MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Faculty *Medicine*
Department *Surgery, Radiological Diagnostics, Radiation Medicine, Therapy and Oncology*

APPROVED BY
Vice-Rector for Scientific and Pedagogical Work
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METHODOLOGICAL RECOMMENDATION FOR PRACTICAL CLASSES OF THE ACADEMIC DISCIPLINE

Faculty, course Medical 6th year

Academic discipline Surgery
(name of the discipline)

PRACTICAL CLASSES

Practical class № 24

Topic: "Limb ischemia syndrome. Diseases that cause it. Conservative and surgical treatment. Evaluation of limb pain syndrome in the diagnosis and differential diagnosis of vascular diseases, nervous system disorders and musculoskeletal system pathology"

Approved:
At the meeting of the Department of Surgery, Radiation Diagnostics, Radiation Medicine, Therapy and Oncology of Odesa National Medical University

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PRACTICAL CLASSES

Practical class № 24

Topic: "Limb ischemia syndrome. Diseases that cause it. Conservative and surgical treatment. Evaluation of limb pain syndrome in the diagnosis and differential diagnosis of vascular diseases, nervous system disorders and musculoskeletal system pathology" – 6 hours

2. Relevance of the topic

The widespread prevalence of peripheral vascular disease of the upper and lower extremities, high level of disability and rapid progression of vascular disease require timely diagnosis and determination of the degree of limb ischemia and venous circulation disorders, on the basis of which treatment tactics are planned.

The symptoms of this disease are encountered by general practitioners. There are some difficulties in diagnosing lower extremity vascular disease, but the analysis of anamnesis data and simple clinical examination methods usually allow to make a diagnosis in the clinic. The majority of patients with limb ischemia present at late stages of the disease, which leads to a high risk of limb loss and ineffective full-fledged conservative therapy.

All of this has led to the fact that in recent years, 15-35% of lower limb amputations in Ukraine have been performed at the hip level for atherosclerotic vascular lesions. At the same time, systemic vascular lesions of the lower extremities and diabetes mellitus caused amputations in 19.6-41.5% of cases, with mortality rates ranging from 8.9-25%.

According to the literature, at least 40% of people over 40 years of age and more than 50% of people over 50 years of age complain of limb pain. With age, the percentage of people with limb pain syndrome increases to 80%. The presence of such complaints significantly worsens the quality of life of patients and limits their physical activity. Limb pain syndrome is a complex symptom complex that includes vascular, nervous and inflammatory components. Incorrect assessment of the dominant component leads to inadequate treatment and often worsens the patient's condition. Underestimation or improper treatment of occlusive lesions of the extremities can even lead to the loss of the affected limb.

3. Objectives:

3.1. General objectives:

The student must learn to:

Identify anamnestic and clinical objective signs of diseases that led to the development of lower extremity ischaemia. Level II

The basic principles of diagnosing the absence of pulsation in the main arteries of the lower extremities and differential diagnosis of acute and chronic lower extremity ischaemia, the degree of ischaemia. Level II

Determine the examination plan using laboratory, ultrasound, and radiological examination methods. Level III

Provide emergency conservative care to patients with pain in the lower extremities (know the pharmacological drugs used in this case, their therapeutic, single and total dose, route of administration and possible complications). Level III

Determine relative and direct indicators for surgical intervention and have a theoretical knowledge of the methodology of their implementation. Level II

I level. To acquaint the student with the symptoms, etiology and pathogenesis of occlusive

diseases of the extremities, venous diseases, nerve damage of the extremities and diseases of the musculoskeletal system.

It is necessary to provide higher education students with the opportunity to study and master the classification and clinic of diseases of the arteries and veins of the extremities.

II level. The higher education student must know and master the symptoms of limb pain syndrome, methods of physical examination and instrumental studies necessary for differential diagnosis. The student must know and be able to evaluate and interpret the results of laboratory and instrumental studies. Also, a higher education student must learn the principles of treatment and determine an individual algorithm for examination and treatment in a particular clinical situation.

III level. To provide higher education students with the opportunity to master the skills and techniques of performing a physical examination of a patient, analysing the results of laboratory and instrumental studies.

IV level. To provide higher education students with the ability to study theoretically, clinically, experimentally patients with limb pain syndrome of various etiologies.

Educational objectives:

1. Formation of a professionally significant personality of a doctor.
2. To emphasise the achievements of the national surgical school of vascular surgeons in the development of modern methods of diagnosis and surgical treatment of critical lower limb ischaemia.

3.2. Reasonable objectives:

To know:

- Anatomy of the heart, large and small circulation;
- Clinical picture of thrombosis and occlusion of the main arteries of the lower extremities;
- Differential diagnostic signs of circulatory disorders of the lower extremities of various genesis;
- Methods of instrumental and laboratory examination of patients with lower extremity circulatory disorders;
- Conservative treatment of patients with lower limb ischaemia.
- Concept of thrombolytic therapy, pharmacological agents, doses and complications.
- Systemic and regional thrombolysis, methods of performance.
- Surgical treatment of patients with lower limb ischaemia.

3.3. Based on theoretical knowledge on the topic: To be able to (master the methods):

- Take anamnesis of the disease.
- To make a differential diagnosis between thrombosis, embolism and chronic occlusion of the great vessels of the lower extremities.
- Determine the diagnosis and degree of impairment of the main circulation of the lower extremities.
- Prescribe conservative therapy for the disease.
- Justify the indications and types of surgical intervention in a particular case.

4. Materials for classroom self-study (interdisciplinary integration)

№	Disciplines	To know	To be able to
1	**2**	**3**	**4**
		I. Previous disciplines	
1.	Anatomy	Structure of the large and small circulatory system. Anatomy of the heart, aorta and its main branches, inferior and superior vena cava. The main places of determination of pulsation arteries in anatomical zones.	Differentiate various areas of absence of pulsation on the main arteries of the neck, upper and lower extremities during the examination.
2.	Physiology and pathophysiology	Features of blood circulation and microcirculation in normal and in acute and chronic occlusion of the main arteries of the of the lower extremities.	Determine disorders of haemodynamics in patients with chronic and acute occlusion (thrombosis, embolism) of the main vessels of the lower extremities.
3.	Biochemistry	Biochemistry of blood coagulation and fibrinolysis.	Interpret data from laboratory tests of the blood coagulation system
4.	Pharmacology	The mechanism of action of drugs that affect the underlying disease.	Determine single and total therapeutic doses of pharmacological drugs.
		II. Intersubject integration	
1.	Acute thrombosis and embolism of major vessels in the setting of haematological and systemic diseases.		Interpret data from biochemical and laboratory tests.
2.	Acute thrombosis and embolism of the great vessels in the setting of cancer diseases	To know the etiology of the syndrome, signs Ultrasonography of the great vessels, endoscopic and X-ray, CT and MRI examinations, contrast angiography.	Taking a medical history and being able to find the signs of the syndrome.

3.	Acute thrombosis and embolism of the great vessels in the setting of chronic heart failure.	Know the clinical picture, have an understanding of ECG and echocardiography, differential diagnosis of acute myocardial infarction	Be able to examine a patient with chronic heart failure

5. Content of the class.

Limb ischemia syndrome. Diseases that cause it

Treatment of lower limb ischaemia in the setting of obliterating atherosclerosis, systemic vascular disease and diabetes mellitus is a challenging task, the solution of which not only helps to save the patient's limb, but also improves the quality of treatment and significantly extends life.

The quality of life of patients with lower limb ischaemia is similar to that of patients in cancer hospitals.

The term ‘critical limb ischemia’ (CLI) was first introduced by P.R. Bell (1982) to identify a group of patients with resting pain, ulcers and necrosis of the distal lower extremities.

The clinical definition of CLI is persistent pain at rest requiring analgesia for 2 weeks or more, trophic ulceration or initial signs of gangrene of the fingers or feet that occurred in the setting of chronic arterial insufficiency of the lower extremities.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS OF CLI

The course of critical limb ischaemia is divided into acute and chronic.

Acute disturbance of the main circulation of the lower extremities

The greatest difficulty is diagnosing the initial manifestations of circulatory disorders in the lower extremities. These include:

- weakness (observed in almost 100% of patients));
- pain in the muscles of the lower leg (100%);
- skin pallor (in 70-90%);
- cold sweat;
- heart palpitations;
- fainting (in 10-30%).

At the same time, all of the above symptoms or their combinations can be observed in different conditions:

1. Bleeding:
   1.1. External bleeding (usually caused by trauma).
   1.2. Bleeding into the abdominal cavity (aborted tubal pregnancy, spontaneous rupture of the spleen. Trauma - rupture of a parenchymal organ, detachment of the intestinal mesentery, etc.)
   1.3. Bleeding into the lumen of the digestive tract.
2. Myocardial infarction.
3. Anaemia of different genesis.
4. Deep vein thrombosis of the lower extremities.
5. Oncopathology.
6. Osteochondrosis of the spine with severe radicular syndrome.

Examination of the patient and a short questionnaire allow the doctor to

quickly suspect a particular pathology, and the use of auxiliary diagnostic methods allows him to accurately determine it.

A. Pain behind the sternum is a common symptom of **myocardial infarction, which is accompanied by the formation of thromboemboli and their migration to the distal lower and upper extremities, as well as to the vessels of the brain. The main non-invasive diagnostic methods are ECG and Echocardiography, ultrasound**.

B. All of the above symptoms and anamnestic data may not be determined. In this case, the cause of weakness, pale skin, dizziness, etc. may be: acute bleeding into the lumen of the digestive tract, oncopathology, anaemia. The sequence of diagnostic measures is as follows: finger examination of the rectum (on the glove - faeces of normal colours, blood, etc.), examination of gastric contents with a probe (normal gastric contents; blood, coffee grounds, etc.), fibrogastroduodenoscopy, fibrocolonoscopy, ultrasound, ECG, EchoCS, CT.

C. Pain in the lower back and lower extremities. According to the prevalence, there are lumbargia (pain in the lumbar or lumbosacral region) and lumboiliac pain (back pain radiating to the legs). In case of acute intense pain in the lower back, the term ‘lumbago’ (lumbar shot) is also used.

Lumbalgia. Acute lumbalgia can be triggered by trauma, heavy lifting, accidental sudden movement, prolonged stay in an uncharacteristic position, or hypothermia. Pain localised in the back excludes root damage and can be associated with both spinal and soft tissue damage (e.g. sprains or ligaments). Sometimes it is the first manifestation of a herniated disc and is associated with irritation of the outer layers of the fibrous ring and posterior longitudinal ligament. Irritation of pain receptors leads to spasm of segmental muscles. Acute lumbalgia usually regresses within a few days or weeks. Chronic lumbalgia develops gradually, often after the regression of acute pain. It is often caused by: spinal instability, myofascial syndrome, osteoarthritis of the intervertebral (facet) joints, spondylolisthesis.

Lumboischialgia is more often of vertebrogenic origin and can be caused by reflex ‘reflection’ of pain or root compression associated with disc herniation, degenerative or other spinal diseases.

A herniated disc is most often detected between the ages of 30 and 50. In most cases, discs LV - SI, and LIV - Lv are affected. Pain in disc herniation is often accompanied by the formation of painful and trigger points on the periphery (in the muscles of the buttock, thigh, and lower leg). Muscle weakness in discogenic radiculopathies is often minimal. But sometimes, against the background of a sharp increase in radicular pain, foot paresis (paralysing sciatica) can develop. The development of this syndrome is associated with ischaemia of the root caused by compression of the vessels supplying it. In the vast majority of cases, paresis successfully regresses within a few months with conservative therapy.

Differential diagnostic significance of external manifestations of CCLI

OBJECTIVE EXAMINATION OF THE PATIENT**.**

When examining a patient, the doctor should first assess the patient's general condition.

In case of satisfactory condition of the patient or moderate severity, perform:

- objective examination of the patient (collection of complaints, medical and

life history, objective examination) with a parallel study of laboratory parameters of blood and urine (complete blood count, urine amylase, etc.).

The patient's behaviour and objective examination findings play an important role in the diagnosis and treatment, which are largely related to the amount of blood loss, the duration of bleeding, and whether the bleeding has stopped or not.

The examination of the patient reveals pallor of the skin and visible mucous membranes, and in case of severe blood loss, cyanosis of the mucous membranes and nail plates.

Examination of patients with critical lower limb ischaemia

Outpatient examination

1. When questioning a patient with critical lower limb ischaemia, it is necessary to find out the duration of previous intermittent claudication, the presence of episodes of critical ischaemia in the history; the duration of pain at rest and trophic changes in the limb, changes in their intensity, prevalence, true localisation of the pain syndrome, and pain-relieving medications.

2. Attention should be paid not only to the symptoms of the lower extremities, but also to the history of other diseases: coronary heart disease (angina pectoris, heart attack), arterial hypertension, cerebrovascular insufficiency, chronic renal failure. All of these conditions are significant risk factors.

3. Physical examination of patients with critical lower extremity ischaemia should include determination of pulsation of the main arteries in typical points (not only on the lower extremities) and auscultation of the abdominal aorta, iliac and femoral vessels, neck vessels, as well as measurement of blood pressure on both upper extremities.

Most often, patients have no or sharply weakened pulsation in the femoral or popliteal arteries compared to the opposite side; a systolic murmur is heard in the projection of the iliofemoral arterial segment or on the thighs. Reduced capillary blood filling of the distal parts of the foot. In diabetic neuropathy, pain and temperature sensitivity decrease.

It is also important to listen to the vessels of the neck and ask the patient about possible transient episodes of cerebrovascular disorders in the form of transient blindness, visual field loss, speech disorders, mono- and hemiparesis. Detection of a systolic murmur in the carotid artery projection in 60% of cases indicates a haemodynamically significant stenosis of the internal carotid artery, which requires surgical treatment, and the presence of the above-described focal neurological symptoms in the history confirms this.

The difference in blood pressure in the arms of more than 20 mm Hg, systolic murmur in the projection of the subclavian arteries or brachiocephalic trunk may indicate damage to these arteries with the development of vertebral-subclavian ‘stealing’ syndrome.

4. At the outpatient stage, ultrasound Doppler examination with measurement of the ankle-brachial index (ABI) is recommended for patients with critical lower extremity ischemia to investigate the condition of the lower extremity vessels.

Examination of arteries. The systolic blood pressure in the lower leg can be measured using a cuff and continuous wave Doppler; this is the most appropriate way to detect the presence of lower limb arterial occlusions. In the absence of arterial blood flow obstructions, the systolic pressure at the level of the lower leg is equal to or higher than the systolic pressure measured at the arm, with an arm/lower leg SBP ratio (ankle brachial index) > 1.0.

The data of ultrasound Dopplerography allow not only to confirm the presence of arterial lesions of the lower extremities, but also to approximately determine the level of arterial lesions of the lower extremities. Ankle brachial index (ABI) is equal to the ratio of systolic pressure measured in one of the lower leg arteries to systemic systolic pressure, i.e. pressure in the brachial artery. Values above 0.9 are considered normal. Below are again the instrumental indicators of critical ischaemia that can be obtained using ultrasound Doppler:

1. ankle pressure <= 50 mmHg.;
2. finger pressure <= 30 - 50 mmHg;
3. ABI <= 0,4.

The values of ankle pressure and ankle-brachial index in diabetic macroangiopathy may be overestimated.

5. For the initial detection of possible risk factors at the outpatient stage, the following studies are advisable: ECG, blood test; esophagogastroduodenoscopy; duplex scanning of the brachiocephalic arteries in patients over 50 years of age.

A blood test should determine the haemoglobin content, haematocrit, platelet count, glucosaemia and creatinine levels.

Knowing the glucose levels at the outpatient stage allows the doctor to guide the diagnosis of possible latent diabetes mellitus and begin its treatment or correction.

The blood creatinine level is important for screening diagnosis of renal failure, which is the most important risk factor for surgery.

Esophagogastroduodenoscopy (EGDS) can detect asymptomatic peptic ulcer disease and start anti-ulcer therapy as early as the outpatient stage of treatment.

Finally, duplex scanning can detect patients with haemodynamically significant stenoses of the brachiocephalic arteries and refer them to the appropriate hospital.

6. If critical lower limb ischaemia is detected, a vascular surgeon should be consulted and the patient should be urgently referred to a specialised vascular unit.

Inpatient examination

The examination of the patient should begin with anamnesis and physical examination.

7. Non-invasive examination of macrohaemodynamics of the affected limb:

1. ultrasound Doppler with measurement of the ABI
2. determining segmental pressure at different levels
3. measurement of finger blood pressure
4. duplex scanning of the aorta, iliac arteries and arteries of the lower extremities, in particular the arteries of the leg and foot
5. magnetic resonance angiography of the aorta, iliac arteries and arteries of the lower extremities, in particular the arteries of the lower leg and foot.

Ultrasound Doppler with measurement of segmental pressure at different levels of the affected limb allows to clarify the level of haemodynamically significant blood flow block. As noted above, in patients with diabetic macroangiopathy, it is advisable to rely on finger blood pressure (see Recommendation 2). In addition to

the traditional plethysmographic method of determining finger pressure, it is possible to measure using an ultrasound Doppler sensor, laser Doppler sensor (toe pole test).

Duplex scanning and magnetic resonance angiography are still used as auxiliary diagnostic techniques, although there are a number of studies suggesting their use as the main ones. Duplex scanning of the iliac, femoral, popliteal, lower leg and foot arteries can clarify the presence or absence of haemodynamically significant lesions in these arteries in case of doubtful angiography data, since angiography is often performed in one projection and a pronounced plaque located along the posterior wall of the vessel may not create a visible stenosis on the radiograph.

8. Invasive examination of macrohemodynamics of the affected limb:

- X-ray contrast angiography of the aorta, iliac arteries and arteries of the lower extremities, in particular the arteries of the lower leg and foot.

X-ray contrast angiography is the “gold standard” for topical diagnosis of arterial lesions. The access is usually chosen depending on the condition of the arteries of the iliofemoral segment of the opposite limb: if there is significant damage, the access is changed from transfemoral to axillary, brachial or translumbar. It is necessary to obtain contrast of the arteries of the lower extremity up to the arteries of the foot. To facilitate this task, the pharmacoangiography technique is used, which involves the injection of vasoactive drugs through a catheter into the vascular bed of the affected limb.

9. Examination of microhemodynamics of the affected limb:

1. transcutaneous oximetry (TcPo2)
2. laser flowmetry (LDF)
3. video capillaroscopy
4. scintigraphy of the affected limb with Thallium 201.

The most common way to assess the microcirculation of the affected limb is transcutaneous oximetry (TcPO2). Most often, it is performed in the first interdigital space, although any other points are possible, for example, at the level of the proposed amputation. The normal value of Tcp02 is considered to be 50-60 mm Hg, and the borderline value is 30±10 mm Hg. Below this level, trophic ulcers do not heal on their own and require either conservative therapy or reconstructive surgery. At an oxygen tension above 40 mmHg, one can expect independent tissue repair. However, patients with intermittent claudication may also have low transcutaneous oxygen tension values.

The other tests listed in the guideline are not yet widely used in clinical practice. There have been reports of increased sensitivity of microcirculation assessment by using a combination of tests.

10. Study of the local status of trophic ulcer:

1. radiography of the foot in two projections;
2. in case of trophic ulcers, it is necessary to carry out cultures from the necrosis zone with the determination of sensitivity to antibacterial drugs.

An X-ray examination of the foot can detect areas of bone destruction or osteomyelitis and assess the viability of bone tissue.

It is advisable to perform culture from the trophic ulcer zone repeatedly and adjust postoperative treatment depending on the microbial flora and its sensitivity. If necessary, a biopsy from the ulcer with morphological examination of the biopsy is

possible.
11. Examination of the patient's general condition:

1. Heart function:
    - ECG at rest and with a load (transesophageal pacing)
    - Luna-KG at rest and under load;
2. EGDS
3. Renal function:
    - Ultrasound of the kidneys
    - general urine analysis
    - urine analysis by Zimnitsky
    - creatinine level
    - the following tests are performed in case of deviations from the norm of previous studies:
    - Nechyporenko urine test
    - Reberg test

4. Respiratory function:
    - chest radiography
    - spirometry

5. Laboratory tests:
    - general blood test
    - glucose level
    - lipid profile
    - transaminase level
    - platelet aggregation
    - coagulogram.

The treadmill test or cycle ergometry test in patients with critical ischaemia is not possible due to the sharp limitation of the walking distance, so the transoesophageal pacing technique is proposed to identify patients with high and extremely high surgical risk. It is advisable for patients with extremely high risk to undergo coronary angiography and decide on coronary artery bypass grafting or coronary artery bypass grafting (see Recommendation 25). The best way to diagnose occult coronary artery disease is with LUNA stress.
Detection of lesions in other arterial basins:

1. duplex scanning of the brachiocephalic arteries
2. Ultrasonography of the abdominal aorta
3. duplex scanning of the branches of the abdominal aorta.

As mentioned above, carotid, subclavian arteries, and brachiocephalic trunk may be affected in patients with critical ischaemia, so if a haemodynamically significant internal carotid artery stenosis (more than 60%) is detected, primary carotid endarterectomy should be considered.
In patients with critical ischaemia, dilation of the abdominal aorta is possible; its maximum outer diameter should be measured by ultrasound. Embolism from the aneurysm cavity can be a direct cause of symptoms of lower limb ischaemia.
Finally, combined lesions of the arteries of the lower extremities and renal arteries

or other visceral branches are not uncommon.

13. Additional studies in patients with diabetes mellitus:

1. daily glucose profile
2. the level of glycosylated haemoglobin
3. urine tests for sugar
4. neurological examination of the foot with the determination of surface and deep sensitivity.

The studies listed in the recommendation will be useful for endocrinologists in the selection of glucose-lowering therapy and for differential diagnosis with diabetic neuropathic foot.

14. Additional studies in patients with obliterative thrombangitis:

1. the level of C-reactive protein
2. indicators of cellular and humoral immunity.

The above examinations allow us to detect the presence of an inflammatory process in a patient and determine the indications for anti-inflammatory therapy.

15. Vascular surgeons, general practitioners and cardiologists, anaesthetists and intensive care specialists, interventional radiologists, functional diagnostics specialists, endocrinologists or diabetologists should participate in the examination and decision-making on the treatment of a patient with critical lower extremity ischaemia.

	Characteristics of pain	Conventional localisation	Reducing pain when lowering the leg	Sensitivity of the leg skin	Foot moisture	Other differences
Ischaemic pain at rest	Constant, aching pain that worsens at night	Distal parts of the limb	Present	Hypoesthesia	Both states are possible	Always diagnosed with damage to the arteries of the limb
Diabetic neuropathy	Burning, ‘shooting’, more often at night	Symmetrical limb areas	None	Hyperesthesia	Dry	Reduced or absent of reflex reactions
Causality	Burning	In the course of the respective dermatome or innervation zone	None	Hyperesthesia	Hyperhidrosis	Occurs more often after injuries to the nerve trunks

Root syndrome	Burning	In the course of the respective dermatologist	None	Hyperesthesia	Hyperhidrosis	Reduces with unloading of the spinal column, combined with low back pain, positive radicular symptoms

There are several conditions with which it is necessary to make a differential diagnosis of critical lower limb ischaemia. Resting ischaemic pain is characterised by persistent pain in the distal limb, which may worsen at night. Lowering the limb often brings pain relief. Usually, except for rare cases of finger arteries, an arterial block is detected in the aortoiliac, femoral-popliteal or popliteal-ankle segments.

Type of ulcer	Regular localization	Pain	Bleeding	Skin changes characteristics	Surrounding inflammation	Related changes
Ischaemic	Distal, on the back of the foot or on the toes	It is expressed mainly at night and is relieved by lowering the limb	Weak or absent	Uneven edges, sluggish granulation tissue	Absent	No pulsation on the arteries, trophic changes in the skin
Stagnant (venous)	Lower third of the lower leg	Moderate, relieved by lifting the limb	Venous bleeding	Shallow, with uneven edges, the bottom is lined with granulation, twisted edges	Present	Congestive dermatitis
Neurotrophic	In places (skin pressure between the adjacent bone and hard surface (e.g., the sole surface of the first or fifth metatarsophalangeal joints	combined with Absence of pain	low back pain, It may be expressed	positive root symptoms Deep	Hyperhidrosis Present	Neuropathy

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Rest pain should also be differentiated from other peripheral neuropathies (vitamin B12 deficiency, syringomyelia, leprosy, alcoholism, substance abuse), gout, rheumatoid arthritis, tunnel syndromes, fasciitis, and so on.

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Ischaemic pain at rest	Constant, aching, worsens at night	Distal parts of the limb	Present	Hypoesthesia	Both states are possible	Always diagnosed with damage to the arteries of the limb
Diabetic neuropathy	Burning, ‘shooting’, more often at night	Symmetrical limb areas	Absent	Hypoesthesia	Dry	Reduced or absent reflex reactions
Cahualgia	Burning	In the course of the relevant dermatome or innervation zone	Absent	Hypoesthesia	Hyperhidrosis	Occurs more often after injuries to the nerve trunks
Root syndrome	Burning	In the course of the respective dermatome	Absent	Hypoesthesia	Hyperhidrosis	Reduces with unloading of the spinal column, combined with low back pain, positive radicular symptoms

Also, pain at rest should be differentiated from other peripheral neuropathies (vitamin B12 deficiency, syringomyelia, leprosy, alcoholism, substance abuse), gout, rheumatoid arthritis, tunnel syndromes, fasciitis, and so on.

Trophic ulcers in critical ischemia are also quite characteristic: they are located in the distal parts of the limb (toes), the pain is often relieved by lowering the limb, there is no bleeding of the tissues in the ulcer area, and arterial damage is detected at different levels.

Type of ulcer	Normal localisation	Pain	Bleeding	Characteristics of skin changes	Surrounding inflammation	Related changes
Ischaemic	Distally, on the back of the of the foot or on the toes	It is expressed mainly at night, relieved by lowering the limb	Weak or absent	Uneven edges, sluggish granulation tissue	Absent	No pulsation on the arteries trophic changes in the skin
Stagnant (venous)	Lower third of the lower leg	Moderate, relieved by lifting the limb	Venous bleeding	Shallow, with uneven edges, the bottom is lined with granulation, twisted edges	Present	Congestive dermatitis
Neurotrophic	In places (skin pressure between the adjacent bone and hard surface (e.g. plantar surface of the first or fifth metatarsal joints	No pain at all	It can be expressed	Deep	Present	Neuropathy

In addition to the above causes of ulcers, ischaemic trophic ulcers should be differentiated from ulcers in vasculitis, collagen diseases, vitamin B12 deficiency, leprosy, blood diseases (polycythemia, leukaemia, thalassaemia, thrombocytopenia), Kaposi's sarcoma, skin metastases, gout, pyoderma, mycotic lesions, drug reactions, and so on.

CCLLI

- Smoking cessation in case of peripheral arterial disease of the lower extremities.
- Lipid control - cholesterol level should not exceed 2.59 mmol/l, however, it is advisable to keep this indicator at 1.81 mmol/l in patients with coronary artery disease and extracranial arteries.
- In patients with symptoms of peripheral arterial disease, it is advisable to correct the diet, and to lower LDL cholesterol, statins should be the first-line drugs.
- If HDL cholesterol levels need to be increased and triglyceride levels reduced in patients with CCLLI, fibrates and/or niacin should be prescribed.
- Blood pressure should be reduced below 140/90 mm Hg, or below 130/80 mm Hg in patients with diabetes mellitus. First-line drugs should be thiazide diuretics and inhibitors. At the same time, beta-blockers are not contraindicated in patients who are scheduled for planned surgical treatment.
- Patients with diabetes mellitus and CCLLI should receive aggressive glucose-lowering therapy, and glycated haemoglobin A1c should be less than 7.0% or as close to 6.0% as possible.

General principles of treatment

Control over key risk factors

The patient should be convinced of the need to completely quit smoking for successful treatment of critical ischaemia. Smoking is the most important risk factor for the development and progression of lower limb arterial insufficiency, increases the number of amputations in the long-term period, reduces patient survival, reduces shunt patency and limb preservation in the long-term period after reconstructive vascular surgery.

It is necessary to assess the severity of coronary heart disease (CHD) and the adequacy of the drug therapy. The main tests for choosing the treatment of CHD are PTE, echocardiography, stress echocardiography. All patients with a diagnosed CHD should receive appropriate treatment, most often beta-blockers, calcium antagonists, nitro drugs and, in addition, antiplatelet drugs (acetylsalicylic acid and ticlopidine or clopidogrel).

Given the fact that many patients have a latent form of coronary artery disease, which is associated with a sharp restriction of physical activity (in particular, walking), they are indicated for examination and adequate treatment. For this reason, a cycle ergometry test cannot always be performed. CPES allows us to quickly and non-invasively identify extremely high-risk patients (low coronary reserve) who need coronary angiography and some type of coronary artery intervention. In patients with a low reserve, the incidence of postoperative myocardial infarction was 12.5%, with medium and high reserve - 4.6 and 6.5%, respectively. In the event of cardiac complications, mortality reaches 43.2%. Therefore, all patients with

coronary artery disease, regardless of its severity, should undergo preoperative coronary vessel preparation.

The blood pressure level in a patient with critical ischaemia should be lowered to a systolic blood pressure of less than 165 mm Hg and a diastolic blood pressure of less than 95 mm Hg, and this also applies to outpatient management of patients after ischaemia has been relieved. Arterial hypertension is the most important risk factor, but a sharp reduction can aggravate critical ischaemia, so in some cases, in patients with moderate hypertension (systolic blood pressure less than 180 mm Hg, diastolic blood pressure less than 110 mm Hg), antihypertensive treatment can be postponed for several weeks.

Hypertension is a very important risk factor for the development and progression of all forms of cardiovascular disease. However, in patients with critical ischaemia, an increase in blood pressure is partly a compensatory reaction aimed at increasing the perfusion pressure in the affected limb, so a sharp decrease in blood pressure can aggravate ischaemia. After critical ischaemia is relieved, blood pressure should be lowered and carefully monitored.

In patients with diabetes mellitus, complete normalisation of blood sugar levels is important, with target fasting glucose levels of 5.5 mmol/l and postprandial glucose levels of < 11 mmol/l. This may require the administration of insulin even in patients who have previously taken oral hypoglycaemic drugs or followed a diet.

Another major risk factor is diabetes mellitus. In addition to the risk of developing arterial insufficiency, they develop diabetic neuropathy and infectious complications. Therefore, it is imperative to achieve compensation for glucosemia, which is most often achieved by transferring the patient to insulin therapy.

Limited walking will be helpful, and it is advisable to avoid injuries. Adequate pain relief is required. To improve perfusion of the affected limb, the lowest possible position of the limb is desirable, but edema should be avoided.

On the one hand, the lowered position of the limb improves perfusion of the tissues of the distal parts of the limb, and on the other hand, it leads to the appearance of foot edema, which worsens the already impaired blood supply. Therefore, it is desirable to find a ‘golden mean’. The patient should be warned that even in the absence of pain after anaesthesia, it is necessary to slightly lower the foot, avoiding the appearance of edema. Narcotic analgesics are more often used as painkillers, and prolonged epidural anaesthesia has a good effect. There are reports on the effectiveness of electroanalgesia.

Systemic antibiotic therapy

Antibacterial drugs before surgery are prescribed only in case of widespread infection of the foot, in which case parenteral administration is preferable.

In case of limited infectious lesions, such as toes, antibiotic treatment before surgery is not required. There are reports of good results of endolymphatic administration of drugs.

It is necessary to convert any ulcer or necrosis into a dry one, with mechanical removal of necrotic masses. More active local treatment in the form of surgery or amputation until the blood supply to the foot improves is undesirable.

In the presence of severe exudate, the use of water-soluble ointments, possibly proteolytic enzymes, is justified. In other cases, it is advisable to use disinfectant liquids, for example, an aqueous solution of iodine (iodopyrine). Without improvement of blood supply to the limb by conservative or surgical treatment, which is objectively registered by an

increase in LVEF and Tcp02, any amputation is undesirable, as the likelihood of secondary necrosis is extremely high.

General advice to a patient with diabetes mellitus on foot care.

Necessary	**You cannot**
Examine the foot daily, using a mirror if if necessary, use a mirror (especially between the toes and in places of pressure)	Put your foot in the bath without checking the water temperature
Wash your feet daily with water at a temperature of less than 25 degrees	Use heating pads or hot water bottles
Apply lotion to the foot after drying	Use chemicals (such as dead skin removers) to treat corns
Check the degree of pressure of the socks on the foot	Walk barefoot
Check your shoes regularly (inside and outside, for fear of foreign objects)	Wear compression socks
Check the condition of the foot at each visit to the clinic	
Avoid sudden changes in temperature	

Improved blood supply to the affected lower limb

Treatment should begin immediately upon admission to hospital. There are three options for treating critical lower limb ischaemia, and they are discussed below in the order of their use. The level of proximal arterial lesion according to the comprehensive examination is important for the choice of treatment tactics, so in the following presentation of the results of reconstructive vascular surgery, we present data for two groups of patients with lesions of the aortoiliac and infrainguinal segments.

Angioplasty

The advantage of any endovascular intervention is a lower risk of systemic complications and mortality, while the limitation is the prevalence of prolonged and multilevel lesions of the vascular bed.

Angioplasty can be performed only in centres where it is possible to convert the operation to an open intervention.

Indications for angioplasty of the aortoiliac segment are:

1. local stenoses of the iliac arteries up to 10 cm in length, not extending to the common femoral artery
2. unilateral occlusion of the common or external iliac arteries that does not extend to the common femoral artery

3. bilateral stenoses of the iliac arteries 5-10 cm in length, not extending to the common femoral artery
4. unilateral stenosis of the external iliac artery with extension to the common femoral artery.

The technical success rate of angioplasty of iliac artery stenoses in all studies exceeds 90%, in some cases reaching 100%. The technical success rate of restoring patency of the iliac arteries in case of their occlusion after recanalisation and dilatation is less and amounts to 80-85%. Long-term patency after such interventions reaches 80% after 1 year and 60% after 5 years. These are the results of studies where the majority of patients suffered from intermittent claudication; it should be borne in mind that in patients with critical ischaemia, the possibility of angioplasty is much less.

The immediate postoperative mortality rate for angioplasty and stenting is less than 1%.

Indications for the use of stents after angioplasty of the aortoiliac segment are:

1. preservation of the residual pressure gradient after dilatation of the stenosis
2. intimal dissection threatening with arterial thrombosis
3. after recanalization and dilatation of chronic occlusions
4. restenosis after previously performed angioplasty.

The four-year primary patency rate after stenting of stenotic lesions was higher and amounted to 77% compared with isolated dilatation - 65%; for occlusions, these figures were 61% and 54%. Apparently, it can be argued that the prophylactic use of stents improves the long-term results of aortoiliac angioplasty.

Indications for angioplasty of the infrainguinal segment are:

1) the presence of local stenosis < 3 cm of the common or superficial femoral artery (unilateral or bilateral) with preserved outflow tracts
2) local stenoses of femoral arteries with a length of 3 to 10 cm, not extending to the distal popliteal artery with preserved outflow pathways
3) several stenoses of the femoral artery, each up to 3 cm in length, with preserved outflow tracts.

The results of angioplasty of femoropopliteal lesions depend on the length of the lesion, the state of the outflow tract and other factors. Most studies have focused on the treatment of patients with intermittent claudication, and it is obvious that the results of treatment of patients with critical ischaemia will be worse. The primary patency of dilated stenotic areas after five years is 50%. If two or three tibial arteries are affected, the primary patency after five years is only 25%.

The ideal option for angioplasty of the tibial arteries is a local lesion with good outflow pathways, and it is believed that the restoration of direct blood flow to the arteries of the foot will be the key to further success. Therefore, only 20-30% of patients with arterial lesions in this region have a corresponding anatomical lesion. Recent published studies report technical success in 80% of cases and preservation of the limb after 2 years in 60% of patients.

Intraoperative angioplasty is possible to correct both inflow and outflow pathways (lower leg and foot arteries).

Contraindications to angioplasty include aortic occlusion and various haemorrhagic disorders.

Reconstructive vascular surgery.

It is usually the method of choice in the treatment of patients with critical lower limb ischaemia due to the presence of extensive and multilevel lesions. The main tactical principle here is to bypass the occluded artery and make a distal anastomosis in the most appropriate part of the recipient artery.

Evidence is provided by the impossibility of performing an endovascular procedure and the availability of sufficient outflow pathways for the proposed reconstructive surgery. Age alone cannot be a reason for a patient to refuse surgery.

Preoperative preparation, in addition to the correction of the main risk factors, most often consists of intravenous infusion pharmacotherapy.

The effectiveness of reconstructive surgery depends on the condition of both inflow and outflow pathways.

Anaesthetic care

For operations on the arteries, lower extremities, it is preferable to use conduction, in particular epidural, anaesthesia, or its combination with general anaesthesia.

Antibacterial therapy

Parenteral intra- and postoperative administration of antibacterial drugs is recommended, especially when using synthetic prostheses. In aorto-femoral, reconstructive interventions, the proximal anastomosis should be applied either at the level or above the site of the inferior mesenteric artery, the choice of the distal anastomosis depends on the severity of the lesion of the intended recipient artery and the state of the outflow tract, most often the common or deep femoral artery. It is preferable to use synthetic prostheses. For aorto-femoral reconstructions, synthetic prostheses are traditionally used (production of Sever, Ecoflon, Basex, Vascutek, Gore-Tex). The choice of the type of surgery (linear or bifurcation) depends on the unilateral or bilateral lesion of the iliac arteries. In case of bilateral haemodynamically significant lesions of the iliac arteries, it is advisable to perform bifurcation aorto-femoral bypass. There may be cases when, due to the extremely high risk of surgery, unilateral bypass surgery of a critically ischaemic limb is performed. After aorto-femoral reconstructions, approximately 95% of patients are relieved of critical ischaemia, and 80-90% of patients maintain a good result for 5 years. The mortality rate after these interventions ranges from 1% to 3.3% according to the best world statistics. In patients with contraindications to aorto-femoral reconstruction, various types of atypical bypass surgery can be performed (cross iliofemoral or femoral-femoral bypass, subclavian-femoral bypass). Indications for such operations are determined on a case-by-case basis. In the absence of hemodynamically significant stenosis of the opposite iliac artery, or after angioplasty of the iliac artery, cross femoral-femoral or iliofemoral bypass surgery can be used in patients with contraindications to aorto-femoral and other reconstructions. In addition, in patients with contraindications to aorto-femoral intervention, the subclavian artery can be used as a tributary artery, after making sure that it is intact

with a duplex scan. Despite the worse patency rates, the technique can probably be used in severe patients, as it is accompanied by a lower mortality rate.

In the case of multilevel lesions (aortoiliac and femoropopliteal), it is preferable to perform staged reconstructions or combine open surgery with angioplasty of the inflow or outflow tracts. Only when preoperative angiography and intraoperative revision of the femoral arteries reveal severe damage to the deep femoral artery and poor flow between its branches and the popliteal artery, is it advisable to perform a single-stage aorto-femoral-popliteal reconstruction.

Standard reconstructive surgeries in the femoropopliteal region include profundoplasty, femoropopliteal bypass above and below the knee joint cleft, femoral-popliteal bypass, and femoral-femoral-foot bypass. The results of each of these operations are discussed below. The difficulty lies in the fact that most studies do not separately report cases of critical ischaemia and therefore the actual results may be somewhat worse. The second difficulty is that different types of plastic material, as mentioned above, affect the outcome of the operation.

It remains controversial to what extent isolated profundoplasty is able to stop the phenomena of critical limb ischaemia. Apparently, this type of reconstruction should be used in severe patients whose main expected effect is to reduce pain.

The main indication for performing the operation is, of course, the presence of hemodynamically significant stenosis/occlusion of the deep femoral artery, ‘good’ inflow pathways and preserved collaterals from the deep femoral artery basin to the popliteal artery and lower leg arteries. The main means of predicting the effectiveness of this operation is the deep femoropopliteal index, calculated on the basis of ultrasound Doppler, and the equal systolic pressure on the thigh - **systolic pressure on the lower leg/ systolic pressure on the thigh.**

It is believed that if this index is higher than 0.4, then isolated reconstruction of the deep femoral artery will be ineffective, i.e. the haemodynamic block formed by stenosis/occlusion of this artery plays a secondary role in the genesis of critical ischaemia. After profundoplasty, it is possible to preserve the limb in 76-84% in the short term, and in the long term in 49-72.4%. The results of profundoplasty in popliteal occlusions are worse - 55.6% of positive results.

Inflow routes of femoral-popliteal shunts. Usually, the site of proximal anastomosis of femoral-distal shunts is the common femoral artery or the branche of the aorto(ilio)-femoral shunt, rarely - the deep femoral artery. Some authors have investigated the possibility of forming an anastomosis with the superficial femoral artery, but

the known fact of the predominant localisation of the atherosclerotic process in the superficial femoral artery severely limits them. Nevertheless, in some cases, it is permissible to shorten the length of the shunt, but only when there is no doubt about the intactness of the donor artery.

The distal anastomosis of infrainguinal reconstructions is recommended to be made with an artery that can provide the best possible blood flow to the affected limb, regardless of the length of the shunt.

Usually, the choice of the distal anastomosis formation site is based on angiographic, duplex studies and intraoperative revision, and in the absence of clear contrast of the distal arteries, their revision and intraoperative angiography should be performed, and then a decision on the patient's operability should be made.

For femoral-popliteal reconstructions above the knee joint cleft, prostheses

made of polytetrafluoroethylene or other synthetic materials or autovenous grafts are used.

There are two different points of view on the question of the plastic material used for femoropopliteal bypass above the knee joint cleft. The following arguments can be made in favour of using a prosthesis in this position: similar long-term primary patency to the vein (75% of passable synthetic shunts after 5 years), better secondary patency, short surgical time, few wound complications, and preservation of the vein for repeat operations or coronary artery bypass grafting. Several facts speak in favour of autovenous veins: better long-term patency (80% of passable shunts after five years), reduced risk of graft infection. The often-cited argument about saving the autovenous for distal reconstructions or coronary artery bypass grafting is valid only in 5-10% of cases when this is done. The first point of view still prevails, and most surgeons use polytetrafluoroethylene or biological prostheses, such as bovine prostheses, for femoropopliteal bypass above the knee joint cleft. For femoropopliteal reconstructions below the knee joint gap, femoral and ankle and popliteal interventions, it is advisable to use an autograft or, if an autograft of the required length is not available, a combined graft.

In contrast to bypass surgery to the proximal popliteal artery, autovenous grafts are recommended for reconstructions of arteries below the knee. This is confirmed by the results of a randomised trial comparing polytetrafluoroethylene prostheses and autovenous. A meta-analysis of five-year results of femoral-distal bypass surgery for critical ischemia (1572 patients with critical ischemia), which includes operations with distal anastomosis in the artery of the feet, shows that in this position, reversible autovenous grafts give the best results - 77% primary patency - or autovenous grafts using the in-situ technique - 68%; polytetrafluoroethylene prostheses in this position demonstrate the worst results - 40%.

The next question, which has not yet been resolved in the literature, concerns which technique of autovenous bypass (reverse or in situ) should be preferred. Each technique has its own disadvantages. The reversing autovenous vein usually does not correspond in diameter to the anastomosed arteries, its fencing damages the feeding arterial branches, and there is a high traumaticity of accesses during autovenous isolation, although currently there are methods of endoscopic autovenous fencing. The use of an in-situ vein depends on the quality of the instrument used to destroy the valves and ligate the branches. The quality of valve destruction can now be controlled visually using an angioscope or intravascular ultrasound. Randomized trials have not shown significant differences in outcomes. For example, Moody et al, 1992 (123 reversing autovenous veins and 103 in situ veins) reported a 62.4% five-year patency rate for reversing autovenous veins in the femoropopliteal position below the knee joint cleft and 63.5% for in situ veins in the same position. On the contrary, Watelet et al, 1997 (50 - reversing autovenous and 50 - in situ vein) reported a five-year patency rate of 46.2% for in situ shunts, compared to 68.8% for reversing autovenous. In our opinion, this may be due to the fact that the experience of the surgeon performing the operation is very significant with the in-situ technique.

If there is a lack of vein length, it is permissible to take a vein from the arm opposite the lower limb, to sew a graft from two fragments suitable for reconstruction, to make a proximal anastomosis below, to use inserts from prostheses in the proximal parts of the grafts; there are studies on the use of the superficial

femoral vein as a plastic material.

When there is no autovenous vein available for distal reconstruction, prostheses, most often polytetrafluoroethylene, have to be used. We have already mentioned the poor results of such operations, so several surgical techniques have been proposed to improve them. First of all, it is the application of an arterio-venous fistula to reduce peripheral resistance. Hainsho et al, 1999 (89 femoral-distal shunts), reported insignificant changes in primary patency in such operations: 54.1% with arterio-venous fistula versus 43.2% without. In domestic studies, there have been reports of an increase in the effectiveness of femoral-distal reconstructions when using shunt offloading into the great omentum transplanted on the vascular pedicle.

It is possible to use autovenous patches or inserts in the area of distal anastomoses (Miller's cuff, St Mary's boot). In 1997, Stonebridge et al published the results of a randomised trial that included 251 patients, of whom 133 used an autovenous insert between the PTFE prosthesis and the distal anastomosis. There were no significant differences in femoropopliteal shunts above the knee joint cleft, while the two-year patency rate for femoral-distal shunts with a Miller cuff was 52% versus 29% without.

The patency of the graft should be checked at the end of the operation. If there are any doubts about its patency and the causes of these disorders, they should be resolved on the operating table, including intraoperative angiography, ultrasound flowmetry, angioscopy, duplex scanning or intravascular ultrasound.

Outcomes of femoropopliteal bypass above the knee joint cleft in patients with critical lower limb ischaemia

In the available literature, we found few studies on this operation in critical ischaemia, which is probably due to the more severe damage in this group of patients. At discharge, the prostheses are passable in 83.4% of cases.

Long-term results of femoropopliteal bypass above the knee joint cleft in patients with critical ischaemia

	Number of operations	% patients with critical ischaemia	Primary passability (%)			Primary passability (%)			Type of transplant
			1 year	2-3 years	4-5 years	1 year	2-3 years	4-5 years	
Woratyla et al,1997	438	77%	74	56	50			91	PTFE
ChrKteiEon et al,1985	153	The majority		88	78			87	PTFE
Quinoiies-Baldrich et al, 1989	146	The majority			49			73	PTFE, 101 above the knee
Patterson et al, 1991	138	79%	75		54	88		70	PTFE

Neale et al, 1994	134	63%		72					PTFE
Kavanagh et al,1998	96	100%	68	49	36	93	85	75	PTFE
O'Riordain et al,1992	71	100%	80	55	39	97	84	77	PTFE

The majority of studies have focused on the use of polytetrafluoroethylene prostheses in this position. Hunink et al. conducted a meta-analysis of the results of femoropopliteal bypass above the knee joint cleft using polytetrafluoroethylene prostheses and reported 47% primary patency after 5 years. In patients with critical ischemia, this variant of surgery can preserve the limb in 70-91% of patients within the same time frame.

Results of femoral-popliteal bypass below the knee joint cleft, femoral-tibial bypass in patients with critical lower extremity ischaemia.

The immediate results of femoropopliteal bypass below the knee joint cleft and femoral-to-popliteal bypass are similar and range from 73 to 98% technical success. The incidence of early thrombosis in this position increases to 4.1-16.5% compared to the previous version of the operation.

Naturally, the type of graft chosen is of great importance for long-term results, as mentioned above. The following tables

shows the most important statistics depending on the type of graft used.

Despite the fact that randomised trials have not shown the advantages of in situ autografting, the best results, according to the world literature, are obtained with this variant of surgery:

After five years, the number of preserved limbs is 57-93%. The long-term results of reversing autovenous surgery in this position are somewhat worse: in the same period, the number of preserved limbs reaches 55%. The worst results are obtained when using prostheses for femoral-distal bypass surgery: 33% of limbs saved after five years.

Long-term results of in situ autovenous bypass below the knee joint in patients with critical ischaemia.

	Number of operations	% critical ischaemia	Primary (secondary permeability) %			Preservation of the limb (%)			Note
			1year	2-3 years	4-5 years	1 year	2-3 years	4-5 years	
Darling et al, 1997	880	100	-(89)		-(76)	96		93	Peroneal artery bypass grafting, In situ- 68%

Marzelle et al, 1992	695	100			50			76	Bypass surgery of the popliteal artery below the joint cleft
Gmss et al,1992	594	Mor e 100			64,9				Bypass surgery of the popliteal artery below the cleft and tibial arteries
Belkin et al, 1996	386	90,8			68(80)				Shin artery bypass grafting

Long-term results of below-the-knee reversible autogenous bypass surgery in patients with critical ischaemia

	Number of operations	% critical ischaemia	Primary (secondary permeability) %			Preservation of the limb (%)			Note
			1year	2-3 years	4-5 years	1 year	2-3 years	4-5 years	
Taylor et.al.1990	241	100			69it				Femoral and lower leg bypass surgery
Luther et al,1998	228	100			55			55	The exact amount of autovenomics used is unknown
Taylor et.al.1990	199	100			8Clit				Femoral-popliteal bypass below the slit
Rutherford etal.1988	22	100	75	63					

Long-term results of below-the-knee bypass surgery with synthetic PTFE prostheses in patients with critical ischaemia

	Number of operations	% critical ischaemia	Primary (secondary) permeability %.			Limb preservation (%)			Note
			1year	2-3 years	4-5 years	1 year	2-3 years	4-5 years	
Sayersetal.1998	635	7	48(54)	31(37)					The exact number of prostheses used is unknown
Luther et al, 1998	228	100			21			33	The exact number is unknown
Schweigeretal.1993	211	100		37(45)	23(25)				
Veithetal.1986	98	88			12				
llluminati, 2000	34	100		12,7					Two-year passability 67%

Results of foot artery bypass grafting in patients with critical lower limb ischaemia

When performing foot artery bypass grafting, the limb can be preserved in 85.7-97% of cases, the incidence of early thrombosis reaches 2.4-21.4%, and the number of amputations is 3.5-14.3%. In the five-year period after bypass surgery, the limb is preserved in 66-86% of patients.

Long-term results of femoral (popliteal) bypass surgery in patients with critical ischaemia

	Number	% critical ischaemia	Primary (secondary) permeability %.			Limb preservation (%)			Note
			1year	2-3 years	4-5 years	1 year	2-3 years	4-5 years	
Darling et al, 1997	291	100	-(88)		-(68)	95		87	
Kalraetal.2001	256	100			58(71)			78	
Rhodesetal,2000	213	100			57(67)			78	
Biankari et al, 1999	165	100	43(76)		34(55)	53	49	36	
Luther et al,1997	109	100		38(69)					

Plecha et al,1996	80	100		72 52(68)			86		periosteal bypass surgery
Biankari et al, 2000	66	100	58	55		88	88		periosteal bypass surgery
Ecksteinetal.1996	56	100	65(71)	55(62)	55(62)	77	71	66	
Farahetal.2000	50	100	72	61					
Isaksson et al.2000	48	100	72(85)			85			

Endarterectomy

The endarterectomy technique can be used in patients with a high risk of standard reconstructive surgery in the presence of a localised occlusion of the superficial femoral artery and preserved outflow tracts.

The essence of the method is to desobliteration of the occluded artery, most often the superficial femoral artery, according to the semi-closed type, i.e., in the course between the arteriotomy holes proximal and distal to the site of occlusion. Since 70-80, low-frequency ultrasound has been used for this purpose.

The only advantage of the operation, in our opinion, is its shorter duration than standard reconstructive surgery, so it will be indicated in patients with an extremely high risk of standard intervention and the impossibility of performing a radiological procedure.

Non-standard reconstructive surgeries

If it is not possible to perform standard reconstructive surgery due to occlusion of the tibial arteries and lower leg arteries, arterialisation of the venous blood flow of the foot can be performed. The operation should be performed in centres with extensive experience in such reconstructions.

It is believed that the main mechanisms of critical ischaemia relief during arterialisation of the venous blood flow of the foot in the short term are blocking of arterio-venular bypass, increasing blood flow to the capillaries and improving tissue oxygenation. In the long-term period, arterialisation stimulates the development of collaterals. The main thing in this operation is the qualitative destruction of valves in the veins of the foot. Two types of surgery have been developed: arterialisation of superficial and deep venous systems. An interesting fact is that to prevent recurrence of ischaemia, the following shunt operation time is required: for arterialisation of the superficial venous system - b months, and for the deep system - 3 months.

Transplantation of the great omentum to the lower leg with microvascular anastomoses (which is preferable) or transplantation of a free flap of the great omentum is quite effective in patients with critical ischaemia due to obliterative thrombangitis. In patients with atherosclerosis with critical ischaemia, this operation is ineffective.

The technique of implantation of a fragment of the great omentum on the lower leg is not widespread, although some authors note its high efficiency. According to some authors, resection of the posterior tibial veins to eliminate pathological arteriovenous shunting is used in patients with obliterative

thrombangitis in the presence of high venous pressure at the ankle level (> 50 mm Hg).

Postoperative management of patients

In the postoperative period, it is advisable to continue tablet disaggregant therapy (acetylsalicylic acid and ticlopidine or clopidogrel), intravenous drug therapy (rheopolyglucin, pentoxifylline) for 5-7 days. In femoral-distal reconstructions, treatment with unfractionated heparin or low-molecular-weight heparins (fragmin, klexan, fraxiparin, troparin) is also desirable for 5-7 days.

Graft thrombosis - Cases of graft thrombosis should be divided into early (up to 30 days) and late (more than 30 days) after surgery. Early thrombosis is usually caused by technical errors and inaccuracies during surgery, for example, violation of the prosthesis geometry, incorrect assessment of the inflow or outflow pathways, i.e. technical and tactical errors. Less common are cases of thrombosis due to coagulation disorders.

In case of early graft thrombosis, revision, thrombectomy or repeated reconstruction should be attempted.

Strict follow-up of patients after vascular reconstruction is necessary. The condition of the grafts should be monitored regularly, especially during the first year after surgery, to identify areas of stenosis and prevent further thrombosis. The expected follow-up periods are 3, 6 and 12 months after surgery.

It is much easier to perform a preventive operation when a graft stenosis site is detected than to attempt to save a limb after thrombosis. It has been shown that more than 20% of autogenous grafts can thrombose in the first year due to stenosis. The best means of control in this case is the measurement of LVEF, and if it decreases, duplex scanning of the grafts. Preventive operations can be represented by angioplasty and stenting, as well as open correction of the narrowed area.

In case of late graft thrombosis, angiographic examination and duplex scanning are required before reintervention, and intraoperative angiography is required during surgery to determine the state of the outflow tract.

The cause of late graft thrombosis is the progression of the pathological process in both inflow and outflow pathways, hyperplasia of the intima in the anastomoses. At present, there is no accurate information about the ability of lumbar sympathectomy to relieve critical ischaemia. Other methods of critical lower limb ischemia relief.In the absence of direct revascularisation, various palliative operations are used, the first of which is lumbar sympathectomy in various modifications. Recently, the endoscopic technique has become widespread. Regarding this operation in critical ischemia, very controversial results are reported, both in the short term - from 30% to 72.4% of the preserved limbs, and in the long term - from 32.1% to 68.1% of the preserved limbs. The best effect is observed in lesions of the lower legs. Most authors stipulate that the best results of this operation are observed when observing the indications, which in the domestic literature are more often established on the basis of functional tests of laser flowmetry. The best results were obtained by foreign researchers in patients with an initial ankle-brachial index above 0.3 and pain at rest. An interesting fact is that in domestic publications, the best results were also observed in patients with initially high values of LIP = 0.48 + 0.04 and Tcp02 = 30 + 0.9 mmHg. Many authors generally consider surgery inappropriate in patients with critical ischaemia. Various variants of periosteal blood flow stimulation in critical ischaemia are inappropriate. Stimulation of periosteal blood flow (tibial compactotomy followed by Ilizarov traction of the detached fragment, corticectomy, revascularising osteotrepanation

according to Zusmanovich, osteoperiosteal vascularisation) is based on two mechanisms: the immediate one is a reflex effect on the periosteum and reduction of arterial spasm, opening of existing collaterals and a corresponding decrease in peripheral resistance; the long-term one, which consists in the development of collateral blood flow in 3-4 months. F.N. Zusmanovich, the founder of the revascularising osteotrepation technique, considers it ineffective in case of severe pain syndrome, orthostatic edema, and any purulent diseases of the affected limb due to the possibility of osteomyelitis development is a contraindication to the operation. All of this, in fact, sharply limits the group of patients with critical ischaemia in whom bone revascularisation is feasible.

Pharmacotherapy

Pharmacotherapy should be initiated immediately upon admission to hospital, regardless of whether reconstructive surgery is planned or not. It is advisable to prescribe disaggregant drugs (acetylsalicylic acid drugs together with ticlopidine or clopidogrel), especially since the vast majority of patients suffer from coronary artery disease and are prescribed these drugs for life. The standard regimen of intravenous infusion therapy includes the administration of low-molecular-weight dextran (rheopolyglucin) 400.0 and pentoxifylline (trental) 10.0-15.0 daily. The volume of infusion can be reduced to 200.0 ml in the presence of severe concomitant cardiac pathology or CKD. Two multicentre, double-blind, placebo-controlled trials have been conducted with regard to intravenous pentoxifylline, which have shown its effectiveness in reducing pain. The first study (The European Study Group, 1995) included 314 patients with critical ischaemia, half of whom received pentoxifylline 600 milligrams twice daily intravenously for 21 days, and the other half received placebo. In the group of patients taking the active drug, a statistically significant reduction in pain and the number of analgesics consumed was achieved. In the second study, the differences in the intensity of pain in the groups were not statistically significant (Norwegian Pentoxifylline Multicentre Trial Group, 1996).

No clinical trials have been conducted on the use of anticoagulants in isolated therapy in the treatment of patients with critical ischaemia, although the literature mentions cases of successful conservative therapy of critical ischaemia with low molecular weight heparin. There are reports of a good effect of sulodexide (Wessel Duo F) in diabetic foot syndrome. Some authors report the effectiveness of intra-arterial injection of various rheology solutions and regional venous blood from the affected limb; in one study, hyperbaric oxygenation (Fiedenucci P., 1985) relieved ischaemic rest pain and healed small ulcers in 1/3 of 2000 patients in 4-6 weeks after the start of treatment. These are single studies and it is difficult to rely on them. Nevertheless, most authors agree that conventional conservative therapy alone is ineffective in treating patients with critical lower extremity ischaemia, and long-term results are unsatisfactory.

Treatment with vasaprostane in patients with critical ischemia is advisable as a preoperative preparation of the receiving vascular bed of the proposed surgery, after reconstructive vascular surgery to improve treatment outcomes, and when vascular reconstruction is not possible for any reason. The initial preference was given to intra-arterial injection of prostaglandin E1, as it was known that the drug was rapidly inactivated in the lungs; later it became known that after temporary inactivation of the active substance, its active analogue was again formed in the body. Subsequently, one of the trials proved the advantage of intravenous

administration of the drug in patients with grade III ischaemia. Currently, the most commonly used dosage is 60 mcg (20 mcg to 80 mcg per day) per day for 10 days, with the possibility of extending the course to 30 days or more. The drug is diluted in 150-200 ml of physiological saline and administered intravenously for at least 2 hours. A faster infusion is not permitted.

There is no information on randomised trials of prostanoids in domestic publications.

In the 'Management of Peripheral Arterial Disease. TASC', published in 2000, presents the results of 13 randomised open or double-blind clinical trials comparing the results of treatment of critical ischaemia with prostaglandin E1 (vasaprostane) or prostaglandin I2 (iloprost) analogues with placebo or pentoxifylline. The daily dosage of vasaprostane ranged from 20 mcg to 80 mcg, and that of iloprost from 0.5-2 ng/kg/min. The total number of patients enrolled in the study was 2748. The duration of therapy varied from 2 to 4 weeks, and the drugs were administered intravenously or intra-arterially. The endpoints of the study were pain relief, reduced analgesic consumption, and accelerated healing of trophic ulcers. Of these, only two trials did not show statistically significant differences in the groups, i.e. in the rest of the studies, prostaglandin treatment reduced pain and accelerated ulcer healing. Patients responded better to long-term treatment (4 weeks). Data on amputations in 3-6 months after treatment were published in three studies on treatment with iloprost, and it turned out that the rate of amputations in this period in patients treated with the drug was lower than in the control group (23% vs. 39%) and the differences were statistically significant. Moreover, the mortality rate during this period was also lower in patients receiving iloprost (35% vs. 55%, $p<0.05$). In general, it can be stated that vasaprostane is well suited for use in the absence of surgical treatment options, as well as preoperative preparation; in case of recurrent ischaemia in the setting of graft thrombosis. The drug is in fact an alternative to amputation, and therefore its widespread use in the treatment of critical lower limb ischaemia is advisable. It should be borne in mind that the effects of the drug administration are levelled out within a few months to 2 years after the therapy, so repeated courses of treatment are recommended in case of recurrent ischemia.

If the activity of the inflammatory process is detected in patients with obliterative thrombangitis, a course of anti-inflammatory pulse therapy is necessary.

An increase in C-reactive protein, circulating immune complexes (CIC), IGG, IGM indicates the activity of autoimmune inflammation. To relieve it, pulse therapy is performed, which consists in the administration of large doses of depot prednisolone (solumedrol 1.0 No. 3 intravenous drip) and cytostatics (cyclophosphane 1.0 intravenous drip on the first day of treatment). Up to three courses of such therapy are possible, with no interval between courses. Its effectiveness, in addition to the clinical picture, is judged by the normalisation of the above immunological parameters. It should be noted that changes in ESR in this case are not significant.

In patients with diabetic polyneuropathy, it is advisable to add alpha-lipoic acid (espa-lipon) and B vitamins (milgama) to the treatment. Espa-lipon is prescribed at a dose of 600-1200 milligrams intramuscularly or intravenously per day for 2-4 weeks with a transition to the tablet form of the drug at the same dose for 3 months. Milgama is administered at 2 ml of solution per day intramuscularly for a week.

Treatment of a patient after discharge from hospital

After discharge from the hospital, a categorical smoking cessation is required, as this allows not only to preserve the limb but also to prolong the patient's life. Therapeutic walking is advisable. Lifelong administration of acetylsalicylic acid (thrombo-ACC, aspirin-cardio) at a dose of 50-100 milligrams per day together with ticlopidine (Ticlid) at a dose of 500 milligrams per day or clopidogrel (Plavic) 75 milligrams per day (in the absence of contraindications); pentoxifylline at a dose of 1200 milligrams per day (vasonit 600 milligrams, trental 400 milligrams) in courses for 2-3 months is indicated. One or two courses of intravenous infusions of vasoactive drugs (see Pharmacotherapy section) and physiotherapy are desirable during the year. Treatment of coronary heart disease and hypertension should be continued.

Hypolipidemic therapy is required to achieve the following values: total cholesterol < 5.2 mmol/l (< 200 mg/dL), LDL 100 mg/d, HDL > 1.0 mmol/l (> 40 mg/dL), triglycerides < 1.7 mmol/l (< 150 mg/d).

An increase in atherogenic blood lipids is associated with an increase in the incidence of lower limb arterial insufficiency. Naturally, it is not possible to achieve blood lipid compensation during inpatient treatment, so this is most likely the task of outpatient physicians. Initially, the patient should follow a strict anti-atherosclerotic diet. If after 2 months it is not possible to achieve normalisation of the lipid profile, then the use of lipid-lowering drugs, preferably of the statin group, should be started. It should be borne in mind that these drugs should be taken for life.

Amputations

It is desirable to perform any amputation in a patient with critical lower limb ischaemia only after consultation with a vascular surgeon. Of course, this applies to the need to amputate a limb at the level of the thigh or lower leg, since in such patients the condition of the main vessels of the affected limb should be determined and the possibility of performing reconstructive vascular surgery or conservative therapy should be determined. Only after exhausting all means of saving the limb is amputation possible in a patient with critical ischaemia. It should be emphasised once again that preliminary revascularisation of the limb allows to reduce the level of the intended amputation or to limit it to a small amputation (finger, foot).

The level of amputation should be chosen taking into account the preservation of the most functional limb stump and at the same time there should be certain guarantees of primary healing of the stump. Most often, in case of lesions of the aortoiliac segment arteries, it is about amputation at the border of the upper and middle third of the thigh, in case of lesions of the arteries below the inguinal ligament - either amputation at the level of the upper third of the lower leg (which is preferable), or at the border of the upper and middle third of the thigh. The first method is preferable, as it is accompanied by less immediate and long-term mortality and more patients are able to use prostheses. In tibial amputation with primary tension, 30 to 92% of the stump heals, and remputation is required in 4-30% of cases, of which about 30% of patients have remputation above the knee.

The level of amputation is determined based on clinical and instrumental data,

including the measurement of transcutaneous oxygen tension at the level of the proposed amputation. If the Tcp02 at this level exceeds ZO mmHg, primary healing of the stump can be expected.

Currently, there are several ways to instrumentally determine the level of amputation. The first one is based on the determination of regional systolic pressure, using 50 mmHg as a critical value, several researchers reported 100% healing of the stump. Subsequent reports have refuted such optimistic statements. It is believed that a Tcp02 of 30 mmHg is usually sufficient for primary stump healing. For greater accuracy, it is preferable to measure oxygen tension at several points.

Rehabilitation after amputation takes about 9 months, but after two years, however, 30% of patients do not use prostheses. The immediate postoperative mortality rate for amputations below the knee varies from 5 to 15%, increasing to 11-39% if the limb is amputated at the hip level.

The fate of a patient with chronic critical lower limb ischaemia depends on the effectiveness of conservative therapy or reconstructive vascular intervention.

The survival rate of patients after successful treatment of critical ischaemia and after amputation of the hip or lower leg.

Survival rate	After 1 year	After 3 years	After 5 years
After successful treatment	84%	75%	57-78%
After amputation	76%	51-56%	34-36%

The survival rate of patients after successful treatment of distal critical ischaemia, i.e., with arterial damage below the inguinal ligament, is 84% after two years, 43-75% after 3 years, and 57-78% after 5 years.

The results are significantly improved in patients who have quit smoking, regardless of their previous smoking history.

If the patient's treatment was ineffective, but he or she was discharged with a preserved limb, then only 81% of the affected limbs will be preserved in one month, and 70% of the affected limbs will be preserved in 3 months. In a year, this figure will drop to 54%. The survival rate in a year will be 46%.

A year after hip amputation, 76% of patients survive, in three years - 51%-5b%, in five years - up to 34-36%. Two years after amputation at the level of the lower leg, 15% of patients will need re-amputation above the knee and 15% of patients will have their contralateral limb amputated.

Antiplatelet therapy in CCLLI

All patients with/without other cardiovascular diseases should be prescribed long-term antiplatelet drugs to reduce cardiovascular mortality. Aspirin is effective in the group of patients with peripheral arterial disease and clinical manifestations of clinical carotid and coronary artery disease. Clopidogrel is the drug of choice in this case, and it is advisable to prescribe it to patients without clinical manifestations of CVD.

Thus, it can be stated that the treatment of critical lower limb ischemia is a difficult task, the solution of which allows not only to preserve the patient's limb and

improve the quality of life, but also to significantly extend life expectancy.

Situational tasks

1. Patient S., 68 years old, was admitted to the surgical department with complaints of weakness, dizziness, severe pain in the right lower limb, no pulsation on the arteries of the lower leg. What could be the cause of the pain?
   Answer standard: The pain is caused by acute thrombosis or embolism of the great vessels of the right lower extremity, most likely on the background of obliterating atherosclerosis.
2. Patient N., 71 years old, complained of pain in the lower extremities when walking up to 100 m. What is the most likely diagnosis?
   Answer standard: Chronic limb ischaemia syndrome.
3. Patient K. with diabetes mellitus, 40 years old, complained of pain in the left lower leg when walking up to 50 m. What is your diagnosis?
   Answer standard: Mallory-Weiss syndrome.

6.3. Orientation map for independent work with literature on the topic of the class

№	Main tasks (to study)	Instructions (to name)
1.	Anatomical and physiological structure of the heart, large and small circles of blood flow.	-Departments of the heart -Anatomical and physiological structure of the small circle of blood flow -Anatomical and physiological structure of the large circle of blood flow
2.	Clinical signs of thrombosis and embolism of the great vessels of the extremities	-clinical picture of: a) thrombosis; b) embolism; c) radicular pain.
3.	Methods of examination of patients with cardiovascular problems.	-ECG; -Echocardiography; -ECHOCARDIOGRAPHY; -Angiography; -CT, MRI angiography.
4.	Conservative therapy in case of acute disturbance of the main blood flow	-Anticoagulant therapy; -Disaggregant therapy; -Correction of microcirculatory disorders.
5.	Indications for surgical intervention	-Direct indications; -Relative indications;
6.	Surgical methods of treatment	-Thromboembolectomy; -Thrombolytic therapy; -Bypass surgery.

1. Materials for self-monitoring the quality of training

A. Questions for self-monitoring:

1. The main clinical signs of acute and chronic ischaemia of the lower limbs.
2. Differential diagnosis of thrombosis and embolism of the great vessels of the lower extremities.
3. Methods of invasive and non-invasive methods of studying blood flow disorders in the lower extremities.
4. Laboratory methods of research in patients with thrombosis and embolism.
5. Indications and methods of conservative therapy.
6. Indications for surgical treatment.
7. Methods of surgical interventions depending on the location of the lesion of the vessels of the lower extremities.

B. Self-assessment tests with answer sheets:

1. 1What are the symptoms characteristic of thrombosis and embolism of the major vessels of the lower tarsi?

A. No pulsation.
B. Increased pain during active movements.
C. Bradycardia.
D. Hommans symptom.
E. Causality.
Answer standard – "A".

2. What does the brachiocephalic index indicate?

A. On the absence of pulsation.
B. About innervation disorders.
C. About deep vein thrombosis of the lower leg.
D. The degree of impaired blood flow in the limb.
E. About the level of thrombosis.
Answer standard – "D".

3. Determine the treatment of acute thrombosis or embolism.

A. Intensive anticoagulant therapy.
B. Thrombolytic therapy.
C. Surgical intervention after haemodynamic stabilisation.
D. All that is listed
Answer standard – "D".

C. Tasks for self-control with answers

1. A patient, 67 years old, was admitted to the emergency department for acute thrombosis of the popliteal artery against the background of acute myocardial infarction. What should the surgeon do?

Answer: Surgical intervention after haemodynamic stabilisation.

2. A patient, 80 years old, is operated on for critical ischaemia with symptoms of wet gangrene of the foot. What should the surgeon do?

Answer: Amputation of the lower limb at the level of the c\3 thigh.

3. A patient, 60 years old, after a massive myocardial infarction on the third day developed

symptoms of acute thromboembolism of the vessels of the lower extremity. What should the surgeon do?

Answer: If there is no effect from intensive conservative therapy, surgery is indicated - thromboembolectomy.

1. Materials for higher education students for self-study.

List of practical training tasks to be completed during the practical session:

- Perform finger pulsation of the main arteries of the lower extremities.
- Determine the blood group of the patient.
- Take part in ECG, EchoCS.
- Participate in ultrasound and angiographic examination and be able to interpret them.
- Interpret the results of the coagulation test.

Instructional materials for mastering professional skills and abilities.

Methods of work execution, stages of execution.

1. Determine the blood group by the method of standard sera and cellulose antibodies.
2. Be able to determine the suitability of blood for transfusion.
3. Be able to determine the degree of blood flow disorder in the lower extremities.

8. Materials for independent mastery of the knowledge, skills and abilities required by this work.

Tests of different levels.

A 73-year-old woman in serious condition. She complains of severe weakness, pain in the lower abdomen and lower extremities, dizziness. What is your diagnosis? What treatment is indicated for the patient at this time?

A. Surgical treatment.
B. Examination.
C. Radiotherapy.
D. Chemotherapy.
E. Symptomatic therapy.

A 73-year-old man complains of pain in the right lower extremity that has appeared for 8 months, with a history of myocardial infarction. What is the most likely diagnosis?

A. Obliterating atherosclerosis of the aorta and great vessels.
B. Osteochondrosis of the spine.
C. Rheumatism.
D. Deep vein thrombosis.
E. Erysipelas.

A 25-year-old man was involved in a car accident, injuring his knee joint and losing pulsation in the arteries of the foot. What pathology should be considered first?

A. Thrombosis of the popliteal artery.
B. Menetrier's disease.
C. Obliterating atherosclerosis of the vessels of the lower extremities.
D. Obliterating endarteritis of the vessels of the lower extremities.
E. Burger's disease.

A 35-year-old patient was diagnosed with Burger's disease. Which additional examination method is most informative for confirming the diagnosis?
A. Angiography.
B. Echocardiography.
C. ULTRASOUND.
D. Coagulogram.
E. CT.

A 57-year-old patient with atherosclerotic occlusion of the left femoral artery and ischaemia of the left lower leg and foot of the II-III degree is undergoing inpatient treatment. Surgical treatment was offered, but the patient refused. What can be the results of conservative therapy?
A. Gangrene of the limb develops.
B. Full recovery.
C. Partial recovery.
D. Sudden death.
E. Loss of ability to work.

A 48-year-old patient with acute thromboembolism of the left popliteal artery arrived at the hospital 2 hours after the onset of the disease. He underwent urgent surgery. What results should be expected?
A. Complete recovery.
B. Finger gangrene may develop.
C. Incomplete flexion and extension of the limb.
D. Can perform all types of work.
E. Needs sanatorium treatment.

In order to prevent the patient from developing vascular thrombembolism after conservative treatment and surgery, the patient needs to be prevented:
A. All of the above.
B. Get rid of excess weight.
C. Bandage the legs with an elastic bandage.
D. Prescribe medications that reduce blood clotting.
E. Treat cardiovascular failure.

On the fifth day after the abortion, a young woman developed sharp pains in the hamstring and lower leg, pale skin on her left foot. The pain intensified with movement. You were diagnosed with acute thromboembolism of the left popliteal artery. What is the cause of thromboembolism in the patient?
A. Increased blood clotting.
B. Chronic inflammatory processes in the abdomen and pelvis.
C. Vascular injuries.
D. Heart defects.
E. Atrial fibrillation.

A 64-year-old patient, who has been suffering from cardiovascular insufficiency for many years, urgently consulted a surgeon about intense ischaemic pain in the right leg. He attributes the pain to lifting weights. Objectively, pallor of the entire limb, coldness of the skin to the middle of the thigh, painful limitation of movements in the limb are noted. In which vessel should we think about thromboembolism in this patient?
A. In the femoral vessels.
B. In the renal vessels.
C. In the abdominal aorta.
D. In the pulmonary vessels.
E. In the carotid arteries.

A woman, 35 years old, on the 9th day after childbirth suddenly developed pain in the lower abdomen and coldness and pallor of both lower extremities. The general condition was severe. Diagnosed: thromboembolism of the abdominal aorta bifurcation. What can explain the severity of the patient's condition?
A. Hypoxia and reflex hemodynamic disorders.
B. Respiratory failure.
C. A sharp decrease in blood pressure.
D. Pain syndrome.
E. Lack of movement in both limbs.

A young man, 25 years old, was admitted to a medical centre with a diagnosis of shin muscle injury: ‘Acute deep vein thrombosis of the lower leg’, which was confirmed by the clinical picture. The patient needs to undergo a course of conservative therapy with mandatory use of the following:
A. Cabokinases.
B. Heparin.
C. Pellet.
D. Kurantil.
E. Trental.

A young man, 25 years old, with a chronic venous ulcer on the lower leg against the background of chronic venous insufficiency after surgery for inguinal hernia developed thigh edema and pain. Which diagnosis is the most correct?
A. Thrombosis of the veins of the lower extremities.
B. Iatrogenic damage to the artery.
C. Iatrogenic damage to the spermatic cord.
D. Iatrogenic vein damage.
E. Iatrogenic damage to the lymphatic vessels.

An elderly woman, 70 years old, consulted a doctor with complaints of pain, swelling and varicose saphenous veins of the lower leg and thigh, and a trophic ulcer in the lower third of the lower leg. The doctor suggested that the woman wear a permanent elastic bandage. What pressure should be applied to the ulcer area?
A. 30 mmHg.

B. 20 mmHg.
C. 10 mmHg.
D. 5 mmHg.
E. Surface pressure.

An elderly woman, 70 years old, consulted a doctor with complaints of pain, swelling and the presence of varicose saphenous veins of the lower leg and thigh, the presence of a trophic ulcer in the lower third of the lower leg. The doctor suggested constant use of disaggregants. Which of the following belongs to this group?
A. Curantil.
B. Heparin.
C. Pellet.
D. Phenylene.
E. Fibrinolysin.

A patient, 60 years old, came to the emergency department with complaints of severe pain and swelling in the left lower extremity, which lasted about a day. Conservative therapy is ineffective. Diagnosis: Acute iliofemoral thrombosis on the left. Which of the following is used for thrombolytic therapy?
A. Streptokinase.
B. Fraxiparin.
C. Calciparin.
D. Rheopolyglucin.
E. Hemodesis.

A pregnant woman, 36 weeks, was diagnosed with ascending thrombosis of the great saphenous vein on the right lower extremity with the presence of a floating thrombus in the saphenous vein. Indicate the optimal tactics.
A. The Trendelenburg operation.
B. Conservative therapy in an outpatient setting.
C. Conservative therapy in inpatient settings.
D. Thrombolytic therapy

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