addition, отвepthe openings prevent graft detachment by providing freeflow of accumulated fluid.

c) Plastic skin on the feeding leg.

Italian method-consists in simultaneously preparing a flap (moving parts of the body-upper and lower limbs) and moving it to the wound area.

Plastic surgery with a migrating stem (V. P. Filatov's method). Prepare a skin flap with two feeding legs, the edges of the flap are sewn together in the form of a"suitcase handle". After healing, after 2 weeks, the flap is trained (squeezing the movable end of the stem), starting from 5 minutes and gradually bringing it up to 1 hour. The development of collaterals allows you to cut off the flap in the area of the trained leg and fix it to the moving part of the body (upper limb). Continue training the remaining feeding leg, and after2-3weeks, the flap is completely cut off from the donor site and the wound defect is closed.

Flap surgery on the vascular pediclee with the useof microsurgical techniques – fixationормof vascular anastomoses that provide blood supply to the transplanted areas.

d) Stage–2 dressings– cultured basal cells of the epidermis (the method was proposed in 1989 at the University of Massachusetts).

General treatment

WithThadyI 'm in burn shock

1. Borb aa with afferent impulses (pain syndrome) - the use of morphinomimetics, taking into account the constitutional and age characteristics of patients. Synthetic opioids are widely used, the distinctive feature of which is their minimal effect on the indicators of central and peripheral hemodynamics in patients with burn injury. Additionally, they use tranquilizers in small doses, neuroleptics (mainly droperidol), GHB. Preference should be given to intravenous analgesicam, which is associated with impaired microcirculation in patients with burn shock. Novocaine administered intravenously in an amount of 200-400 ml of a 0.25% solution has a good analgesic and calming effect.

2. BCC replenishment. The approximate volume of infusion agents required for a patient with burn shock on the first day was calculated according toюthe formula proposed in 1952 by Evans.

V= 2 ml x burn area in % x body weight in kg + 2000 ml of 5% glucose solution.

This formula is used for burns of less than 50% of the body surface. Depending on the severity and hemodynamic parameters, a different ratio of colloids and crystalloids is used (on the first day, the ratio of crystalloids and colloids is 2/1, and on the second day – 1/1). With stable blood pressure, crystalloids should prevail, and with a decrease in blood pressure, the amount of colloids infused increases. As the shock progresses, the volume of infusion therapy is graduallyюreduced (2 times on IIday II, 3 times on IIIday III). To normalize water-salt metabolism, Ringer's solution, lactosol and other crystalloids are used.

3. Correction of CSF (sodium bicarbonate, trisamine).

4. Restoration of energy balance (glucose with insulin, fat emulsions).

5. Correction of the kallikrein-kinin system (proteolytic enzyme inhibitors).

6. Adrenal hormones (prednisone, hydrocortisone).

7. Installation катетерof three iv catheters –$_{O2\ insufflation}$ through the nasal passages, bladder catheterization and diuresis control, iifusionI therapy through central or peripheral veins.

WithTadiI acute burn toxemia and septicotoxemia

Significantly reduces the severity of burn disease during these periods, the tactics of early excisionof necrosis in the burn wound with temporary closureand coatings. Subsequently, a utodermoplasty y is performed аутодермопластику (see local treatment of burns).

Complex treatment of acute burn toxemia and septicotoxemia includes::

1. Дedezyntoxication therapy using the technique of forced diuresis, and in more severe cases – extracorporeal detoxification methods (plasmapheresis and hemosorption). Such detoxification drugs as: unitiol, hemodez, polydez, neocompensan, as well as 5% glucose solution and 0.99% NaClsolution .

2. Correction of anemia – bloodя transfusion of fresh blood 2-3 times a week.

3. Correction of hypoproteinemia – infusion ofой native plasmasы, albumina, proteina, the productof incomplete protein hydrolysis and a solutionof balanced mixtures of amino acids.

4. Replenishment of energy costs – the introduction of glucoseы, fructoseы and fatx emulsionsй. After the restoration of hemodynamics and diuresisя, a probe diet was performed: protein blood substitutes, nutrient mixtures, crystalloids, as well as balanced high-calorie natural mixtures (500.0 milk + 250 g of milk powder + 50 g of honey + 50 g of sugar + 50.0 olive oil + 3 eggs).

5. Anabolic agents and stimulantsaof reproductive processes (anabolic hormones, potassiumsulfate, pentoxyl, methyluracil, xymedone).

6. Glucocorticoids (prednisone, hydrocortisone).

7. Antihistamines.

8. Vitamins.

9. Inhibitors of proteolytic enzymes.

10. Immunotherapyн(active immunization with polyvalent vaccines and toxoids).

11. Antibiotic therapy (group of choice – aminoglycosides).

In **case of a burn of the respiratory tract** выполняют, diagnosticyю and therapeuticbronchoscopy is performedю. In addition to local and general measures related to the treatment of burns,:

1. вагосимпатическvagosympathetic blockageythat quickly relievesbronchospasm;

2. medical inhalations: ephedrine, eufillin, antihistamines and mucolytics;

3. with non – stopping bronchospasm-интубациюintubation or tracheostomyю with mechanical ventilation;

4. in case of pulmonary edema - administration of cardiacx glycosidesов and diureticsов.

CHEMICAL BURNS

Chemical burns occur under the action of concentrated solutions of acids, alkalis, heavy metal salts, and some gases on the skin and mucous membranes.

The nature of changes that occur in tissues depends on the type of chemical substance. When exposed **to acids** and **heavy metal salts**, protein coagulation occurs, and**coagulation(dry) necrosis develops**. In these cases, a dense scab quickly forms, preventing deep penetrationof chemical agents, and burns are superficial.

Alkalis bindto proteins and saponify fats, resulting развивается **in colliquation (wet) necrosis .** A soft scab does not prevent the chemical from penetrating deep into the tissues, and deep burns develop.

In chemical burns, in addition to local and general manifestations of damage to the integumentary tissues, **toxic damage to internal organs** is possible (with nitric acid, phenol, mercury salts, phosphorus compounds). First of all, the liver and kidneys are subject to toxic effects. Exposure to nitric acid leads to the formation of nitrates and nitrites, which contribute to the appearance of methemoglobin in the blood.

Externally, chemical burns are similar to thermal burns. The scab may take on a different color depending on the substance causing the lesion.

In first aid, the main task is to remove the chemicalsubstance from the body surface. The damaged area is washed with a jet of water for10-15minutes, followed by the application of a dryaseptic dressing. Further treatment is carried out according to the general principles of treatment of dry or wet necrosis.

COLD INJURY

Depending on the etiological factor and the conditions of cold exposure, thereare : general hypothermia and frostbite.

The urgency of the problem of general hypothermia and frostbite during prolonged exposure to negative temperatures is primarily determined by the climatic conditions of a significant part of our country with its extreme impact on people, long and harsh winters. Recently, there has been a significant dependence of the frequency of general hypothermia and frostbite on social factors, especially in people without a certain place of residence (homeless).

GENERAL HYPOTHERMIA

General hypothermia (freezingm) is a pathological condition that occurs when the body temperature drops below 35°C. Changes that occur in the body during hypothermia are basedon circulatorydisorders , metabolic disorders, and tissue hypoxia. There are three degrees of severity of hypothermia:

Mild severity – adynamic form, when the body temperature drops to 33-35 °C. There is chills, pallor and cyanosis of the skin. Speech slows down, becomes chanted, andshows weakness and drowsiness. Pulse and blood pressure are within normallimits .

Moderate severity-stupor form, with a decrease температуры in body temperature to 29-33 °C. The skin becomes cold, movements in the joints become stiff, drowsiness appears, depression of consciousness with violation of verbal contact. Respiration is rare (8-10 миньbpm), shallow, thepulse is slowed down to 40-50 bpm, weak filling, Blood pressure is reduced to 90 and 60 mm Hg.

Severe hypothermia – convulsive form, when the temperature drops to 25-29 °C. There is no consciousness, the pupils are narrow, and they react sluggishly to light. There are tonic cramps of the extremities (rigor mortis), contraction of the masticatory muscles, abdominal muscles. Breathing is rare (3-4 per minute), shallow, pulse is slow (30-40 per minute), weak , arrhythmic, blood pressure is not detected.

Treatment

In the treatment of patients with adynamic hypothermia, specialmeasuresare not required, except for warming up , providing hot drinks with general care, не требуется.

Treatment of patients with a stupor-like form of general hypothermia is performedby YT in the intensive care unit.

Principles of intensive care:

1. Gradual external warming in the form of dry wrapping, applying warm heating pads to the feet, using mattresses heated to 37 °C and warm drinking. Effectivee gastric lavage with warm solutions (t = 37-40 °C). All иinfusion media must also be heated to 37 °C.
2. Oxygen therapy. The YT wireis inhaled with oxygen heated to 30 °C.
3. Improvement of microcirculation by administration of drugs that affect rheology (rheopolyglucin with heparin, trental, etc.).
4. Maintainingthe functioning of vital organs and systems of the body. It is advisable to conduct infusion therapy with volume-substituting solutions and crystalloid agents, and in the presence of indications – mechanical ventilation. It is also necessary to preventy pneumonia, pulmonary edema, brain edema, neuritis, paresis and paralysis.

All patientsам with convulsive hypothermia require comprehensive cardiopulmonary resuscitation from the first minutes of admission to the intensive необходимаcare unit. Convulsive form of general hypothermia is almost incompatible with life.

FROSTBITE

Frostbite is a local lesion of the skin and underlying tissues that occursee under the influence of low temperatures.

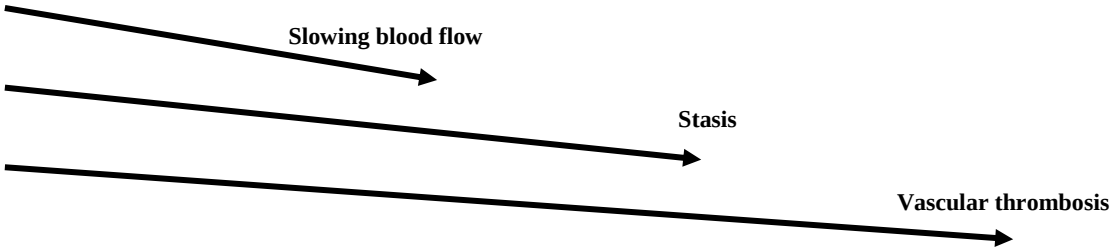
Factors that increase the risk of frostbite:

- high wind speed, and every 1.5 km / h equates to a decrease in air temperature by 1°C;
- violation of blood circulation in the extremities in various diseases (obliterating atherosclerosis, diabetic angiopathy, etc.);
- the impact on the body of alcohol, narcotic substances, etc., which, on the one hand, disrupt the function of the microcirculatory link, on the other, due to their impact on the psyche, do not allow a critical assessment of the situation;
- recurrent exposure to cold.

Pathogenesis

As a result of exposure to low temperature to reduce heat transfer, a vascular spasm reflexively occurs, which gradually spreads from the surface deep (from the skin vessels towards the main ones). Further changes are developed in accordance with the following scheme:

Vascular spasm



Thus, tissue necrosis in frostbite is secondary, resulting from increasing ischemia. In this case, the type of tissue damage is segmentalм.

Classification of frostbite

1. By the depth of the lesion:

I degree - there is no necrosis ofthe skin,after warmingнаблюдается , its cyanosis is observed.

Grade II – necrosis of the epithelium to the germ layer, bubbles appear filled with a transparentliquid.

IIIGrade III- necrosis of the entire thickness of the skin with a possible transition to subcutaneous tissue. The blisters are filled with hemorrhagic fluid. Bottom irritation (mechanical or alcohol) does not cause a sensitive reaction.

IVGrade IV – spread of necrosis to muscles, joints and bones.

2. By flow periods:

a) pre-reactive;

b) reactive.

With frostbite of the III-IV degree, 4 zones of damage are distinguished, differing in the degree of trophic changes:

1. total necrosis zone;
2. the zone of irreversible total changes (characterized by the occurrence of trophic changes in the future).x ulcerative and ulcerativexscarsов);
3. the zone of reversible degenerative changes (this zone coincides with the place of choice of amputation after the elimination of edema);
4. zone of ascending pathological processes (neuritis, endarteritis, osteoporosis, etc.).

Clinic and treatment

Pre-reactive (hidden)периодthe time period coincides with the duration of exposure to the cold factor. During this period, paresthesias appear: tingling and burning, then there is a complete loss of sensitivity in the affected tissues, the skin is pale.

Treatment of patients in the pre-reactive period of frostbite begins with the introduction of narcotic analgesics and general warming. Warming by mechanical action on the skin (massage, rubbing), especially with the use of snow, it is impractical, sincemicrotraumas worn during rubbing can become infected. Intensive heating (hot water and the use of heating devices) is also contraindicated, since the exchange in the surface layers is activated, and the nutrition of tissues is disrupted due to stasis or thrombosis. Intensive heating contributes to thrombosis of the main vessels. When using baths, you should start at 20 °C, increasing the water temperature by 5 °C for 2 hours. Optimal is the application of heat-insulating bandages with 70 ° alcohol against the background of measures that restore microcirculation. To improve the general condition and blood circulation in the affected extremities, the implementation of case novocaine blockades contributes.

The reactive period begins with the beginning of warming of the limb, it is divided into early and late.

The early reactive period lasts from the moment when signs of frostbite appear after the cold factor stops acting and until the first signs of tissue necrosis appear. The duration of the early reactiveperiod is about 12 hours.

In the early reactivем periode, there is pain in the affected area of the body, sometimes quite intense, cyanosis of the skinand, the appearance ofяетсяthetissue swells and отек тканbuilds up. Sensitivity is disturbed from paresthesia and itching to complete anesthesia.

The late reactive period (frostbiteI of III and IV degrees) begins from the moment the first signs of necrosis appear and proceeds until its complete separation from healthy tissues (the formation of a demarcation shaft).

The main diagnostic tasks for frostbite are to determine the depth and volume of tissue necrosis. Complementary techniques are used to clarify these parametersметодики:

1. Tactile and pain sensitivity of the frostbite area, the dynamics of changes in sensitivity allow you to navigate during the restoration of the viability of the affected areas as a result of the treatment.
2. Radiograph of the affected limb. Marginal necrosis and limited bone clearings are detected on radiographs by7-8days, and theемаркационнdemarcation lineю in soft tissues - by 1414-15days.
3. Infrared thermography helps to determine the volume of necrosis, conduct thermophysical monitoring of the effectiveness of treatment.
4. Creatine kinase test. Biochemical determination of the level of blood creatine kinase allows predicting the volume of tissue necrosis, since III–IV степенях отморожения the concentration of the enzyme remains high in the III-IV degrees of frostbiteой.

General treatment. The main taskoftreatingя patients in the reactive period of frostbite is to maximize the restoration of impaired blood circulation of tissues and the formation of coagulation necrosis. For this purpose, apply:

1. andperfusion media that improve the rheological properties of blood (rheopolyglucin , etc.), vasodilatorsвещества;
2. aanticoagulants and disaggregants (heparin, fraxiparin, clexan, aspirin, aspizol);
3. antibacterial therapy;
4. They are given aspecifictetanus prevention program;
5. painrelief .

Deterioration of the patient's condition is associated with the development of toxemia, in order to stop it, detoxifying blood substitutes are administered, and diuresis is forced.

Local treatment. With frostbite of the I–II degree, wounds are treated with antiseptics, blisters are cut off, wet-drying bandagesare applied .

IIIn necrosis, enzyme preparations are widely used, and after cleaning wounds, they switch to ointment dressings. If it is not possible to convert wet gangrene to dry gangrene and severe intoxication and sepsis are observed, thenamputation ампутациof the affected limb segments is undertaken within healthy tissues. When dry necrosis is completely delimited, necrectomy is performed along the line ofthe demarcation shaft, in which theследующем granulating woundy is treated according to general principles.

With the formation of extensive skin defects, an autodermoplasty is performedy.

Long-term complicationsложнениям of frostbite include: a) trophic ulcers in the area of previous frostbite; b) cold polyneuritis; c) arthritis, arthrosis, and joint contractures.

ELECTRICAL INJURY

The growing use ofelectricity in the home and in industry is leading to an increase in cases of electric shock. Electrical injuries account–for 2-2.5% of the total number of industrial injuries. Less often, electricaly injuries are caused by atmospheric electricity-lightning.

The nature and depth of electrical injuries are affected by the time of exposure, contact area, and tissue resistance (depending on skin thickness, skin moisture, human grounding, etc.). Life-threatening are alternating currents with a voltage of 120 V and higher, although fatal outcomesare also known when a lower voltage current is struck.

Electricvehicle operation

The direct effect of electric current on the body causes general disorders of the central nervous system, respiratory and cardiovascular systems.

The released (Joule) heat leads to the appearance of characteristiclocal changes – burnsов, called "current signs".

Heat, light, and soundgenerated in the environment, can alsoывать cause characteristic changes in the body (blinding and burns caused by a voltaic arc, damage to the hearing organs, etc.).

Thecause of death from electrotrauma can be: 1) primary paralysis of the heart, 2) primary paralysis of respiration, 3) simultaneous paralysis of the heart and respiration, 4) paralysis of the brain (electric shock).

Clinical pictureческая картина

The clinicalpictureof electric shock depends on the severity of the injuryand consists of local and general symptoms.

"Current signs" represent changes at the current input andoutput points. Most often, these are rounded gray areas with a diameter of up to 2–3 cm, dense, dry, raised above the surface tothe eye. They are almost painless, there is no inflammatory reaction of the tissues aroundthem .

In severe cases, local changes are more pronounced, up to charring of the affected areas with melting of bones.

OMost symptoms are determined нарушениями by disorders of the central nervous, respiratory, andmusculoskeletal systems. Attention is drawn to the discrepancy between the patient's general well-being and pronounced deviations in his objective examination. In severe cases, there is a blackout of consciousness with pronounced motor arousal, in the future-retrogradeamnesia. Victims are disturbed byая headache, общая generalбостьweakness, increased excitability, a feeling of fear, and the development of paresis, paralysis, and neuritis is characteristic. Convulsive muscle contractions can lead to their rupture, as well as to отрывным переломdetached bone fractures. Breathing becomes rare, shallow, and in severe cases, pulmonary edema may develop. Heart sounds are muffled, the pulse is slow, the heart rhythm is disturbed. In the late period, the development of liver and kidney function insufficiency is possible.

When examining blood, leukocytosis is detected with a shift of the formula to the left. Significant changes occur withelectrocardiography and electroencephalography.

Treatment

Primarycare for electrical injuries includes:

- termination of electric current exposure;
- carrying out resuscitation measures in the presence of indications;
- applying an aseptic dressing to the burn area;
- hospitalization of the victim in a hospital.

After first aid, it is necessary to carefully monitor the patient, conduct anti-shock measures (intravenous administration of cardiac agents, blood components, the use of respiratory analeptics, oxygentherapy).

Local treatment is similar to the treatment of thermal burns, in the presence of massive necrosis, an early necrectomy is performed, in case of charring of the limb, amputation is resorted to ампутации.

RADIATION BURNS

Radiation burns occur when the body surface is exposed to radiation energy **(**ultraviolet, X-rays, α-, β -, and γ-rays). In addition to the local manifestations characteristic of burns, и specific general symptoms of radiation sickness also occur in the victim's body. Under the influence of radiation energy in the skin , capillaries expand with stasis, degenerative changes in nerve endings occur. Нарастает Swelling and destruction of structural elements of the skinincreases . With a high dose of radiationформируется , deep dry necrosis is formed.

There are3 phases of radiation burns: the primary reaction, the latent period, and the period of necrotic changes.

The primary reaction occurs a few minutes after the injury and lasts for several hours, developing hyperemia and swelling of the skin, minor soreness. General symptoms may include weakness, headache, nausea, and vomiting.

The latent period (lasting from several hours with sunburn to several weeks with ionizing radiation) proceeds withoutany local and general manifestations.

In theperiodof necrotic changes, pain and swelling of the skin occur. With a high dose of radiation в дальнейшем , necrotic ulcers develop in the future, characterized by a significant decrease in regeneration processes. General manifestations are represented by pronounced subjective and objective manifestations of radiation sickness. In acute radiation sickness (radiation dose is more than 200 rad)возможны, hematopoietic disorders, fever, petechialrashes on the skin and mucous membranes, hair loss, as well as various infectious complications associated with a decrease in immunity are possible 2-3 weeks after exposure.

If radioactive substances get on the skin, they are washed off as quickly as possible with a jet of water. If it is impossible to remove radioactive substances by sparing methods, то для предупреждения более глубокого поражения, then the skin and subcutaneous tissue are excised together with them to prevent a deeper lesion. They also carry out measures to prevent infectious complications and increase the body's resistance. Local treatment is similar to the treatment of thermal burnsax.

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