MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Faculty *Medicine*
Department *of Surgery with Postgraduate Education*

APPROVED BY

Vice-Rector for Scientific and Pedagogical Work

_____ Eduard Buriachkivskyi

_____ _____ 2025

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 № 17

Topic: "Modern methods of diagnosis and treatment of diseases of the cardiovascular and respiratory systems"

Approved:

At the meeting of the Department *of Surgery with Postgraduate Education* of Odesa National Medical University

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PRACTICAL CLASSES

Practical class № 17

Topic "Modern methods of diagnosis and treatment of diseases of the cardiovascular and respiratory systems" – 6 hours

1. Relevance of the topic.

Cardiovascular diseases are the main cause of disability and premature death of people in economically developed countries. Today, the share of these diseases in the structure of mortality is 40-60%, while the rise in morbidity and damage to the inhabitants of our planet at a young age is emphasized, which makes cardiovascular diseases the most important medical and social health care problem.

According to economic forecasts, in the third millennium, health care costs related to the treatment of lung diseases will exceed the costs of combating diseases of the cardiovascular system and oncological diseases.

Air pollution, the prevalence of smoking, including passive smoking, alcohol abuse, hypothermia, a significant frequency of acute bronchitis and pneumonia during flu epidemics, changes in the reactivity of the human body, and deficiencies in the organization of treatment contribute to the increase in the prevalence of lung diseases.

The increase in the incidence of lung disease in the population leads to an increase in the amount of disability in society. With age, there is an increase in the number of chronic lung diseases. This gives this problem not only medical-biological and socio-hygienic, but also economic significance.

2. The purpose of the class:

2.1. Learning goal:

1 level:

- to acquaint the student of higher education, to create an idea about the pathology of the respiratory system and the cardiovascular system, methods of diagnosis and treatment.
- learn the terminology used in clinical medicine.
- learn the methodology used in the diagnosis of diseases of the cardiovascular and respiratory systems
- learn information about methods of laboratory-instrumental diagnostics in internal medicine

2 level:

A student of higher education must master:

- knowledge of the main points of the clinical picture of the most common diseases of the cardiovascular and respiratory systems.
- knowledge of indications and contraindications for conducting the most important instrumental studies in the diagnosis of diseases of the cardiovascular and respiratory systems.
- knowledge of diagnostic capabilities and limitations of the most important methods of instrumental diagnostics.
- understanding the principles of modern therapy of the most common diseases of the cardiovascular and respiratory systems

3 level:

- - To give the student of higher education the opportunity to master the skills and techniques of performing cardiovascular and respiratory system examination methods

4 level:

- To give the student of higher education the ability to conduct a clinical examination of the cardiovascular and respiratory systems
- analyze research results
- differentiate diseases of the cardiovascular and respiratory systems;
- prescribe treatment depending on the detected pathology
- determine the indications and contraindications for surgical intervention, choose the optimal access and volume of surgical treatment;
- correctly assess possible complications during surgery and in the postoperative period;
- determine rehabilitation of patients and further dispensary observation.
- to issue medical documentation.

2.2. Educational objectives:

- to form deontological principles of examination and management of patients with diseases of the cardiovascular and respiratory systems;
- take into account psychosomatic aspects of the pathogenesis of these diseases;
- to develop a sense of legal responsibility for the timeliness and correctness of choosing the optimal method of treatment of diseases of the cardiovascular and respiratory systems.

3. Interdisciplinary integration

№	Discipline	To know	To able to
1.	Previous disciplines: 1. Anatomy 2. Physiology 3. Propaedeutics of internal diseases	Anatomy of the chest cavity Lung and heart physiology Examination methods respiratory and cardiovascular systems	determine the function of external breathing and blood circulation parameters Be able to identify the borders of the heart, perform percussion and auscultation of the lungs and heart
2.	Next 1. Cardiology 2. Pulmonology	Clinical signs and ECG changes in acute myocardial infarction. Clinical signs of lung diseases and their manifestations on the radiograph of the chest cavity	Read ECG Identify changes on the X-ray of the organs of the chest cavity

3.	Interdisciplinary integration 1. Thoracic surgery	Emergency conditions of diseases of the chest cavity	Provide emergency aid
	2. Cardiac surgery	Signs of acute coronary syndrome	Decide on an algorithm for modern diagnostics and treatment

4. Content of the class

Research methods of respiratory organs.

1. Questioning: the patient's complaints and their semiological assessment. Examination and palpation of the chest

2. X-ray

X-ray, roentgenoscopy, bronchography and tomography of the lungs are used to study the respiratory system.

Roentgenoscopy is the most common research method, which allows you to visually determine changes in the transparency of lung tissue, detect foci of compaction or cavities in it, detect the presence of fluid or air in the pleural cavity, as well as other pathological changes.

Radiography is used for the purpose of registration and documentation of changes in the respiratory organs detected during radiography on the X-ray film. In case of pathological processes in the lungs that lead to loss of lightness and compaction of lung tissue (pneumonia, lung infarction, tuberculosis, etc.), the corresponding areas of the lungs on the negative film have a paler image compared to normal lung tissue. A cavity in the lung, containing air and surrounded by an inflammatory roller, on a negative X-ray film has the appearance of a dark oval-shaped spot surrounded by a paler shadow than the shadow of the lung tissue. The fluid in the pleural cavity, which is less permeable to X-rays compared to the lung tissue, gives a shadow on the negative X-ray film, which is paler than the shadow of the lung tissue. The X-ray method allows you to determine not only the amount of fluid in the pleural cavity, but also its nature. In the presence of inflammatory fluid or exudate in the pleural cavity, the level of its contact with the lungs has an oblique line that gradually goes upward and is lateral to the midclavicular line; when non-inflammatory fluid or transudate accumulates in the pleural cavity, its level is located more horizontally.

Tomography is a special method of radiography that allows you to produce a layer-by-layer radiological examination of the lungs. It is used to diagnose tumours of the bronchi and lungs, as well as small infiltrates, cavities and caverns located at different depths of the lungs.

Bronchography is used to study the bronchi. After preliminary anaesthesia of the respiratory tract, the patient is injected with a contrast agent that delays X-rays (for example, iodolipol) into the lumen of the bronchi, then an X-ray of the lungs is performed and a clear image of the bronchial tree is obtained on the X-ray. This method makes it possible to diagnose the expansion of the bronchi (bronchiectasis), abscesses and caverns of the lungs, narrowing of the lumen of the large bronchi by a tumour or a foreign body.

Fluorography is also a type of X-ray examination of the lungs. It is carried out with the help of a special device - a fluorograph, which allows you to take an X-ray picture on a small-format photo film, and is used for mass preventive examination of the population.

Computed tomography (CT) is a study that allows you to obtain an X-ray image of cross-sections of the chest and its organs with very high image clarity and high resolution. On cross-sections, it is possible to clearly distinguish the changes in the lung tissue, trachea, bronchi, mediastinal lymph nodes caused by the pathological process, more precisely determine the spread of the pathological process, its relationship with other organs, the presence of effusion in the pleural cavity and pleural changes in tumours.

Magnetic resonance imaging. The method allows you to differentiate tumours from cysts and vascular neoplasms, as changes in the vessels are clearly visible on the obtained images without the introduction of a contrast agent.

Endoscopic examination

Endoscopic research methods include bronchoscopy and thoracoscopy.

Bronchoscopy is used to examine the mucous membrane of the trachea and bronchi of the first, second and third order. It is performed with a special device - a bronchoscope, to which special forceps are added for biopsy, extraction of foreign bodies, removal of polyps, a camera and so on. Before the introduction of the bronchoscope, the upper respiratory tract is anesthetized with a 1-3% dicain solution. Then the bronchoscope is inserted through the mouth and glottis into the trachea. The examining physician inspects the mucous membrane of the trachea and bronchi; with the help of special forceps on a long handle, you can take a piece of tissue from a suspicious area (biopsy) for histological and cytological examination, as well as photograph it. Bronchoscopy is used for the diagnosis of erosions, ulcers of the mucous membrane of the bronchi and tumours of the bronchial wall, extraction of foreign bodies, removal of bronchial polyps, treatment of bronchiectasis and centrally located lung abscesses. In these cases, purulent sputum is first sucked out through a bronchoscope, and then antibiotics are injected into the bronchial lumen or cavity.

Thoracoscopy is performed with a special device - a thoracoscope, which consists of a hollow metal tube and a special optical device with an electric light bulb. It is used to examine the visceral and parietal layers of the pleura, take a biopsy, dissociate pleural adhesions, and perform a number of other medical procedures.

Methods of functional diagnostics

Methods of functional diagnostics of the external respiratory system are of great importance in the comprehensive examination of patients suffering from diseases of the lungs and bronchi. They make it possible to detect the presence of respiratory failure often long before the first clinical symptoms appear, to establish its type, nature and degree of severity, to follow the dynamics of changes in the functions of the external respiratory system during the development of the disease and under the influence of treatment.

Pulmonary ventilation. Pulmonary ventilation indicators do not have strict constants: in most cases, they are not only determined by the pathology of the lungs and bronchi, but also depend to a large extent on the constitution and physical training, height, body weight, sex and age of a person. Therefore, the obtained data are evaluated in comparison with the so-called proper values, which take into account all these data and which is the norm for the person under study. The appropriate values are calculated using nomograms and formulas, which are based on the definition of the proper basic exchange.

Pleural aspiration

Pleural puncture is used to determine the nature of the pleural fluid in order to clarify the diagnosis and to remove the fluid from the pleural cavity and then inject medicinal substances into it for therapeutic purposes. Before the puncture, the manipulation field is treated with iodine and alcohol and local anaesthesia is applied at the puncture site. A puncture is usually performed along the posterior axillary line in the seventh or eighth intercostal space along the upper edge of the rib (see Fig. 1). For diagnostic purposes, 50-150 ml of fluid is taken and sent for cytological and bacteriological examination. For therapeutic purposes, when a large amount of fluid accumulates in the pleural cavity, first take 800-1200 ml of fluid. Removal of a large amount of fluid from the pleural cavity leads to a rapid shift of the mediastinal organs to the diseased side and may be accompanied by collapse. To extract the liquid, use a special syringe with a volume of 50 ml or Poten's apparatus. The fluid obtained from the pleural cavity can be of inflammatory (exudate) or non-inflammatory (transudate) origin. For the purpose of differential diagnosis of the nature of the liquid, its specific gravity, the amount of protein contained in it, erythrocytes, leukocytes, mesothelial and atypical cells are determined. The specific gravity of the inflammatory liquid is 1.015 and above, the protein content is more than 2-3%, the Rivalt test is positive. The specific gravity of the transudate is less than 1.015, the amount of protein is less than 2%, the Rivalt test is negative.

To perform the Rivalta test, take a 200 ml cylinder, fill it with tap water, add 5-6 drops of strong acetic acid, and then pipette a few drops of pleural fluid into it. The appearance of a turbid cloud at the site of dissolution of the drops indicates the inflammatory nature of the pleural fluid containing an increased amount of serosomucin (positive reaction, or Rivalt's test). Non-inflammatory fluid does not produce a turbid cloud (negative Rivalt's test).

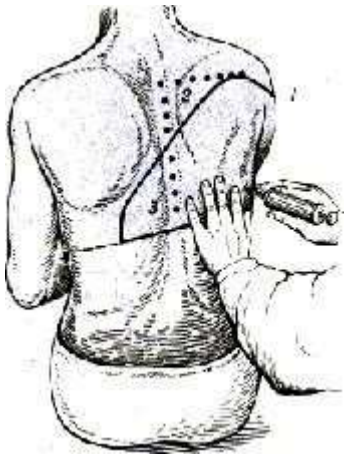

Fig. 1 Pleural aspiration

1 — the Damoiseau line; 2 — Garland's triangle; 3 — Grocco-Rauchfuss triangle; 4 — the lower border of the lungs.

Examination of sputum

Microscopic examination of sputum is performed in both native and stained preparations. Cells of malignant tumors often get into the sputum, especially if the tumor grows endobronchial or disintegrates. In the native preparation, these cells are distinguished by their atypicality: large size, different often ugly shape, large nucleus, sometimes multinucleate.

Diagnosis of cardiovascular diseases

Electrocardiogram (ECG) – one of the most common and effective methods of diagnosing cardiovascular diseases, based on the analysis of the curve - the result of fixing the electrical voltage in the muscle of the working heart.

Special devices - electrocardiographs of various types - are used to record the electrocardiogram. Usually, this device is a standard unit with which ECG signals are received through the lead cable (electrodes are placed on the chest, limbs of the patient), these signals are stored in memory, and also displayed on the indicator, fixed on paper - a curve is displayed that reflects changes in time of the difference in the electric field potentials (biopotentials) of the heart during its contractions.

ECG is a valuable diagnostic tool. It can be used to estimate the source (the so-called driver) of the rhythm, the regularity of heart contractions, and their frequency. All this is of great importance for the diagnosis of various arrhythmias. Changes in cardiac conduction can be judged by the duration of various intervals and ECG waves. Changes in the terminal part of the ventricular complex allow the doctor to determine the presence or absence of ischemic changes in the heart.

An important indicator of the ECG is the amplitude of the waves. Its increase indicates hypertrophy of the corresponding parts of the heart, which is observed in some heart diseases and hypertension.

Indications for an ECG:

1. The main risk factors for heart diseases are:
   - Hypertensive disease
   - For men - age after 40 years
   - Smoking
   - Hypercholesterolemia
   - Transferred infections
   - Pregnancy
2. Deterioration of the condition of patients with heart diseases, appearance of pain in the heart area, development or worsening of shortness of breath, occurrence of arrhythmia.
3. Before any operative interventions.
4. Diseases of internal organs, endocrine glands, nervous system, diseases of the ear, throat, nose, skin diseases, etc., if the involvement of the heart in the pathological process is suspected.

Electrocardiogram monitoring (daily (Holter) monitoring) - a study of the electrical activity of the heart, which reflects the correctness of its work during the physical and emotional loads usual for the patient, which is produced with the help of a special device that records an electrocardiogram for 24 hours.

This procedure has some peculiarities. Five or seven electrodes will be taped to the patient's chest. These electrodes are attached to a recording device, which in size and weight resembles a small transistor radio or tape recorder. The patient will have to wear this recording device, equipped with a shoulder strap, during the day. The patient will have to note in a special diary what he did during that day. If any symptoms appear, such as dizziness, chest pain, shortness of breath or a feeling of fluttering in the chest, irregular heartbeat and the like, it is worth noting it in the diary. When analysing the recording, the doctor will compare the activity of the heart with the symptoms noted in the diary.

Angiographic examination of coronary vessels is actively used for the diagnosis of vascular lesions in the cardiology clinic, while coronary angiography is, as a rule, the logical final link in the comprehensive examination of a patient with coronary artery disease (CAD), as it is the most informative method for solving such important questions as:

- CAD diagnosis verification;
- clarification of the localization of the lesion of the vascular bed;
- determination of treatment tactics.

Coronary catheterization - x-ray contrast method of research, which is the most accurate and reliable way of diagnosing coronary artery disease, allowing to accurately determine the nature, place and degree of narrowing of the coronary artery.

Coronary catheterization procedure:

- The patient is taken to the X-ray endovascular surgery room. The procedure is not traumatic - during the entire procedure the patient is conscious.
- After local anaesthesia, the examination is started - a special catheter is passed through the femoral artery and the upper part of the aorta into the lumen of the coronary arteries.
- In some cases, the catheter is inserted through the artery of the forearm, which reduces the period of observation after the performed coronary catheterization.
- A radiopaque substance is injected through the catheter, which is carried by the blood flow through the coronary vessels. The process is fixed using a special device - an angiograph.
- The result is displayed on the monitor; in addition, it is placed in the digital archive.

In the course of coronary catheterization, the degree and size of the lesion of the coronary vessels are established, which determines the further tactics of treatment.

Indications for coronary catheterization:

- high risk of complications according to clinical and non-invasive examination data, including in case of asymptomatic course of coronary artery disease
- ineffectiveness of drug treatment of angina pectoris
- • unstable angina that is not amenable to medical treatment, occurred in a patient with a history of myocardial infarction, accompanied by left ventricular dysfunction, arterial hypotension, or pulmonary edema
- post-infarction angina
- inability to determine the risk of complications using non-invasive methods
- future open-heart surgery (for example, prosthetic valves, correction of congenital heart defects, etc.) in a patient older than 35 years

In modern cardiology, it has become possible to detect the initial stages of coronary heart disease and coronary atherosclerosis in high-risk patients by a non-invasive method.

The new method - virtual coronary angiography, allows you to examine the state of heart vessels, the patency of stents after shunting, measure the level of vascular calcification, and obtain indicators of heart functions.

The research is carried out with the help of a modern computer tomograph capable of transmitting 64 images in 0.4 seconds with further processing on the computer and creation of three-dimensional models of the heart and blood vessels.

The duration of the study is 40-50 seconds, does not require hospitalization and anesthesia. The contrast agent is injected into the elbow vein, and the acquisition of images is synchronized with a certain phase of the cardiac cycle.

Coronary angiography allows you to obtain information about the state of the heart's vessels and prevent the development of a myocardial infarction, as well as reduce the risk of sudden death.

Ultrasound of the heart and blood vessels in medical practice is primarily used to detect heart defects. It is used for the diagnosis of ischemic heart disease - angina pectoris, myocardial infarction, conditions after a myocardial infarction; diseases of the muscle and outer shell of the heart (cardiomyopathy, pericarditis); with diseases of peripheral arteries - brain, lower limbs, organs of the abdominal cavity, kidneys.

Ultrasound of the heart and blood vessels is increasingly used for preventive examinations, as the method allows for the earliest detection of heart disorders.

Ultrasound of the heart and blood vessels is performed with the help of devices that allow you to receive images and pictures during the procedure.

When examining the heart, the patient undresses to the waist, the front part of the chest is lubricated with a special gel, the doctor installs the ultrasound sensor in different positions, which allows you to see different parts of the heart and perform the necessary measurements.

In cardiology, ultrasound research methods are a priority and have a number of advantages:

non-invasive safety
availability
the possibility of repeated research.

Echocardiography has high diagnostic significance.

Doppler ultrasound is an integral part of ultrasound examination of the heart and allows to assess the blood flow in the heart and vessels in real time.

Ultrasound examination (ultrasound) of the heart (echocardiography) and blood vessels allows you to get an image of the heart, its four chambers, valves, all of which can be seen in motion in real time. The use of a special principle of image analysis - Doppler - allows documenting the movement of blood inside the heart itself and in the vessels. Thanks to such approaches, ultrasound of the heart allows to evaluate not only the structure of the heart, but also its functions.

Echocardiography on modern devices equipped with computers allows obtaining a number of quantitative indicators characterizing the main function of the heart - contraction. Already at the early stages of a decrease in this function, it is possible to recognize these disorders and carry out appropriate treatment. Repeated studies allow the doctor to assess the effectiveness of treatment measures. Echocardiography allows with great accuracy to recognize diseases of the outer shell of the heart - the pericardium, thickening of the pericardial leaves, adhesions between them, the presence of fluid in the pericardial cavity. Heart tumours are clearly visible. Examination of peripheral vessels reveals, mainly, a narrowing of their lumen.

An exercise stress test - this is a method in which the doctor makes a recording of the patient's electrocardiogram during physical exertion. During the study, the patient is offered to run on a track (treadmill) or pedal a bicycle (cycle ergometer). The obtained results help to assess the state of the cardiovascular system. Most often, the method is used to diagnose coronary heart disease.

Invasive electrophysiological research (EPS)

The His bundle potential was first recorded by Scherlag et al. in 1969. Since then, electrophysiological studies have been widely used to diagnose cardiac arrhythmias.

Thanks to the development of new technologies in the last 10 years, analogue 8- and 16-channel devices have been replaced by digital systems based on a personal computer, which not only allow recording up to 128 channels from one electrode, but also build 3-dimensional and 4-dimensional images. Nowadays, invasive EPS is widely used as a means of diagnosis, treatment and prognosis in many clinical situations.

To perform intracardiac pacing under local anaesthesia, large veins (femoral or subclavian) are punctured and one or more multipolar electrodes are placed in the heart cavity under X-ray and ECG control to record the electrical activity of various parts of the atrium, ventricles and His bundle, intracardiac electrograms and endocardial stimulation. The essence of the EPS is to perform programmable atrial or ventricular stimulation in combination with simultaneous recording of electrograms of various parts of the heart and several ECG leads.

This study has undoubted diagnostic (obtaining information about the nature of the rhythm disturbance, its electrophysiological mechanism), therapeutic (evaluation of the ongoing therapy and ablation of arrhythmogenic zones or additional conduction pathways) and prognostic value.

Nevertheless, the indications for its clinical use are not sufficiently clear. This issue needs to be resolved, given that the EPS technique, which used to be only a tool for complex scientific research, is now available to many regional medical centers. In the clinical use of EPS, it is necessary to take into account not only the risk-benefit ratio, but also the cost-effectiveness.

Key indicators for conducting an EPS:

- the need to determine the electrophysiological mechanism of rhythm disturbances;
- topical diagnosis of arrhythmogenic foci and additional conduction pathways;
- clarification of the degree of malignancy of ventricular arrhythmias;
- monitoring the effectiveness of drug antiarrhythmic therapy in ventricular arrhythmias;
- paroxysmal tachycardias refractory to drug therapy that require ablation or surgical treatment;
- diagnosis of unclear syncopal states.

Complications during intracardiac EPS:

- bleeding from the puncture site;
- myocardial or vascular perforation;
- thrombophlebitis at the puncture site;
- death due to ventricular fibrillation, cardioversion that is not eliminated.

One of the main methods for non-invasive diagnosis of heart rhythm disorders is **transesophageal electrophysiological examination (TEE)**. Its availability, safety and relatively low cost make it possible to significantly expand its use.

It turned out that the results of TEE in many cases coincide with invasive ones. TEE is defined as a set of methods of electrical stimulation of the heart through the esophagus, which, together with the recording of a transesophageal electrogram during cardiac arrhythmias, allow to assess the functional state of various parts of the cardiac conduction system and obtain certain information about possible mechanisms of arrhythmias.

Benefits of the TEE:

- allows to evaluate the electrophysiological mechanism of supraventricular paroxysmal tachycardia, the nature of antegrade conduction, as well as most antegrade refractory periods of different parts of the cardiac conduction system;

- the main electrophysiological criteria for the diagnosis of SVT do not differ from those of intracardiac EPS;

- non-invasive method that does not require expensive equipment and a special laboratory.

Disadvantages of the method:

- discomfort;

- does not allow for topical diagnosis of additional pathways, the magnitude of retrograde refractory periods of different parts of the conduction system of the heart.

Conducting of TEE is contraindicated in the presence of the following pathological conditions:

- tumours, diverticula, scars, varicose veins of the esophagus, esophagitis;

- stable angina pectoris III-IV functional class (FC);

- electrical instability of the myocardium due to acute coronary syndrome (first-onset and progressive angina pectoris);

- circulatory failure of III-IV FC;

- left ventricular aneurysms, intracardiac blood clots, prosthetic valves;

- acute infectious diseases.

Indications for the research:

- sinus node dysfunction;

- attacks of steady heartbeat;

- fainting of unclear etiology;

- assessment of the risk of atrial fibrillation with high heart rate in patients with premature ventricular excitation;

- selection of antiarrhythmic therapy for patients with paroxysmal supraventricular tachycardia.

TEE in patients with supraventricular paroxysmal tachycardia has the following goals:

- to study the nature of the antegrade atrioventricular (AV) conduction;

- to identify and localize additional AV connections (Kent's bundles) functioning in the antegrade direction;

- to study the functional state of different parts of the antegrade conduction system of the heart;

- to establish the electrophysiological mechanism of supraventricular paroxysmal tachycardia;

- to determine the mode of electrical stimulation, which allows to provoke and stop an attack of supraventricular tachycardia;

- to determine the mode of electrical stimulation, which allows to provoke and stop an attack of supraventricular tachycardia

- further testing of the effectiveness of antiarrhythmic drugs in the conditions of a TEE.

The diagnosis of atrial fibrillation usually does not present significant difficulties if at least one paroxysm is recorded on the ECG. The role of TEE in the diagnosis of atrial fibrillation, as well as in their flutter, is reduced to solving the following tasks:

- verification of the occurrence of atrial flutter paroxysms by inducing it in patients with undocumented palpitations;

- differential diagnosis of atrial flutter, atrial fibrillation with other variants of paroxysmal tachycardia with wide QRS complexes.

In the development of paroxysmal tachycardia with wide QRS complexes, which occurs without severe hemodynamic disorders, it is advisable to record an esophageal electrogram, which allows for a differential diagnosis between ventricular tachycardia and antidromic tachycardia in WPW syndrome, supraventricular tachycardia with functional block of the bundle branchial pedicle, and to assess the possibility of tachycardia relief with atrial pacing.

Speaking about the diagnosis of rhythm disturbances, we cannot but mention the tilt test, which is used in the diagnosis of syncopal states. In an upright position, blood accumulates in the legs, reducing venous return. Normally, this leads to reflex tachycardia and vasoconstriction. However, in some people, increased ventricular contractions against a background of reduced overload activate mechanoreceptors, leading to a sharp activation of the parasympathetic system, resulting in reflex hypotension and bradycardia and syncope.

A number of conditions are required for the correct conduct of the tilt test (along with the appropriate equipment): a dimly lit, slightly cool room without outside noise.

The Tilt test is used to examine people with syncope. The patient is placed on a special table and, after measuring blood pressure and pulse, the upper body is quickly raised with an inclination angle of 60% to 80% for 20 to 45 minutes. The use of isoproterenol increases the sensitivity of this method and reduces the examination time. The initial dose of isoproterenol is 2 milligrams with a subsequent increase to a maximum of 8 milligrams. Isoproterenol enhances vasodilatory effect, which leads to a decrease in heart rate and blood pressure up to the development of syncope in some patients.

Treatment of chest organs

1. Therapeutic bronchoscopy

Removal of aspirated foreign bodies

For a long time, bronchoscopy's therapeutic capabilities have been limited to the removal of aspirated foreign bodies, and it is still the only bloodless method of removing them from the bronchi.

The development of flexible extractors and the considerable experience gained to date suggests that most aspirated foreign bodies in adults can be removed with a bronchofibroscope under local anaesthesia and even on an outpatient basis. However, airway foreign bodies sometimes present unpleasant surprises to the bronchologist, forcing him to use general anaesthesia and rigid instruments that require maximum concentration and skill, and sometimes inspiration.

Drainage of intrapulmonary purulent foci

The therapeutic effect of bronchoscopy as a method of drainage of intrapulmonary purulent foci, whether bronchiectasis or lung abscesses, is undeniable. Therapeutic bronchial catheterisation during bronchoscopy allows unblocking a significant part of intrapulmonary abscesses, and long-term transnasal drainage ensures constant administration of antibacterial drugs into the cavity and relieves patients from repeated bronchoscopies and catheterisations. A method of immunosupplementation therapy in the form of intracavitary injection of a suspension of autologous macrophages has been developed, which makes bronchoscopic treatment even more effective.

The therapeutic role of bronchoscopy in chronic obstructive pulmonary disease (COPD) has traditionally been limited to restoring airway patency with stimulation or imitation of impaired bronchial drainage function and local use of antibacterial and secretolytic agents. After the first publications of A. Soulas and P. Mounier-Kuhn, who

described the method of treating patients with chronic nonspecific lung diseases using a bronchoscope, many different methods of bronchoscopic treatment of COPD were proposed. Some of them were abandoned as those that had not been tested in practice, while others took their place in the arsenal of therapeutic agents in patients with diseases of the bronchopulmonary system.

Bronchofibroscopy has proven to be an effective treatment procedure for bronchial obstruction in patients in the early postoperative period and, especially, in patients requiring long-term mechanical ventilation (MV). The flexible bronchofibroscope can be easily inserted into the patient's airway through an intubation or tracheostomy tube, which allows for daily, and if necessary, several times a day, to perform sanitation bronchoscopies in patients on mechanical ventilation.

In addition to these fairly common situations requiring bronchoscopy, there are a number of rarely occurring pathological conditions in which bronchoscopy can also be of therapeutic value. These include individual cases of destructive pneumonia complicated by pyopneumothorax. In some patients with this disease, wide or multiple bronchopleural fistulas not only do not allow the lung to be expanded after drainage of the pleural cavity, but also do not allow successful sanitation of the pleural cavity due to the penetration of lavage fluid into the airways. In such a situation, it is possible to introduce a foam rubber or collagen sponge obturator through a bronchoscope into the corresponding segmental or lobar bronchus and temporarily block it. This seals the lung and stops the discharge of air through the drainage. At the same time, conditions are created for effective lavage of the pleural cavity and straightening of the lung. Such a bronchial blockade is possible for a period of several days to 2 weeks. During this time, the pleural staples manage to fix the lung in a straightened state, and small fistulas can close. Temporary bronchial occlusion is also successfully used for large solitary lung abscesses, contributing to the reduction and obliteration of their cavity.

1. Endotracheal and endobronchial surgical interventions

A description of the therapeutic capabilities of bronchoscopy would be incomplete without mentioning endotracheal and endobronchial surgical interventions. At first, they were performed using a high-frequency current, and recently, high-energy IAG lasers - neodymium and holmium - have been preferred. Using this technique, benign tumours of the trachea and large bronchi are successfully removed during bronchoscopy, and recanalization of the trachea is performed in case of tumour, granulation, and scar stenosis. The latter are quite common, complicating prolonged tracheal intubation or tracheostomy in patients in intensive care units. To prevent recurrent stenosis of the trachea after its recanalization with a laser, in peribronchial tumours that compress the lumen of the trachea or main bronchi, as well as in the descent of the tracheal walls as a result of tracheomalacia, silicone stents of various designs are used - self-expanding with protrusions, T-shaped or Y-shaped, bifurcation.

Such spacer stents can remain in the lumen of the trachea and main bronchi for a long time and provide free patency of the large airways, in some cases allowing to avoid tracheostomy.

Contraindications to bronchoscopy

Contraindications to bronchoscopy are usually relative. These include severe

respiratory failure, cardiac arrhythmias, a tendency to bronchospasm, impaired blood clotting, and severe intoxication. In these cases, we are talking mainly about diagnostic studies. Where bronchoscopy is performed for therapeutic purposes, these contraindications often fade into the background, and bronchoscopy can be justified in the most serious patients for vital indications.

Bronchoscopy complications

With the increase in the number and invasiveness of bronchoscopic techniques and the expansion of indications for them, the risk of the procedure has also increased, which, despite the increased level of anesthetic support, is still occasionally accompanied by quite serious complications. Their prevention and treatment constitute a separate and very extensive problem that cannot be covered in the limited scope of this review. Our analysis of the complications of bronchofibroscopy and so-called rigid or rigid bronchoscopy in homogeneous groups of patients showed that “flexible” bronchoscopy performed for diagnostic purposes is generally accompanied by a significantly lower number of severe complications, in particular, those caused by diagnostic manipulations, because it is associated with less trauma to the bronchi and biopsy objects. This allows us to talk about the relatively greater safety of diagnostic bronchofibroscopy under local anaesthesia, which is especially important in outpatient practice. It is impossible to compare the safety of therapeutic bronchoscopic manipulations performed with rigid and flexible endoscopes, since the indications for their use, and therefore the severity of the patients' condition, differ significantly. It should only be emphasized that bronchofibroscopy, as well as “rigid” bronchoscopy, cannot be considered an absolutely safe method of examination and treatment. This procedure requires the endoscopist to be able not only to perform it in various ways and to be familiar with endobronchial and pulmonary pathology, but also to be prepared for the development of various, sometimes severe complications, and requires certain knowledge and skills of resuscitation, therapeutic and surgical nature. The room in which bronchoscopy is performed, whether it is a special room or an intensive care unit, should be appropriately equipped with all the devices for successful resuscitation or immediate treatment of any complication that may occur during the insertion of the bronchoscope and endobronchial manipulations with its help.

2. Videothoracoscoy

Currently, there are two types of minimally invasive intrathoracic interventions: thoracoscopic, in which a thoracoscope combined with a video camera and instruments are inserted into the pleural cavity through thoracoports, and video-assisted operations, when the so-called utilitarian minithoracotomy (5-6 cm), used to remove the fragment to be resected at the end of a thoracoscopic operation, is performed at the beginning of the intervention, which allows for a double view of the operated area and the use of traditional instruments. The term “video assisted” is used in the English-language literature to describe such operations, and the new direction in thoracic surgery is called, respectively, “video assisted thoracic surgery” (VATS). In the Ukrainian-language literature, the most common term is “intrathoracic surgery with video guidance”. Over the past 5-6 years, thoracoscopic operations and intrathoracic interventions with video support have become increasingly routine, especially for such indications as interstitial (disseminated) lung diseases and pleurisy of unclear genesis, in which thoracoscopic biopsy allows for diagnosis verification in 100% of cases with a minimum number of complications.

Thoracoscopy in case of spontaneous pneumothorax allows performing manipulations that are performed during thoracotomy: resection, pleural ablation or pleurectomy.

The purpose of using video technologies in spontaneous pneumothorax is primarily to minimize surgical trauma, which leads to a reduction in postoperative pain, the number of complications, the length of hospital stays, and an early return to professional activity.

In case of pleural empyema, thoracoscopy can be used to remove pus from the cavities, fibrin from the parenchyma and visceral pleura under visual control, perform partial lung decortication and pleurectomy.

In recent years, thoracoscopy has also been used for hemithorax empyema after pneumonectomy. The essence of the method is to sanitize the cavity, remove fibrinous deposits, and attempt transthoracic occlusion of the main bronchial stump fistula using a herniostapler.

Thoracoscopy is often the optimal treatment for **mediastinal pathology**, although manipulations in this area are very difficult and stressful due to the anatomical relationships and narrow field of view. Nevertheless, benign mediastinal neoplasms, such as cysts, are often indications for thoracoscopy. Thoracoscopic manipulations in the posterior mediastinum include drainage of paravertebral abscesses, puncture and removal of bronchogenic cysts, ligation of damaged thoracic lymphatic duct, and removal of neurogenic tumours.

The role of thoracoscopy in the diagnosis and treatment of **lung cancer** is the most controversial and debatable. Video-guided lobectomy or pneumonectomy should be performed only in patients with sufficient functional reserves to undergo traditional surgery, as it may be required at any time.

The successful use of thoracoscopy in the diagnosis and treatment of many diseases of the chest cavity has led to the increased use of this method in open and closed chest trauma, as well as in the consequences of surgical trauma. The ligation of the thoracic lymphatic duct in postoperative chylothorax, treatment of postoperative bronchial fistulas, removal of foreign bodies and detached drains from the pleural cavity are described.

The scope of thoracoscopy is not limited to the above indications, but also includes interventions for bronchiectasis, internal thoracic artery aneurysms, patent ductus arteriosus, hiatal hernia, ventricular arrhythmias, and diaphragm relaxation.

Indications.:

Diseases of the pleura: nonspecific pleural empyema**.**

Lung diseases: bullous disease, spontaneous pneumothorax, tuberculoma, benign lung tumours, solitary metastases, peripheral and central lung cancer in the T1M0 and T2M0 stages, bronchiectasis.

Diseases of the pericardium: pericarditis, pericardial cysts.

Diseases of the mediastinum: thymoma, mediastinal cysts, mediastinal tumors, chylothorax.

Diseases of the esophagus: esophageal achalasia, gastroesophageal reflux disease, esophageal leiomyoma, esophageal cancer.

Diaphragm diseases: relaxation of the diaphragm dome, diaphragmatic hernia.

Chest trauma: hemothorax, foreign bodies in the pleural cavity.

Other indications: peptic ulcer, bronchial asthma, idiopathic hyperhidrosis of the palms, armpits and face, Raynaud's disease, Sudeck's dystrophy, arterial occlusion disease, shoulder and forearm syndrome, migraine**.**

Absolute contraindications. Gross pleural adhesions resulting from the lesion itself or from previous surgical intervention due to the impossibility of lung collapse.

Relative contraindications. General somatic contraindications (the presence of concomitant pathology, which causes a high risk of anesthesia and surgery); the prevalence of the process, which raises doubts about the possibility of performing the required volume of surgery by means of endoscopic surgery (endoscopic surgery can be used, but only if it is possible to convert it into an open intervention). Possible complications. Common pulmonary surgical intraoperative (traumatic, anesthetic) and postoperative complications (purulent-inflammatory, pleuro-pulmonary, discoagulation, cardiovascular and respiratory failure, bronchial patency and atelectasis).

General characteristics. In modern conditions, thoracoscopic operations are usually performed under intubation anaesthesia with muscle relaxants and artificial lung ventilation. Preference is given to separate intubation into the main bronchi, although endotracheal intubation is also used. However, when performing diagnostic thoracoscopies with a small number of surgical procedures, intravenous, mask anaesthesia in combination with local anaesthesia can be used. In some cases, the use of local anaesthesia alone is permissible. Thoracentesis is performed, depending on the localization of the pathology, at a point that provides an optimal view of the pleural cavity (as standard, in the fifth or sixth intercostal space along the middle, anterior or posterior axillary line). A thoracoscope is inserted into the pleural cavity, an examination is performed, and the place for insertion of instrumental thoracoports is determined. Depending on the task of the intervention, the total number of thoracoports can be from one to four to five. Three are most often used, which are placed to form an isosceles triangle; further ports are placed based on the specific topographic and technical situation. If necessary, the viewing and manipulation ports can be swapped. If there are pleural fusions, they are destroyed, pleural effusion (if any) is removed, and then the parietal pleura, mediastinal structures, visceral pleura, and lung are examined. The presence of a pathological process, its nature, prevalence are assessed, and a biopsy is performed in the areas of pathological changes. If necessary, a minithoracotomy is additionally performed. Next is surgical intervention (marginal lung resection in case of disseminated process, coagulation, suturing or removal of bullous lung fragments in case of bullous emphysema, lung resection with a solitary neoplasm, and so on). The operation, like an open thoracotomy, ends with drainage of the pleural cavity.

Thus, thoracoscopic interventions are now rightly considered an alternative to traditional thoracotomy. The advantages of these minimally traumatic surgical techniques include better visibility of the operated area, a marked reduction in the number of postoperative complications, less soreness, early postoperative activity and a short hospital stay.

Laser destruction

Indications for endoscopic laser destruction:

1. The presence of complete or partial tumour obstruction of the tracheobronchial tree with hypoventilation, obstructive pneumonia, atelectasis of the corresponding lung parts.
2. The presence of an endobronchial tumour component in patients undergoing special treatment.
3. Endobronchial recurrence of cancer after surgery or radiation therapy.
4. The presence of a benign tumour in the tracheobronchial trunk.

Endoscopic laser destruction is an effective and safe method of treating neoplasms

of the tracheobronchial tree. The effectiveness of endoscopic laser recanalization of malignant tumours depends on the location, growth pattern and severity of tumour stenosis: the highest - in partially stenotic endobronchial tumours of the trachea and main bronchi, significantly lower - in bronchial tumours of smaller caliber, as well as in cases of complete stenosis, regardless of the location of the tumour in the bronchial tree.

The use of endoscopic laser tumour destruction as a component of the treatment of malignant tumours of the trachea and bronchi is an effective means of optimizing the conditions of surgical intervention, due to the reduction of tumour mass, elimination of bronchial obstruction, associated respiratory failure and concomitant inflammatory phenomena.

Endoscopic laser destruction performed to eliminate stenosis of the tracheobronchial tree may be the method of choice in the palliative treatment of incurable patients with stenotic malignant tumours of the trachea and bronchi and contribute to improving the quality of life of patients. Endoscopic laser destruction is an effective method of treating benign tumours of the tracheobronchial tree. In the absence of an intramural and exobronchial tumor component, the use of this method allowed to achieve radical tumour removal in 100% of patients.

Treatment of cardiovascular diseases

Intervention methods

Indications for interventional treatment of chronic coronary artery disease:

- Angina pectoris of FC III-IV.
- Past myocardial infarction in the anamnesis even without a clinic of angina pectoris.
- Stenosis of the left coronary artery trunk of more than 50% even without a clinic of angina pectoris (very often immediately begins with an extensive MI)
- Stenosis of the right coronary artery more than 30% in patients with angina of any functional class.

Coronary balloon angioplasty

It was first performed by Gruntzig in 1977. Principle: a balloon dilatation catheter is inserted into the coronary artery, under the control of the screen, the balloon is inserted into the stenosis site, after which the pressure in the balloon is brought to 6-8-10 atmospheres for 3 minutes, as a result, the plaque is crushed. At the end of the procedure, pressure measurements in the artery below the stenosis and control coronary angiography are required. The angiographic criterion for success is a reduction in stenosis by more than 20%. Balloon dilation is often completed with stenting of the vessel (stents 2-4.5 mm). 24 hours before the procedure, the patient starts taking antiplatelet agents, and at the time of angioplasty, heparin and nitroglycerin are administered intracoronary.

- Angioplasty is performed in a fully equipped cardiovascular operating room and with constant ECG monitoring (complications include acute arterial occlusion, intimal dissection, acute myocardial ischemia).
- New technologies of angioplasty: laser recanalization - using “cold” laser radiation (at the end of the light guide), a channel is made in the lumen of the occluded artery, and then balloon angioplasty is performed.
- Indications for angioplasty: single stenoses of any of the coronary arteries (except for the main trunk of the LCA), single stenoses of no more than 2 coronary arteries, multiple stenoses in one coronary artery, chronic occlusions of less than 3 months and no more than 2 cm in length.

Mortality rate is 1.2%, the nearest positive result is 90%, and restenosis occurs in 40% within

1 year. The incidence of complications requiring emergency surgery is no higher than 6%.

Surgical treatment (coronary artery bypass grafting and mammary coronary bypass grafting)

- CABG was first performed by Michael DeBecky in 1964.
- Indications: stenosis of the main trunk of the LCA (even with an ejection fraction < 40%), stenosis or occlusion of more than 2 coronary arteries, multiple coronary artery stenoses.
- Basic principles: the operation is performed only in the conditions of GIC on a "dry heart", preferably with the use of optics (magnification 2-4 times); all arteries with hemodynamically significant stenosis are bypassed (no more than 7 arteries with a diameter of more than 1 mm can be bypassed at a time), but no more than 4 anastomoses are made with the aorta; usually, coronary anastomoses are applied first, then aortic anastomoses; during the operation, the function of the shunt is monitored with a flowmeter (blood flow through the shunt - not less than 50 ml. min). Currently, no more than 4 shunts are considered optimal.
- Contraindications to CABG are severe distal lesions.
- After CABG, due to the high risk of acute heart failure, transaortic balloon counter pulsation or an artificial left ventricle should be provided.

Results and prognosis after CABG

- Mortality after CABG is 5.7%; in patients under 75 years of age - 1.4%, in patients with angina without a history of NSTEMI - 0.5%.
- The five-year survival rate after CABG is 96%, with conservative treatment of the same category of patients - 60%. The frequency of myocardial ischemia after CABG is 1% per year, without CABG > 3%.
- During the 1st year, CABG patency is maintained in 80% of patients, then the frequency of shunt occlusions is 2% per year, and after 5 years - 5% per year. In women, the results are 2.5 times worse.
- In the case of 1 CA lesion (excluding the LCA trunk), the results of CABG are comparable to the results of conservative therapy. In case of 2 or more CA lesions in FC I-II angina, surgical treatment improves the quality of life, relieves the patient from angina attacks and constant use of antianginal drugs, without significantly affecting long-term survival. In FC III-IV CABG, surgical treatment also increases long-term survival.

Transmyocardial and endomyocardial laser revascularization.

- Principle: using a "cold" laser, 30-60 tubules are created in the myocardium either transmyocardially (on a working heart) or endomyocardially (with a catheter).
- It is an alternative to CABG in patients with severe distal lesions and low ejection fraction.

Treatment tactics

- - Conservative treatment is the same as for unstable angina. Adrenoblockers and calcium antagonists (reduce the ischemic zone), adequate analgesia with narcotic analgesics are mandatory. In case of cardiogenic shock - TABC. The period of stay in the intensive care unit is 10 days (risk of severe complications).
- Emergency intracoronary fibrinolytic and antithrombotic therapy followed by balloon angioplasty is effective if no more than 6 hours have passed since the moment of MI.

5. 5. Plan and organizational structure of the class

5.1. Tasks for self-testing of the ascending level of knowledge

Questions

1. Describe the classification of diseases of the chest cavity.
2. Tell the classification of diseases of the cardiovascular system.
3. List the main methods of studying the respiratory system.
4. List the main methods of study of the cardiovascular system.
5. Name the main signs and changes in ECG in coronary heart disease.
6. Name the signs of lung diseases and their manifestations on the radiograph.

№	Main tasks	Directions (to name)
1.	Name the main modern methods of diagnosing diseases of the chest cavity, indications, contraindications	- radiological methods -functional examinations -endoscopic examinations -diagnostic pleural puncture -sputum examination
2.	Name the main modern methods of examination of the cardiac system, indications, contraindications	-ECG -ECG monitoring -coronary angiography -EPS -Tilt test -Ultrasound of the heart and blood vessels
3.	Name the main methods of respiratory treatment, indications, contraindications	-Bronchoscopy -video thoracoscopy -endobronchial laser puncture
4.	The main methods of modern heart treatment, indications, contraindications	-interventional methods -surgical methods

6. Material for self-monitoring the quality of training.

A. Questions for self-control

1 Describe the main methods of examination of the chest cavity.
2.Name the main methods of studying the cardiac system.
3.Name the main methods of treatment of the lungs.
4.List the interventional methods of treatment of the heart.
5. Methods of surgical treatment of diseases of the cardiovascular system.

B. Tests for self-monitoring

1. **Which of the following methods is the most informative for detecting coronary heart disease?**

A. Coronarography.

B. Electrocardiography (ECG).
C. Magnetic resonance imaging (MRI).
D. Ultrasound examination of the heart (echocardiography).

2. **What diagnostic method helps to detect arrhythmias that occur only during physical activity?**
   A. Cycling ergometry.
   B. Spirometry.
   C. Holter ECG.
   D. Rapid cholesterol test.
3. **What is the main drug for the treatment of hypertension?**
   A. Beta-blockers.
   B. Antibiotics.
   C. Antiaggregants.
   D. Antiviral drugs.
4. **Which treatment method is used for angina pectoris if conservative treatment is ineffective?**
   A. Coronary artery bypass surgery.
   B. Laser therapy.
   C. Chemotherapy.
   D. Physiotherapy.
5. **What is bronchoscopy?**
   A. Method of diagnosing the condition of the bronchi using an optical instrument.
   B. Method of studying pulmonary circulation.
   C. Blood test for infections.
   D. A physiotherapeutic method of treating bronchitis.
6. **Which method allows to measure lung volume?**
   A. Spirometry.
   B. X-ray.
   C. CT.
   D. Ultrasound.
7. **What is the most effective treatment for pneumonia?**
   A. Antibacterial therapy.
   B. Chemotherapy.
   C. Nutrition therapy.
   D. Physiotherapy.
8. **What is used for exacerbation of chronic obstructive pulmonary disease (COPD)?**
   A. Inhaled glucocorticosteroids.
   B. Antiviral drugs.
   C. Anticoagulants.
   D. Vitamins.
9. **What method of therapy is used to improve sputum discharge in bronchitis?**
   A. Mucolytics.
   B. Antibiotics.

C. Statins.
D. ACE inhibitors.

10. **What disease is characterized by the appearance of radiographic signs of "jellyfish-like" shadows in the lungs?**
A. Pneumonia.
B. Tuberculosis.
C. Pulmonary embolism.
D. Bronchitis.

Tasks for self-control

Patient K., 27 years old, was admitted with complaints of sharp pain in the left half of the chest cavity, shortness of breath, heart palpitations. Pulse 96 beats/min, blood pressure 110/70 mm Hg, respiratory rate 24 per minute. Auscultation on the right side of the lungs was heard throughout, on the left - sharply weakened. Radiologically, the left lung is collapsed, the mediastinal shadow is shifted to the right. Diagnosis: left-sided pneumothorax. What is your treatment tactic?

A. Drainage of the left pleural cavity.
B. Thoracotomy.
C. Pleural puncture.
D. Conservative treatment.
E. Bronchoscopy.

7. List of training practical tasks to be completed during the practical session

1. Correct reading of the chest radiograph.
2. Correct interpretation of the ECG for the recognition of acute myocardial infarction.
3. Methods of pleural puncture and drainage of the pleural cavity.

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