**MINISTRY OF HEALTH OF UKRAINE**
**ODESSA NATIONAL MEDICAL UNIVERSITY**

**Medical Faculty № 2**
**Department Traumatology, Orthopedics and Battlefield surgery**

**I APPROVE**
Vice Rector for scientific and pedagogical work
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" 2nd" September 2024

# METHODOLOGICAL RECOMMENDATIONS FOR INDEPENDENT WORK OF MASTER STUDENTS ON THE DISCIPLINE

5th COURSE OF THE INTERNATIONAL FACULTY
EDUCTIONAL DISCIPLINE «TRAUMATOLOGY AND ORTHOPEDICS»

**Approved:**
At the meeting of Traumatology, Orthopedics
and Battlefield surgery department
Odessa National Medical University
Protocol № 1, 26.08.2026

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**Topic:** *«METHODS OF DIAGNOSIS OF DAMAGES BONES AND JOINTS»* ***– 2 hours***

**Goal:** As a result of independent work on the topic, students should:

***- know:***

1. Schematic survey of orthopedic and trauma patients.
2. Features of orthopedic and trauma patients examination.
3. The main benchmarks for determining the bone extremities and spine .
4. Violation of posture - deviations from the norm.
5. X-ray signs of fractures and diseases of bones and joints.
6. Modern methods of X-ray examination of patients with orthopedic and trauma - computed tomography (CT), nuclear magnetic resonance (NMR).
7. Laboratory testing methods.
8. Methods of conservative and surgical treatment of orthopedic and trauma patients.

***- be able to:***

1. Independently collect anamnesis suffered, taking into account the injury mechanisms in orthopedic patients with features of the disease.
2. Measure the length of the limbs with a tape and identify the anatomical, functional and relative shortening (lengthening)
3. Determine the extremities and the spine axis. Measure the circumference of the limb.
4. Determine the range of motion in the joints of the limbs by a protractor.
5. Read radiographs of patients with fractures and diseases of bones and joints.
6. Clinically and radiographically detect fracture, deformation of the musculoskeletal system.
7. Based on the combination of features given radiologic, CT, NMR data and laboratory diagnosis.
8. Outline a plan of conservative and surgical treatment.

**Basic concepts:**

In the history of the orthopedic patient must pay attention to hereditary predisposition, especially in the beginning of the disease, on the implementation of a

conservative and operative treatment. For injuries on the mechanism of injury and the traumatic nature of the subject, pre-medical and medical care in the prehospital period.

Inspection of orthopedic patient should be carried out in the nude condition because violation of one organ functions inevitably leads to dysfunction of the entire musculoskeletal system (shortening of the lower extremity after fracture leads to an imbalance of the pelvis fixed, compensatory curvature of the spine, lameness, etc.)

On examination, it is necessary to distinguish between the three main pillars of the patient:

1. Active.

2. Passive (passive dangling wrist fracture of the humeral bone with damage to the radial nerve).

3. Stimulated (at dislocations in the cervical spine the patient holds his head tilted forward, supported by her hands).

On examination, the patient should be the following types of gait: sparing pain syndrome, not sparing the limb lameness in shortening, paralytic, spastic, "duck."

Palpation allows you to set the temperature, skin turgor, dry or high humidity, the nature of the swelling, her relationship with the surrounding tissue, the presence of fluid in the joint, floating abscesses. Fingertip define local tenderness (for fractures, epicondylitis, epiphysiolisis without bias).

When bimanual palpation determine the mobility, correct relationship bony protrusions and other.

**Determination of range of motion in the joints.**

At the beginning of exploring the amplitude of active movement, carried by the patient, then the - the amount of passive movements. Measurements are taken using the protractor, whose jaws are set along the axis segments forming the joint, and joint goniometer axis is the axis of rotation, respectively. The starting position for the hip and knee joints - 180 ° (joint position with the free upright torso and limbs).

Movements in the frontal plane is called abduction and adduction, and sagittal - flexion and extension, around the longitudinal axis of the limb - external or internal rotation. motility disorders are characterized by:

a). Complete immobility in the joints (bone ankylosis).

b). Stiffness (fibrous ankylosis).

at). Limitation of joint movement in one direction (contracture).

Perverse installation limbs or segments can be concordant or disconcordant, that is functionally comfortable under which patients may, move with crutches, canes and disconcordant in which patients are unable to move, even with crutches.

**Determination of muscle strength.**

Along with the range of motion determine the strength of muscle contraction and the resistance force exerted by the hands of the researcher. Measurement of muscle force is produced by comparing the healthy limb.

Assessment is based on 5-point scale:

5 - similar to muscle strength corresponds to the intact limb.

4 - decreased muscle strength.

3 - sharply reduced.

2 - there is no function and effect of the motor is.

1 - paralysis.

**Measuring circumference and leg length.**

Measure the length of the affected limb is made in comparison with the healthy. The optimal points for measurement are bony prominences. The following types of shortening:

*1. anatomical or true (absolute)*

- The length of the thigh from the greater trochanter to the knee joint gap.
- Lower leg length - from the joint space of the knee to the lateral malleolus tip.
- Shoulder length - from the greater tuber of the humeral bone to the tip of the olecranon.
- Forearm - from the tip of the olecranon to the styloid process of the ulna.

*2. The relative shortening* (length of the upper extremity - from the acromion process of the scapula to the styloid process of the ulna, the length of the lower limbs from the front upper iliac spine to the top of the inner ankle).

*3. Functional shortening* - the distance from the heel to the floor determined using coasters. It is the sum of the anatomical and relative shortening. Research carried out in the state orthostatic. When atrophy, joint effusion, edema of the limb circumference measurements as the damaged and healthy limb on the symmetric parts are equally distant from the bone protrusions can monitor their dynamics.

**X-ray examination.**

It is important for the orthopedic patient survey in clarification and diagnosis. X-ray images are produced with the correct installation of the patient in two projections (anteroposterior and lateral). In difficult cases to diagnose (stage presence osteochondropathies, osteo-articular tuberculosis) produce comparative radiographic images sick and the healthy side.

For fractures of long bones X-ray picture should be performed with the capture of the joint closest to the fracture, and fracture two-bone segment (forearm and lower leg) - with the capture of two adjacent joints. The main radiological signs of fracture is the presence in the shadow of the bone and the fracture line displacement of the bone fragments. Distinguish offset fragments by length, width and offset angle of the periphery, which depends not only on the traumatic impact factor, but also on the muscle contraction after the fracture.

**Laboratory research.**

In addition to general research is widely used in orthopedic practice physiological, biomechanical and morphological researches.

**Plan:**

**1. Questions for self-control:**

1. What are the features of the survey with trauma injuries of the spine and orthopedic diseases of the spine?

2. What are the radiographic changes are observed in vertebral fractures and orthopedic diseases of the spine (scoliosis, congenital anomalies of development, spondylolisthesis, etc.)?

3. What guidelines should pay attention to during the examination arrived with damage to the upper and lower limbs, orthopedic diseases of the upper and lower extremities?

4. List the absolute signs of fractures of long bones.

5. What are the radiological signs of bone fractures of the upper and lower extremities (types of fragments typical of displacement)?

6. What are the radiological signs of orthopedic diseases of the upper and lower extremities?

7. What laboratory methods are needed for research of orthopedic patients?

8. What is a biopsy?

**2. Test task for self-control:**

1. The total length of the lower limb includes the distance from the anterior superior spine of the pelvis

a) to the greater trochanter

b) up to the knee joint gap

c) to the outer edge of the ankle.

g) to the calcaneal tuber

/ The correct answer is C /

2. The axis of the upper limb is held

a) through the head of the humeral bone

b) the radial head

c) the head of the ulna

d) the tip of the finger III

/ The correct answer is C /

3. Extension and flexion of the limb - a movement

a) in the sagittal plane

b) in the frontal plane

c) in the axial plane

d) internal movement around the longitudinal axis

/ The correct answer is A /

4. While reading the X-ray can be determined

a) form the axis of the limb

b) the shape and width of the joint space

c) the form and nature of the attachment of muscles

g) the state of the sprout layer and ossification nuclei

/ The correct answer is C /

Note: in the test vote true or false statements. Put A if the statement is true, in - if false.

1. The number of standard plaster bandages required for applying spica cast.

A) 18 - 20 bandages.

B) 10 - 12 bandages.

/ The correct answer is A /

2. Physiotherapy treatment is contraindicated:

A) in malignant tumors

B) for cardiovascular disease in the compensation stage.

/ The correct answer is A /

3. In normal (healthy) knee joint is not possible:

A) hyperextension - 15 degrees.

B) retraction - 20 degrees.

/ The correct answer is B /

4. A reference point when the score of the vertebrae in the cervical spine is spondylograms:

A) of the skull base

B) 1-spinous process of the cervical vertebra.

/ The correct answer is B /

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic:** *«REANIMATION OF PATIENTS WITH INJURIES OF THE MUSCULOSKELETAL SYSTEM»* ***– 2 hours***

**Goal:** As a result of independent work on the topic, students should:

***- know:***

1. Methods of temporary and final stop bleeding.
2. Causes of asphyxia.
3. Measures for the prevention of traumatic shock.
4. Clinic traumatic shock.
5. The causes of pneumothorax.
6. Events pneumothorax prevention.
7. Types of artificial respiration on the stages of medical evacuation.
8. Principles and indications for transfusion of blood and blood products.
9. Blood-substituting solutions, which are used for resuscitation.
10. The main complications that can occur during the blood transfusion and blood products.
11. What is intubation of the larynx?
12. Types of anesthesia that are used at different stages of medical evacuation.
13. The causes of blood transfusion shock.
14. The causes of anaphylactic shock.
15. The causes of hemorrhagic shock.
16. Causes of crush syndrome.

***- be able to:***

1. Turn the open pneumothorax into a closed.
2. Apply tourniquet and a pressure bandage.
3. To carry out hemostasis in the wound.
4. Apply Cramer transport bus or Diterikhs on the injured limb.
5. Carry out external cardiac massage.
6. Perform artificial respiration mouth to mouth.
7. Under the guidance of the teacher to carry out local anesthesia the fracture site.

**Basic concepts:**

***Traumatic shock***

Traumatic (hypovolem) shock - an acute and severe the dynamic state of the body, which occurs as a result of the injury and is characterized by depression of vital body functions. The cause of traumatic shock is a decrease in the effective circulating blood volume (CBV) (ie, the ratio of the bcc to the capacity of the vascular bed) and the deterioration of the pumping function of the heart. For fractures of the pelvis possible bleeding in the retroperitoneal space (blood loss averaged 1500 ml). Fractures of the long bones are often accompanied by hidden bleeding (hemorrhage reaches 500-1000 ml).

*The mechanism of the shock*. In severe mechanical trauma powerful flow of pain impulses from the damaged organs leads to stimulation of the nervous and endocrine systems, to the release into the blood large amounts of catecholamines, and other biologically active substances, and this in turn leads to a spasm of arteriole blood bypass on arteriovenous anastomoses, capillary blood flow slow down. This increased activity requires more intensive blood supply, which is provided by the so-called centralization of blood circulation to the shutdown of the blood volume of an active circulation.

The tissues are in a state of hypoxia, violated the redox processes in the direction of acidosis and toxic products are produced, leading to paralysis of precapillar and hormonal-tissue metabolism, changes in blood rheology and its aggregation formed elements. As a result of the aggregation of red blood cells which developed considerable part of the blood returns to the heart and is developing the so-called decentralization of circulation. As a result of acidosis and decrease venous return of blood to the heart myocardial contractility and stroke and minute volumes fall in blood pressure is progressively reduced.

Hypovolemia becomes pulmonary vascular resistance, causing an extra load of the right ventricle is even more pronounced, sharply increases and a decrease in cardiac output (low ejection syndrome) that leads to the development of "shock lung." From insufficient ventilation enhanced circulatory and tissue hypoxia, the kidneys are

affected, the cortex of the adrenal glands, the liver. A vicious circle of violations, from which the body alone is not able to get out.

*Clinic.* The severity of the shock depends on the traumatic agent, reactivity and the damaged area. There are erectile and torpid phase. The latter, depending on the severity has four degrees - mild, moderate, severe and very severe. The main indicator of the depth of shock is a safe level of blood pressure - 80/50 mm Hg. Art.

Erectile phase (excitation). Blood pressure is normal or increased to 150-180 mm Hg. Art. Pulse normal. Characteristically motor and speech excitement when stored consciousness. Pain response increased dramatically. Face pale, eyes restless. Sweat cold, but not sticky. Patients complain of pain loudly. Such excitation lasts 10-20 minutes, and then moves in the braking phase. Go erectile torpid phase is performed in a short time.

Torpid phase (depression).

Grade 1 (mild). Condition of the victim is satisfactory or moderate. Blood pressure - 100/80 mm Hg. Art., rhythmic pulse, 80-100, speeded up breathing in 20 minutes. The face is pale, masklike. There is a mismatch between the behavior of the patient and the severity of the injury. Consciousness is preserved.

Grade 2 (moderate severity). Status of moderate severity. Maximum blood pressure - 85-80 mm Hg. Art., Minimal - 60-50 mm Hg. Art, pulse -. 120-130, rhythmic, soft. Breathing frequent, superficial. The skin is pale and cold to the touch, sticky sweat. The pupils react sluggishly to light. Consciousness is retained, but there is some confusion.

Grade 3 (severe). His condition was grave. Blood pressure decreased to 70/50 mm Hg. Art. and below, and sometimes it cannot be detected at all. Pulse - 140-150, thread. Pupils dilated, sluggishly reactive to light. Sudden pallor, profound lethargy. Breathing frequent, superficial. Hypothermia.

Grade 4 (very severe), or terminal state, which in its course has 3 stages.

1. Pre-agonal state - BP is not detected. The pulse is felt only on the carotid or femur arteries. Breathing shallow, uneven, with pauses. Consciousness dimmed or

absent, the skin pale gray, cold, covered with cold sticky sweat. Pupils dilated, poorly or do not respond to light.

2. Agonal state has the same features, but is combined with a severe respiratory disorders such as Cheyne-Stokes. Reflexes disappear.

3. Clinical death. Active CNS functions and the clinical signs of life are completely absent, but the metabolic processes in the brain continue even an average of 5-6 minutes.

*Prevention* of traumatic shock is associated with the correct organization of the ambulance at the scene, during transport and at the hospital.

The main principle of the first medical aid - in the shortest possible time, an average of 20 minutes, to perform urgent measures: to eliminate the pain and negative reflex reactions, ensure gentle immobilization and transportation. To this end, used analgesics, neuroleptics, procaine blockade. It is necessary to identify the causes of the most dangerous of functional disorders - acute respiratory and circulatory disorders - and immediately remove them.

In severe respiratory failure is necessary to the toilet of the mouth and nasal cavities, to eliminate the root of the tongue, to enter and secure the air duct, to restore patency of the upper airway. With an open pneumothorax is necessary to impose an occlusive dressing, without delay, to stop external bleeding tourniquet or pressure bandage on the wound impose aseptic bandage. Open injuries should be protected from secondary pollution.

*Qualified anti-shock events.*

*1. Elimination of the pain factor.* When closed or open fractures of long bones of limbs without massive crush the soft tissues in the prehospital enough local anesthesia and conduction anesthesia with 0.25% or 0.5% solution of novocaine, followed by immobilization of a limb.

Novocaine blockade fractures and crush injuries perfectly interrupt pain impulses. For this, the 0.25% solution of novocaine solution. More concentrated solutions of novocaine used metered - an adult no more than 40 ml of a 2% solution.

In fractures, injuries of major vessels and large nerves beforehand prior to immobilization transport buses run by intramuscular or slow intravenous injection of narcotic and non-narcotic analgesics (fentanyl, 1-2 ml of 1-2% sodium promedoli solution dipyrone). Reduce side effects of narcotic analgesics can be achieved by their application at doses 2-3 times lower than this, but in combination with sedatives and antihistamines (5-10 mg Seducsen or Relanium, 10-20 mg of diphenhydramine, 10-20 mg Suprastinum, 25- Pipolphenum 50 mg; indicated doses correspond 1-2 ml standard solutions of each of these substances in ampoules), and sodium oxybutyrate (10 mL of 20% solution).

*2. Normalization of excitation and inhibition in the central nervous system.* The victim should be provided with rest. Passed on to the stretcher and the stretcher on the table to be careful. Limb is placed in ice packs. Special care should be used neuroleptics (Droperidolum in the initial dose of 2.5-5 mg in combination with analgesics). They are shown only at sharp excitation and stable blood pressure and respiration undisturbed.

*3. Compensation of circulating blood volume.* To increase the venous return to the patient give the Trendelenburg position (angle of 20-30 °). If massive blood loss with the aim of filling the BCC during infusion therapy uses native or dry plasma albumin, plasma expanders - polyglukin, reopoligljukin, hemodesis and laktasol, crystalloid solutions and glucose solutions.

When blood pressure is below the critical level of 80/50 mm Hg. Art. should immediately start intra-arterial blood transfusion to raise blood pressure to a safe level, then go to an intravenous transfusion of blood or blood products and crystalloid solutions. In hypovolemic shock fluid therapy is better to start with crystalloid solutions. They reduce blood viscosity, eliminate violation of electrolyte balance. Blood substitutes are stored for a long time in the bloodstream, and thereby hold the reduction of blood pressure. Albumin and plasma protein fraction effectively increase the volume of intravascular fluid, but fluid can go in interstitial lung tissue, which can cause respiratory distress syndrome. Therefore, albumin and plasma protein fraction is usually attributed to the drug provision.

*4. Treatment of severe acidosis*. Inhalation of oxygen, mechanical ventilation, and fluid therapy restores the physiological compensatory mechanisms, and in most cases eliminate acidosis. In severe metabolic acidosis (pH below 7.25) administered intravenously 2% sodium bicarbonate solution in an amount of about 200 ml.

*Monitoring* is needed to assess the effectiveness and to determine further treatment strategy. Focuses on the restoration of organ perfusion. Lack of perfusion may be due to a violation of cardiac pump function, hypovolemia, and changes in vascular resistance.

*The level of consciousness* reflects the severity of hypoxia, circulatory condition and the extent of the injury.

*Diuresis, urine osmolality and composition* allow us to estimate the water balance and kidney function to identify urinary tract damage. Oliguria is insufficient compensation for BCC. Urine output - the best indicator of tissue perfusion. Diuresis be maintained at a level of 30-50 ml / hr. Diuretics are not indicated as long as there is no bcc fully restored. The only indication for diuretic - resistant oliguria, with increased central venous pressure and normal blood pressure and heart rate values.

*Rate, rhythm and strength of heart contractions* allow to evaluate the function of the cardiovascular system and the effectiveness of infusion therapy. ECG reveals cardiac arrhythmias and repolarization. For the normalization of cardiac activity is sufficient to restore the BCC.

*CVP measurement* reveals hypovolemia and reflects the function of the heart, to evaluate the effectiveness of infusion therapy. CVP measurement is not required, but it is indicated in patients with underlying cardiovascular and pulmonary diseases, as well as during mechanical ventilation, massive blood transfusion and infusion therapy.

### *Crush syndrome (WBS)*

Under the CRA to understand the general reaction of the organism, which arose in response to pain, prolonged ischemia or degenerative changes occurring in tissue during prolonged crushing of limbs or segments of large weights (rubble, soil, heavy machinery). SDR develops immediately after the liberation of the limbs and restore

blood flow. The larger and longer the compression, the more severe the symptoms of local and general pronounced.

*Pathogenesis.* The pathogenesis are expressed microcirculatory disorders plasma-loss, toxemia, metabolic disorder. On the body there are three factors: ischemia, venous stasis and painful stimuli due to injury of nerve trunks, which also causes a complex set of neural and neuroendocrine disorders. The destruction of striated muscle contributes to the development of traumatic toxemia. It is necessary to add a co-plasma- and blood loss associated with edema and hemorrhage in the area of crushed tissue.

The initial changes in the body are similar to a severe traumatic shock, later - toxemia and acute renal failure (ARF).

*Clinic.* There are periods of SDRs:

I - compression period before liberation;

II - the period after the liberation of the limb from the compression of:

1) early - period of ARF (3-4-day for 8-12 days);

2) the interim period (the period of the alleged well-being);

3) Late period - the manifestation of the local changes, continuing 1-2 months.

The compression of time before the release of the victims complained of pain in the compressed parts of the body, thirst (40%), shortness of breath, a feeling of fullness in the limb. There have been confusion or loss of, cases of mental depression (lethargy, apathy, drowsiness). After his release from compression there are complaints on the sharp pain in the affected limbs, swelling, purple-bluish color of the skin, and limitation of movement in the affected limb, general weakness, dizziness, nausea, vomiting. These complaints are typical for early and intermediate periods of the SDR.

Objective evidence SDR begin to appear after 4-6 hours after release from compression. During this time, the condition can be satisfactory, pulse and blood pressure - in the normal range. The limb is cold, palely, the pulse of the peripheral vessels barely detectable, fingers cyanotic.

The early period (first 2-3 hours) is characterized by hemodynamic disorder and local changes. Rapidly developing limb swelling distal to compression, reaching through the 4-24 hours the maximum. In parallel, general condition worsens: marked

short-term excitement resembling erectile phase of traumatic shock, but after a few hours there comes a sharp retardation injured lethargic, sleepy. There are paleness, cold sweats, rapid heart rate, decreased blood pressure and urine output - the amount of urine decreases sharply (up to 300 ml per day). Urine becomes lacquer-red, then dark brown.

*Local changes*: on the skin of compression zone there are hemorrhages, bruises, blisters filled with serous fluid. Movement joints are limited due to pain caused by damage to muscle and nerve trunks. Tissues become woody density due to the swelling of muscles and sharp voltage fascial and muscular sheaths. Sensitivity damaged zone and distal extremities decreased. Surge vessels affected limb is weakened with the growth of the edema.

Interim period (3-6 days), or between an imaginary being, characterized by a relative improvement in the patient's state of health. Against the background of deepening the arrester body retained products of intermediate metabolism and water. Grow toxemia caused of ischemic necrosis of muscle and plasma, oliguria and azotemia, decrease in blood pressure. All this can lead to death from uremia. Swelling of a limb becomes so pronounced that the soft tissues acquire a solid consistency, the skin formed bubbles with hemorrhagic content.

Late period SDR begins on 10-14 day of the disease and is characterized by a predominance of local manifestations in the constricted limb over general. Reduces swelling in the affected parts of the body and identify foci of necrosis extremities. There are cellulitis, ulcers, sometimes bleeding. If compression is accompanied by a broken bone, it may be osteomyelitis, and sepsis. Often limb necrosis areas sequestered and rejected. There is a high risk of infection in wounds and sepsis. Healing occurs by granulation and the formation of large scars. Full Restore crushed muscles occurs.

Kidney function gradually recovered, while there is polyuria (up to 5 liters / day), normal water and electrolyte balance of the blood. Saved hyper-proteinuria, urine specific gravity remains at the level of 1007-1001.

*Medical assistance in accidents*

The period of isolation (being in the rubble) assistance is provided in the form of self or mutual aid:

1) release of the respiratory tract from dust and foreign bodies;

2) release of the compressed parts of the body.

Prehospital medical care should be as close to the site of the lesion. Right in the rubble before the release may conduct infusion therapy, oxygen and alkaline solutions. In health care, nominated to the site of injury, is the first medical aid to members qualified for health reasons.

*1. The anti-shock therapy:* infusion polyglucin, reopoliglyukina, haemodesis, native or dry plasma, albumin, glucose solution, saline (at a volume of infusion therapy - 4-6 liters / day); Correction of acid-base balance (sodium bicarbonate, laktasol; pain management: the introduction of analgesics, drugs); procaine blockade of the cross section of the injured limb above the compression of the level; the introduction of cardiovascular agents. Criteria for removal from the shock: stable rates of blood pressure and heart rate for 2-3 hours, hourly urine output - 50 ml / h.

The evacuation of the lesion in specialized medical institutions should be carried out after the removal of the shock by special transport (better - by helicopter), accompanied by a health worker.

2. *Fighting with AKI:* perirenal Novocain blockade to 100-120 ml of 0.25% solution of warm solution of Novocain on each side; bladder catheterization, monitoring of urine output; Lasix divided doses of 200-300 mg to 2 g / s when restoring diuresis.

*3. Restoration of the microcirculation and the DIC warning*: heparin 5000 IU after 6 hours; Contrycal, Gordoks 100 000 IU, 2 times a day.

*4. The fight against infection and immunosuppression:*

1) the introduction of tetanus toxoid;

2) the introduction of antibiotics: aminoglycosides; cephalosporin (except tseporina).

Antibiotics can replace penicillin, tetracycline or chloramphenicol; metronidazole or Metrogilom; Timalin, Timogenom.

5. *life-saving operations*. To maintain the viability of the affected limb use local hypothermia, elastic bandaging, immobilization. Hold compression soft tissue limb skin incisions - a big mistake, which leads to the development of local infectious

complications. The most widely used is the subcutaneous fasciotomy, holding that it is advisable in the first 12 hours of receipt of the victim to the hospital.

Indications for fasciotomy:

1) marked a progressive swelling of the limbs;

2) violation of the tactile and pain sensitivity;

3) the absence of active movements in the limb;

4) the ineffectiveness of ongoing detoxification.

It is a longitudinal skin incision and fascia on one or both sides of the damaged limb segment throughout its duration.

Comprehensive treatment of the SDR in specialized hospitals include extracorporeal detoxification methods: haemosorption, lymphosorption, plasmapheresis, hemofiltration, prolonged arterial-venous filtration, hemodialysis. The most pronounced effect is achieved by the combination of 2-3 of these methods.

In the late period of the SDR, treatment should be aimed at the rapid recovery of the functions of the damaged extremity (physical therapy, massage, physiotherapy), anti-infectious complications, prevention of contractures and secondary anemia.

**Plan:**

**1. Questions for self-control.**

1. Clinic arterial bleeding and how to stop it.
2. Clinical manifestations of venous bleeding and how to stop it.
3. Manifestations of internal bleeding and how to stop it.
4. Clinical manifestations of pneumo thorax, his views on the stages of pre-hospital care and the first medical aid.
5. What is hemothorax, assistance for medical evacuation stages.
6. Causes of asphyxia, aid for medical evacuation stages.
7. Indications for tracheotomy, the methods of implementation.
8. The methods of artificial respiration at the stages of honey. evacuation.
9. Closed cardiac massage.
10. The procedure of blood transfusion.

11. When performed blood transfusions and blood products?

12. The volume of first medical and pre-medical, first medical aid during the final damage.

13. What are the means of prevention:

- Traumatic shock;
- Pneumonic shock;
- Anaphylactic shock;
- Blood transfusion shock.

14. The complex resuscitation, which is held on the stage of qualified and specialized one practical lesson is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic:** *«THE STABLE-FUNCTIONAL OSTEOSYNTHESIS»* **- 2 *hours***

**Goal:** As a result of self-study of this topic, students should:

***- know:***

1. What is stable-functional osteosynthesis.
2. How it is carried out;
3. What are the advantages of this method;
4. What are the disadvantages of this method;
5. Prospects for the development of osteosynthesis.

***- be able to:***

1. Determine indications for the use of stable-functional osteosynthesis;
2. Correctly determine the treatment tactics after surgery of stable-functional osteosynthesis.

**Basic concepts:**

According to the degree of immobility of fragments, which can be achieved as a result of the use of one or another type of osteosynthesis, we distinguish stable and unstable osteosynthesis. In this case, osteosynthesis is considered stable, in which a strong fixation of the fragments is carried out, excluding any of their mobility. The main advantage of this method of fracture treatment is the possibility of early development of movements in the joints of the injured limb and early recovery of function. That is why the concept was introduced - ***stable-functional osteosynthesis.***

**Osteosynthesis with plates and screws**

Screws and plates are implants for performing extramedullary osteosynthesis, meaning such type of surgical treatment, during which the structures that fix the fragments are located on the surface of the bone.

The materials from which the screws and plates are made must have sufficient strength and plasticity to hold the fragments until fusion occurs and be modeled along the contour of the bone. At the same time, their good biological compatibility with body tissues is also necessary. Therefore, stainless steel, titanium-aluminum-vanadium alloy and, less often, chrome-cobalt, vitalium, tantalum are used as industrial materials for the

production of plates and screws. The most important property that unites the bone structures is their high resistance to corrosion. Titanium and its degradation products behave passively and cause neither toxic nor allergic reactions.

**Screws.** They are most often used in extramedullary osteosynthesis. It is a threaded rod with a pointed end and a head. The screw can be used for two purposes:

1) creation of compression between fragments or between the plate and the bone;

2) provision of splinting - preservation of the relative position of fragments, implant and bone.

The head of a screw is the part with a diameter greater than the diameter of the thread. The head serves as a support for a bone fragment or plate. The shape of the head can be cylindrical, conical, and have a horizontal bottom surface. However, since the end of the fifties, screws with only a spherical head have been used in clinical practice. This head geometry allows the screw to be inserted at an angle while maintaining the congruence of the lower surface of its head and the hole in the plate.

The head has a connection unit with a screwdriver for the transmission of torque when tightening and unscrewing the screw. Joint nodes in the form of a simple or cruciform slot are not widespread, since if the axis of the screwdriver and the screw does not coincide, they can break off. The most common joint is today the hexagonal recess in the screw head.

The most important component of a screw is its thread. All screws used in orthopedics have a cylindrical shape, that is, the diameter of their threaded part is the same. The thread of the bone screws is asymmetrical. Its pulling surface makes an angle of 95 ° with the long axis of the screw. This support thread counteracts the maximum load and provides a stronger fixation of the graft, preventing it from loosening.

The screws are cortical and spongy. The cortical screws have a fine thread along their entire length. Its diameter is related to the diameter of the body as 1: 1.5. Spongy cancellous screws have deep threads and a relatively small body diameter (1: 2). To easily penetrate and push through cancellous bone, the screw threads are thin.

Depending on the shape of the end of the screw, the methods of implanting it into the bone differ. Blunt-ended screws (these are usually cortical screws) are inserted into a pre-drilled channel with a tapped thread on it.

Spongy screws have a conical end in the form of a corkscrew. The end of the screw presses the trabeculae of the cancellous bone, forms a channel in the form of threads. Due to the compaction of the bone, the fixing strength of the screw increases. Spongy screws are introduced into the zone of the metaphysis and epiphysis of bone without the tap.

In the last decade, self-tapping cortical screws have become more widespread. The term "self-tapping" refers to a screw that is inserted into a drilled channel without threading. The screw itself performs the function of a tap, due to the special shape of its end - a triangular trocar or cutting recess. The advantages of self-tapping screws are reduced operation steps, fewer tools required and time savings.

In addition to self-tapping cortical screws with a diameter of 4.5 mm, there are special-purpose implants - malleolar screws, bolts for blocking nails, Shants screws.

Currently, self-drilling screws with a drill end are being actively introduced in clinical practice. They are inserted immediately (without forming an auxiliary hole), like a K-wire with a thread.

To perform osteosynthesis with screws, you must have:

1) large cortical screws with a diameter of 4.5 mm with a head with a diameter of 8 mm with a 3.5 mm socket for a hex screwdriver; body diameter 3 mm, thread along the entire length with a step of 1.75 mm; implant length from 14 to 80 mm in 2 mm increments;

2) small cortical screws with a diameter of 3.5 mm with a head diameter of 6 mm with a 2.5 mm slot for a hex screwdriver; body diameter 2.4 mm; thread along the entire length with a pitch of 1.25 mm; screw length from 10 to 40 mm in 2 mm increments;

3) small cortical screws with a diameter of 2.7 mm with a head with a diameter of 5 mm with a 2.5 mm socket for a hex screwdriver; body diameter 1.9 mm; thread along the entire length with a step of 1 mm; screw length from 6 to 40 mm in 2 mm increments;

4) minicortical screws with a diameter of 2 mm with a head with a diameter of 4 mm with a 1.5 mm hex or cruciform slot; body diameter 1.3 mm, thread along the entire length with a pitch of 0.8 mm. Screw length from b to 38 mm with a step of 2 mm;

5) minicortical screws with a diameter of 1.5 mm, with a head with a diameter of 3 mm with a 1.5 mm hex or cross-shaped recess; body diameter 1 mm thread along the entire length with a pitch of 0.6 mm; length of implants from 6 to 20 mm with a step of 1-2 mm;

6) large cancellous screws with a diameter of 6.5 mm; thread length 16 mm, 32 mm or along the entire length; diameter of the body of the threaded part 3.0 mm, diameter of the body without thread 4.5 mm; head with a diameter of 8 mm with a 3.5-hexagonal socket for a screwdriver; implant length from 30 to 120 mm in 5 mm increments;

7) small cancellous screws with a diameter of 4 mm with a head with a diameter of 6 mm, with a 2.5 mm hexagonal socket for a screwdriver; the diameter of the body of the threaded part is 1.9 mm with a pitch of 1.75 mm; screw length 10-60 mm, thread length 5-16 mm.

## Principles of osteosynthesis with screws

### *1. Compression osteosynthesis*

It is well known that in the presence of diastasis between bone fragments, the main load falls on the implant fixing them. Closing the fracture gap due to the application of interfragmental compression recreates the structural integrity of the bone. The physiological load is transferred from the fragment to the fragment, the implant undergoes less deformation, and the strength of the osteosynthesis increases. Thus, the most stable method of fixation is compression osteosynthesis.

To create interfragmental compression with a screw, it is necessary that its thread is jammed in only one fragment. Then, when tightening, the compression increases between the screw head and the underlying fragment and the opposite fragment attracted by the screw thread. Such screws are called lag screws. Any cancellous screw is constricting, since the diameter of its thread exceeds the diameter of the body of the

unthreaded part. It is only necessary that all threads of the screw are located in the opposite fragment and do not cross the fracture line. Any osteosynthesis of a bone fracture in the metaphyseal or epiphyseal zone using large and small cancellous screws is compression. In order to prevent punching of the thread and increase the bearing area of the screw head, it is recommended to place a toothed washer under it.

In order for the cortical screw to perform the function of a tightening screw, it is necessary that the threads of its thread slide freely in the nearest fragment (or cortical) and wedge in the opposite one. The diameter of the hole in the first cortex should be the same as the screw thread (sliding hole). The second hole (threaded) is pre-tapped with a tap. Then, when the screw is tightened, interfragmental compression occurs. The next stage in the evolution of lag screws was the creation of a rod screw. It has a thread with a diameter of 4.5 mm at half its length.

The advantage of such a screw is increased strength and rigidity, as well as an increase in the force generated by the compression by 40-60% due to the fact that the smooth part of its body freely passes into the sliding hole without being jammed in it by the threads.

The compression force of the lag screw is very high. Interfragmental compression is symmetrically distributed along the entire fracture line and effectively prevents the slightest displacement of fragments. The force capable of pulling a screw out of a bone is about 400 kg per 1 mm of its cortical thickness.

The disadvantage of lag screw osteosynthesis is that such fixation cannot withstand the dynamic loads on the operated limb during functional postoperative treatment. Even the smallest displacement of the screw relative to the bone leads to the destruction of the screw-to-bone connection system due to the stripping of the threads in it. In this case, the strength of fixation is irreversibly lost. Therefore, the majority of osteosynthesis with screws should be "protected" by additional imposition of splinting (neutralizing) plates.

Obviously, in the absence of a functional load, the optimal location of the lag screw will correspond to the perpendicular to the fracture plane. But in most observations, the fracture plane includes several components with different orientations.

Therefore, for example, with a spiral fracture, the optimum angle of inclination of the screw corresponds to the bisector of the angle between the fracture lines. Functional load on the limb leads to axial compression. To counteract it, the screw must be positioned more perpendicular to the long axis of the bone. Thus, in order to stabilize the spiral fracture, it is necessary to insert three screws perpendicular to the fracture line, perpendicular to the long axis of the bone and along the bisector of the angle between the first two screws.

Compression osteosynthesis with screws is useful in any situation when there are two fragments of bone, with their size and shape allowing it to be performed, but more often it is indicated for spiral and long oblique fractures.

***2. Splinting***

Splinting is an operation performed in order to maintain the spatial position of an object relative to another object by rigidly connecting them with some device (for example, screws). The elastic properties of such a connection do not exclude the possibility of reverse deformations of the system.

An example of splinting to prevent length displacement is the syndesmosis screw. A 4.5 mm cortical screw, inserted through a thread cut in both tibia, fixes the position of the fibula in the tibial notch, creating an elastic connection without mutual compression.

Another example of splinting is the stabilization of an intramedullary nail against rotational and axial displacements by transfixing it with locking bolts to one or both fragments. The locking bolts then function as cross bars.

Finally, the classic version of the splinting screw is the Shants screw in external fixation devices.

***3. Plates***

Plates are implants that are fixed on the surface of the bone in order to connect its fragments. According to their shape, they are divided into straight, curly and angular (blade). According to the function performed, neutralizing (protective), compression, support (supporting) and bridge plates are distinguished. By the shape of the holes, the plates are classified as self-compressing and non-self-compressing. And, finally, by the

nature of the contact with the bone, full contact plates, limited contact plates, point contact plates and non-contact plates are distinguished.

**Neutralizing plates**

Osteosynthesis with lag screws allows you to achieve a very large interfragmental compression. However, it is not resistant to bending, torsion and shear deformation due to the short arm length. Under the action of a dynamic load, the threads in the bone are torn off. Therefore, osteosynthesis with lag screws "in pure form" is practically not used at present. It is always "protected" from dynamic loads by the imposition of a neutralization plate to counteract the forces of rotation, bending and shear. The plate is applied in a neutral position, and the main function of fixation lies with the interfragment lag screw. Any plate lying on the shaft of the bone can become a neutralizing plate, but more often straight plates play their role.

**Compression plates**

If the diaphyseal fracture has a short fracture plane (transverse, short oblique), it is impossible to compress the fragments with a lag screw. In this case, axial compression of the fragments is achieved using a compression plate. Such a plate is first fixed to one fragment, then with the help of a special tightening device, the fragments are compressed, and the plate is fixed in this position to another fragment. The resulting compression is static. It should be noted that due to the eccentric position of the plate (on one side of the bone), the compression force mainly acts on the cortical adjacent to the plate. The fracture gap in the area of the opposite cortical bone is widened. To compress it, you must first bend the plate so that its middle is 1.5-2 mm from the fracture zone (angle of 175 °). Then, when tightening the screws, the plate will press against the bone and, deforming, will close the fracture gap on the opposite side.

Another way to achieve axial compression is to use so-called self-compression plates (one-third-tubular, semi-tubular, dynamic compression). Due to the special shape of their holes, the eccentric introduction of the screw causes its spherical head to slide along the inclined fresco of their inner surface. In this case, the bone under the fixed plate moves horizontally and closes the fracture gap. Currently, in clinical practice, plates with round holes that do not induce self-compression are practically not used.

It should be noted that the compression created by the plates is many times less than the compression force under the action of an interfragmental tightening screw, and does not exceed 600 Newtons. Therefore, to enhance the compression, an additional lag screw can often be inserted through the plate and the transverse fracture line.

Due to the anatomical features, the bones are subjected to eccentric loading. So, compression forces act on the inner surface of the thigh, and stretching on the outer surface. The humerus is equally eccentrically loaded - the posterior, convex surfaces are subject to stretching, and the anterior, concave ones - to compression. The forces of compression and distraction on the lower leg and forearm are practically balanced. In case of a fracture of a bone with an eccentric load, to counteract the resulting flexion deformity, it is necessary to use a coupler, that is, to perform compression osteosynthesis with a plate, placing it on the side of stretching. The applied compression completely neutralizes the bending moment. Therefore, in case of a fracture of the hip, the plate should be laid along its outer surface, and in case of a fracture of the shoulder, along the back. On the lower leg and forearm, the plate can be placed both from the outside and from the inside. This takes into account the ease of access and the possibility of closing the implant with muscles (the threat of infectious complications in the case of subcutaneous placement of the plates!).

**Support plates**

With an intra-articular fracture, shear and flexion forces act on the fragments of the articular surface, causing them to sag. In order to support the articular surface, osteosynthesis with a support plate is performed. Precisely modeled along the contour of the bone, such a plate serves as a support for the fractured articular surface, preventing axial shear deformation. The screws inserted into the base plate can function as tightening screws. Due to the fact that the shape of the plate should reproduce the contour of the articular end of the bone, it is necessary that it be easily modeled. Therefore, the most common base plates are 2 mm thin T- and L-shaped plates. There are also support plates specially designed for common intra-articular fractures. For example, a spoon-shaped plate and a clover-leaf plate for fixing fractures of the distal

metaepiphysis of the tibia, a lateral plate for the head of the humerus and a condylar support plate for fixing intra-articular femoral fractures.

**Bridge plates**

In case of multi-splinter fractures with destruction of the diaphysis or metaepiphysis of the long bone over a long distance, performing a complete anatomical reduction becomes unnecessarily traumatic and difficult to perform. The surgeon is left with the task of restoring the length and axis of the limb. This can be done by osteosynthesis with a bridge plate. As a rule, it is a long and strong plate, fixed to the proximal and distal fragments and bridging the area of the multifragmented fracture. Such osteosynthesis is purely splinting. The main functional load falls on the implant, since the structural integrity of the bone is not restored, but only the length and the correct rotational position of the fragments are recreated. In osteosynthesis with bridge plates, fractures grow together with the formation of a large periosteal callus. Osteosynthesis of a multi-fragment fracture with a bridge plate can be called internal extrafocal osteosynthesis.

**Blade plates**

The name refers to the shape of the plates and the way they are fixed in the bone, rather than the function they perform. Wedge-shaped plates have a sharpened blade located at an angle to the diaphyseal part. The indications for the use of wedge-shaped plates are fractures of the metaphyseal zones of the bones in the case when the articular surface is not damaged or the intra-articular fracture is simple. The most commonly used wedge plate is the 95-degree condylar plate. This wedge-shaped plate is applied to the thigh for condylar, supracondylar, low diaphyseal and subtrochanteric fractures. There is growing interest in the use of wedge-shaped plates for fractures of the proximal metaphysis of the tibia, fractures of the surgical neck of the shoulder, fractures of the distal metaepiphysis of the radius, and periarticular fractures of the metacarpals, metatarsal bones and phalanges. The advantage of any angle-shaped plate is the achievement of rigid fixation due to a constant angle between the wedge-shaped and diaphyseal parts of the implant driven into the metaphysis. This completely eliminates the threat of angular displacement of fragments under the action of bending forces.

The 95-degree condylar plate is now being replaced by dynamic femoral and condylar screws. These implants also have a rigidly fixed angle between the metaphyseal and diaphyseal parts, but their insertion is less traumatic. In osteosynthesis of a bone with a complex configuration, it is necessary to use a plate that can be modeled in three planes. Reconstruction plates meet this condition. The indications for their use are fractures of flat bones (pelvis, skull, and facial skeleton), fractures of the clavicle, scapula and long metaphysis of the shoulder.

**Advantages of extramedullary osteosynthesis**

1. Extramedullary osteosynthesis allows achieving complete reduction, which is especially important in intra-articular fractures, since only anatomical reduction and rigid fixation create optimal conditions for cartilage regeneration.

2. Compression osteosynthesis with screws and plates provides the prerequisites for the manifestation of a unique property of bone - the ability to grow together by direct (primary) healing without the formation of periosteal callus.

3. Correctly performed extramedullary osteosynthesis allows for functional postoperative management of the patient, that is, early movements in adjacent joints, load on the limb and complete restoration of its function until the completion of the fracture union.

**Disadvantages of extramedullary osteosynthesis**

1. Plating requires extensive surgical access and long bone exposure. This increases the risk of developing infectious complications in comparison with closed intramedullary osteosynthesis or external extra-focal osteosynthesis.

2. Massive implants placed on the periosteum, even without peeling it off, lead to a violation of the periosteal blood supply. The plate, in contact with the bone with its entire surface, causes its necrosis and widespread osteoporosis. This is a natural biological response of the bone, expressed in the accelerated remodeling of its Haversian systems.

3. Osteoporosis-related impairment of bone strength can lead to refraction at the screw insertion sites if the plate is removed before the remodeling process is completed

(for the lower leg and thigh, the remodeling period after extramedullary osteosynthesis is 18-24 months).

**Plan:**

**1. Questions for self-control:**

- Types of osteosynthesis.
- What is stable-functional osteosynthesis?
- What devices and instruments are used for extramedullary osteosynthesis?
- What are the basic principles of extramedullary osteosynthesis?
- What are the advantages and disadvantages of extramedullary osteosynthesis?
- What are the prospects for the development of extramedullary osteosynthesis?

**2. The tests of different levels.**

1. Patient B., 34 years old, was taken to the trauma department. Complains of pain in the middle third of the forearm, dysfunction of the limb. Examination of the patient revealed a closed transverse fracture of the lower third of the ulna without displacement of fragments.

What method of treatment is appropriate for this patient?

A. Metal osteosynthesis

B. Extensional

C. Fixational

D. Functional

E. Transosseous osteosynthesis

2. Patient D., 52 years old, was admitted to the emergency department with complaints of pain in the right hip and looseness of the limb. 2 hours ago he fell in the street. The examination revealed a transverse fracture of the middle third of the femoral diaphysis with displacement of fragments along the length of up to 7 cm.

What method of treatment is indicated for this patient?

A. Fixational

B. Extensional

C. Metal osteosynthesis

D. Functional

E. Transosseous osteosynthesis

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic**: *«COMPLICATIONS IN THE TREATMENT OF INJURIES OF MUSCULOSKELETAL SYSTEM»* ***– 2 hours***

**Goal:** As a result of an independent study of the topic, students should:

***- know:***

1. New understanding of bone tissue regeneration processes (degree of reparative osteogenesis). Forms of Leriche-Zudeka syndrome, ischemic contracture Volkmann.
2. Reasons for (general and local factors) violations of reparative osteogenesis, the pathogenesis of the formation of a false joint. Precipitating causes of Zudek disease and ischemic contracture Volkmann.
3. Classification of pseud-arthrosis, depending on the clinical manifestations and radiological characteristics. Clinical phase of Zudek syndrome. The main symptoms of ischemic contracture of Volkmann.
4. General and local symptoms of treatment of bone fractures with impaired reparative osteogenesis. Know the methods of prevention and Volkmann contracture neuro-dystrophic Zudek syndrome. Indications for surgical treatment of ischemic contracture Volkmann.
5. Principles of rehabilitation of these complications.

***- be able to:***

1. Identify the characteristic clinical signs of a false joint contracture Volkmann and neuro-dystrophic Leriche-Zudeka syndrome. Interpret radiographs pseud-arthrosis.
2. Formulate a clinical and radiological diagnosis of pseud-arthrosis. To diagnose diagnostics contracture Volkmann, and neuro-dystrophic- Zudek syndrome.
3. Differentiate between un-united fracture of pseud-arthrosis. The X-ray to determine the types of callus; - The degree of adjustment of osteoporotic bone structure.
4. Recognize the early symptoms of contracture Volkmann.
5. Identify the main indications of conservative and surgical treatment of delayed fusion of bones, they were not fusion and pseud-arthrosis. Assign treatment of Zudek syndrome depending on the clinical phases. Properly apply a plaster cast.

**Basic concepts:**

As a result of violations of reparative osteogenesis fracture healing is slower, cases happen not fusion and formation of a false joint. This determines the general and local factors. The general belongs to: violation of the functions of the endocrine glands (diabetes and the like), pregnancy, beriberi. Acute and chronic infectious diseases, violation of trophic and the like.

Local factors are leading among the causes of the violation of reparative osteogenesis. They can be divided into 3 groups:

1) Errors during treatment: lack of reposition of bone fragments and eliminated interposition of soft tissue between them unreliable immobilization after reduction and frequent replacement of plaster casts, too extensive sclerosis of bone during surgery (impaired blood flow), the use of inappropriate clips for osteosynthesis (unstable fixation) etc.

2) Factors associated with the severity of the injury and its complications: multiple and open fractures, massive damage to the soft tissue (muscles and nerves), abscess and osteomyelitis.

3) The reasons which depend on the anatomical and physiological characteristics of the fracture: localization, the degree of blood supply (fracture of the navicular bone, or femoral neck) and the like.

Under the slow consolidation of the fracture understand those cases where the bone fragments fusion did not take place in common, normal terms for the specific localization of the fracture.

Asymphytous fracture is called one in which after a double term required for fusion of the bones determined clinically pain and pathological mobility and radiographically - gap between the fragments, but still closed (not spliced bone) marrow cavities.

During the mobility of fragments is constantly injured fresh callus structure inclusive of a newly formed blood vessels.

When saving propensity of the human body to repair processes in the fracture site appear "compensatory" changes in the form of boundary growths at the site of bone

fragments, that this or that measure gradually reduce the pathological mobility. To form hypertrophic or so-called "hyper-vascular" corn. When they dominate the processes of bone formation over bone resorption.

Clinically, in the area of bone fragments determine pathological mobility, pain, and radiographic fusion between them is not visible. This gap between the fragments filled with coarse fiber connective tissue.

Further regenerative process with delayed union can take place in two directions, which are dependent on a number of factors.

If the fragments are in contact with each other, and when load (physiological muscle contraction, the dosage load sling) acting force coincides with the axis of the damaged segment is perpendicular to the line of fracture, then there is metaplasia of fibrous tissue in the cartilage - namely, into the bone. That is, there comes a secondary fracture healing, although it lasts a long time.

In the case of bone fragments of mobility, when that force is not a segment of the axis, or is "on the cutting," that is the same as or close to the line of fracture, the fracture is not fused and gradually formed hypertrophic pseudo arthrosis.

The characteristic clinical sign of a false joint has abnormal mobility and the absence of pain at the site of the former fracture, and the presence of radiographic bone marrow cavities "closing the plates."

In cases of significant soft tissue damage, especially in the diaphyseal fractures, exposure of bone fragments at a stretch and diastasis between them as a result of violation of local blood supply to the repair processes are reduced, and fade with time. Dominated by the processes of resorption over bone formation. The ends of the fragments are thinner and pointed, and the gap between them - wider. Para-os bone layers, there is usually no. Fragments between a compound of connective tissue, which is the least differentiated and does not require a full blood supply. With substantial pathologic mobility between the fragments formed slit and a typical hyper-vascular ( 'atrophic') pseud-arthrosis, more often pseud-arthrosis of the tibia, at least - the bones of the forearm, shoulder and hip.

Prolonged pseud-arthrosis, the gap over time filled with mucoid fluid, and the ends of the fragments from the coarse fiber friction are covered with cartilage, are ground, the site is covered by "fibrous capsule", and thus there is a "new joint" (neo-arthrosis).

*Treatment* of bone fractures in violation of reparative osteogenesis includes general and local methods.

Common methods of treatment are to improve the immune-reaction forces of the body, muscle tone, improved hemodynamics, metabolic processes, and so on. To do this, use a full, rich in proteins and nutritional vitamins, anabolic steroids (Nerabol), ACTH, mummies, exogenous DNA and the like . Assign physical therapy, massage, physiotherapy (common KTS, warm wraps, vacuum electrophoresis of Ca, P, and the like).

Operative treatment of false joints are used for a long time and methods of operations have improved to the extent of the development of science. When pseud-arthrosis method of choice was ostheosintesis with bone grafting. When bare spots pseud-arthrosis bone fragments free of scars and refresh, and then reposition, firmly fix the intramedullary rod and auto-transplant. Less traumatic surgery - bone grafting for Hahutov.

When hyper-vascular pseud-arthrosis paid off operation "decortication" that updates the processes of regeneration.

Ischemic contracture of Volkmann develops due to long (take hours) and significant (but not complete) disorders of blood circulation in the limbs. This complication occurs after limb injury, and may be caused by a violation of blood flow at any level of the arteries. Usually ischemic contracture develops when supracondylar and condylar fractures of the humerus and forearm fractures. In most cases, ischemic contracture occurs when imposed tight circular plaster bandages, leading to disruption of the blood supply to the limb. When properly overlay the cast, but in the subsequent build-up of edema.

The main features are in the flexor muscles of the forearm pain, despite the good reposition of bone fragments. Permanent signs - the disappearance of the pulse at the

radial artery, increasing edema and cold extremities, disturbance of sensitivity and finger movements, they take flexion position.

Treatment. In the presence of the mentioned symptoms need to take urgent action:

- Cut plaster cast over the entire length and remove;
- Straighten the forearm to 110-120 degrees and apply a plaster splint or establish a system of cutaneous traction;
- Blockade on Vishnevsky in the upper third of the shoulder;
- Ice packs on his elbow and forearm.

If in the next 1 to 2 hours of blood supply disorders symptoms are persistent or growing, it should be without undue hesitation to start the operation: a longitudinal skin incision from the elbow to the wrist, cut fibrous bridges in the elbow bend and the forearm fascia, exposure of the brachial artery and the median nerve ;

- Neurolysis, removal of the proximal row of carpal bones of the wrist joint arthrodesis and others.

**Leriche-Zudek syndrome.**

The pathological condition caused by inflammation or damage to the soft tissues, nerves, bones and joints, the most striking manifestation of which is the expression of bone atrophy.

Cause of Zudek atrophy can be any trauma bones, joints, soft tissues (burns, frostbite, electrical accident), nonspecific purulent inflammation of bones and joints, damage of the central and peripheral nervous system, vein thrombosis and circulatory disorders, skin diseases, and others. In connection with this release:

- Acute traumatic.
- Infectious and inflammatory.
- Thrombotic and neurogenic Zudek atrophy form.

The clinical picture of the syndrome of Zudek distinguish 3 phases:

1. Inflammation.
2. Dystrophy (true)

3. Atrophy or terminate inflammation.

Microscopic examination indicated the rapid absorption of calcium in the bones move soluble state and "washing" it from the bones. In vivo detection, determination of the nature and extent of Zudek atrophy possible only with the help of X-rays.

Treatment:

- up position of limbs
- NPVS therapy
- immobilization limb functionally favorable position
- round or para-articular Novocain blockade.
- sacra-spinal Novocain blockade
- ganglion blockade
- active physiotherapy events (phase 3), thermal treatments, massage, occupational therapy, physical therapy.

**Plan:**

**1. Questions for self-control.**

1. What are the signs of consolidation of fractures, ischemic contracture Volkmann and Zudek syndrome?
2. What causes a violation of reparative osteogenesis fracture healing?
3. What are the typical clinical signs of delayed fracture consolidation, pseud-arthrosis, neo-arthrosis, ischemic contracture Volkmann and Zudek syndrome?
4. Identify types of callus, which will be formed by extramedullary, intramedullary, compression-distraction osteosynthesis?
5. What are the main radiological signs of delayed fracture consolidation, pseud-arthrosis, neo-arthrosis wrong accrete fracture Zudek atrophy?
6. What are the anatomical and physiological conditions of education pseud-arthrosis and delayed consolidation of the femoral neck bone fragments, the tibia in the lower third, the navicular bone, shoulder and forearm?
7. Name the basic principles of treatment of non-united fractures and pseud-arthrosis, ischemic contracture Volkmann, complex regional pain syndrome?

8. What are the indications for surgical treatment of false joints, ischemic contracture Volkmann?

9. What is bone grafting? List the types of transplants.

10. What is the position of taking fingers brush with muscular contracture Volkmann?

11. List the preventive measures at contracture Volkmann.

12. What is an arteriogram?

**2. Tests for self-control with correct answers.**

1. Violations of reparative osteogenesis assists:

A. Too prolonged fixation of bone fragments plaster cast;

B. Stiffness in the joints;

C. Unrelieved soft tissue interposition between the fragments;

D. Contractures of the joints;

E. Muscle atrophy

/ The correct answer is C /

2. The destruction of newly formed capillaries regenerate bone fragments produces:

A. Compression of bone fragments;

B. Diastasis between the fragments of 150-200 nm;

C. Para-os hematoma;

D. Reposition late to correct bone fragments;

E. Functional load.

/ The correct answer is D /

3. Primary bone fusion occurs over the shortest time at the diastasis between the fragments:

A. 150-200 microns;

B. 200-250 microns;

C. 50-100 microns;

D. 250-300 microns;

E. 300-350 microns.

/ The correct answer is C /

4. Radiographic signs of nonunion:

A. No gap between the fragments;

B. Closing bone marrow cavities, "platelets normally open";

C. Absence sclerosis at the ends of the fragments;

D. Lack of osteoporosis at the ends of the fragments;

E. Absence of osteophytes at the ends of the fragments.

/The correct answer is B/

5. The leading method in surgical treatment of pseud-arthrosis is:

A. Intramedullary fixation;

B. Osteosynthesis with allograft bone grafting;

C. Osteosynthesis with xenograft bone plate;

D. Compression-distraction osteosynthesis;

E. Operation of the "Russian castle."

/ The correct answer is D /

6. When any method of treatment of pseud-arthrosis bone fragments do not refresh and bone plate is not obligatory:

A. Bone grafting for Hahutov;

B. Auto-transplant with bone grafting;

C. Compression-distraction osteosynthesis;

D. Xeno graft bone plastics;

E. Operation of Chaklin using extra and intramedullary bone graft.

/ The correct answer is C /

7. Hyper vascular "atrophic" pseud-arthrosis process of fusion of fragments longer optimal when:

A. Segment fixation limbs (calf) plaster cast with a metal stirrup;

B. Prosthesis fixation segment;

C. Compression hardware osteosynthesis and bone grafting.

D. Compression hardware without bone osteosynthesis plate.

E. Applying operation microfracturing by Beck.

/ The correct answer is C /

8. In most cases there are pseud-arthrosis:

A. Femur;

B. Tibia.

C. Humerus;

D. Forearm;

E. Metatarsals.

/ The correct answer is B /

9. The most important clinical symptom in the early stages in ischemic contracture Volkmann is:

A. Pain in the distal limb segment;

B. Appearance of muscle contractures

C. Absence of a pulse in the peripheral vessels;

D. Violation of the sensitivity in the fingers of the hand;

E. Violation of finger movements.

/ The correct answer is C /

10. The restructuring of the osteoporotic bone structure with Zudeka syndrome occurs after the onset of disease later:

A. 6-8 weeks;

B. 7-10 days

C. 1.5-2 months;

D. 3-5 months;

E. 6-12 months

/ The correct answer is E/

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and

orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic:** *«PROSTHETICS IN TRAUMATOLOGY AND ORTHOPEDICS»* **– *2 hours***

**Goal:** As a result of independent work on the topic, students should:

***- know:***

1. Indications for amputation of limbs and their methods.
2. Requirements for formation of the amputation stump of the limb.
3. Indications and contraindications for prosthetics.
4. Types of prostheses, orthoses, orthotic devices and orthopedic footwear.

***- be able to:***

1. Identify the indications for amputation.
2. To determine the level of amputation for a function recovery after prosthetics.
3. Identify indications and contraindications for prosthetics.
4. Identify indications for prosthetic devices and orthopedic shoes.

**Basic concepts:**

Prosthetics - an integral part in the restorative treatment of various injuries and diseases of the musculoskeletal system. Numerous orthopedic and orthotic products on its purpose can be classified as follows:

• Medicinal products - designed to fixate the joints, limbs and spine, in order to save the results of conservative (surgical) treatment and saving of a functionally correct position. The products can play a supportive role. Medical products include tutorials, corsets, devices, bandages.

• Fixing products - prescribed to stabilize joints, limbs, spine with total paralysis of the muscles, spastic paralysis, partial destruction of the joint, the spine (after osteomyelitis, tuberculosis).Products help to perform a support function and to maintain the correct position of segment. These include inarticulate devices, holding corsets.

• Orthopedic shoes – is appointed at defects of the feet (congenital and acquired deformities), shortened of limbs, on orthopedic appliances.

• Prostheses - items, replenishes the lost body part. There are the upper limb prostheses (functional, cosmetic), prostheses with working nozzles, lower limb

prostheses (functional and cosmetic work), and prostheses of breast, eye, ear and other organs.

• Other devices: strollers, manual car, "walker", crutches, sticks, insoles, clothing, etc.

**Medical orthopedic articles**

**Tutor** - a device for joint fixation, when it is necessary to exclude the active and passive movements. Tutor can be combined, that is to fix two adjacent joint, such as knee and ankle. Tutor is made from leather, polyethylene resin, so it exactly matches the shapes and sizes of the joint.

Tutors are assigned after tuberculous processes in the joint for the prevention of secondary deformities after surgery arthrodesis or resection arthroplasty before development of bone ankylosis, deforming arthritis with III degree with significant pain.

**Corset** - designed for fixation and unload of the spine, correction of deformity and improving muscle function of trunk. Corsets are made from plaster casts, and they exactly correspond to the forms and dimensions of the chest. They can be made of thick durable material, polyethylene, polyamide resin. Cloth and leather corsets can be reinforced further by metal rails, which give the product properties of a fixator. Unloading of the spine in a corset is made by accurate modelling of the product in the wing of the ilium. On effects on spine corsets are distinguished in fixation and corrective (functional).

***Fixation corsets:***

Fixation corsets help to create a stiffness of the affected spine. However, they are also unloading and correcting. The patient should wear a fixation corset in the supine position. Taking into account the immobility of the spine in a long period, it is recommended after removal of the corset to perform exercises to strengthen back muscles, abdomen, extremities, and in the supine position (mainly reclination exercises).

***Corrective corsets:***

The main purpose of corrective corsets – to impact on the curvatures of the spine to correct them. All corsets of the group, except the correction, in varying degrees unload and support the spine.

For scoliosis I degree and defects of posture (round or hunched back) is recommend fabric or hard corset-reclinator.

For scoliosis II - III degree is prescribed corrective functional corset, which not only corrects the violations in the static case, but also at the same time maintains maximum function of the spine.

**Bandage** - a product developed for additional fixation of the anterior wall of the abdomen at its weaknesses, the divergence of false symphysis, and descent of the pelvic organs. Bandages are made-to-measure from durable unstretchable fabric with a lining. Its amount is adjusted with lacing at the back surface of the product.

**Fixing orthopedic products**

Depending on the target apparats are divided into produce functional (inarticulate), fixation and unloading.

The basis of the device, regardless of its type - metal frame of the longitudinal tires on both sides of the product, connected by a hinge. If it`s necessary to turn off the motion in the knee or hip joints are added locks that can be opened for convenience, when the patient sits up. In the transition to a vertical position hinges are automatically closed at the expense of special tools with rubber or spring-rods. Also produce devices using semi-finished metal, but on an individual plaster casts.

**Functional units (inarticulate):**

The peculiarity of them is maintaining sufficient mobility in the joints to ensure stability of walking. Using functional products - a kind of gymnastics and mechanic therapy that has a therapeutic effect on the recovery of muscle function.

**Fixing devices:**

If there are locks in the apparats inarticulate device becomes a locking (latching). Indications for apparats of this group:

• widespread paralysis of the limbs after poliomyelitis in the residual phase and after spinal cord injury;

• child cerebral palsy;

• condition after intra-articular or periarticular fractures with delayed consolidation.

Walking in the locking apparatus with shutting down of joints movements is accompanied by low muscle activity and contributes to their atrophy. Therefore, the wearing of such a device should be combined with passive, and while maintaining muscle - with active movements and foot massage.

**Unloading apparatus**

Main purpose - unloading the entire lower limb or separate joint. Unloading apparatus prescribed in the following situations.

• If necessary, unload the lower limb after surgery, especially after bone grafting for a period of adjustment of the graft.

• After the inflammatory joint disease in remission stage.

• At the delayed consolidation when there is no need to remain in the cast, and the load on the limb is premature.

• At the paralytic trophic ulcers for a rest the limb.

**Orthopedic shoes**

In some diseases (flat feet, heel spur, a small shortening of the limb, valgus deformity of the big toe) are used orthotic components: insole, supinators, interdigital pads, which invest in any shoes. Orthopedic shoes should be encouraged after consulting with an orthopedic doctor and in the subject to the maximum deformity correction with conservative (in children) or a surgical treatment.

Simple orthopedic shoes are made for standard wooden pads with the correction of defects.

Complex orthopedic shoes are made for individual plaster casts, which can be simulated then with existing defects: compensate for shortened limbs, feet, if possible, conceal the shortcomings of the form. Finished shoes must have sufficient bearing area, facilitate a person walking, improve impaired static, eliminate or reduce lameness, make walking a more supple and resilient.

**Prosthesis of limbs**

Prosthesis is called a product that replaces a missing part of the limb. For the lower limb are made prosthesis of shin, thighs, and the prosthesis used after isolating legs out of hip joint. For upper limb are prostheses of the fingers, wrist, forearm, upper arm and prosthesis used after isolating the arm out of shoulder joint. By the degree of recovery of lost functions prostheses are divided into three groups.

1.Cosmetic, reproducing only the appearance of the limb. Such prostheses prescribed only for the upper limb and in the absence of one hand.

2.Functional and cosmetic, restoring all or part of the lost functions and reproducing the shape of the limb.

3. Working prostheses to help disabled perform certain movements.

Type of prosthesis is chosen, guided by the length and condition of the stump, the activity of the invalid and social orientation. The component parts of the prosthesis: reception cavity communicates with the body of the prosthesis, and missing parts artificial of limb (shin-foot, forearm-wrist). At the level of the former joint parts the prosthesis is connected with moving artificial joints.

Prosthesis - an individual product, made strictly on the forms and dimensions of the stump of invalid. This is achieved by adjusting of the receiving cavity or manufacture of plaster casts of the stump. The receiver can be made of leather (soft receiving cavity), wood, metal, plastic, polyamide resin (hard receiving cavity).

At hanging shin stumps support in the prosthesis is made on tuberosity and condyles of the tibia, and femur stumps - on the sciatic tuber, greater trochanter and femoral muscles. At the supporting stumps load falls mainly on the end of the stump, resting in the bottom of the receiving cavity.

Particular difficulties arise in prosthetics of invalids who have lost their upper limbs. Until now, are used so-called active force, or traction, prostheses. Disclosure of fingers in them to capture the subject expenses with movement of shoulder girdle. Achievements in upper limb prosthetics at their time were the bioelectric prostheses. Their work is based on the principle of using external energy sources in combination with bioelectrical activity of muscles. The advantage of bioelectrical prosthesis is in the natural phantom movements of the hand. You do not need big muscular effort, the

capture is corrected by the visual. Such prostheses are appointed to persons with burning phantom pain of amputated limb.

To increase self-care and volume of possible work invalids are supplied with the work prostheses with different attachments: a hook, hammer, chisel, scissors, a ring for shovels, rakes, etc. Unfortunately, the modern scientific and technological level of the upper limb prostheses cannot let many disabled people to live without outside help.

Prosthesis has not only the purpose of the external replacement of lost segment, but puts overall task of the maximum possible recovery of its functions and return a person to socially useful work. The latter circumstance has a great psychological importance for the invalid; he realizes that he may be useful to society.

**Plan:**

**1. Questions for self-control.**

1. Describe features of orthotics devices for the lower limb.
2. Indications for the imposition of an orthopedic device to the upper limb.
3. Types of orthopedic corsets.
4. Types of orthopedic shoes.
5. The classification of types of prostheses.
6. Features of the stump preparation for the prosthetics after the amputation of shin.
7. Features of the prosthetics of forearm.
8. Prosthesis after isolation.

**2. Tests for self-control with correct answers.**

1. Orthoses are made of all materials, except:

A. Iron;

B. Wood;

C. Skin;

D. Skin imitation;

E. Matter.

2. What endprostheses are used in plastic of the hip joint?

A. Smith-Petersen;

B. Moore;

C. CITO;

D. Sivash;

C. Zimmer.

3. Indications for amputation:

A. Opened and gunshot fracture of limbs;

B. Combined and multiple injury;

C. Gangrene;

D. Obliterating endarteritis;

E. Malignant tumors.

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

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**Topic: «***ENDOPROSHETICS IN ORTHOPEDICS AND TRAUMATOLOGY***» - 2 *hours***

**Goal:** As a result of self-study of this topic, students should:

***- know:***

1. Indications for endoprosthetics.
2. Types of endoprostheses.
3. Basic principles of endoprosthetics.
4. Possible complications after endoprosthetics.
5. Disadvantages of this method of treatment.

***- be able to:***

1. Determine indications and contraindications for endoprosthetics.

**Basic concepts:**

## PRINCIPLES OF JOINT ENDOPROSHETICS

Replacing lost organs and tissues with artificial ones is an old dream of all doctors. In the old days, random materials were used to replace, for example, individual segments of bones - wood, ivory, metal rods. However, these were only attempts to find a reliable replacement for the lost anatomical structures and to obtain the desired functional result.

The most urgent problem of reconstructive surgery of the musculoskeletal system is the restoration of painless joint mobility and limb support. Joint pathology is a disease of the century. Joint dysfunction is associated with congenital pathology, trauma, rheumatoid, infectious lesions and is the most common degenerative-dystrophic pathology.

This pathology is caused by metabolic and hormonal disorders, adynamia, overloads, etc. Degenerative-dystrophic changes in the articular cartilage lead to its thinning, decrease in shock-absorbing properties and, as a result, the appearance of bone-cartilaginous growths on the articular surfaces, the formation of so-called spine-like outgrowths. At the same time, deep pathological changes occur in the joint capsule, the destruction of cartilage with its disappearance in a number of areas of the articular

surfaces, which on radiographs manifests itself in the form of a sharp narrowing of the joint space.

Only at the beginning of the disease, when the phenomena of deforming arthrosis are expressed to an insignificant degree, can one expect a relatively long-term effect from conservative treatment. With the progression of the process, increased pain, the formation of deformities (this is especially significant on the lower limb), there are indications for surgical treatment: osteotomy, arthroplasty, arthrodesis.

The above applies not only to the lower limb. True, for the upper limb, the main thing is to ensure the mobility of the joint; however, for patients with physical labor, in addition to the mobility of the joint, its stabilization is also necessary. And this can only be achieved by joint replacement.

The creation of optimal designs of endoprostheses, modern anesthetic, instrumental and surgical support, and the development of a system of postoperative rehabilitation of patients has caused an avalanche spread of endoprosthetics of joints, especially of the hip, in the last 15-20 years.

Endoprosthetics is an operation to replace joint components with implants that have the anatomical shape of a healthy joint and allow the entire range of motion.

The technological rise of endoprosthetics and total endoprosthetics of joints, mainly of the hip, dates back to the 50-60s. Deep material science research led the Englishman J. Charnley to create the theory of low-friction endoprosthetics, which played a revolutionary role in the development of the problem of endoprosthetics.

The low coefficient of friction in the mobility unit and the cement fixation of the endoprosthesis components in the bones made it possible to successfully solve the problem of hip endoprosthetics for up to 25 years. J. Charnley was the first to propose the use of ultra-high molecular weight polyethylene in the mobility unit. This material is still the best as one of the components of the mobility unit of the hip and other joints endoprostheses. He also developed special acrylic cement for anchoring endoprostheses in the bone, which is still widely used today.

As it was said, there were two ways to fix the endoprosthesis - mechanical and using acrylic-cement. Both have their positive and negative sides, as well as indications

for use. It must be said that recently up to 80% of endoprostheses were fixed with acrylic cement. Recently, there has been a tendency towards an increase in the proportion of cementless endoprosthetics. This is due to the emergence of new designs of endoprostheses, which differ in the nature of the surface of the stem and cup and other features that increase the degree of attachment of the endoprosthesis.

According to the fixation method, hip joint endoprostheses can be divided into three groups - cement, cementless and hybrid fixation. In the first case, parts of the joint are attached to the bones using a special high-strength polymer, called the not entirely successful term "bone cement".

In the second case, the surface of the endoprosthesis is covered with a special material even at the stage of its manufacture, to which the surrounding bones seem to "grow" due to the "Press-fit" technique.

In the third case, one of the components is fixed with bone cement, and the second component is fixed using the “Press-fit” technique. All fixation methods ensure reliable fixation of the endoprosthesis. However, it is believed that younger and more physically active patients are better suited for cementless endoprostheses, while for the elderly, cement ones.

A distinction is also made between unipolar (only worn parts of the joint are replaced, for example, the head of a bone or glenoid cavity) and total (the entire joint is replaced with an endoprosthesis) methods of endoprosthetics.

In a healthy human joint, friction occurs between the articular cartilages. In an artificial joint, rubbing surfaces are most often made from:

• a metal alloy and a high-strength polymer called high-pressure polyethylene (metal-plastic friction pair);

• ceramics (friction pair "ceramics - ceramics");

• metal alloy (metal-to-metal friction pair).

Today the most common friction pair is "metal - plastic".

The materials from which modern joint endoprostheses are made are highly durable and take root well in the human body. The endoprosthesis, like any mechanical structure, is subject to wear. Its service life to a certain extent depends on the loads to

which it is subjected during operation. Obviously, the younger the patient is and the more active he leads, the more intensive the wear of the artificial joint will be. In old age, when physical activity decreases, the life of the endoprosthesis increases. As a rule, if the doctor's recommendations are followed, more than 95% of endoprostheses function normally for 15 years, and in some cases for more than 20 years. After this time, the probability of mechanical destruction of the endoprosthesis or its loosening in the bone (instability) increases significantly. As a rule, this is manifested by pain in the joint area. In such a situation, a second endoprosthesis operation is required (the so-called revision), during which the unstable endoprosthesis is replaced with a new one. Thus, only elderly patients can avoid reoperation (revision). For people of middle and especially young age, in the future, it will almost inevitably arise the need for revision endoprosthetics.

According to their design features, knee joint endoprostheses are divided into 2 types: sled type and articulated all-assembled;

for materials in the mobility unit - metal-polymer and metal-plastic metal;

by the method of anchoring in the bone - for mechanical fixation or with the help of bone cement.

In the case of ankle endoprosthetics , which is done very rarely, a metal-polymer endoprosthesis is usually used, which is usually fixed with bone cement. The large loads applied to the joint and the small size of the talus do not allow reliable use of the mechanical method.

The joints of the upper limb, in comparison with the joints of the lower limb, have their own peculiarities, which cause differences in approaches to the designs of endoprostheses and methods of endoprosthetics.

Shoulder endoprosthetics is rarely used. When designing shoulder joint endoprostheses, it is possible to create structures that would block the anatomical and functional capabilities of the joint. From this point of view, a total one-piece shoulder joint endoprosthesis is not an optimal design. There is reason to believe that it is more rational to create split designs. Stabilization of the joint should be ensured by the tone of

the muscles surrounding the shoulder joint. Under these conditions, one can expect to obtain a sufficient range of motion in the shoulder joint.

It should be noted that unipolar endoprostheses are quite acceptable for shoulder endoprosthetics, since the patient is unlikely to significantly overload the joint with excessive efforts after endoprosthetics.

At the same time, when creating unipolar endoprostheses, it is necessary to ensure such a selection of material for the mobility unit, the modulus of elasticity of which would be close to the modulus of elasticity of the cartilage and the coefficient of friction would be as low as possible. This is achieved by combining materials - creating a metal-polymer structure, in particular, using a silicone coating on the endoprosthesis head.

Endoprosthetics of the elbow joint, in addition to the general features inherent in endoprosthetics of other joints, is also complicated by local ones. These include, first of all, the absence of muscle mass around the joint, and therefore a thin integumentary layer (skin, subcutaneous tissue, fascia) is in direct contact with the endoprosthesis. Due to the absence of a muscle "pad" between the endoprosthesis and the skin, in some cases, bedsores appear - a formidable complication during endoprosthetics.

A special place in the endoprosthetics of large bones and joints is occupied by the replacement of a completely affected joint with a large segment of bone. The indications for this kind of surgery are often bone tumors. These are the so-called savings operations, which in some cases are performed instead of limb amputation. At first, an allograft was used as a "substitute" for the removed bone segment. However, experience has shown that the use of large allografts for replacement of a joint and a large bone segment does not solve the problem, because both the functional result and the support of the limb were disappointing. This situation aroused interest in finding a solution to the problem of endoprosthetics.

However, the need for combined endoprostheses is not limited only to tumor pathology. A considerable number of patients suffering from other diseases and deformities caused by other reasons (for example, echinococcus of the bone, defects after bone resection due to infectious diseases and injuries), there are also patients who have to use combined joint-bone endoprostheses.

The radial head endoprosthesis has an original attachment that fixes the stem in the radial canal. An endoprosthesis is used for fragmental fractures of the radial head, in some cases for rheumatoid arthritis. Endoprosthetics of the radial head after its removal is, on the one hand, a therapeutic surgical technique, and on the other, prophylactic, since as a result of this operation conditions are created that prevent the upward displacement of the radius and a violation of the bone ratio in the wrist joint.

The wrist joint in anatomical and functional terms is a complex formation. Total wrist endoprosthetics is a rare operation. For this, hinged samples are used. The endoprosthesis is fixed by introducing its legs into the radius and into the II-III metacarpal bones. The indication for total wrist endoprosthetics is usually rheumatoid arthritis, less often post-traumatic arthrosis with pronounced joint stiffness.

Endoprosthetics of the joints of the fingers of the hand is most often done in case of rheumatoid arthritis.

Today, there are 2 types of finger joint endoprosthesis designs: articulated and non-articulated. At first, the hinges were made entirely of metal, there was a metal-metal pair in the mobility unit, then a polymer was introduced into the mobility unit, and a metal-polymer endoprosthesis was created.

**Plan:**

**1. Questions for self-control.:**

- Indications for endoprosthetics?
- What materials are used for the manufacture of endoprostheses?
- What are the design features of various joint endoprostheses?
- Disadvantages of endoprosthetics?

**2. The tests of different levels.**

1. Differentiate coxarthrosis should:

a) with rheumatoid arthritis

b) with tuberculous process

c) with ankylosing spondylitis

d) with osteochondrosis with radicular syndrome

e) with sacroiliite

2. The most characteristic radiological sign of coxarthrosis:

a) narrowing of the joint space

b) degenerative cyst in the head and in the lid of the cavity

c) bone growths around the joint

d) sclerosis of the subchondral region of the head and cavity in the area of the most loaded part of the joint

e) all of the above

3. A 50-year-old patient with stage III bilateral coxarthrosis, severe pain syndrome and limited movement in the hip joints (adductor-flexion contracture in the sagittal plane within 160-100 °, no rotational movement, no abduction of the hips). On radiographs, the joint space is barely visible; the heads are sclerosed, the roofs of the acetabulums are sclerosed. There are single degenerative cysts in the heads and cavities. During radionuclide examination, there is a decrease in the concentration of the radiotracer in the projection of both hip joints. The patient is prescribed:

a) regular conservative therapy 2 times a year, including mud therapy

b) arthroplasty on both sides

c) endoprosthetics with a bipolar prosthesis on one side and the second stage - arthrodesis of the second joint

d) bilateral endoprosthetics

e) osteotomy according to McMurray on both sides

4. A 21-year-old patient has dysplastic right-sided coxarthrosis of I, II degree. Disturbed by pain in the hip joint after exercise, while walking long distances. Rotational movements are limited, adduction and abduction are not limited. The volume of movement in the sagittal plane is complete. On the roentgenogram, there is sclerosis of the subchondral part of the head and cavity at the site of the greatest load. The cavity is

shallow, the roof is underdeveloped, and there is a deficiency in covering the femoral head. The patient is prescribed:

a) conservative therapy, including ultrasound with hydrocortisone, massage, exercise therapy, mud therapy

b) Foss operation

c) McMurray operation

d) Hiari osteotomy

e) subtrochanteric detorsion osteotomy and Hiari osteotomy

5. Patient 50 years old with idiopathic coxarthrosis II degree. left hip joint Pain when walking at the end of the day after a functional load. Limitation of rotational movements in the joint, limitation of abduction of the hip, adductor-flexion contracture. The roentgenogram shows good centering of the femoral head, a deep depression, and there is no deficiency of head coverage. The joint gap is narrowed, there is a reactive bone growth in the roof area, a degenerative cyst in the head. The patient is prescribed:

a) conservative therapy

b) operation on Brantes - Foss

c) operation on McMurray

d) subtrochanteric osteotomy according to Pauls

e) arthroplasty of the hip joint

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic:** *"METHODS OF PHYSIOTHERAPEUTIC TREATMENT IN TRAUMATOLOGY AND ORTHOPEDICS"* ***— 2 hours***

**Goal:** As a result of independent work on the topic, students should:

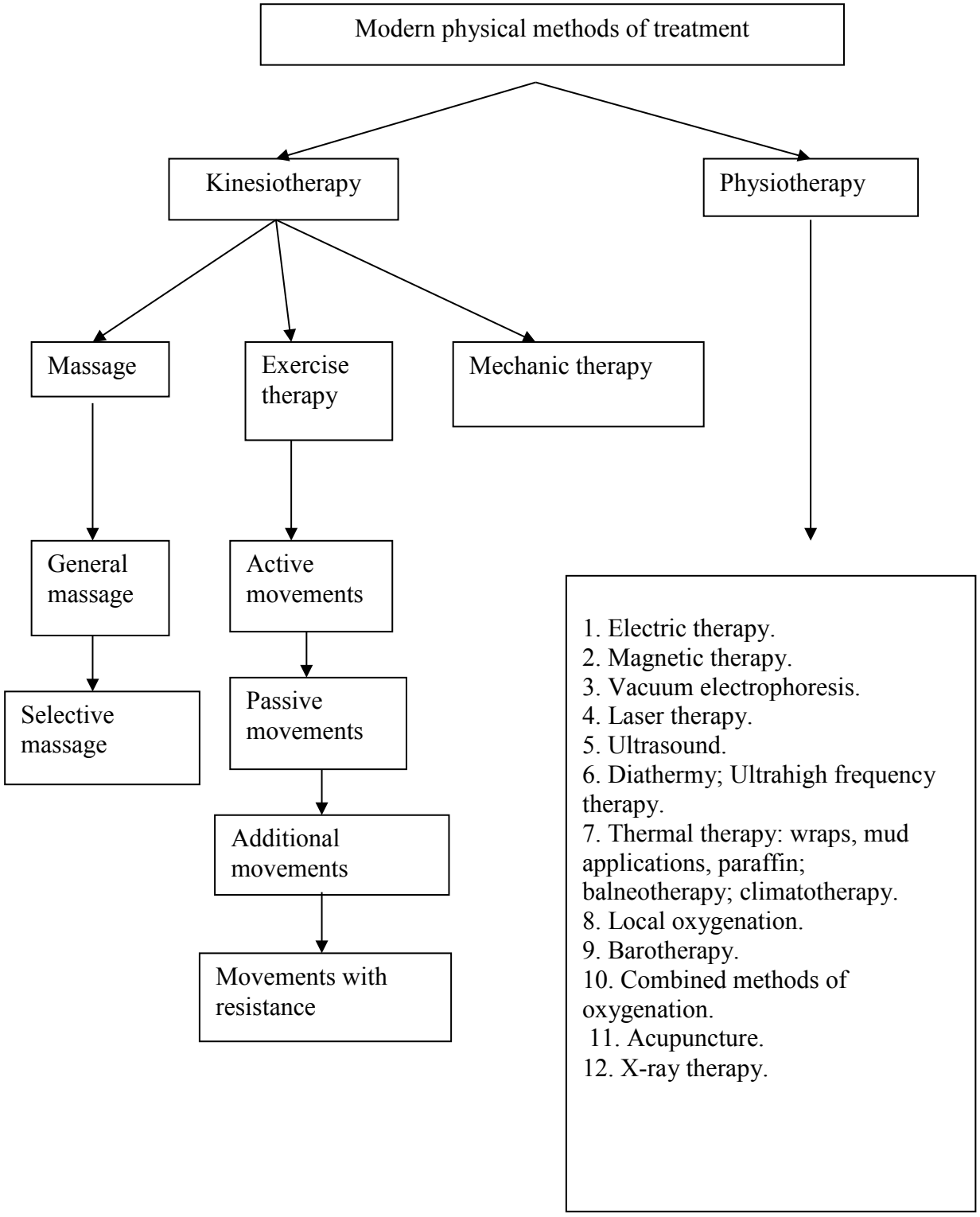
***- know:***

1. The process of reparative osteogenesis, its stages.
2. Conditions affecting on terms of formation of the regenerated.
3. Deviations from the usual flow of the process of repair.
4. Types of nonunion.
5. Clinical and x-ray methods of diagnostic of.
6. Tonic massage, exercise therapy, elements of manual therapy.
7. Physiotherapeutic methods of treatments (magnetic therapy, vacuum electrophoresis, oxygen therapy, ultrasound, etc.)

***- be able to:***

1. Use clinical and radiologic methods of examination of patients with injuries of bones.
2. Conduct methods of local anesthesia.
3. Use technic of massage.
4. Use simple elements of manual therapy.
5. Conduct exercise therapy.
6. Conduct physiotherapy.

**Basic concepts:**



**Plan:**

**1. Questions for self-control.**

1) What are the basic principles of rehabilitation?

2) What are the targets of rehabilitation?

3) What questions solves medical rehabilitation?

4) How are classified resorts on natural healing factors?

5) What are the main types of spa facilities?

6) What is the essence of ultrasonic sound?

7) What methods of oxygen therapy do you know?

8) What is the structure of rehabilitation centers?

9) What is cause of the choice of method occupational therapy?

10) What are the rules and methods for recovery of injured limb?

11) What are the terms of immobilization and incapacity of physical and mental healthy persons with injuries of the locomotor apparatus?

12) What types of rehabilitation centers exist?

13) What is the essence of magnetic therapy?

14) What is the essence of vacuum electrophoresis?

15) What are the main elements of physiotherapy?

16) What combined methods of physiotherapy do you know?

**2. Tests for self-control.**

1. What should be considered at the rehabilitation measures?

A) Course of the disease process;

B) Conditions of life;

C) Work conditions;

D) Marital status;

E) Character.

2. The basis of the effectiveness of rehabilitation:

A) early start;

B) late start.

3. At having disability, what kinds of difficulties there are?

A) physical;

B) mental;

C) psychological;

D) material;

E) social.

4. On which major organism systems physical factors have effect?

A) bone;

B) muscle;

C) nervous;

D) vascular;

E) endocrine.

5. What main actions are included in recovery of physical functions?

A) rest;

B) increase of the joints mobility;

C) strengthening of muscles;

D) high-calorie food;

E) breathing exercises.

6. What is the basic mechanism of effect on tissue of vacuum electrophoresis?

A) updates" the bloodstream;

B) promotes hypertrophy of axons;

C) affects on acupuncture points;

D) changes the impedance of tissues;

E) affects on hormones.

7. What types of balneotherapy you know?

A) carbonate waters;

B) hydrogen sulfide waters;

C) radon waters;

D) nitrogen-siliceous thermal waters;

E) glandular waters.

8. What conditions in tissue builds oxygen therapy?

A) increases muscle tone;

B) improves the oxidation-reduction processes;

C) increases the content of oxygen;

D) contributes to the lysis of scar tissue;

E) beneficially affects on nerve endings.

9. What is the therapeutic effect of mud applications?

A) promotes relaxation of the spastic contracted muscles;

B) improves hemodynamics;

C) improves the metabolic processes;

D) has analgesic effect;

E) allows to carry out the development of movements more effectively.

10. What the basic techniques of massage techniques do you know?

A) pressure;

B) stroke;

C) grinding;

D) kneading;

E) pounding..

**3. Tasks for self-control.**

1. A young man 25 years old, during a football game, has injured right shin. 3 months after the immobilization was produced by X-ray control. The X-ray shows the line of fracture. Make a clinical diagnosis. Explain the method of treatment. What additional treatment is necessary to physiotherapeutic factors?

2. In the traumatological emergency room turned came 49 years old man complaining of pain in the right ankle joint, which appeared at the fall on feet 6 months ago. Make a clinical diagnosis. Please chose and justify a method of treatment, make a prediction.

3. To physician came the patient about 63 years complaining on severe pain in the lumbar spine. In anamnesis is fracture of $L^1$ 1 year ago. Specify the order of the

examination, make clinical diagnosis and indicate possible effects of physiotherapy, methods of immobilization, and a spa treatment. In this case, is there a need in vacuum electrophoresis, massage, and if so, justify.

4. At the falling the patient injured elbow joint. At examination: thickening, cyanosis, severe pain on palpation, absence of movements. After diagnosis, the patient is imposed a skeletal traction for ulnar bone. Indicate the order of treatment and rehabilitation.

5. In the clinic came a man 38 years with complaints of severe pain in the stump of his left shin (in anamnesis is car accident). Make a diagnosis. Make a list of rehabilitation activities, a further prediction. Is there shown use of magnetic therapy in this case?

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic**: *«METHODS OF TRANSPORT IMMOBILIZATION AT FRACTURES OF LIMBS»* **- 2** ***hours***

**Goal:** As a result of an independent study of the topic, students should:

***- know***:

1. What is transport immobilization
2. Types of transport immobilization used in the provision of medical care.
3. Conservative and surgical methods of treatment of patients with open and closed injuries of the extremities and the means of transport immobilization used in this case.
4. Existing methods of transport immobilization of limbs.
5. Existing methods of medical immobilization of the limbs.

***- be able to:***

1. Carry out transport immobilization of the limbs
with service remedies for limb injuries
2. Perform local infiltration anesthesia of the injury site,
introduction of a solution of novocaine or lidocaine into the hematoma, and carry out the necessary transport immobilization of the limbs.
3. To carry out case anesthesia in case of open trauma of the extremities.
4. Inspect the wound, stop bleeding with a pressure bandage for venous bleeding or a tourniquet for arterial bleeding and carry out the necessary transport immobilization of the limbs.
5. Apply the necessary transport immobilization with standard tires.

**Basic concepts:**

To implement the objectives of the lesson, students need basic knowledge in the following areas:

1. Desmurgy
2. Equipment for skeletal traction (tires, staples, knitting needles, spoke tensioner).
3. Types of transport immobilization of fractures of the upper limb
4. Types of transport immobilization of lower limb fractures

5. Service means for transport immobilization (Cramer tires,

Dieterichs, inflatable rubber pneumatic tire, etc.).

With closed injuries in outdoor conditions, the limb is immobilized using improvised means. In case of open fractures, limbs are immobilized by standard means for transport immobilization (Kramer's, Dieterichs' tires, an inflatable rubber pneumatic tire, etc.), they temporarily stop bleeding (pressing bandage, tourniquet), an aseptic bandage is applied to the wound, painkillers, broad-spectrum antibiotics are administered , tetanus toxoid for the vaccinated; and tetanus toxoid for the unvaccinated. Control and correction of dressings and hemostatic tourniquets, improvement of transport immobilization with the help of Kramer and Dietrichs service tires are carried out. Pain relievers and antibiotics are administered.

Group 1 - those in need of first aid for non-delayed indications in the dressing room:

a) with open fractures and not stopped external bleeding;

b) with a previously applied tourniquet;

c) in a state of shock;

d) with torn off limbs hanging on a skin flap;

e) with open fractures, in which there is a threat of pain shock development;

f) contamination of wounds and dressings with radioactive and toxic substances.

Group 2 - those in need of first aid in order of priority: there are no signs of shock, it is necessary to improve transport immobilization, fix dressings, introduce antibiotics, pain relievers, etc.

Group 3 - patients *in a terminal state remain at this stage for symptomatic treatment.*

Transport immobilization of the extremities is carried out with the service tires of Kramer and Dietrichs. Their design allows, by bending, to give the tire the required position. Further fixation of the splint to the body is carried out with soft gauze bandages. Surgical treatment of an open fracture at this stage should be completed by washing the wound, reposition of bone fragments, injecting antibiotics into the soft tissues around the wound, installing drainage tubes for flow-washing drainage, applying

an aseptic dressing to the wound and immobilizing the limb using one or another type of plaster cast ... In severe injuries, when the limb is not viable, they resort to amputation of the limb for primary indications, one of the existing methods. After X-ray clarification of the nature of the fracture, the primary task of this stage is to choose a method of further treatment.

1. In case of bone fractures without displacement or with slight displacement, treatment with a fixation method (immobilization of the limb with a plaster cast).

2. In case of many comminuted hip fractures, especially in the presence of purulent infection, pronounced edema of the damaged segment of the limb, the need to reposition the fragments during treatment, transport immobilization is replaced by the method of permanent skeletal traction.

3. Transport immobilization for various types of open fractures of the hip is of a temporary nature and later, upon admission of the victim to the hospital, stable out-of-focal osteosynthesis of the wire using rod or rod devices is shown. In the presence of a bone defect, a compression-distraction apparatus can be applied. Slow distraction will create an opportunity to form bone regenerate and thereby restore the required limb length. In addition, it is possible to create good conditions for the treatment of soft tissue wounds, including the restoration of lost skin by various methods of skin grafting.

4. After suppression of wound infection and wound healing, submersible stable-functional metal osteosynthesis can be applied without additional external fixation. However, provided that there are rod or rod apparatuses previously applied to the wire that preserve the stability of the bone fragments, the treatment can be continued with these apparatuses.

**Plan:**

**1. Questions for self-control.**

1. Brief description of transport immobilization.

2. Desmurgy types of soft bandages on the upper limb

3. Types of transport immobilization with fractures of the upper and lower extremities.

4. Describe the scope of first aid for fractures of the lower extremities.

5. Outline indications for standard tires for transport immobilization

6. Describe and define the purpose of the chase and hip bandage, kerchief bandage, Delbe rings.

7. Outline the rules and terms for applying plaster casts.

8. What methods of fixing fractures are used?

9. Formulate the indications for lower limb amputation.

10. Describe the complications when using the transport immobilization method.

**2. Test questions and tasks for self-control.**

1. Conduct an objective examination of the patient.

2. Get acquainted with the rules of desmurgy, study the types of soft bandages for the upper limb.

3. Measure the length of the limb and assess the volume of active and passive movements in the joints of the injured lower limb.

4. Analyze the radiograph of the affected segment.

5. Plaster casts, types and their purpose.

6. To study the complications of using plaster casts.

7. Apply Cramer's splint on the lower limb, learn how to apply a persecutory plaster cast.

8. Prevention of immobilization contractures.

**3. Tests for self-control.**

1. When examining a patient with an injury of the upper limb, a violation of its anatomical axis at the level of the elbow joint with an angle open outwards is determined. What kind of violation of the anatomical axis of the limb is the patient?

A. Varus

B. Recurvation

C. Valgus

D. Antecurvation

2. When examining a patient with an injury of the lower extremity, a violation of its anatomical axis is determined at the level of the knee joint with an angle open anteriorly. What kind of violation of the anatomical axis of the limb is the patient?

A. Varus

B. Antecurvation

C. Valgus

D. Recurvation

3. When examining a patient with an injury of the upper limb, the violation of its anatomical axis is determined at the level of the middle third of the shoulder with an angle open posteriorly. What kind of violation of the anatomical axis of the limb is the patient?

A. Valgus

B. Recurvation

C. Varus

D. Antecurvation

4. With conservative treatment of a clavicle fracture, all of the listed dressings are used to immobilize the clavicle, except

A. Kuzminsky tires

B. 8-shaped bandage

C. Rings Delbe

D. Plaster cast according to Tourner

5. After repositioning the dislocation, the shoulder should be fixed with

A. Kerchief

B. Soft bandage

C. Plaster cast

D. Thoraco-brochial bandage

**The orienting map for independent work with literature according to the topic**

| Tasks | Notes to the task | Student's answer |
|---|---|---|
| Brief description transport immobilization | Indications for transport immobilizatsii.1.Vidy transport immobilization. 2. The standard tire for transport immobilization 3.Plaster immobilization | |
| Desmurgy, kinds of soft dressings on the upper limb | Regulations concerning soft bandages | |
| Plaster bandages, types and their purpose | Terms of cast application. Dates cast application. | |

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic**: *"INJURIES OF THE CHEST"* - ***2 hours***

**Goal:** To be able to diagnose, provide first aid and to know the methods of treatment of chest injuries. To view the contribution of domestic scientists and members of the department to study the problem of damage to the rib cage.

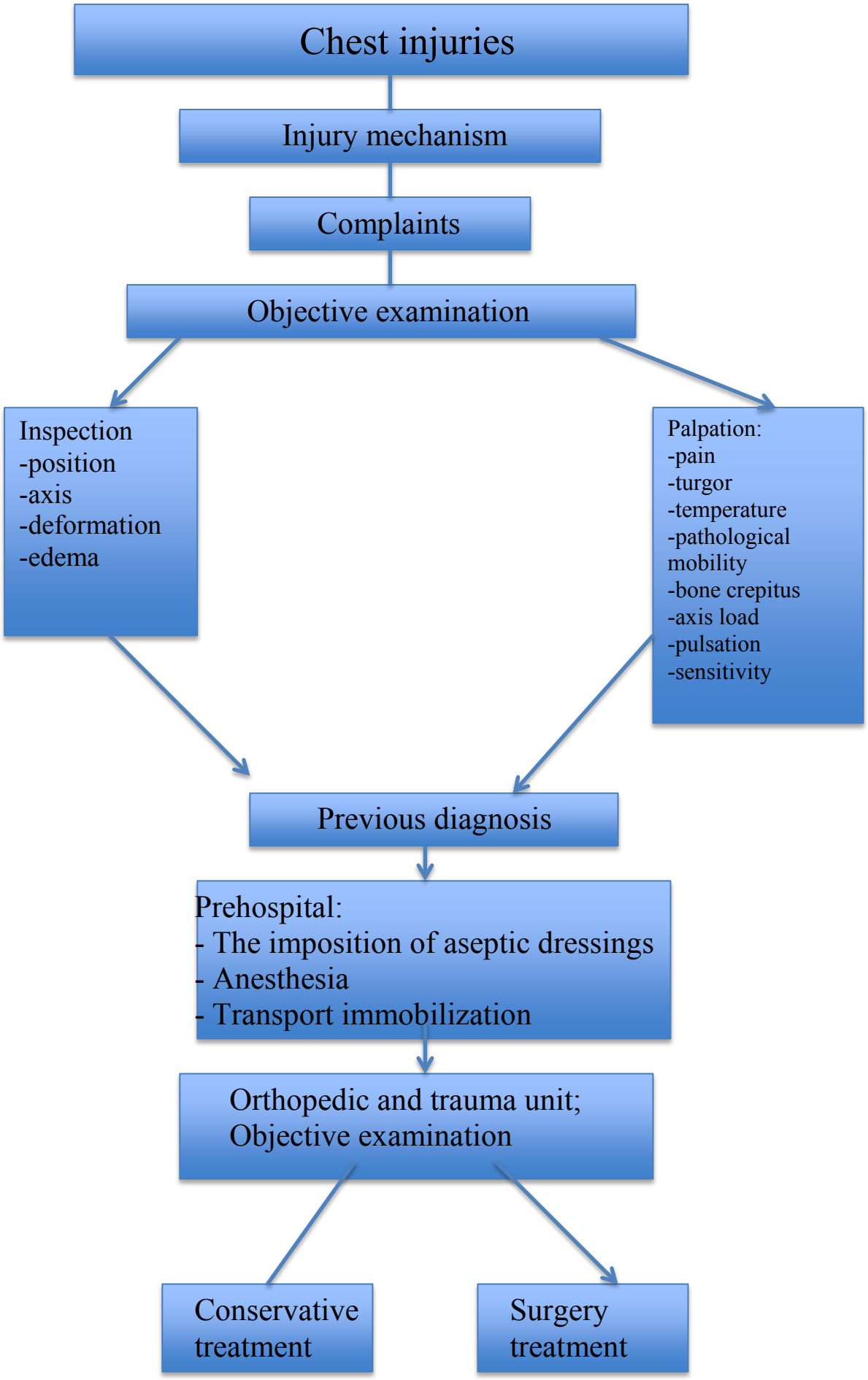
***- to know:***

1. Information indicating the mechanism and nature of the damage.
2. The main clinical symptoms of damage to the rib cage.
3. Immediate and medical aid for chest injuries.
4. X-ray picture of chest injuries.
5. Therapeutic measures with chest injuries.

***- to be able to:***

1. Select from the history information, indicating damage to the chest
2. To interpret the mechanism of injury.
3. To identify the clinical signs of damage.
4. Interpret radiological picture.
5. Carry out inspection and palpation of the chest.
6. Formulate a diagnosis.
7. Provide emergency medical care.
8. Perform transport immobilization.
9. Mark the plan of conservative and surgical treatment.

**Basic concepts:**



**Plan:**

**1. Self-assessment initial level of knowledge, skills.**

Test number 1. On examination, the patient with chest trauma doctor noted swelling, deformation, local pain on palpation and crepitus in the xiphoid process of the sternum. What damage is most likely?

A. Dislocation xiphoid sternum

B. Fracture of the ribs 11

C. Fracture of the xiphoid process of the sternum (The correct answer is - C)

D. Bruising sternum

E. Dislocation sternal end of the clavicle

Test number 2. A patient suspected of having an open fracture of the clavicle with a small bleeding wound in the collarbone on the background of significant edema. He complained of severe pain and inability to hand movements, palpation of the clavicle is determined crepitus. Which set of symptoms is among the pathognomonic for fracture?

A. Swelling

B. Severe pain

C. Violation of limb function

D. Bleeding

E. Crepitus (Correct answer - E)

**2. Questions for self-control.**

1. Classification of injuries of the chest and its organs. Methods of treatment.
2. Types of hemothorax. Diagnostics. Tactics of treatment.
3. Types of pneumothorax. Diagnostics. The principles of treatment.
4. Fractures of the ribs. Possible complications, diagnosis, treatment.
5. Fractures of the sternum. The principles of treatment.
6. dislocation sternal end of the clavicle. Diagnosis, treatment principles.
7. Dates seam rib fractures.
8. Features of outpatient treatment.
9. Types of immobilization when damaged ribs.

**3. Tests of different levels.**

*Test number 1*. The patient received a through wound of the right half of the chest. Delivered in the receiving department through 2 hours after being wounded. His condition was grave. He complains of severe weakness, dizziness, feeling of suffocation, and chest tightness. Very pale. Swollen neck veins. Pulse 123 in 1 min., Weak filling. A slight hemoptysis. The bandage on the chest got off, exposing the outlet injured. Rana point, located on the front right side. air is not sucked onto wounds. When percussion determined dullness across the right half of the chest, in addition to over-and subclavian areas. Cardiac dullness is significantly shifted to the left. The blunting zone breath does not listen. What you write down the diagnosis in primary care card?

1. What are the main causes of the serious condition of the victim?
2. It is shown that if the wounded pleural puncture?
3. Does the injured blood transfusion is shown? (Well no).
4. Where and in what place should evacuate the victim?

Right answers:

1. Through a penetrating wound to the right side of the chest. Large hemothorax.
2. Acute blood loss. Respiratory failure due to compression of the right half of the chest with blood, streamed into the pleural cavity. Circulatory difficulty in small and large circle for the same reason.
3. In order to remove a portion of the blood from the pleural cavity for the normalization of respiratory function and cardiovascular activity.
4. Not shown
5. In the intensive care unit in the first place.

*Test number 2.* Small hemothorax is when amount of blood into the pleural cavity is:

1. 500 ml. (Correct answer)
2. 1000 ml.
3. 1500 ml.
4. 2000 ml.

5. 2500 ml.

*Test number 3.* What types of hemothorax?

1. Increasing
2. Stable
3. Incoagulated.
4. Infected and uninfected
5. All of the above (correct answer)

*Test number 4.* Pyothorax – it is:

1. Continued bleeding into the pleural cavity
2. Blood clots in the pleural cavity
3. Incoagulated hemothorax
4. The coagulated hemothorax
5. Infected hemothorax (correct answer)

*Test number 5.* Aeropleura - it is:

1. The air in the pleural cavity (correct answer)
2. Blood clots in the pleural cavity
3. Incoagulated hemothorax
4. The coagulated hemothorax
5. Infected hemothorax

*Test number 8.* Puncture of the pleural cavity for the purpose of aspiration of blood and exudate is usually carried out:

1. At the level of 7-8 ribs on the mid-axillary line (correct answer)
2. At the level of 2-3 ribs on the middle or posterior axillary line
3. At the level of 4-5 ribs on the middle or posterior axillary line
4. At the level of 7-8 ribs on the anterior axillary line
5. In the 2-3 intercostal space in the midclavicular line in front

**The orienting map for independent work with literature according to the topic**

| № | Tasks | Instructions | Answer |
|---|---|---|---|
| 1. | Learn etiology | Name the basic etiological factors of damage to her chest organs | |
| 2. | Clinic | Create a classification of clinical manifestations of various injuries of the chest and its organs | |
| 3. | Diagnostics | Post a list of the main methods for diagnosis of damage | |
| 4. | Differential diagnostics | Fill in the table of the differential diagnosis of lesions of the chest and its organs | |
| 5. | Treatment | Create a typical treatment regimen injuries of the chest and its organs | |

## List of recommended literature:

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.

**Topic**: *"DAMAGES OF SHOULDER GIRDLE"* - ***2 hours***

**Goal:** To be able to diagnose, provide first aid and to know the methods of treatment for injuries of the shoulder girdle. To view the contribution of domestic scientists and members of the department to study the problem of damage to the shoulder girdle.

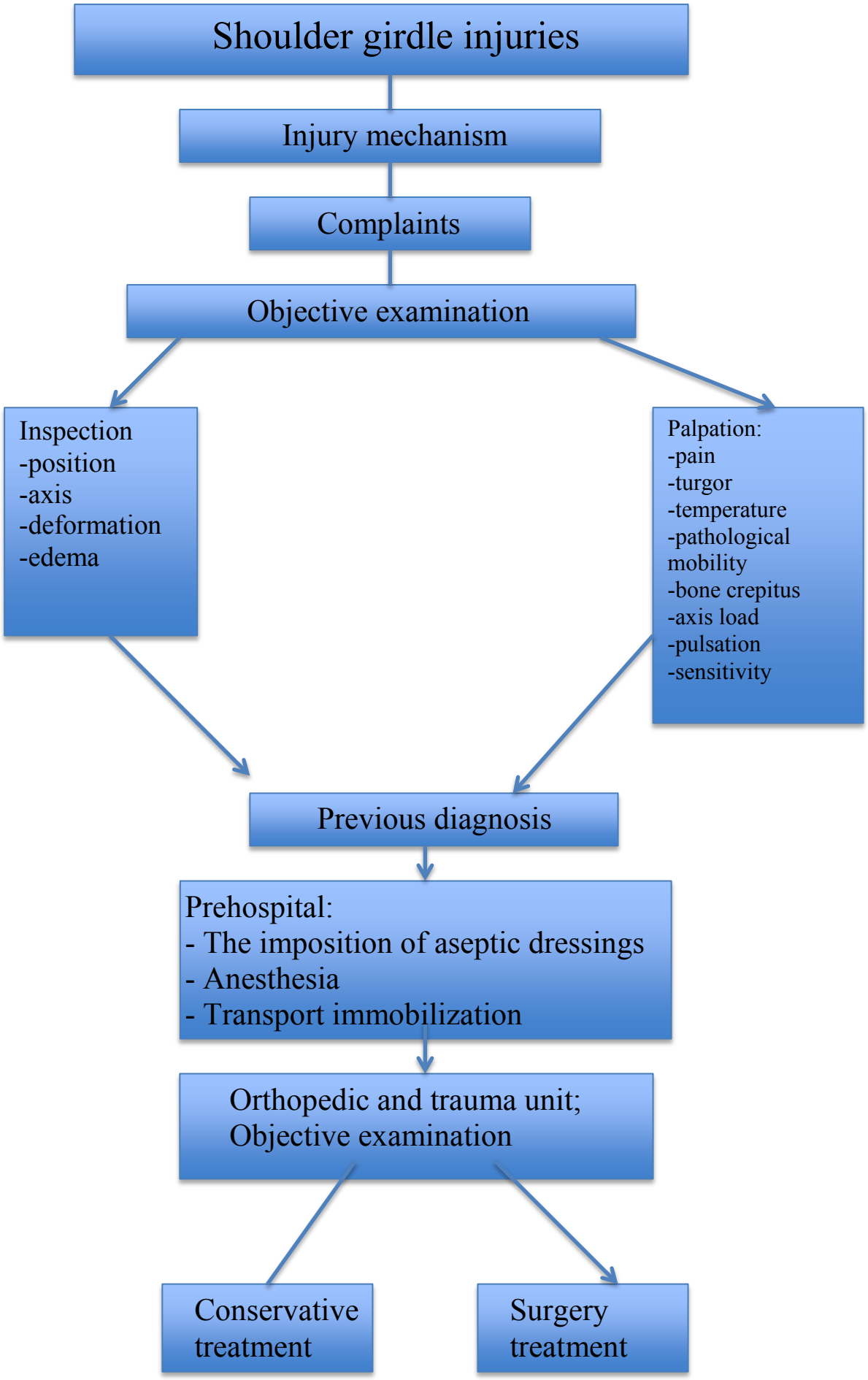
***- to know:***

1. Information indicating the mechanism and nature of the damage.
2. The main clinical symptoms of shoulder girdle injuries.
3. First medical aid in injuries of the shoulder girdle.
4. Radiographic lesions girdle.
5. Therapeutic measures in case of damage of the shoulder girdle.

***- be able to:***

1. Select data from the history information indicating the shoulder girdle injuries.
2. To interpret the mechanism of injury.
3. To identify the clinical signs of damage.
4. Interpret radiological picture.
5. Carry out inspection and palpation of the shoulder girdle.
6. Formulate a diagnosis.
7. Provide emergency medical care.
8. Perform transport immobilization.
9. Mark the plan of conservative and surgical treatment.

**Basic concepts:**



**Plan:**

**1. Self-assessment initial level of knowledge, skills.**

Test number 1 .A patient suspected of having an open fracture of the clavicle with a small bleeding wound in the clavicle on the background of significant edema. He complained of severe pain and inability to hand movements, palpation of the clavicle is determined crepitus. Which set of symptoms is among the pathognomonic for fracture?

A. Swelling

B. Severe pain

C. Violation of limb function

D. Bleeding

E. Crepitus (correct answer)

Test number 2. If any damage ligaments of the clavicle is possible to determine the symptom "keys":

A. Clavicular-coracoid

B. Clavicular acromial

C. Sternal clavicular.

D. Clavicular-coracoid-clavicular and acromial (correct answer)

E. Clavicular-edged

Test number 3. A patient suspected of having an open fracture of acromion process of the scapula with a small bleeding wound in the area of the acromion on the background of significant edema. He complained of severe pain and inability to hand movements at shoulder palpation determined crepitus. Which set of symptoms is among the pathognomonic for fracture?

A. Swelling

B. Severe pain

C. Violation of limb function

D. Bleeding

E. Crepitus (correct answer)

**2. Questions for self-control.**

1. Classification of injuries of the chest and its organs. Therapies
2. Classification of injuries of the clavicle. The mechanism of fractures. Diagnostics. Tactics of treatment.
3. Fractures of the scapula. Diagnostics. The principles of treatment.
4. Fractures of the acromion process of the scapula. displacement types, complications, diagnosis and treatment.
5. Fractures of the scapula coracoid. The principles of treatment.
6. dislocation sternal end of the clavicle. Diagnosis, treatment principles.
7. Dates seam clavicle fractures.
8. Features of ambulatory treatment
9. Types of immobilization in injuries of the clavicle.

**3. Tests of different levels.**

1. The anatomical structure of the shoulder girdle?
   A) scapula
   B) clavicle
   C) humerus
   D) all of the above
   E) the clavicle, scapula and ligaments
2. The place of attachment of the long head of the biceps?
   A) anatomic shoulder neck
   B) surgical neck shoulder
   C) the upper surface of the neck of the scapula
   D) olecranon
   E) acromion process
3. Components of the scapula?
   A) acromion process
   B) the coracoid process
   C) all of the above

D) of the scapula body

E) the upper and lower scapula angle

4. The formation of the joint involved paddle?

A) scapuloclavicular

B) articulatio costo-scapularis

C) all of the above

D) shoulder

E) none of the above

5. The weakest spot of the clavicle?

A) the middle third

B) body

C) between the middle and the outer thirds of the

D) sternal process

E) All of the above

6. Symptom with full dislocation of the acromial end of the clavicle?

A) torticollis

B) symptom of "keys"

C) symptom Girgolav

D) symptom of "drawers"

E) all of the above

7. Types of scapular fracture?

A) longitudinal fractures

B) all of the above

C) fracture of the anatomical neck of the scapula

D) fracture of the lower corner of the scapula

E) all wrong

8. For a complete dislocation of the clavicle is characterized by:

A) gap acromioclavicular and clavicular-coracoid ligament

B) gap acromioclavicular ligament

C) gap clavicular-coracoid ligament

D) symptom Baykov

E) all wrong

9. Forms clavicle damage?

A) fracture

B) sprain

C) all of the above

D) fracture-dislocation

E) injury

10. The muscles of the rotator cuff?

A) supraspinatus

B) infraspinatus

C) subscapularis

D) all of the above

E) small round

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

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**Topic:** *"REHABILITATION OF PATIENTS WITH CONSEQUENCES OF SPINE AND PELVIS INJURIES"* ***– 2 hours***

**Goal:** As a result of an independent study of the topic, students should:

***- know:***

1. What issues are decided by medical rehabilitation.
2. The role of the physical. techniques and physical therapy in rehabilitation of patients with consequences of spinal injuries and pelvis.
3. The value of corsets in the rehabilitation of invalids with consequences of spinal injuries and pelvis.
4. Value of Social (household) Rehabilitation in case of injuries of the spine and pelvis.
5. The role of vocational rehabilitation in the preparation of the disabled to work.
6. The role of rehabilitation centers in the rehabilitation of the disabled.
7. Features of treatment of the consequences of the spine and pelvis injuries.

***- be able to:***

1. Clinical and radiological definition of accretion of bone in the pelvis fractures in order to resolve the issue of further rehabilitation.
2. Teach the patient to develop receptions LFK joints; LFK on Dreving - Gorinevskoy.
3. Produce a plaster corset as a temporary expedient.
4. Remove the yardstick for manufacturing a permanent corset.
5. At the time to send the patient to MSEK for the definition of disability under the effects of the spine and pelvis injuries.

**Basic concepts:**

**Rehabilitation** - socially necessary is functionally and Labor restoration of sick and disabled people (after injury) committed complex holding state, social, medical, psychological, educational, professional, legal and other means.

**Basic principles of rehabilitation:**

1. Start the rehabilitation measures must be organically integrate into therapeutic measures and complement them.

2. Continuously rehabilitation as the basis of its effectiveness.

3. The comprehensive nature of rehabilitation. In the rehabilitation of disabled persons should be involved not only health professionals but also other professionals: psychologist, sociologist, representative bodies of the social security and trade union lawyer, etc. But all the rehabilitation measures must be carried under the guidance of a doctor.

4. Individually controlled rehabilitation. Taken into account during the process of the disease, the nature of people in different conditions of life and work, which requires a strictly individual preparation of rehabilitation programs.

5. Execution of rehabilitation in groups of patients. This is due to the fact that the goal of rehabilitation - the victim to return to the team.

6. Return the disabled to active, socially useful work.

**The concept of rehabilitation include:**

- Functional recovery (full compensation and with limited or no recovery).
- Adapting to everyday life.
- Attraction to work.
- Clinical supervision.

**The aim of rehabilitation:**

It consists in the following: adaptation to the former workplace or readaptation - work at the new location with the changed conditions, but at the same enterprise (work with reduced physical activity, in accordance with the obtained new skills, close to the previous specialty).

If it is impossible the implementation of the items listed above requires an appropriate retraining in the same enterprise; in the case of the apparent impossibility of recovery - retraining in the rehabilitation center with the following search of work on a new specialty. At the moment, there are three main types of rehabilitation: medical, social and professional.

**Medical rehabilitation**

It includes therapeutic measures aimed at the resumption of the patient's health. During this period, also performed psychological preparation victim to the need for

adaptation or readaptation retraining. Medical rehabilitation starts with the treatment of the patient to the doctor, so the psychological preparation of the victim is at the doctor's competence.

**Social (household) Rehabilitation**

Social rehabilitation or home is one of its most important species and poses the main purpose of the development of skills the victim to self-service. The main task of a doctor in this case is to teach the disabled person to use the simplest mainly household appliances. Of great importance is the individual approach to the patient and creative imagination rehabilitators in the manufacture of various tools that simplify self invalid.

**Vocational rehabilitation**

Professional or industrial rehabilitation main aim is to prepare a disabled person to work. The time that has elapsed from medical rehabilitation to vocational, should be minimal. For the disabled it is important not only to the physician information about the course and prognosis of the disease, but also the conviction with which he will talk about it. Otherwise, the patient himself gives answers to the questions put to them, which in most cases does not meet reality, and so it is often not conducive to a successful outcome of treatment. The longer treatment is ranked, the more opportunities for mental reaction on the part of the disabled: he begins to think that is no longer needed in the production, lost contact with the team. During this time, the working conditions are changed. Being treated in hospital are often not confident in their abilities, they have dominated the feeling of inferiority, there is a need for protection and special treatment. The fact that the patient is treated, service, bandage, etc., weaken his will. Therefore, from the first day of treatment the patient need to encourage, persuade a positive result with a demonstration of examples to the moment when he starts to not take part in its social and productive rehabilitation. Rehabilitation should always be not only physical but also mental: Refundable confidence. The patient must believe that he is a full member of society. In the production of rehabilitation combined advances in medical and social rehabilitation. Today found that rational work improves

cardio - vascular activity and blood circulation and metabolism, while the prolonged immobility leads to muscle wasting and premature aging. It is therefore extremely important in the treatment process gets occupational therapy.

The main objectives of occupational therapy are:

1. Resumption of physical function: a) an increase in joint mobility, muscle displacement. Resumption of coordination, support and increase the capacity for the development of job skills; b) training of daily activities (meal reception, dressing, etc.).; c) training of domestic work (childcare, home cooking); g) training in the use prostheses and orthoses, and care for them.

2. Production in the department of occupational therapy simplified devices that allow the disabled to engage in everyday forms of labor and household activities.

3. Determining the degree of occupational disability disabled in order to optimize performance, which is suitable in each case.

**Plan:**

**1. Tasks for self initial level of knowledge:**

1. The anatomical structure of the spine
2. The anatomical structure of the pelvis.
3. Complications arising from the treatment of fractures that may lead to disability (delayed consolidation, non-union, osteomyelitis).
4. The duration of stay of the patient on sick leave.
5. What are the issues and solve the WCC MSEK.
6. What is a "prosthesis" and what is "brace".
7. How to make a plaster corset.

**2. Questions for self-control.**

1. What is rehabilitation?
2. Types of rehabilitation.
3. Who is in need of rehabilitation?

4. Complications that arise in the treatment of orthopedic and trauma patients with fractures of the spine and pelvis.

5. Who and how decisions are made on disability?

6. Stages of rehabilitation.

7. The role of associations in the prosthetic rehabilitation of the disabled.

8. The role of rehabilitation centers in the rehabilitation of orthopedic and trauma patients.

**The orienting map for independent work with literature according to the topic**

| № | Main tasks | Instructions | Students Answers |
|---|---|---|---|
| 1 | What is the rehabilitation of orthopedic patients - travmatologicheskih | Give the definition of "rehabilitation", its objectives and consistency | |
| 2 | Medical rehabilitation | What issues are decided by medical rehabilitation when it starts and its consistency | |
| 3 | Social rehabilitation | Understand the role and importance of social rehabilitation of the patient to provide livelihoods | |
| 4 | Vocational rehabilitation | The role of vocational rehabilitation to return to the disabled | |
| 5 | The role of rehabilitation centers | Understand that only in rehabilitation centers can comprehensively address all issues | |
| 6 | The role of plants in the prosthetic rehabilitation of trauma patients | Prosthetic Association decides on important matters of rehabilitation of invalids | |
| 7 | The role of the WCC in the rehabilitation of patients and MSEC | Address social issues on the financial support to the sick and disabled | |

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and

orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

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**Topic**: *"OSTEOARTICULAR TUBERCULOSIS"*- ***2 hours***

**Goal:** As a result of an independent study of the topic, students should:

***- know:***

1. Classification of osteoarticular tuberculosis
2. Early clinical signs of osteoarticular tuberculosis
3. Differential diagnosis
4. Principles of treatment of osteoarticular tuberculosis
5. Methods of conservative and surgical treatment of osteoarticular tuberculosis

***- be able to:***

1. Perform examination of the patient
2. Identify and classify symptoms
3. Interpret radiographs
4. Conduct a differential diagnosis
5. Determine the tactics of patient treatment

**Basic concepts:**

Most often, tuberculosis affects the spinal column, then the hip and knee joints. Other localizations are relatively rare. Cases of multiple lesions of bones and joints are observed. Osteoarticular tuberculosis develops against the background of dissemination of the process and sensitization to tuberculosis infection of perivascular bone marrow elements due to hematogenous drift of tuberculous mycobacteria from elements of the primary complex in the lungs or from second tuberculosis foci. The perivascularly located primary focus for the skeletal system was called primary osteitis (tuberculous osteomyelitis), although its origin is secondary (P.G. Kornev).

Fresh foci of tuberculous inflammation of the bone marrow can be found in any visceral forms of tuberculosis occurring with the phenomena of hematogenous dissemination of the process.

As a rule, the primary osteitis is localized in the epimetaphyseal parts of the long bones, where the vascular network of the red bone marrow is especially strongly developed. Primary osteitis, progressing in its development, leads to purulent fusion of

tissues, the accumulation of curdled-necrotic masses and the formation of a bone cavity. In the future, the tuberculous focus goes beyond the bone in two ways: intra-articular and extra-articular. The intra-articular path consists in a breakthrough of the focus into the joint, leading to tuberculous inflammation of the joint (tuberculous panarthritis), a secondary specific arthritis with destruction of the articular surfaces and joint structures. Tuberculous granulations can grow towards the compact substance of the outer surface of the bone, destroy it, and then pass to the periosteum and soft tissues, where tuberculous tubercles with curdled necrosis and purulent fusion of necrotic masses are formed. Here the formation of a perifocal sinus abscess occurs - this is the second, extra-articular path of development of primary tuberculous osteitis.

Insecure abscesses can descend along the intermuscular spaces and are determined far away from the localization of the main tuberculous process. The content of abscesses often breaks out through the skin and then a fistula forms. The latter becomes infected a second time, differs in the tortuosity of the moves and the persistent flow. The fistulous, or open, form of osteoarticular tuberculosis is read as the most severe.

In 5-10% of cases, the pathogen by the hematogenous route can be introduced into the synovial membrane of the joint, and then a primary tuberculous focus appears in it, causing primary tuberculous arthritis (synovial form). The course of the latter, in contrast to secondary tuberculous arthritis, is more favorable, without significant destructive bone changes.

Ponce's tuberculous arthritis is a rare form of tuberculous joint disease. It arises as a result of individual high sensitivity of the soft tissues of the joint, including the synovial membrane, to tuberculous intoxication. There are no specific morphological changes in the tissues of the joint in this disease. The development of serous synovitis is characteristic. The causative agent of the disease is not found in the punctate. The process is localized mainly in the small joints of the limbs, usually the hands, but other localizations are also possible.

The clinical picture in the initial stage of the disease is very similar to toxic-allergic arthritis of the rheumatoid type. The course of the disease is sluggish and persistent.

When diagnosing Ponce's tuberculous arthritis, it is important to establish the localization of the focus of tuberculosis infection and the source of sensitization of the body, as well as the lack of effect when using conventional antirheumatic drugs.

In children, the course of the osteo-tuberculosis process is dynamic, destructive and reparative changes are expressed quite clearly. In adults, as a rule, there is a sluggish course of the disease, and the recovery processes are less vigorous.

Phases of the course of osteoarticular tuberculosis. It is customary to distinguish between three successive phases of the course of the bone-tuberculous process. The first phase (pre-arthritic) is the formation of a tuberculous focus of primary osteitis in the epimetaphyseal parts of the bones near the joint. The second phase (arthritic) is a tuberculous process, developing, leading to the destruction of bone tissue and breakthrough of the focus into the joint. The development of the process is divided into three stages: the beginning, the height and the decay. The third phase (post-arthritic) - the process gradually subsides, however, exacerbations may occur in this phase of the disease

Clinically pronounced foci of osteoarticular tuberculosis are found most often in primary tuberculosis in children and, much less often, in disseminated tuberculosis in adults.

It is important to note that the less violent forms of disseminated tuberculosis in the myeloid tissue of the bone marrow cause the formation of single tuberculous tubercles or their conglomerate with necrosis in the center and tubercles in the scarring stage. Often, some of these foci of dissemination of mycobacteria in the bone marrow are not clinically manifested. Other foci develop more progressively, passing through the phases listed above in the course of osteoarticular tuberculosis.

**Clinic.** The clinical picture depends on the location, phase and stage of the process. The localization of the process determines the main clinical division of osteoarticular tuberculosis into bone damage (mainly of the spinal column) and damage

to the joints (hip, knee, etc.). Phases and stages of the bone-tuberculous process are important in the clinical assessment of the disease. So, in the pre-arthritic phase, when the focus is still in the bone, the clinic is poor in symptoms. Possible minor, quickly passing pain, mild limitation of function in the joint, sometimes effusion.

X-ray examination, especially tomography, determines the focus of destruction of bone tissue in the cancellous substance of the epiphyses and metaphyses of tubular bones, vertebra or small bones near the articular edge, but outside the joint. The contours of such tuberculous foci are not sharply outlined, their edges are, as it were, smeared in places, and in the second areas they are eaten away. The structure of the cancellous bone tissue in the center of the lesions is not determined. There are no reparative and reactive processes around tuberculous foci. They often contain sequesters with uneven, blurred edges. Osteoporosis of bone tissue in the pre-arthritic phase of osteoarticular tuberculosis is not determined.

The arthritic phase is characterized by clinical signs of joint inflammation, the degree of which depends on the stage of the process. The initial stage of the second phase is clinically manifested by persistent joint pain, dysfunction, mild effusion, muscle atrophy, and diffuse osteoporosis of the bones, determined by x-ray. At the height of the process, when all structures of the joint are involved in the inflammatory process, clinical symptoms such as sharp pain, swelling, contracture and vicious position of the limb join, and atrophy of its muscles increases. The temperature of the skin over the joint is increased. At the height of the heat, drip abscesses and fistulas form. Radiographically, extensive destructive processes, pitting of the edges of bone tissue, foci, sequestration, osteoporosis, narrowing of the joint space as a result of reactive dystrophic changes in the articular cartilage, shadows in the soft tissues of sintered abscesses, etc. are determined.

With the breakthrough of a tuberculous bone focus into the joint and the development of acute arthritis, osteoporosis acquires the character of a spotty one, the joint space can be slightly widened. This X-ray symptom is of particular importance if it occurs after a diagnosed narrowing of the joint space. Expansion of the statutory gap usually indicates the presence of significant joint effusion. During this period of time,

soft tissue X-rays are also visible on the X-rays - dense and thickened turns of the capsule of the affected joint. It depends on edema and inflammatory tissue infiltration that occurs with total tuberculous lesion of the joint at the height of the process. The stage of remission of the arthric phase is characterized by a decrease in the inflammatory ones presented: the temperature over the joint is normalized, the pain gradually subsides, the swelling of the joint decreases. Destruction phenomena give way to restorative processes.

The clinical picture of the post-arthritic phase of the process is largely determined by the degree of those functional and morphological disorders that occurred in the damaged organ in the previous phases and stages of the disease. Inflammatory phenomena are usually absent. The disease, characterized by a certain cyclical course, subsides. On radiographs in the post-arthritic phase, residual usures, marginal defects, osteoporosis, narrowing of the joint space, destruction of the articular surfaces and their deformation, usually developing at this stage of the disease, are revealed. With the help of special methods of X-ray, perifocal and sintered abscesses, fistulas and other pathological conditions of bone and surrounding soft tissues are recognized. The recovery processes are growing.

The ability to recognize primary tuberculous arthritis due to synovial lesions is very limited. The disease is characterized by the expansion of the joint space, determined by X-ray, and osteoporosis of the epimetaphyseal parts of the bones that form the joint. A slight expansion of the joint gap is due to reactive effusion into the joint and is determined by comparing X-ray images of healthy and diseased joints. Thickening of turns on X-ray images made with soft rays is usually combined with osteoporosis of the bone tissue in places adjacent to the areas of bursa attachment and turns of the joint capsule. The best outcome of the disease is the tuberculous process of bones, joints and synovial membranes, which firmly guarantees relapses, and is currently considered to be bone ankyloses - bone fusion of articular surfaces in a functionally advantageous position.

**Diagnosis.** Osteoarticular tuberculosis is diagnosed on the basis of anamnesis, clinical data, X-ray and laboratory studies.

In the clinical picture, in addition to the phasing of the process, it is necessary to take into account the signs of general intoxication of the patient's body: low-grade fever, weakness, loss of interest in the environment, lack of appetite, weight loss, poor sleep, changes in white blood - neutrophilia, increased ESR. Clinical blood tests may vary depending on the phase and stage of the disease. Chronic tuberculous intoxication causes neurodystrophic changes in soft tissues near the focus, as well as in more distant areas. These changes are confirmed by impaired sweating, increased growth of nails and hair, various vasomotor reactions, edema of the subcutaneous base - Aleksandrov's symptom, which consists in thickening of the skin fold on the diseased limb.

X-ray examination, in addition to conventional planar radiography, includes volumetric - stereo-roentgenography, deep layer-by-layer tomography, the use of air and contrast agents for arthropneumography, abscessography, fistulography, etc. The presence of foci, sequesters, usures, narrowing of the joint space and osteoporosis speaks in favor of tuberculous bone lesions. Of great importance for the diagnosis of osteoarticular tuberculosis are X-ray examinations, which allow observing the development of the pathological process in dynamics. This makes it possible to determine the phase and staging of the disease and to identify the degree of destructive and reparative changes in bones and joints.

Laboratory research methods confirm the tuberculous etiology of the disease. Pus and the contents of foci obtained from fistulas, during puncture of abscesses and foci or during surgery, are subjected to bacterioscopic, bacteriological, cytological and histological studies. A biological test - intraperitoneal injection of the contents of the focus or abscess to a guinea pig - also allows you to clarify the diagnosis. In the presence of tuberculosis infection, the guinea pig dies and generalized tuberculosis is determined at an autopsy.

A certain role in the diagnosis of osteoarticular tuberculosis is played by specific tuberculin test reactions: the Pirquet skin test and the Mantoux intradermal test. Biochemical studies are also important in the diagnosis of osteoarticular tuberculosis, with the help of which the ratio of protein fractions in the blood, calcium-phosphorus metabolism in the body, hematological research in dynamics, etc. are determined.

**Treatment.** Treatment of patients with osteoarticular tuberculosis should be comprehensive, sanatorium and orthopedic, based on the fact that this disease is a manifestation of a general tuberculosis infection in the patient's body. Proceeding from the first, the treatment is structured so that it raises the general resistance of the organism to tuberculosis infection and affects the elimination of local manifestations of the disease.

In recent years, thanks to the achievements of domestic scientists, the activity of the treatment of osteoarticular tuberculosis has been clearly defined, which consists in a combination of conservative tactics with the use of early surgical treatment. The remedies that increase the general resistance of the body and have a beneficial effect on the activity of the nervous, cardiovascular, respiratory and second systems include rest, food rich in proteins and multivitamins, if possible, around the clock stay in the fresh air in the conditions of high-mountain and seaside sanatoriums, the reasonable use of heliotherapy and others. Such general strengthening treatment in the south is successfully carried out not only in special sanatoriums, but also in sanatorium-type medical institutions at the place of residence.

The treatment of sick children in children's osteo-tuberculosis sanatoriums, created everywhere in our country, is effective. Various types of physiotherapy, systematic irradiation in winter of patients with a mercury-quartz lamp, a sollux lamp, if possible, 24-hour aerotherapy are a good addition to therapeutic and restorative treatment.

Orthopedic measures - unloading and immobilization - should be aimed at creating maximum rest of organs affected by the tuberculous process. Immobilization is achieved with circular plaster casts, special devices or back plaster splints, in which patients are placed for a long time. The unloading of the damaged organ is carried out by the patient being in an orthopedic bed with a wooden shield, as well as with the help of adhesive (adhesive-plaster) or cuff traction. To prevent disorders of healthy parts of the apparatus of movement and support, massage and physiotherapy exercises are widely used. Sanatorium and orthopedic treatment is complemented by specific

antibiotic therapy and chemotherapy (streptomycin, ftivazide, saluside, PASK, etc.). According to the indications, surgical treatment is performed.

All types of surgical interventions for osteoarticular tuberculosis can be divided into three groups: radical, therapeutic and auxiliary and corrective operations.

Radical operations are performed to remove pathologically; altered tissues and foci. These operations include economical joint resections, necroectomy. Especially carefully, these operations should be carried out in children without disturbing the epiphyseal zones of bone growth. The cure of the disease with an outcome in ankylosis in the functionally correct position of the limb after economically performed joint resection with the removal of tuberculous foci (especially in advanced cases) is the best and most stable result of disease therapy. Recently, early necrosectomy in the pre-arthritic phase of the disease has been widely used. Timely removal of isolated periarticular foci prevents their breakthrough into the joint and preserves its function.

Therapeutic and auxiliary operations are aimed at improving the conditions for the healing of the tuberculous focus and preventing the spread of the process to the nearby joint, the development of destruction of the articular surfaces and the prevention of the development of deformity. In these operations, the focus is removed. These operations may include extra-articular arthrodesis, spinal fusion. Sometimes these operations are performed as additional osteoplastic interventions after radical surgery.

In case of fistulous forms of osteoarticular tuberculosis, according to indications, a shortening fistulotomy or fistulectomy is used. Corrective surgical interventions are used to correct the vicious provisions that are a consequence of the transferred tuberculous process. An example of such operations are various kinds of osteotomies, resections, etc.

**Plan:**

**1. Questions for self-control.**

1. What is the primary tuberculous osteitis, the path of its development.
2. The clinical picture of tuberculous arthritis Ponce.
3. Phase currents osteoarticular tuberculosis.
4. The clinical picture of osteoarticular tuberculosis.
5. Diagnosis of osteoarticular tuberculosis.
6. Treatment of osteoarticular tuberculosis.
7. Types of surgical interventions for bone and joint tuberculosis.

**The orienting map for independent work with literature according to the topic**

| ***Tasks*** | ***Notes to the task*** | ***Student's answer*** |
|---|---|---|
| 1. Etiology and pathogenesis | Determine the cause and the main factors of the pathogenesis of the disease | |
| 2. Classification and clinic | Identify the leading symptoms, diagnostic signs of the disease, its clinical classification | |
| 3. differential diagnosis | Conduct a differential diagnosis with other diseases | |
| 4. Treatment | Determine the indication and volume of treatment in a specific clinical case | |

**List of recommended literature:**

*Basic:*

1.V.F.Venger, V.V.Serdyuk Rashed Mochammad Traumatology and orthopedics: Compilation of methodical developments to the practical studies on traumatology and orthopedics including the materials for self-training of students of medical institutes of higher education. – Odessa: Print, 2004. – 248 p.

2. Golka G.G., Burianov O.A., Klimovitskiy V.G. Traumatology and orthopedics: textbook for students of higher medical educational institutions : transl. from. ukr. lang. – Vinnytsia : Nova Knyha, 2018. – 400 p.