

First medical aid for critical conditions. Fundamentals of bandages and transport immobilization



Методическое пособие для подготовки к практическим занятиям
общая хирургия (3 курс)
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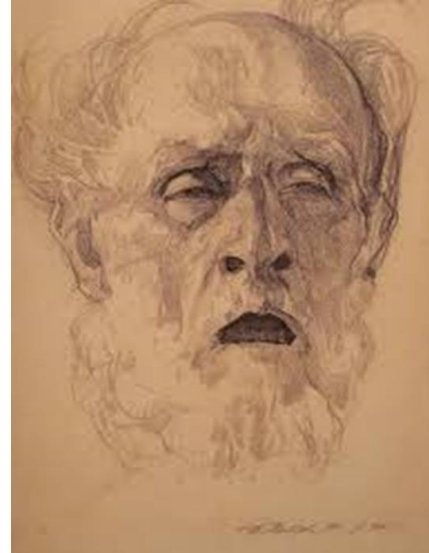
Terminal conditions

a critical disruption of the body's vital functions, which is based on severe hypoxic damage of organs and systems, mainly the brain, as well as acidosis and metabolic disorders caused by oxygen deprivation.



Types of terminal conditions

- PRE-AGONY
- AGONY
- CLINICAL DEATH



terminal conditions should always be differentiated from fainting



**Fainting is a brief loss of consciousness
caused by a temporary disruption of cerebral
blood flow.**



The mechanism of fainting development

- **decreased cardiac output**
- **impaired vascular nervous regulation**
- **decreased oxygen content in the blood**



Clinical manifestations of fainting

- 
- ✓ loss of consciousness is preceded by dizziness, nausea, blurred vision, or "flies" in front of the eyes, and ringing in the ears.
 - ✓ The skin is ashen-gray, the heart sounds are difficult to hear, the pulse on the radial artery is reduced in volume and tension, and the blood pressure is low.
 - ✓ The striated muscles are relaxed, and the reflexes are not detectable or severely reduced.
 - ✓ The pupils are dilated, but the photoreaction is preserved.
 - ✓ There are convulsion and involuntary urination.



First aid in case of fainting



- lay the patient on the back
- raise his legs
- loosen the tight collar of their clothing
- turn the patient's head to the side



Pre-agony is a critical deterioration of the function of vital organs and systems (heart, lungs, and the central nervous system), in which

- ✓ **systolic blood pressure is 70 mmHg or less**
- ✓ **no pulse on radial arteries**
- ✓ **presence of pulse on the central arteries**
- ✓ **confusion or no consciousness**
- ✓ **pathological breathing patterns (Kussmaul, Biot, Cheyne-Stokes)**



Agony is a brief surge of vital activity that precedes clinical death



Clinical death

a reversible terminal state that occurs immediately after cardiac arrest (and respiratory arrest, since breathing stops immediately after circulatory arrest) and before the death of cortical cells



Biological death

— an irreversible terminal condition characterized by the stopping of physiological processes in the cells and tissues of the body



Signs of biological death



Early:

- clouding and drying of the cornea
- Beloglazov's symptom («cat's eye» symptom)

Late:

- drying of the skin and mucous membranes
- decrease in body temperature
- appearance of livor mortis
- rigor mortis
- cadaveric decomposition or autolysis



Signs of respiratory arrest

- ☐ absence of chest excursion, determined visually
- ☐ absence of air flow near the mouth or nose
- ☐ a mirror held near the mouth or nose does not fog



Circulatory arrest



a condition in which cardiac contractions do not create a pulse wave, which means that there is no progressive movement of blood through the vascular system



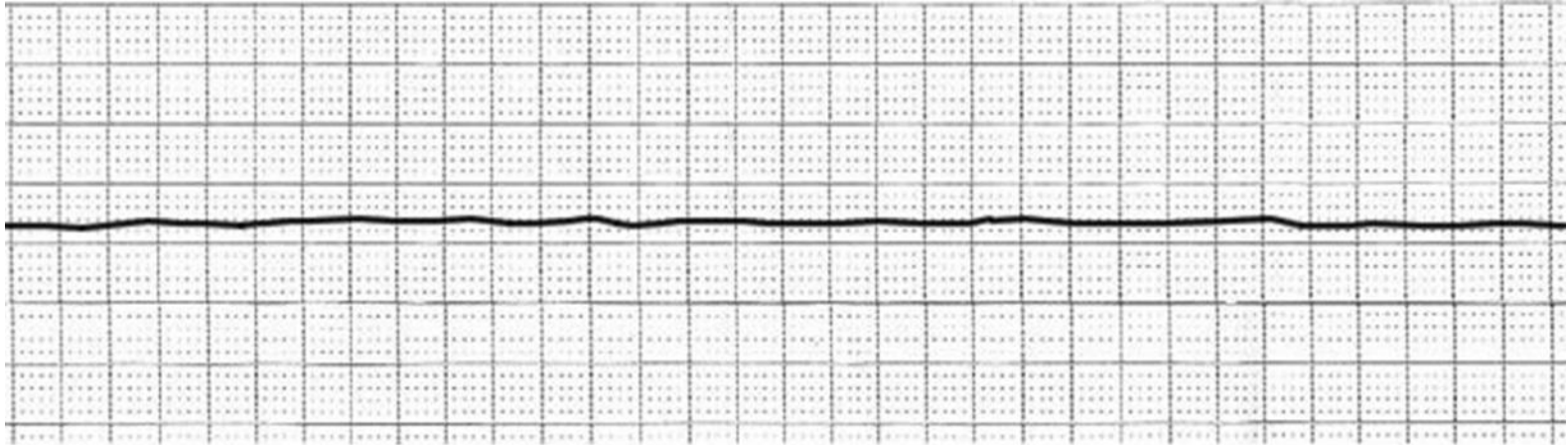
Types of circulatory arrest



- ✓ asystole
- ✓ ventricular fibrillation
- ✓ electromechanical dissociation
- ✓ paroxysmal ventricular tachycardia without a pulse

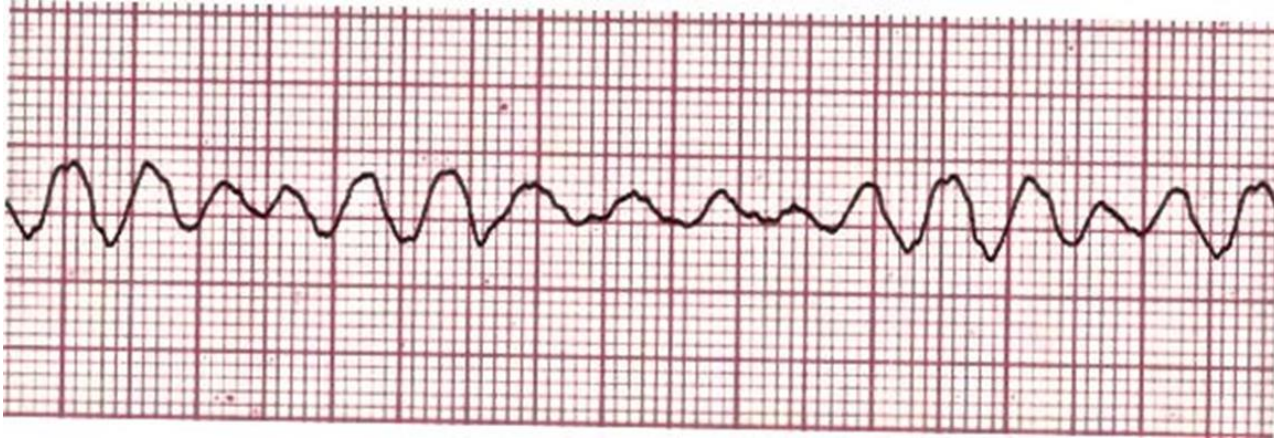


Asystole is the complete absence of electrical activity in the heart



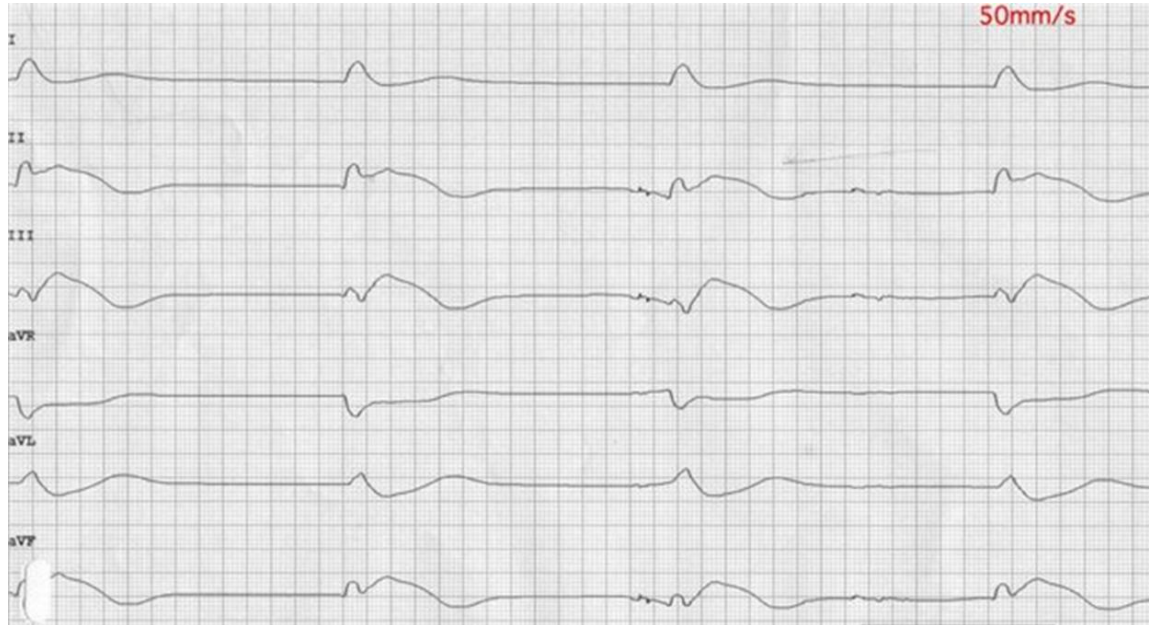
Ventricular fibrillation

individual groups of muscle fibers contract separately and uncoordinatedly, causing the heart to lose its ability to contract in a coordinated manner and causing blood circulation to stop



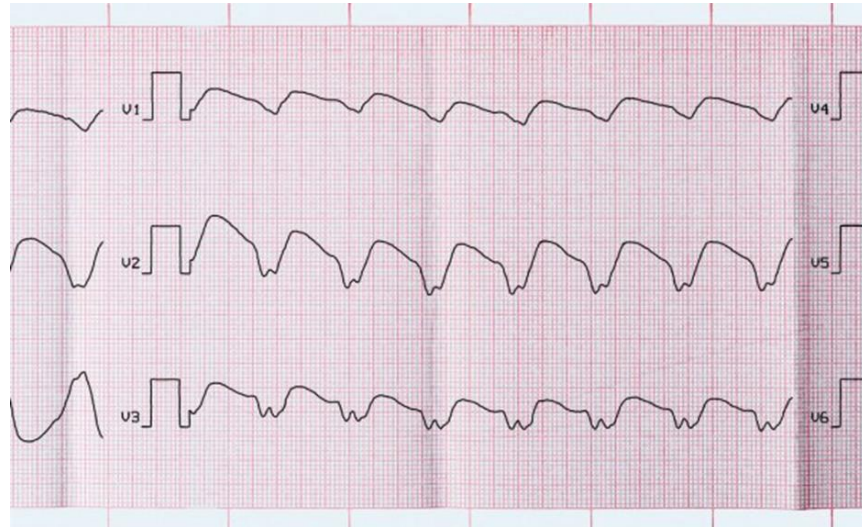
Electromechanical dissociation

— absence of mechanical activity of the heart in the presence of electrical



Paroxysmal ventricular tachycardia without a pulse

characterized by ventricular contractions at a rate of about 200 per minute



Signs of circulatory arrest

A cardinal symptom: a wide pupil that does not react to light

Additional symptoms:

- no bleeding from the wound
- no breathing
- no consciousness
- no heart sounds
- pale gray skin color
- no pulse on the carotid artery



Cardiopulmonary resuscitation

- a set of measures aimed at restoring the body's functions in case of circulatory and/or respiratory arrest



CPR algorithm

- 
- A – (airways) ensuring the patency of the respiratory tract
 - B – (breathing) artificial respiration
 - C – (circulation) closed heart massage



Step «A» – ensuring airway patency

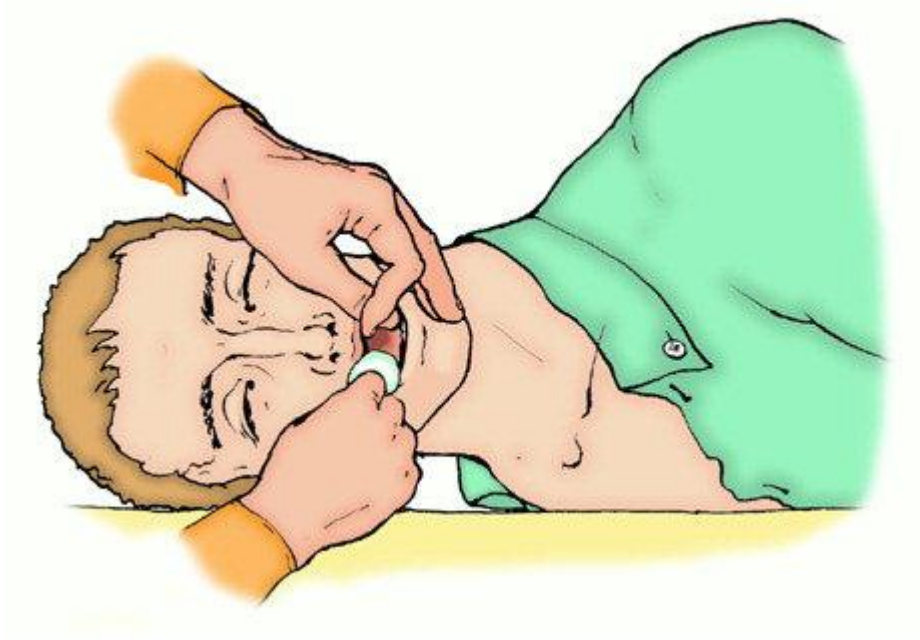
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1. Extend the cervical spine by tilting the patient's head back.
 2. Open the patient's mouth (using the Safar maneuver, if necessary).
 3. Push the lower jaw forward.
 4. Remove any foreign bodies from the oral cavity.
 5. Perform the Heimlich maneuver, if necessary.



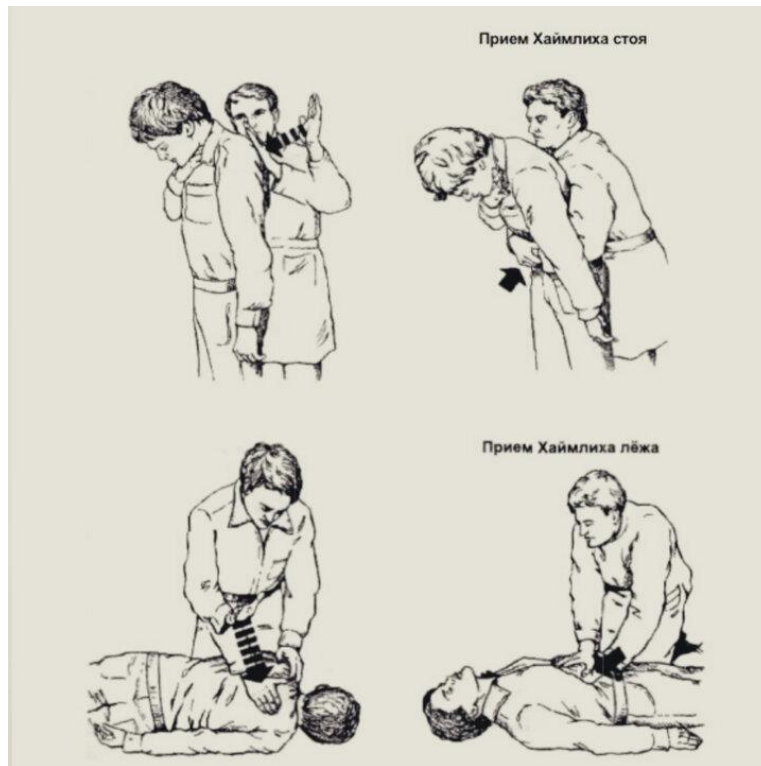
Safar's Triple technique



Removal of foreign bodies from the oral cavity



Heimlich method



Step "B" - Artificial Respiration

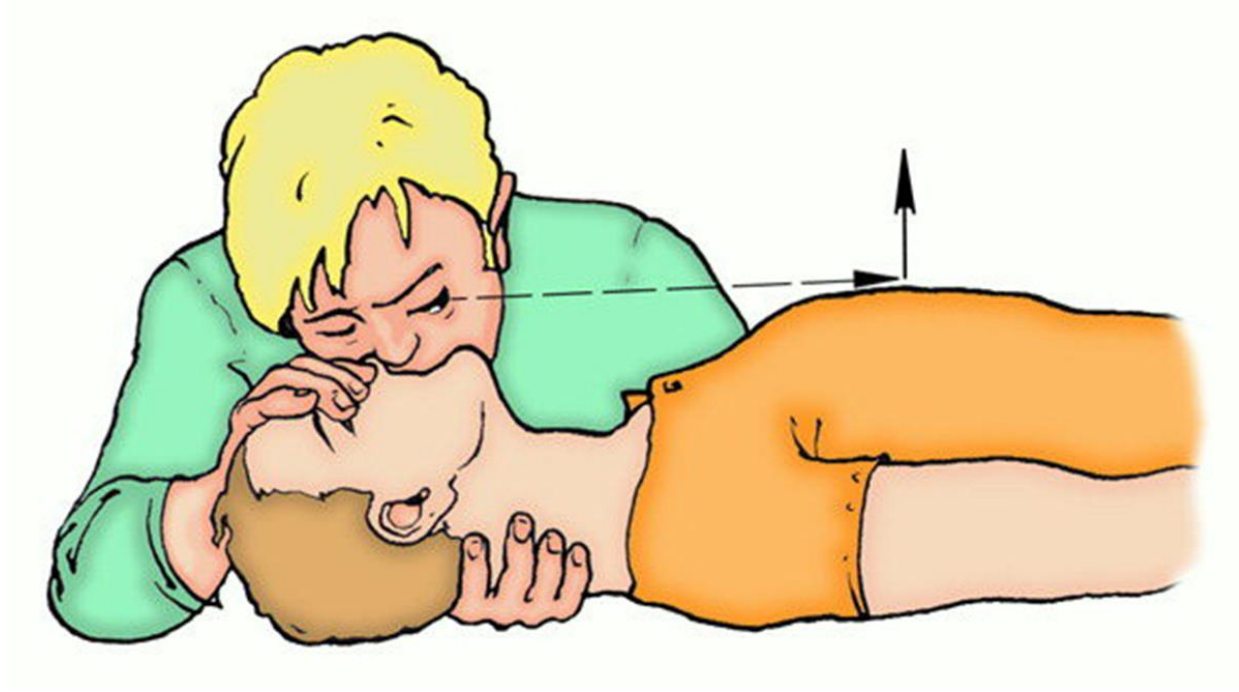


Technique for performing expiratory artificial lung ventilation using the "mouth-to-mouth" method

1. Place the rescuer's right hand under the patient's neck to support it in an extended position
2. Place the heel of the left hand on the patient's forehead
3. Pinch the patient's nose between the 1st and 2nd fingers of the left hand, completely blocking the nasal passages
4. Form a tight seal with your lips around the patient's mouth and smoothly blow air



Mouth-to-Mouth Breathing



Step "B" - Artificial Respiration

Technique for performing expiratory artificial lung ventilation using the "mouth-to-nose" method

1. Place the heel of the left hand on the patient's forehead
2. Use the palm of the right hand to move the lower jaw upward and seal the patient's mouth shut
3. Using 2 points of support (the patient's forehead and lower jaw), maintain the extended position of the cervical spine
4. Form a tight seal with your lips around the patient's nose and smoothly blow air



Mouth-to-Nose Breathing



Expiratory Artificial Lung Ventilation

Key aspects of correct performance

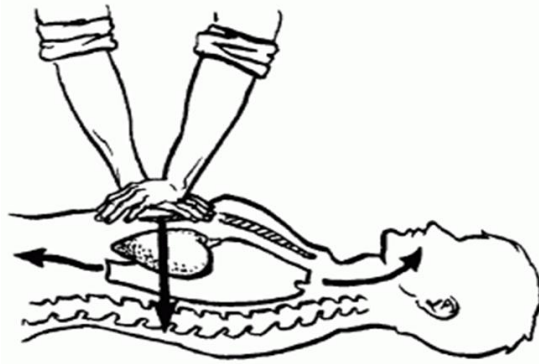
1. Visual control of chest excursion during active inhalation and passive exhalation
2. The volume of air inhaled should be 400 to 600 ml
3. An artificial breath should be performed smoothly over approximately 1 second
4. Artificial Ventilation (AV) always begins with 2 breaths
5. In case of choking, drowning, carbon monoxide poisoning, or opioid poisoning, AV should begin with 10 breaths



Step "C" - Closed Cardiac Massage

- 
- The patient must lie on their back on a hard, flat surface
 - The heel of one hand with straightened fingers is placed on the border between the middle and lower third of the sternum along the midline
 - The heel of the other palm is placed on the back of the first hand so that the points of maximum pressure on the anterior chest wall coincide
 - Chest compressions are performed at a rate of no less than 100-120 per minute strictly at a right angle to the frontal plane
 - The compression depth should be at least 5 cm; the impact should be strong but quick





a



b

Correct hand
placement for
closed cardiac
massage

Step "B" + "C"

Key aspects of correct performance

- Regardless of the number of rescuers, alternate 2 artificial breaths with 30 chest compressions
- Chest compressions should be paused during expiratory AV using the "mouth-to-mouth" or "mouth-to-nose" method
- In one minute, 100 chest compressions should be combined with 10 breaths
- The stage of assessing signs of circulatory arrest should not exceed 10 seconds
- Harm to the patient from unnecessary chest compressions in the absence of cardiac arrest is minimal and is outweighed by the consequences of delayed CPR initiation



Criteria for correct CPR performance

Each breath causes distinct chest excursion

Each compression produces a distinct pulse wave in the radial artery



Criteria for effective CPR performance



The main criteria for effective CPR: Pupil constriction, appearance of photoreaction

Subsequent criteria:

- Appearance of own heart contractions
- Restoration of spontaneous breathing
- Appearance of muscle tone
- Restoration of physiological skin color



Desmurgy

(from Greek Δεσμός - "connection, bandage" and
έργον - "work")

A branch of medicine that studies the rules of wound treatment, bandages, and methods of their application



Basic Concepts

Bandage - dressing material fixed on the patient's body for therapeutic purposes



Dressing material includes various products made of gauze (napkins, balls, tampons, wicks, bandages), cotton wool (white and gray), cotton and linen fabrics



Dressing refers to the change of a bandage



Classification of bandages

by type of material used:

soft

- adhesive
- triangular (cravat)
- bandage dressing (gauze roll)
- net (tubular)

hard (rigid)

- plaster (cast)
- splints
- orthoses
- corsets
- supporters (bandages/belts)



Classification of bandages

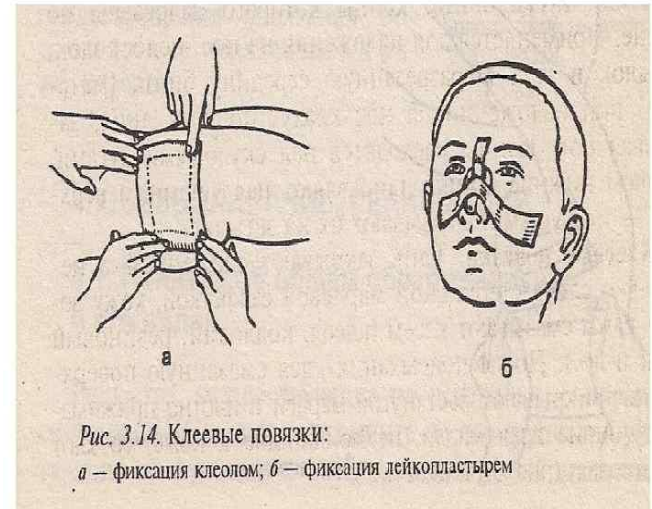
by purpose:

1. retentive (fixing):
 - protective (aseptic)
 - medicinal (therapeutic)
2. hemostatic (pressure)
3. with traction
4. immobilizing
5. corrective
6. occlusive (sealing)



Adhesive bandages: adhesive plaster, collodion, cleol

- ✓ used mainly for minor injuries and postoperative wound care regardless of location
- ✓ if there is hair in this area, it must be shaved off first



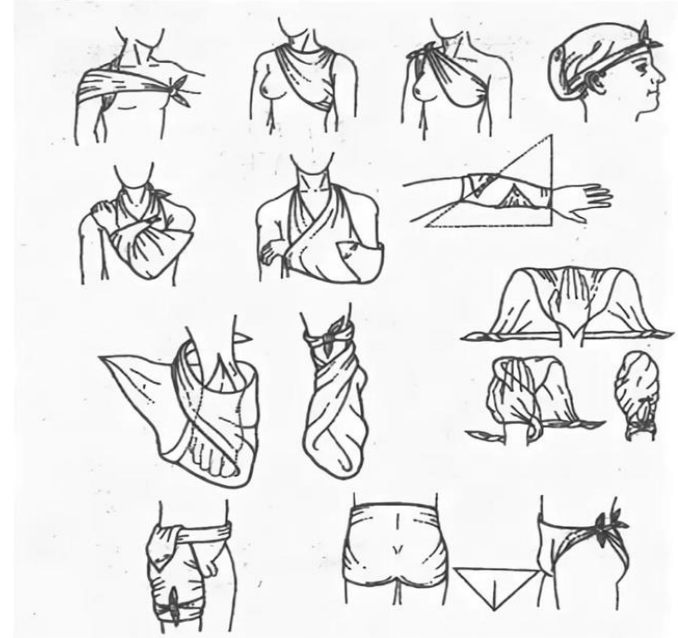
Self-adhesive bandages

- ✓ The center is represented by an absorbent pad made of non-woven material, and the edges have an adhesive layer that firmly adheres to the skin
- ✓ A modern alternative to collodion and cleol bandages, which are practically not used today



Triangular (cravat) bandage

- ✓ For its formation, a triangular piece of any dressing material (gauze, calico, etc.) is used
- ✓ The longest side of such a bandage is called the base of the cravat, the angle opposite it is the apex, and the two other angles are the ends



Bandage (gauze roll) dressing

- ✓ Bandages are applied from part of a bandage, entirely from one or several rolls of bandage
- ✓ The width of the bandage is chosen depending on the application site:
 - Narrow: (3-5-7 cm) for bandaging fingers of the hand and foot
 - Medium: (10-12 cm) - for the head, hand, forearm, lower leg
 - Wide: (14-18 cm) - for bandaging the chest, breast, and thigh



Rules for applying bandage (gauze roll) dressing

- 
- Explain to the patient the reason for applying the bandage and the sequence of your actions
 - The patient should be in a comfortable position
 - The person applying the bandage should face the patient
 - The part of the body on which the bandage is applied must be immobile
 - Before forming the bandage, gloves must be worn
 - The part being bandaged should be in the position it will be in after the bandage is formed, considering the mid-physiological position of the limb



Rules for applying bandage (gauze roll) dressing

- 
- Bandage formation begins with a fixing circular turn, ensuring its stability
 - The bandage is unrolled in one direction, usually from left to right relative to the bandager
 - Bandaging should be done from bottom to top, with the right hand unrolling the bandage head, and the left hand holding the bandage and straightening the bandage turns
 - Each turn of the bandage should cover the previous one by half or two-thirds of its width



Rules for applying bandage (gauze roll) dressing

- After forming the bandage, it is necessary to find out if the bandage is pressing, if it sufficiently covers the affected part of the body
- The end of the bandage must be secured
- In case of a fracture, the bandage should be secured on an uninjured area
- If the bandage is soaked with blood, the fixing bandage should be removed and a new napkin should be applied over the one covering the wound
- If the tissue around the bandage is swollen, the bandage should be loosened to avoid impairing circulation

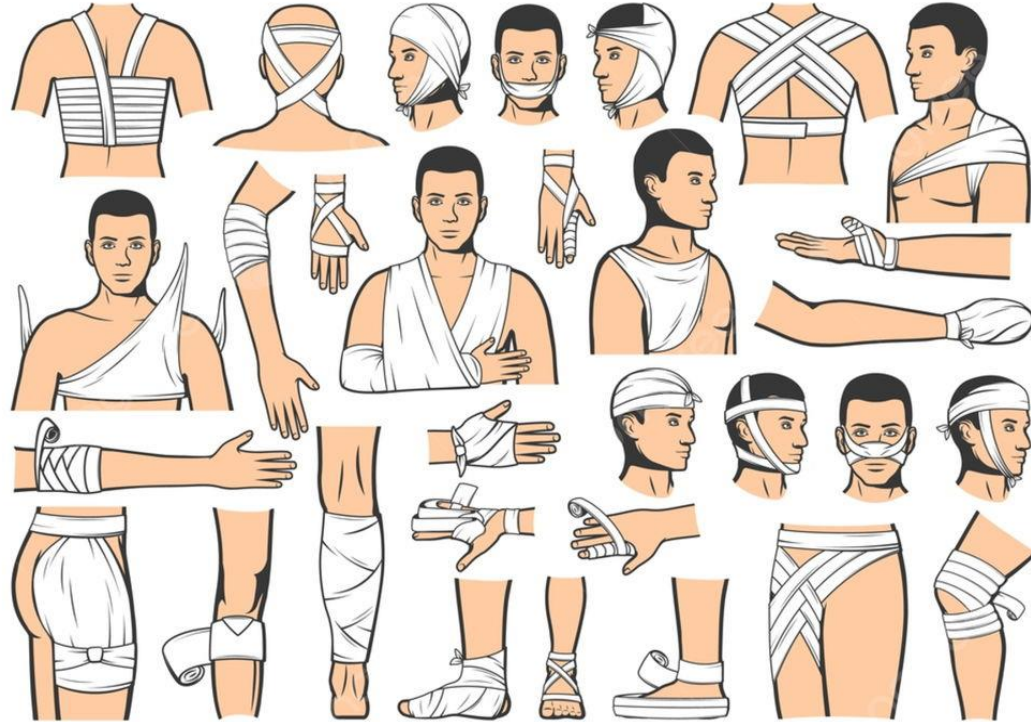


Requirements for a correctly applied bandage

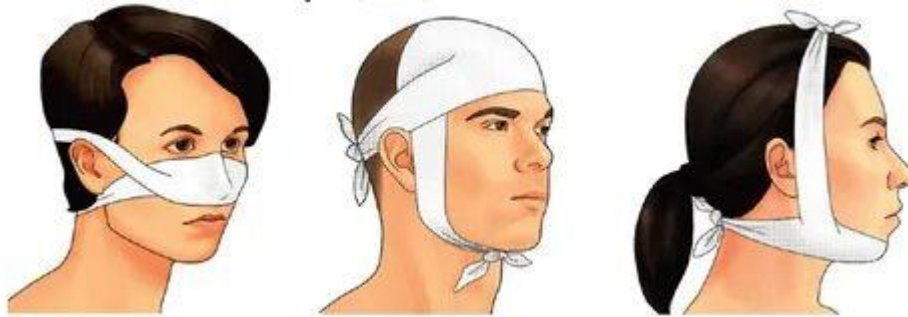
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- - The bandage must securely fix the dressing material and well cover the wound surface
 - - The bandage must not impair blood supply and innervation of the injured limb
 - - The bandage must be comfortable and not cause additional suffering to the patient
 - - The bandage must not restrict limb movements if they are permitted
 - - The bandage must have a neat appearance



Types of bandage (gauze roll) dressing



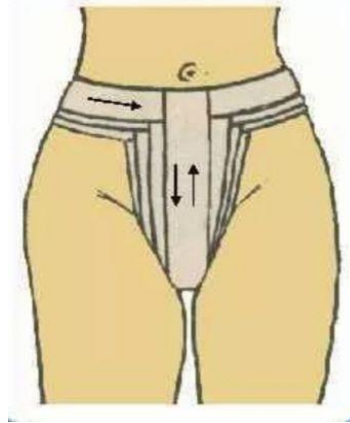
Tailed bandage



- It is made from a part of a bandage (gauze roll)
- Both ends of the bandage are cut lengthwise towards the center, without joining them completely



T-shaped bandage



- It consists of a strip of bandage, to the middle of which the end of another strip is sewn or looped.
- It is most often applied to the perineum.



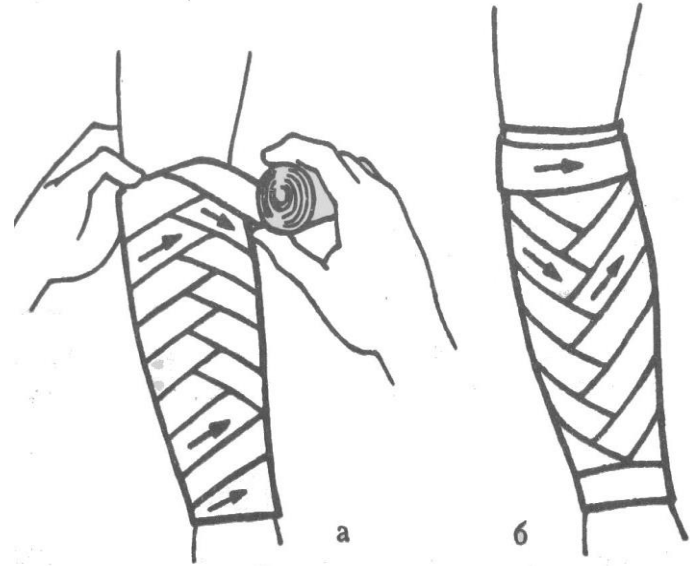
Circular bandage

- one turn of bandage is placed on another, completely covering the previous one



Spiral bandage

- Each subsequent round covers the previous one by half or a little more.
- The bandage has two types: with an ascending type, bandaging is done from the bottom up, and with a descending type, it is the other way around.



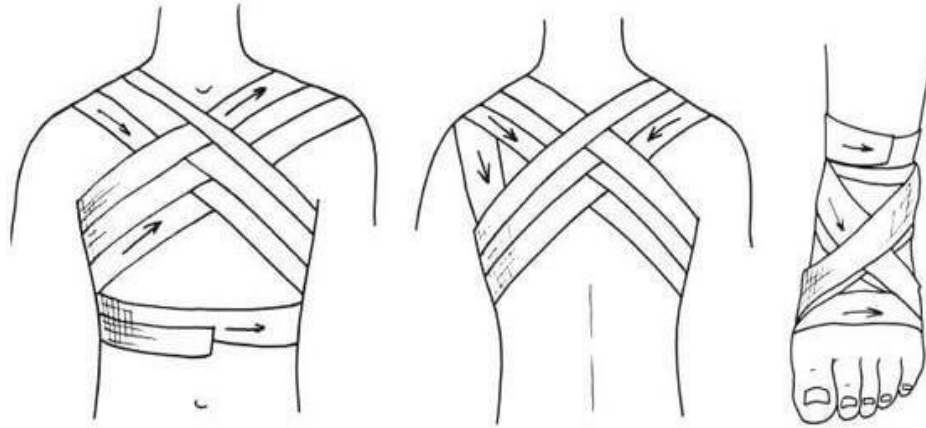
Ascending type (a), descending type (b)

Creeping bandage

- It is applied in the same way as the spiral, but the turns do not touch each other.
- It is usually used as an element of a complex bandage at the initial stage of its formation to hold napkins applied to the body.



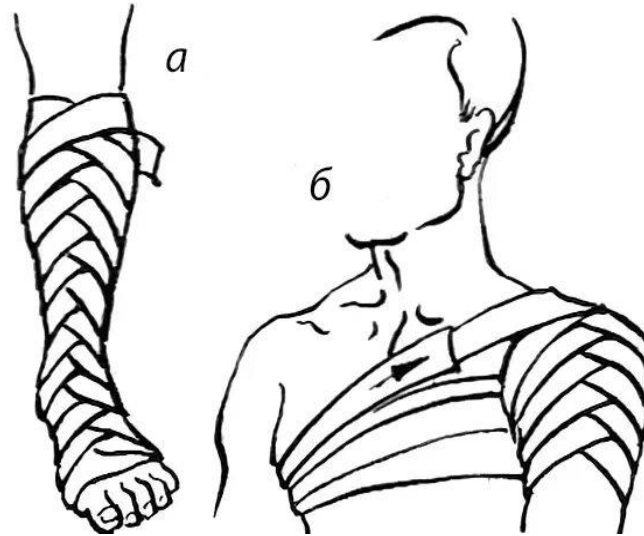
Cross or figure-eight bandage



- With this type of bandage, the turns of the bandage cross each other



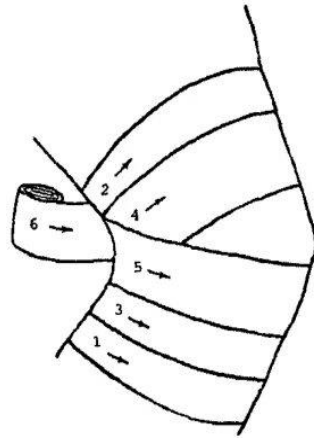
Spica bandage



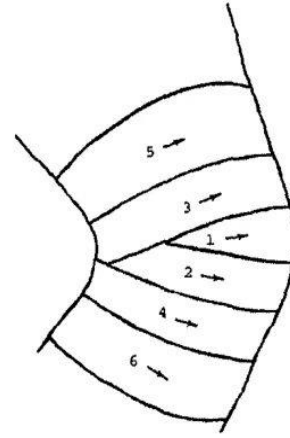
- Is a type of figure-eight bandage, where the crossing occurs along one line, which resembles a spica



«Turtle» knee and elbow bandage



A



B

- Applied to the area of bent joints
- There are two types – convergent (A) and divergent (B)



Recurrent bandage

- The bandage is traditionally applied to the stump of a limb after amputation.
- The formation begins with several fixing circular moves.
- Then the bandage, holding it with your fingers, is bent at an angle of 90° and led in the longitudinal direction through the stump.
- Each such loop is secured with a circular turn, etc. until the stump is completely closed.

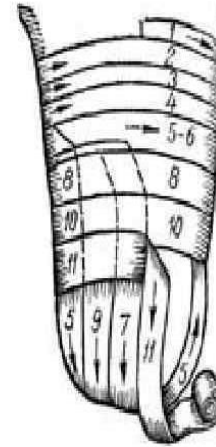


Рис.50. Возвращающаяся повязка на культю бедра

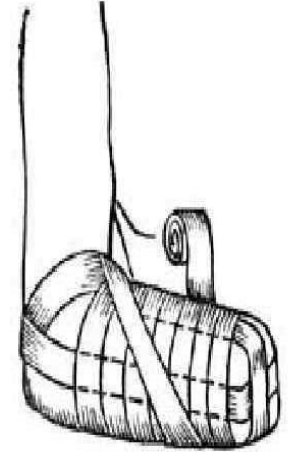
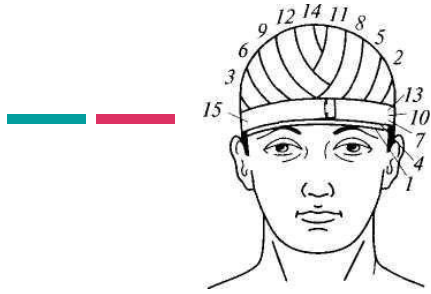


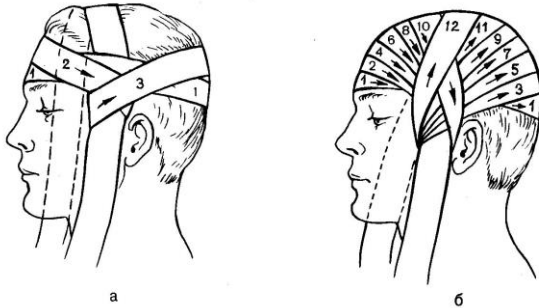
Рис.51. Возвращающаяся повязка на культю предплечья



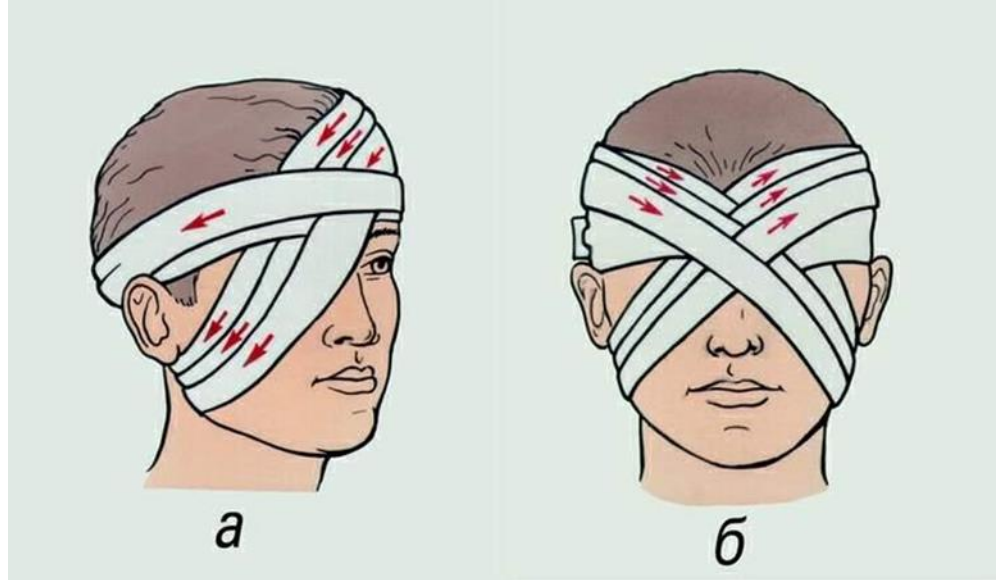
Head bandages



Hippocrates' cap



Capeline bandage



Bandage on one eye (a) and on both eyes (b)

Upper limb bandages

- a) Bandage on one finger
- b) Bandage on the thumb
- c) Recurrent bandage on the hand
- d) Bandage on the forearm (spiral)
- e) Bandage on the elbow joint
- f) Bandage on the armpit



a



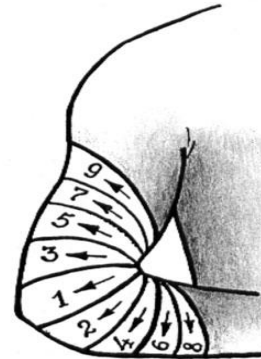
b



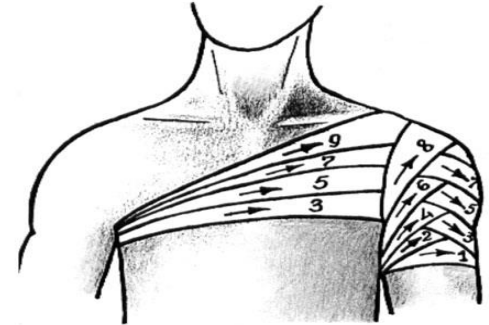
c



d



e

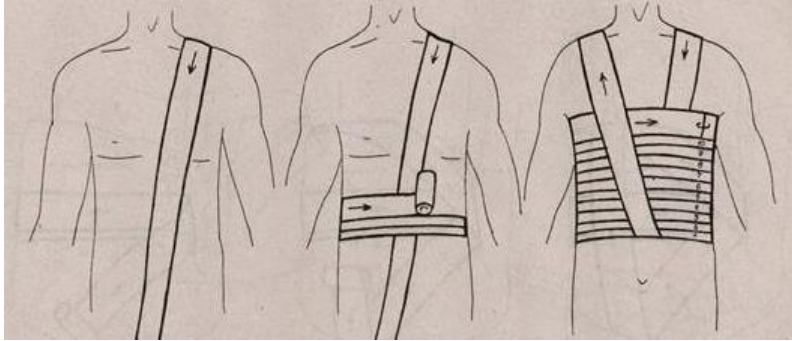


f

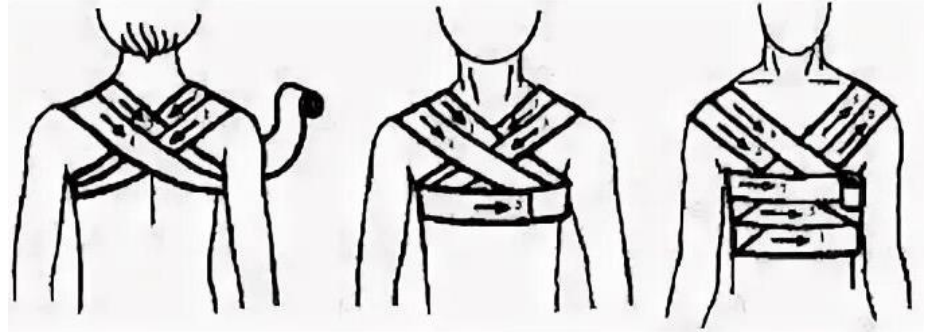
Chest bandages

When applying them, it is necessary to remember that tight bandaging can interfere with breathing, and if too loose, the bandage loses its purpose.

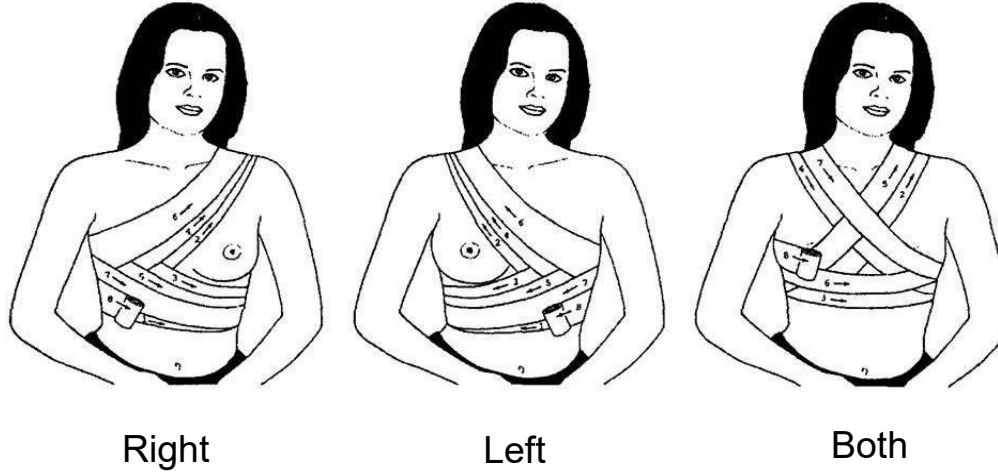
Spiral bandage



Cross-shaped bandage



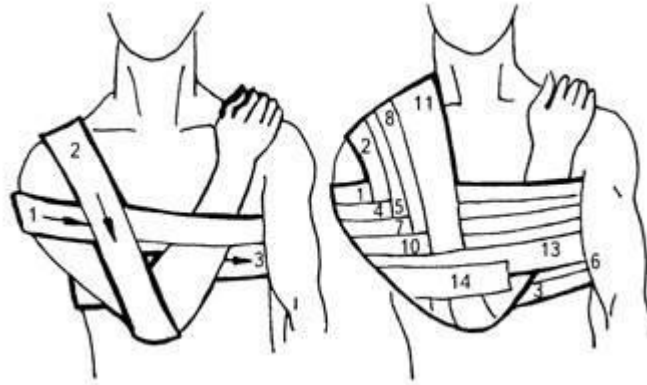
Bandage on the mammary gland



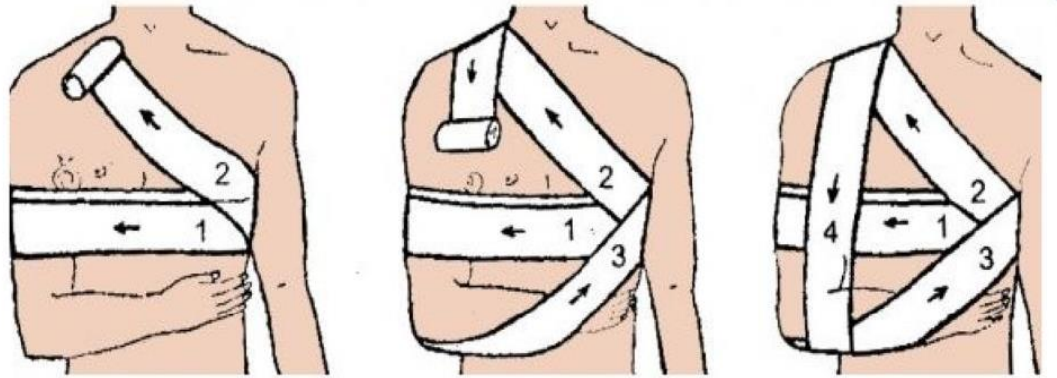
When performing this type of bandage, it can be applied to one or both mammary glands.



Velpeau's bandage

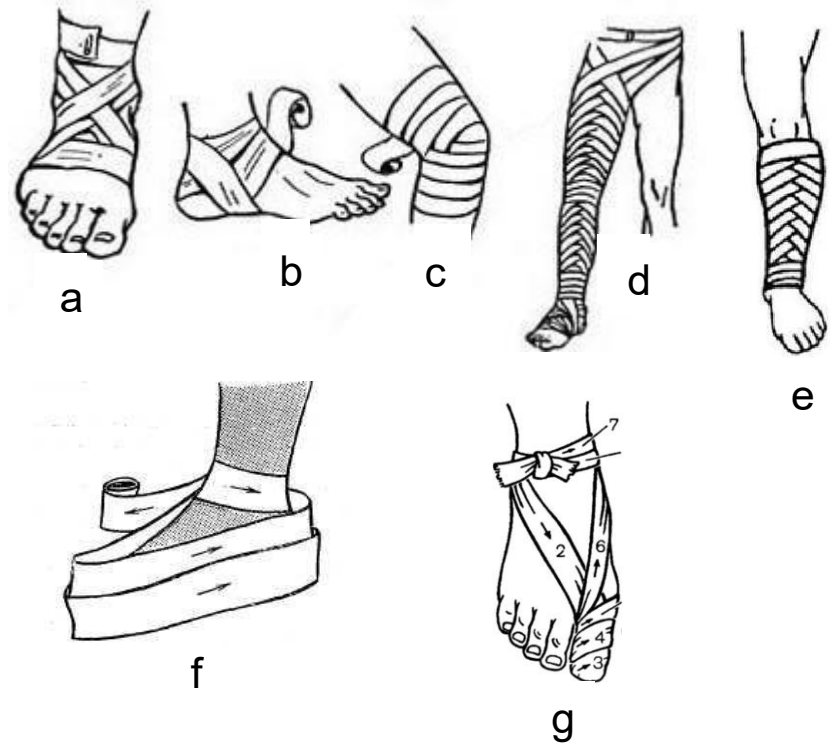


Desault's bandage



Lower limb bandages

- a) Bandage on the ankle joint
- b) Bandage on the heel area
- c) Bandage on the knee joint
- d) Bandage on the entire limb
- e) Bandage on the lower leg
- f) Bandage on the entire foot with toe capture
- g) Bandage on the big toe



Net (tubular) bandages



Used as an alternative to bandage (gauze roll) dressing when it is necessary to fix the dressing material



Hard (rigid) bandages



Used when it is necessary to create immobility in any part of the body



Immobilization - creation of immobility of the injured part of the body using various methods

Immobilization is used for bone fractures, extensive soft tissue damage, dislocations, inflammatory processes of the extremities, injuries to large vessels and extensive burns, damage to joints, tendons and nerves.

Immobilization



Transport



Therapeutic





General principles of immobilization

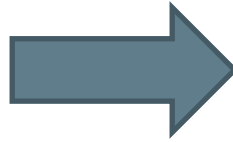
- ! For all types of spinal injuries, immobilize it using a cervical collar and a backboard
- ! In case of an open fracture, stop the bleeding and apply a bandage to the wound before applying splints
- ! Treat all suspicious sprains and deformities as fractures until proven otherwise
- ! When immobilizing a limb, one joint above and all joints below the injury site are fixed
- ! For closed fractures, a splint can be applied over clothing
- ! Applying a splint directly to the skin without a pad is not allowed
- ! After immobilization, it is necessary to check for pulse and sensitivity in the distal parts of the limb



Transport immobilization

- is one of the main elements of first aid for fractures and injuries of the musculoskeletal system.

The **purpose** of transport immobilization is to quickly ensure immobility of the injured part of the body, which creates favorable conditions for transporting the patient to a medical facility.

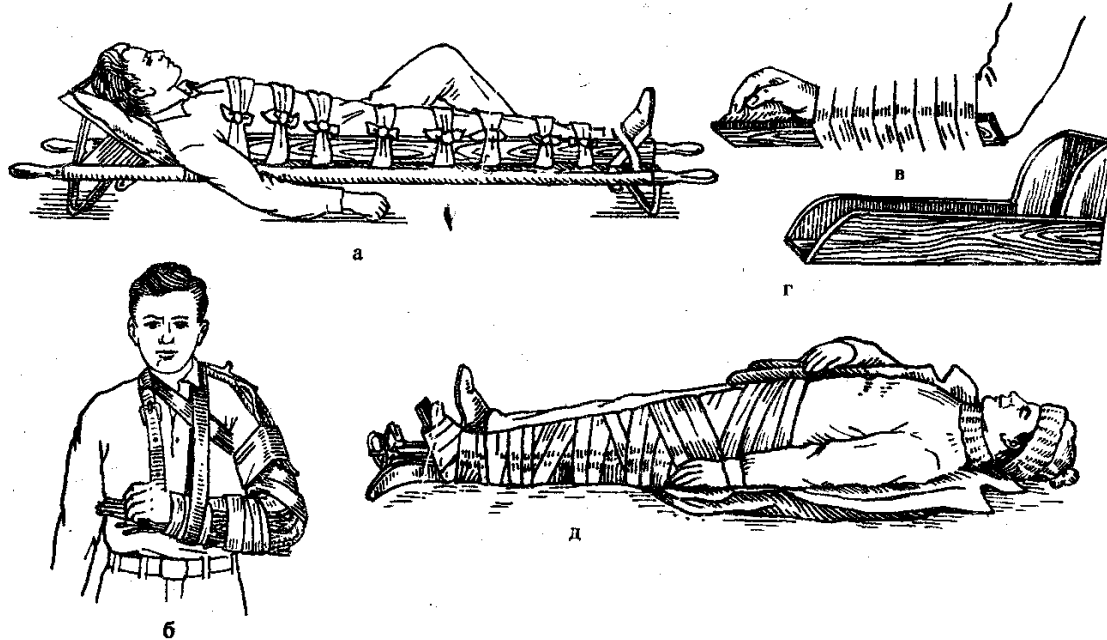


- ❖ Pain reduction
- ❖ Shock prevention
- ❖ Prevention of fragment displacement
- ❖ Reduction of the threat of injury to vessels, nerves, muscles



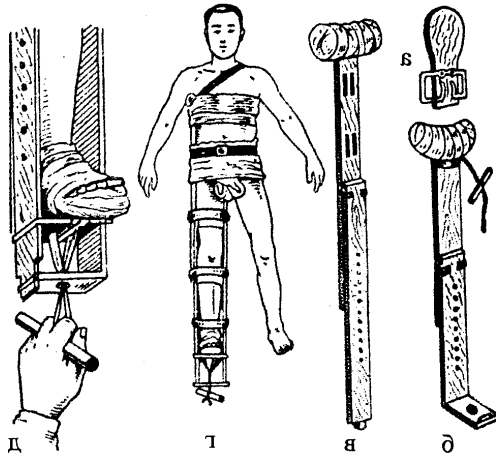
SPLINTING

Immobilization of damaged or affected areas of the body using special devices and appliances - splints



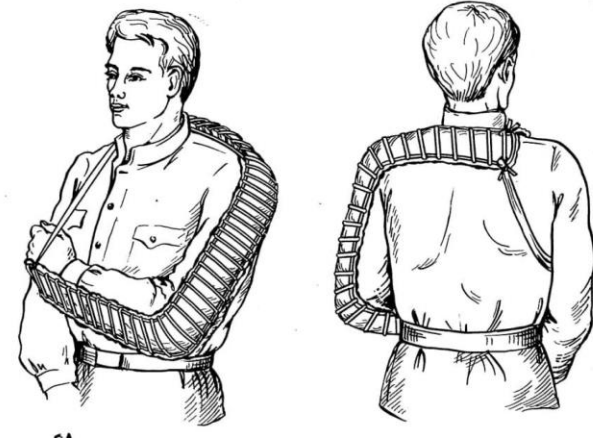
Dieterichs splint

Consists of two sturdy wooden parts - crutch-pads, the length of which can be easily changed, and a wooden sole with a twist for traction.



Cramer wire ladder splint

- ❖ The splint is easily modeled and can be given any shape.
- ❖ Before application, the inner surface of the splint is lined with cotton wool, which is fixed with a bandage.
- ❖ The splint is given the desired shape, applied to the area to be immobilized, and firmly fixed with a bandage.



Pneumatic (air) splints

- ❖ They are a double-walled chamber with a zipper fastener.
- ❖ The limb is placed on a splint of the desired configuration, the zipper is fastened, and air is pumped in.
- ❖ When air is pumped into the chamber, the inner wall surrounds the limb from all sides and creates complete immobility.
- ❖ Before removing the splint, air is released from it and the zipper is unfastened.



Vacuum splints



- ❖ Vacuum splints consist of a chamber filled with synthetic granules and a protective cover.
- ❖ The removable protective covers of the chambers are made of durable waterproof fabric and equipped with fixing straps.





Rules for transporting the patient

! Do not attempt to move or change the position of the patient if an ambulance is arriving soon.

! Move the injured person only if the scene poses a threat to the life of the patient and/or rescuer, or if there is no hope for the quick arrival of an ambulance.

! Quickly assess the patients condition according to the ABC algorithm.

! If a cervical spine injury is suspected, stabilize the patient's neck.

! If there is a spinal injury, the patient should be transported on a board.

! If there are fractures immobilization should be performed if possible



Therapeutic immobilization

- ❖ Carried out in a medical institution (hospital, clinic, trauma center, medical unit) for a long period
- ❖ The main means of therapeutic immobilization are various plaster casts

Plaster - Calcium sulfate - a white powder obtained by calcining natural gypsum stone at 70-140°C. Gypsum powder, when mixed with water, first turns into a soft plastic mass, and after 7-10 minutes turns into a solid body. This property is used when applying plaster casts, which hold the reduced bone fragments well in an immobile state. Currently, plaster bandages are produced industrially.



Types of plaster casts



By application technique:

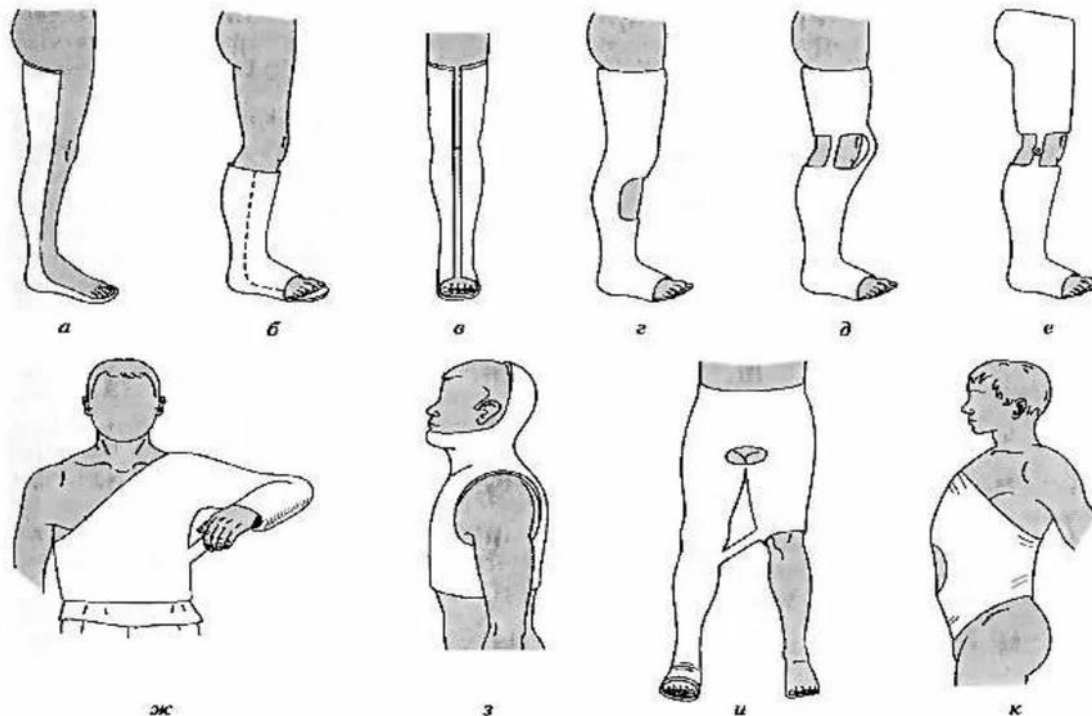
- ✓ Splint: A splint modeled to the shape of the limb is fixed to the limb with turns of a soft bandage.
- ✓ Splint-circular: A plaster splint is fixed with turns of a plaster bandage.
- ✓ Circular: The entire cast is applied with turns of a plaster bandage.

By application site:

- ✓ Plaster collar: for fixation of the cervical spine.
- ✓ Corset: applied to the torso.
- ✓ Thoracobrachial: cast on the torso and upper limb.
- ✓ Hip spica (coxite): cast on the lower half of the torso and the lower limb.
- ✓ Tutor (brace): applied to the thigh, knee joint, and lower leg.
- ✓ Boot.



Various types of plaster casts



6.3. Виды гипсовых повязок:

а — лонгетная; б — лонгетно-циркулярная; в — циркулярная рассеченная; г — окончатая;
 д — мостовидная; е — шарнирная; ж — торакобрахиальная; з — торакокраниальная;
 и — кокситная; к — корсетная

Polymer (plastic) bandages



- ❖ A modern alternative to standard plaster casts.
- ❖ Made of synthetic material (a special mesh impregnated with polyurethane resins).
- ❖ Allow fixation of various parts of the body in case of traumatic injuries.

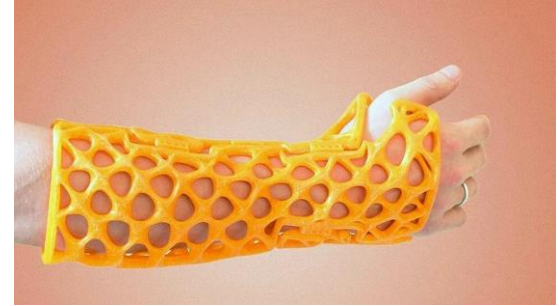


Exoskeletal cast "Cortex"

This version of a fixing cast was created using a 3D printer.

The patient is scanned with X-rays, the fracture is found, then the fracture area undergoes 3D scanning, the data is loaded into a computer, which models the cast, which is printed by a 3D printer.

The final product has one opening side, which is subsequently fixed with strong fasteners.



Orthosis

A technical rehabilitation aid used to change the structural and functional characteristics of the neuromuscular and skeletal systems and, depending on medical indications, providing orthopedic correction, unloading, fixation, and activation of motor functions.



Supporters (bandages/belts) and corsets

