DISEASES OF INTERNAL ORGANS IN COMBAT SURGICAL TRAUMA AND INJURIES IN CATASTROPHES AND ACCIDENTS IN PEACETIME. DISEASES CAUSED BY EXPOSURE TO THERMAL FACTORS (HEAT AND COLD)

Methodical instructions
for the 5th year students
to the practical class

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Харківський національний медичний університет

DISEASES OF INTERNAL ORGANS IN COMBAT SURGICAL TRAUMA AND INJURIES IN CATASTROPHES AND ACCIDENTS IN PEACETIME. DISEASES CAUSED BY EXPOSURE TO THERMAL FACTORS (HEAT AND COLD)

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ЗАХВОРЮВАННЯ ВНУТРІШНІХ ОРГАНІВ ПРИ БОЙОВІЙ ХІРУРГІЧНІЙ ТРАВМІ ТА ТРАВМАХ В УМОВАХ КАТАСТРОФ ТА АВАРІЙ МИРНОГО ЧАСУ. ЗАХВОРЮВАННЯ, ВИКЛИКАНІ ДІЄЮ НА ОРГАНІЗМ ТЕРМІЧНИХ ФАКТОРІВ (ТЕПЛА ТА ХОЛОДУ)

Методичні вказівки
для здобувачів вищої освіти V року навчання
до проведення практичного заняття

Затверджено
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Захворювання внутрішніх органів при бойовій хірургічній травмі та травмах в умовах катастроф та аварій мирного часу. Захворювання, викликані дією на організм термічних факторів (тепла та холоду) : метод. вказ. для здобувачів вищої освіти V року навчання / упоряд. Д.В. Мартовицький, А.Я. Меленевич, Д.Г. Молотягін. – Харків : ХНМУ, 2022. – 20 с.

Упорядники Д.В. Мартовицький
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Topic 4: «Diseases of internal organs in combat surgical trauma and injuries in catastrophes and accidents in peacetime. Diseases caused by exposure to thermal factors (heat and cold)»

1. Hours: 5.

2. Importance of the topic:

The evolution of firearms has a peculiar phasing, inevitably associated with the views and techniques of treating gunshot wounds. The invention of cartridges, multiply charged automatic weapons, pointed cartridges, bullets that easily unfold or flatten in the human body (which are prohibited by the III Declaration of the Hague Convention of 1899), leaving no chance for the enemy, led to the emergence of such a science as wound ballistics.

Frostbite is considered a frequent companion of wars, sometimes it has the character of an epidemic and occupies a significant share in the structure of sanitary losses. Mostly the fingers of the upper and lower extremities, ears, nose, and sometimes the external genitalia are frozen. According to military and peacetime statistics, frostbite of the lower extremities predominates.

Hyperthermia is a pathological condition of the body that occurs as a result of a violation of thermoregulation and / or the action of external heat.

3. Aim of studying: The aim of this theme is be able to expansion and deepening of students' general and medical horizons of knowledge, development of clinical thinking skills, continuation of the formation of the doctor's personality, training of medical professionals to work in emergencies associated with adverse situations.

Specific objectives to be achieved after conducting practical classes:

Students need to know:	Students will be able to:
- classification of burns and frostbite depending on the factor that injures; - simple ways to determine the area and degree of thermal damage; - signs of burn shock; - the volume of first aid for thermal burns and frostbite; - principles of providing PMP during hyperthermia and freezing; - simple ways of transport immobilization of victims and transportation rules	- determine the area and degree of thermal damage; - to prevent burn shock; - provide PMF in case of thermal damage, with general overheating and hypothermia; - ensure proper transportation of victims

4. Indicative syllabus

- Signs and symptoms of cold and hot injuries
- Causes
- Pathophysiology
- Diagnosis

- Classification
- Differential diagnosis
- Prevention
- Management.
- Prognosis

5. Material and methodological support: Visual material, multimedia devices, visual material prepared presentations of Microsoft Power Point, tables, posters. Training manuals. Regulations Ministry of Health. Special patient.

6. Materials for practical classes:

Combat surgical trauma

The issues of timely diagnosis and qualified assistance in case of gunshot and mine-explosive injuries do not lose their relevance in peacetime.

The evolution of firearms has a peculiar phasing, inevitably associated with the views and techniques of treating gunshot wounds. The invention of cartridges, multiply charged automatic weapons, pointed cartridges, bullets that easily unfold or flatten in the human body (which are prohibited by the III Declaration of the Hague Convention of 1899), leaving no chance for the enemy, led to the emergence of such a science as wound ballistics. Types of firearms wounding projectiles are divided into low-speed up to 300 m/s (PM; 9 mm), medium-speed 300–750 m/s (AKM; 7.62 mm), high-speed 750–1200 m/s (AK-74; 5.45 mm).

Nikolai Ivanovich Pirogov, an outstanding military field surgeon, was the first to study the issue of the destructive effect of projectiles on human tissue experimentally. This made it possible to identify and compare the general patterns of the behavior of injuring projectiles and the features of the action of bullets of different calibers. The results of the studies carried out and the combat experience already accumulated by him made it possible for N. I. Pirogov to connect the action of shells mainly with their kinetic energy and tissue resistance. Taking into account the characteristics of the damaging element and the physical properties of the tissue at the site of injury is a huge achievement of the 19th century, which gave a huge backlog for years to come.

The destructive effect of a projectile at any distance, which, in relation to all tissues of the body, is determined by the kinetic energy and the degree of density of the projectile, as well as the resistance of the element that is struck. This formulation is proved by the experiment of IP Ilyin: he shot at the heads of corpses. Having two groups – with and without a burr hole – he observed that in the first group there are 8 times less destruction than in the second. In accordance with this theory, it can be said that the higher the deceleration of the projectile's flight speed and the faster the kinetic energy of the projectile is transferred at the moment of its contact with the tissue, the higher the degree of tissue damage. Consequently, the main factor in the traumatic effect of the projectile is the measure of energy transferred to the tissues.

In addition to a bullet wound, among combat injuries there is also a mine-explosive injury, which is more severe for the macroorganism, although the principles of treatment do not differ. Currently, it is generally accepted that a mine-explosive injury (MBT) is a gunshot combined injury or, as is found in some sources, a polytrauma that occurs in a person as a result of the impulse effect of a complex of damaging factors of an explosion of engineering mine ammunition and is characterized by an interdependent and mutually aggravating effect as deep and extensive destruction of tissue structures, and general contusion-concussion syndrome. A significant group (97 %) are wounds with bone fractures, often multiple, up to destruction and detachment of limb segments. Non-penetrating blast wounds in some cases are combined with distant injuries to internal organs.

Damage factors of the explosion: A blast wave (gas-flame flows of detonation products) and its derivative – a shock wave (air, water, in the ground, in the environment of the target). Primary and secondary wounding elements. Hitting obstacles and falling (tertiary damage). Psycho-emotional impact. Powerful electromagnetic pulse.

Jets of flame and hot gases, fragments of mine ammunition and secondary injuring projectiles, with their obvious importance, are inferior to the shock wave in terms of the scale and depth of morphofunctional disorders and disorders both in the tissue structures of the limbs and the central nervous system. Of certain importance is the fact of the biological summation of the damaging effects of ammunition explosion factors, which together determine the qualitative etiopathogenetic difference between MBT and typical bullet and shrapnel wounds. For example, during an anti-personnel mine explosion, mechanically homogeneous structures of the limb and the blood column are the main conductors of shock waves. Along these anatomical formations, the most severe and deepest extended contusion injuries of the surrounding formations are formed, which can be traced both visually and in microexaminations.

In the Middle Ages, the method of cauterizing wounds with a red-hot iron was used. From the point of view of disinfection, this method can be effective, but it is not humane in the 21st century. When the first samples of firearms appeared, the very structure of the wound changed, and, consequently, the course of the wound process, which directly depends on the correctness of the surgical treatment of the wound. Most doctors, trained on the principles of peacetime surgery, are accustomed to completing the surgical treatment of wounds with the imposition of a blind suture. This is a fatal error that can cost the patient his life. The established negative attitude of a doctor to an open wound has led, is leading and will lead to serious complications in the form of a wound infection with all the ensuing consequences. As Carl Thiersch said, concluding the discussion, in 1892 at a congress dedicated to the treatment of wartime wounds: “We can close the discussion, but leave the wounds open”.

Absolute contraindications to the primary suture of a gunshot and mine-explosive wound:

Lost time (more than 6 hours). Strong pollution. Tension of the edges of the wound. A combination of injuries (bones, blood vessels, nerves). The action of combined factors. The inability to observe the wounded before removing the sutures (by the operating doctor).

Principles of proper wound care: Primary wound excision, removal of non-viable tissue, contaminating fragments, foreign organic materials and blood clots. Good wound drainage, consisting in fascial decompression, leaving the wound open without suturing, applying a bulky absorbent dressing. Hemostasis. Wound immobilization. Vaccination against tetanus, use of antibacterial and analgesic therapy. Balanced diet. Care and use of physiotherapy methods: restoration of the patient's physical functions. Avoid unnecessary dressing changes. Primary delayed wound closure (in 4–5 days).

Frostbite, classification, signs, pre-medical care in combat and non-combat conditions

1.1. Frostbite

– this is damage to tissues, individual parts of the body under the influence of low temperature or freezing (the whole body). Frostbite and freezing in war are observed not only in winter, but also in spring.

During the Second World War of 1941–1945, frostbite of the extremities was combined with injuries in 32.2 % of cases. Such a large percentage is explained by the bleeding of the wounded and his helplessness, because of which he remained lying in the snow on the frozen ground for a long time.

Thus, frostbite is considered a frequent companion of wars, sometimes it has the character of an epidemic and occupies a significant share in the structure of sanitary losses. Mostly the fingers of the upper and lower extremities, ears, nose, and sometimes the external genitalia are frozen. According to military and peacetime statistics, frostbite of the lower extremities predominates.

Possible causes of frostbite/hypothermia:

- Influence of low temperatures;
- Prolonged exposure to wind, high humidity;
- Use of tight and/or wet shoes; prolonged immobility of the victim;
- Unsatisfactory general condition of the victim (illness, exhaustion, alcohol intoxication, blood loss, etc.) even at positive ambient temperatures.

The occurrence of frostbite is facilitated by: wind, wet and tight shoes, wet clothes, forced immobility of the body, injuries and blood loss, fatigue and malnutrition, previous frostbite. There are three periods in the development of frostbite: latent (pre-reactive) period of tissue hypoxia; reactive (after tissue warming).

In the pre-reactive period, damaged areas of the body (ears, tip of the nose, fingers, toes) are white, cold to the touch, pain and tactile sensation is sharply reduced or absent.

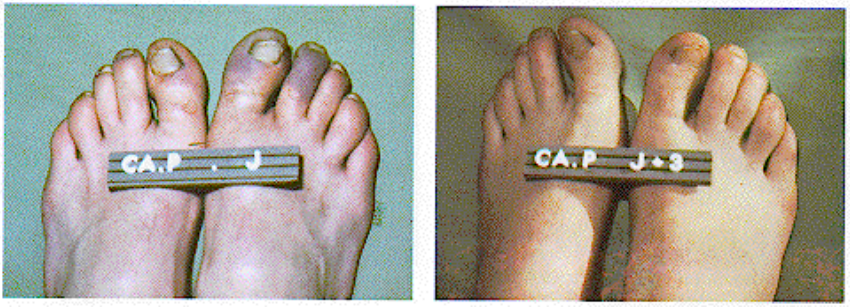
After warming, the white color of the skin changes to bright hyperemia or cyanosis. There are violations of sensation – anesthesia, hyperesthesia, various paresthesias.

A sign of the beginning of the reactive period, along with an increase in tissue temperature, is the appearance and growth of edema in areas of frostbite.

Local signs, by which we can talk about the death of tissues, appear only after 3–10 days.

Depending on the depth of tissue damage, there are four degrees of frostbite:

I degree (congelatio erythematosa) – the skin of the affected person is pale, slightly swollen, sensitivity is reduced or completely absent; characterized by reversibility of functional disorders and morphological changes. After warming, the skin becomes red or bluish in color, itching, pain, paresthesia, and swelling occur. All these phenomena are eliminated by the end of the week, but cyanosis, swelling, pain persist for a long time – up to 10days. Increased sensitivity to cold, which can last 2–3 months or more.



Frostbite I degree

II degree (congelatio bullosa) – in the area of frostbite, blisters are formed, filled with a transparent or white liquid; characteristic increase in body temperature, chills.

The blisters have a tendency to coalesce. The bottom of the bubble forms a pink, sharply painful wound surface (the growth layer of the epidermis). The healing of such a wound ends in 2–3 weeks, but cyanosis of the skin, real estate in the joints, increased sensitivity to cold can be stored for up to 2–3 months or more.

Frostbite II degree

Frostbite III degree

III degree (congelatio phlegmonosa) – necrosis of the skin: blisters appear filled with dark red or dark brown liquid as a result of frostbite of the deep dermis; an inflammatory shaft (demarcation line) develops around the dead area; the development of intoxication is characteristic – chills, sweating, a significant deterioration in well-being, apathy; loss of sensation; Pulsation – pain and burning.

Frostbite IV degree

IV degree (congelatio escharotica) – the appearance of blisters filled with black liquid. The victim is showing signs of shock. Necrosis covers all layers of tissues of the distal extremities.

The necrotic process covers all tissues, including bone. The damaged area is brightly cyanotic, cold to the touch. The development of edema occurs after 1–2 hours. Edema, as a rule, extends to the proximal extremities. Then mummification develops, less often – wet gangrene.

1.2. Trench foot, freezing, first aid in combat and non-combat conditions

"Trench foot" (immersion injury) is one of the forms of frostbite, which develops as a result of prolonged, at least 3–4 days, cooling of the limb in a humid environment.

Cold injury

Chilliness of the hands and feet is a cold injury resulting from the abnormal reaction of the human body to cold. Chilling is the result of constriction of small blood vessels in the skin under the influence of cold, followed by leakage of blood into the surrounding tissues after warming. A painful injury that causes little or no permanent deterioration. Injured skin is red, swollen, and also tender, hot to the touch, and may itch. This skin lesion may develop only within a few hours of exposure to cold. Chilling must be taken very seriously, as it can progress to a trench foot. Prevention and first aid are the same as for the trench foot.

Chills (pernio) is a synonym, but this lesion causes more pain and is the result of exposure to cold and moisture for a long time.

Trench foot (immersion injury) got its name from World War I, when troops were forced to stand in water-filled trenches for days to months and sustained this injury as a result. An immersion foot injury was described during World War II with features similar to a trench foot, and described symptoms in people on rescue ferries who were in the water. This is a cold injury, not caused by frostbite, but when the skin is exposed to cold water or mud for a long time. The combination of cold and moisture softens the skin causing tissue damage or infection. The effect of cold, damp conditions on the feet leads to constriction of the blood vessels, which can cause local neurovascular damage.

Too tight boots are also the cause of this type of injury. Cold moisture causes heat loss, and swelling and constriction of blood vessels will affect tissue ischemia.

Causes of occurrence:

Trench foot

It develops as a result of prolonged exposure to cold, humidity or prolonged immersion of the feet at temperatures up to 17 °C for more than 12 hours. A shorter immersion time at 0 °C results in a similar injury. It develops at a temperature of 0–12 °C. May develop at higher temperatures as a result of prolonged immersion in water. Blunt trauma or march can lead to more severe injuries.

Prolonged exposure to cold damages the skin and nerves, and over time, these changes become irreversible. At first, patients complain of tingling and numbness. The legs are pale, punctate, insensitive rather than throbbing and immobile. Rewarming the legs can be very painful, as the legs become congested. Eventually swelling and blisters form. Gangrene may also develop.

Procedure for rendering first aid in case of "trench foot" (immersion injury)

- Avoid further exposure to cold.
- Get rid of wet clothes and replace them with dry and warm clothes.
- Do not massage.
- Dry the limb, warm the torso and allow the feet to warm up passively.

Do not immerse your feet in warm or hot water. Warm slowly to room temperature. The affected area is likely to swell, turn red, and become hot to the touch after warming it up. Blisters may form.

- Elevate your foot to reduce swelling.
- Avoid walking on affected limbs.
- If bubbles appear, do not remove.
- Seek immediate medical attention.
- Pain relief: the only effective drug is amitriptyline at a dose of 50–150 mg at night. Other pain relievers are either not effective at all or (such as drugs) do not relieve the pain.
- Bubbles must be left intact; ruptured vesicles will require careful antiseptic treatment after they open.

Prevention:

Keep your feet dry and warm by changing socks. Check regularly for signs and symptoms of this condition. Minimum morning and evening. Gentle foot massage will improve blood circulation. Sleep with arctic mittens on your feet. Protect your feet from injury with dry shoes. Remember that it is the commander's responsibility to maintain fighting strength. Strict adherence to the recommendations is absolutely mandatory. Soldiers, apathetic to the situation, usually neglect to take care of their feet. Check constantly!

1.3. Freezing (hypothermia) occurs due to a person's long stay in a cold environment (temperature below 10 °C) and violations of thermoregulation. It happens to people who are lost, exhausted. Most often, people who are in a state of intoxication freeze. During prolonged cooling of the body, normal

temperature is maintained longer in the central parts of the body – the head and trunk, and quickly decreases in the periphery.

With general freezing, a feeling of fatigue, stiffness, drowsiness, and indifference first appears. With a decrease in body temperature by a few degrees, fainting occurs. Prolonged exposure to cold quickly leads to respiratory and circulatory arrest.

Freezing is a general pathological hypothermia of the body, caused by a progressive drop in body temperature under the influence of the cooling effect of the external environment, when the protective thermoregulatory properties of the body are insufficient. Freezing is based on a violation of the body's thermoregulation. General hypothermia causes a decrease in all types of metabolism, as a result of which conditions are created under which heat transfer significantly exceeds heat generation.

In the clinical course of freezing, three phases are distinguished:

Adynamic phase – mild damage. The victim is lethargic, lethargic, wants to sleep. The skin is pale, the extremities are bluish or have a marble color, "goosebumps". The pulse is slowed down, blood pressure is increased, breathing is within normal limits, body temperature is reduced to 34–35 °C.

The stuporous phase is moderate damage. The body temperature is reduced to 31–32 °C, adynamia, chills set in, the limbs are pale, cold to the touch. The pulse is thready, difficult to determine, blood pressure is slightly increased or decreased, breathing is rare, 8–10 per minute.

Convulsive phase – severe damage. The body temperature is below 30 °C, consciousness is lost, convulsions, vomiting are noted. The pulse is determined only on the carotid artery, blood pressure is reduced, breathing is rare. Complications that are life-threatening for the patient (swelling of the brain and lungs, hemorrhages in tissues and organs) join. Death can occur when the temperature in the rectum drops to 25 °C.

First aid for superficial frostbite on the battlefield.

1. Cover your cheeks with warm hands until the pain subsides.

2. Place open, superficially frostbitten fingers under opposite armpits, closer to the skin.

3. Place bare, superficially frostbitten legs under clothing on the partner's stomach.

4. Do not warm up by methods such as massaging, by an open flame, by soaking in cold water, or by rubbing with snow.

5. Apply a thermal insulation bandage.

6. Be prepared for pain when the affected area begins to melt. DO NOT thaw but do not thaw severe frostbite while there is a possibility of re-frostbite.

7. Evacuate the victim with suspected severe frostbite to the base for final treatment.

When providing first aid for deep frostbite, observe the following rules:

1. If frostbite is considered severe, do not attempt to treat it on the battlefield.

2. Get to the hospital or emergency room in the fastest way.

3. Evacuate the victim on a stretcher.

4. Protect the damaged part from further damage. Wrap the limbs (thermal insulation bandage).

5. Do not try to thaw the damaged part by rubbing, bending or massaging. Do not rub with snow, do not immerse in cold or hot water, do not put near open flames or hot air, do not use ointments or hot compresses. The victim cannot move independently. Meanwhile, the danger is less when walking on frozen feet than after frostbite.

REMEMBER!

Do not let the victim with frostbitten feet or fingers walk, evacuate him on a stretcher.

DO NOT thaw tissues if there is a possibility of re-frostbite during evacuation.

DO NOT thaw the feet if the casualty must go to help.

DO NOT warm the victim near the fire.

DO NOT rub snow into the wounded person's skin.

Frostbite Prevention

Mutual assistance and mutual support are the most important preventive measures and should be constantly used. For inactive periods, it is important to provide adequate clothing and shelter. The face, fingers and toes should be inspected from time to time to keep warm and detect any numbness or hardening of the surface. The ears should be warmed from time to time with the hands for the same purpose.

Hyperthermia. First aid in combat and non-combat

Hyperthermia is a pathological condition of the body that occurs as a result of a violation of thermoregulation and/or the action of external heat.

When exposed to high ambient temperatures against the background of physical activity, military personnel may experience: heat cramps, heat fatigue, heat stroke.

With hyperthermia, the following signs should be distinguished:

1) heat cramps – painful muscle contractions (most often in the region of the legs or muscles of the anterior abdominal wall);

2) heat exhaustion – the most common condition in conditions of overheating, which leads to dehydration of the body and is caused by exercise or work in hot conditions. In this case, fluid loss through sweating is not replenished properly. This leads to a decrease in the volume of circulating blood.

Signs of heat fatigue: normal or elevated body temperature, cool, moist, pale or reddened skin, headache, nausea, dizziness or weakness,

3) heat stroke – occurs when the mechanisms of thermoregulation of the body are disturbed (sweating stops).

Signs of heat stroke: high body temperature, sometimes reaching 41 °C, red, hot dry skin, irritability, loss of consciousness, rapid shallow breathing.

Providing first aid to victims of hyperthermia

1. Make sure the scene of the accident is safe and only then provide assistance to the victim. If the place is dangerous, wait for the rescuers to arrive.

2. Conduct an examination of the victim, determine whether he is conscious or unconscious, find out the presence of breathing. If the casualty is not breathing, begin CPR.

3. If the victim has heat cramps:

3.1. put it in a cool place;

3.2. give him chilled water (18 °C);

3.3. massage your muscles.

4. If the victim has heat exhaustion and heat stroke:

4.1. put it in a cool place;

4.2. give him chilled water (18 °C);

4.3. unbutton your clothes;

4.4. place wet cool compresses on the area of large vessels (lateral surface of the neck, axillary areas) and on the forehead;

4.5. general cooling.

5. In no case do not leave the victim unattended during transportation (evacuation). Prior to the arrival of the emergency (ambulance) medical team, periodically check the condition of the victim.

If the condition of the victim in the evacuation worsens, provide intravenous access and start infusion therapy with cool solutions.

3. Burns, classification, signs, first aid in combat and non-combat conditions

Burn – tissue damage, occurs from local thermal (thermal), chemical, electrical or radiation exposure. Thermal burns are the most common.

Burns are divided into:

- Thermal,
- Electrothermal,
- Chemical,
- Radiation,
- Combined lesions,
- Burns caused by combat fire mixtures.

Thermal burns occur as a result of exposure to high temperature on the surface of the human body. Thermal burns are the most common type of injury and account for 90–95 % of all burns. It should be noted that burns at work account for only 25–30 % of all injuries, the remaining 75 % are household injuries.

Thermal burns can be widespread, for example, during fires, disasters, accidents. Open flame burns are especially dangerous when the upper respiratory tract and a significant area of the body are damaged. The larger the burn area, the more severe the general condition of the victim and the prognosis.

Most often, burns occur due to exposure to a flame, hot liquid, steam, as well as when touching hot objects. Tissue death occurs due to protein coagulation from direct exposure to a thermal factor on tissues. For the formation of a burn, not only the temperature of the traumatic factor is important, but also the duration of its exposure.

According to the statistics of local conflicts in recent years, burns occupy 5 % of the injuries on the battlefield. During the Korean War, burns from napalm used by American aircraft amounted to 25 %, in Vietnam – 45 %, and according to general statistics during the war in Afghanistan – 5 % of the total number of sanitary losses (mainly among mechanized units). In modern warfare, with the use of nuclear weapons and incendiary mixtures, the frequency of burns can be 60–80 % of all defeats.

In peacetime, the share of burns among other injuries is 10–12 %. Burns often occur from the action of superheated steam, hot or molten metal, electrical discharge.

Conventionally, all thermal burns are divided according to severity into mild and severe. Severe burns are considered to be burns that occupy at least 10 % of the body surface. Burns are especially dangerous for children and the elderly. The more extensive the burn and the deeper the damage, the more dangerous it is for the life of the victim. Burns of 30 % of the body surface are often fatal.

The severity of the victim's condition depends on a combination of various factors:

1) an effective agent (hot steam or liquid, a flame, an object heated to a high temperature, etc.),

2) the duration of the agent;

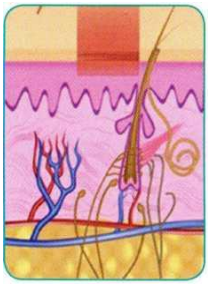
3) depth of tissue damage;

4) the age and condition of the victim and other reasons.

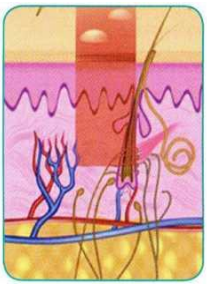
Classification of thermal burns.

The skin consists of two layers: epithelial tissue – the epidermis and connective tissue – the dermis. The epidermis is constantly updated due to the growth of new epithelial cells – basal and studded. The basal cell layer contains the superficial endings of blood vessels that supply the skin with blood. In the case of cell death of the germ layer, the growth of the epithelium in the affected area does not occur and the defect is closed by secondary intention with the help of a connective tissue – a scar.

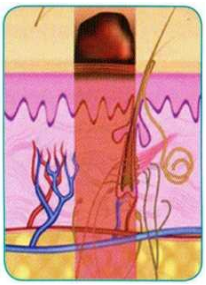
Depending on whether the affected growth layer is or not, that is, whether epithelialization is possible in the future or not, superficial and deep burns are distinguished.



I degree



II degree



III degree

From the severity of tissue damage, burns are divided into four degrees:

I degree (erythema) – redness of the skin, swelling and pain

II degree (blistering) – severe pain with intense redness, detachment of the epidermis with the formation of blisters filled with a clear or cloudy liquid;

III degree – necrosis of the entire thickness of the skin with the formation of a dense scab with damaged tissues underneath. Divided into III-A and III-B; III-A – necrosis of the superficial layers of the skin with partial damage to the growth and basal layers of the skin and independent epithelization is possible; III-B – necrosis of the entire thickness of the skin (epidermis and dermis);

IV degree (charring) – significant necrosis of the skin and tissues contained deeper, sometimes charring of various parts of the body, occurs when tissues are exposed to very high temperatures (flame, molten metal, etc.); more often these are fires during accidents on vehicles (road accidents), aircraft, accidents in mines; the result of such burns is damage to muscles, tendons, bones.

Burns of I, II, III-A degrees are superficial, the skin after them regenerates on its own. III-B and IV degree burns are deep, if they occur, surgical correction is performed.

According to the severity of the injury, there are: light, moderate, severe and extremely severe burns.

The severity of the burn injury depends on the area, localization, depth of the lesion of the skin and tissues underlying it, the age of the victim and concomitant diseases, the presence of burns of the respiratory tract and poisoning by products of incomplete combustion (in case of fire in enclosed spaces, poisoning with carbon monoxide or other toxic substances during combustion of synthetic materials).

Burn disease prognosis depending on the prognostic index.

The course of a burn disease complicates the burn of the upper respiratory tract.

The presence of a burn of the respiratory tract can be assumed on the basis of the following features:

- the burn occurred in a closed room (room, elevator car, shaft)
- burn with steam, flame;
- there are burns of the face, neck.

Flame, hot air and combustion products during fires in confined spaces (dugouts), military equipment and in the areas of use of combat fire mixtures often affect the respiratory organs. When hot air is inhaled, a pronounced swelling of the oral mucosa and upper respiratory tract with the development of asphyxia can be noted after a few hours.

In the presence of a burn of the respiratory tract, the probability of developing a burn shock increases by 2 times.

A burn of the upper respiratory tract can be indicated by: hoarseness, shortness of breath, cough, complaints of sore throat, burns of the mucous membrane of the lips, tongue, pharynx, nose, burned hair in the area of the nasolabial triangle.

The procedure for providing first aid for burns

1. Make sure the scene is safe and only then provide assistance to the victim. If the place is dangerous, wait for the rescuers to arrive.

2. If necessary, stop the effect of the thermal factor on the victim. Extinguish the fire. Move the patient to a safe area. Remove all burnt clothing. Safely isolate the patient from the source of electricity in the event of an electric shock. Rinse off chemicals with plenty of clean species.

3. Conduct an examination of the victim, determine whether he is conscious or unconscious, find out the presence of breathing. Stop bleeding and secure the airway.

Remove all items that are close to the body. Remove your watch, ring, belt, boots, and all contaminated clothing and equipment. Due to increased swelling, a ring or bracelet can compress tissue and cause amputation and loss of a finger or limb, so remove it as soon as possible

3.1 ask someone or call the emergency (ambulance) team yourself.

3.2 if the casualty is not breathing, begin CPR.

If the victim has 1st and/or 2nd degree burns:

1) it is necessary to cool the burn site with cold, but not ice water (1–18 °C); ice cannot be used;

2) after cooling, cover the damaged area with a clean damp cloth.

No need to pierce the blisters – the integrity of the skin protects against infection; if the blisters have ruptured, a clean, sterile dressing should be applied. If the victim has III and/or IV degree burns, it is necessary:

1) monitor the patency of the respiratory tract; burns around the mouth and nose may indicate damage to the upper respiratory tract and lungs; if you suspect a burn of the respiratory tract or lungs, mandatory constant monitoring of breathing;

2) apply a wet bandage to the burned surface and make sure that this bandage remains cold; it is necessary to periodically water it with cold water;

3) if there are signs of shock, provide the victim with an anti-shock position.

4. Cover the patient. Cover the patient with a clean, dry sheet to prevent further contamination during transport. Apply saline-soaked dressings to areas of skin covered with white phosphorus to prevent the phosphorus from igniting when exposed to air.

5. Protection against hypothermia. Use blankets or other warming materials to prevent hypothermia. Patients with large burn surfaces are at increased risk of developing hypothermia.

Never leave the victim unattended. Prior to the arrival of the emergency (ambulance) medical team, periodically check the condition of the victim. Never put gel dressings on burn wounds.

The procedure for providing first aid to a victim with chemical burns

1. Make sure the scene is safe and only then provide assistance to the victim. If the place is dangerous, wait for the rescuers to arrive.

2. If necessary, stop the effect of the chemical factor on the victim. Move the patient to a safe area. Rinse off chemicals with plenty of clean species.

3. Conduct an examination of the victim, determine if he is conscious or unconscious, find out if he is breathing. Stop bleeding and secure the airway.

3.1. Ask someone or call the emergency (ambulance) team yourself.

3.2. If the casualty is not breathing, begin CPR.

4. If the victim has burns with concentrated acids (except sulfuric), the burn surface is necessary for 15–20 minutes. rinse with cold water.

5. If the victim has burns with sulfuric acid, then base solutions are used to neutralize acid residues: 2–3 % sodium bicarbonate solution (1 teaspoon per glass of water). Sulfuric acid, when interacting with water, generates heat, which can aggravate the burn.

6. If the victim has burns with the basics. Base burns should be rinsed well under running cold water and then treated with a 2 % solution of acetic or citric acid (lemon juice). After treatment, an aseptic bandage or a bandage moistened with solutions used to treat burns should be applied to the burned surface.

7. Burns with quicklime must not be washed off with water. To do this, use oil, carry out mechanical removal of pieces of lime.

8. If the burn is caused by phosphorus, after washing the affected area, its remains are finally removed in a dark room, because in the light the phosphorus particles that remain in the wound cannot be detected. But it must be remembered that phosphorus ignites spontaneously in air and can cause, in addition to chemical, thermal damage, so the affected area must be immersed under water and with a stick or special tools (not hands!) Remove phosphorus particles. Then a bandage is applied to the burn surface with a 5 % solution of copper sulfate (copper sulfate).

9. Washing of burn surfaces, neutralization of the agent and transportation of the victim should be carried out under conditions of adequate analgesia.

10. Never leave the victim unattended. Before the arrival of the emergency (ambulance) team, periodically check the condition of the victim.

7. Main questions to be studied in this lesson

1. Frostbite, classification, signs. Trench foot, freezing. First aid in combat and non-combat conditions.
2. Hyperthermia, first aid in combat and non-combat conditions.
3. Burns, classification, signs. First aid in combat and non-combat conditions.
4. Features of the defeat of combat fire mixtures, first aid.
5. Help with eye burns of various origins.

8. List of practical skills

1. First aid for victims of general overheating and hypothermia, frostbite ("trench foot") during peacetime emergencies and in combat conditions. (algorithm for providing PMP, thermal insulation bandage).
2. Determination of the area and degree of thermal damage.
3. First aid to victims, depending on the degree of burns in emergency situations in peacetime and in combat conditions.
4. First aid in case of defeat by combat fire mixtures.
5. First aid for eye burns of various origins.

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Навчальне видання

ЗАХВОРЮВАННЯ ВНУТРІШНІХ ОРГАНІВ ПРИ БОЙОВІЙ ХІРУРГІЧНІЙ ТРАВМІ ТА ТРАВМАХ В УМОВАХ КАТАСТРОФ ТА АВАРІЙ МИРНОГО ЧАСУ. ЗАХВОРЮВАННЯ, ВИКЛИКАНІ ДІЄЮ НА ОРГАНІЗМ ТЕРМІЧНИХ ФАКТОРІВ (ТЕПЛА ТА ХОЛОДУ)

Методичні вказівки для здобувачів вищої освіти V року навчання до проведення практичного заняття

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