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

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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 № 18

Topic: "Chest pain syndrome, respiratory and heart failure in the diagnosis and differential diagnosis of diseases of the chest cavity"

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 № 18

Topic: "Chest pain syndrome, respiratory and heart failure in the diagnosis and differential diagnosis of diseases of the chest cavity" – 6 hours.

1. Relevance of the topic

Thoracic pain (thoracalgia) can be associated with damage to internal organs, bone and cartilage structures of the chest, myofascial syndrome, diseases of the spine and peripheral nervous system, or psychogenic diseases. Thoracalgia can be a manifestation of angina pectoris, myocardial infarction, mitral valve prolapses of aortic aneurysm, dissecting pulmonary embolism, pleurisy, pneumonia, malignant lung tumour, gastrointestinal diseases (gastric or duodenal ulcers, pancreatitis or pancreatic cancer, cholecystitis), and diaphragmatic abscess. In everyday medical practice, timely differentiation of chest pain is of great importance, as it contributes to adequate diagnosis and rational therapy. Thoracalgia can also be a manifestation of such serious conditions as acute respiratory and acute heart failure.

Acute respiratory failure is a frequent and usually the highest priority pathological condition in emergency medicine. Acute respiratory failure by its genesis can be primary, caused by a pathological process of the respiratory tract and lung parenchyma, or secondary, associated with damage to other organs and systems. Severe acute respiratory failure of the parenchymal type, which often occurs in life-threatening conditions, is a serious problem and often causes death or disability. The symptom complex of acute respiratory failure is the main clinical sign of acute lung injury syndrome and acute respiratory distress syndrome. Cardiovascular disease is the leading cause of death worldwide. If in 1900, CVD accounted for less than 10% of deaths, then according to WHO, in 2000, CVD became the leading cause of death. In 1996, 15 million people died of CVD in the world, and experts predict that by 2020 this figure could reach 25 million.

2. Objectives:

2.1. Learning objectives:

1 level:

- To familiarize the applicant for higher education, to create an idea of modern medical achievements in the diagnosis and differential diagnosis of chest pain syndrome;

2 level:

- The applicant for higher education must know, master the pathogenesis of diseases accompanied by chest pain syndrome, acute heart and respiratory failure.

3 level:

- To provide higher education students with the opportunity to master the skills and techniques of performing examination methods, methods of additional diagnostic tests for chest pain syndrome, to master the algorithm for the study of patients with acute cardiac and respiratory failure;

4 level:

- to provide higher education students with the opportunity to analyse the results of laboratory, X-ray, ECG examination of patients with acute heart and respiratory failure;
- differentiate diseases accompanied by chest pain syndrome;

- to teach higher education students the ability to study patients with chest pain syndrome.

2.2. Educational objectives:

- To familiarize the student with the contribution of domestic scientists to the study of chest pain syndrome, diagnosis and treatment of acute respiratory and heart failure.
- to form deontological principles of examination and management of patients with chest pain syndrome, taking into account the psychosomatic aspects of the pathogenesis of this disease;
- develop a sense of legal responsibility for the timeliness and accuracy of diagnosis.

3. Interdisciplinary integration

№	Disciplines	To know	To be able to
1.	Previous courses: 1. Anatomy 2. Physiology 3. Propaedeutics of internal diseases	Anatomy of the chest cavity organs Physiology of the lungs and heart Methods of examination of respiratory and cardiovascular systems	Determine the function of external respiration Be able to identify the boundaries of the heart, perform percussion and auscultation of the lungs and heart
2.	Next 1. Cardiology 2. Pulmonology	Clinical signs and changes in ECG in acute myocardial infarction Clinical signs of lung diseases and their manifestations on the chest radiograph	Read ECG Detect changes in the chest X-ray
3.	Interdisciplinary integration 1. Thoracic surgery 2. Cardiac surgery	Emergency conditions of diseases of the chest cavity Signs of acute coronary syndrome	Provide emergency assistance Determine the algorithm of modern diagnosis and treatment algorithm

4. Content of the class

1. Causes of chest pain syndrome.

- *non-cardiac causes of painful attacks*

1. Diseases of the chest wall and spine:

- Costochondritis (Tietze syndrome), fibrosis, myositis, osteochondrosis of the thoracic spine

of the spine, rib fracture, arthritis of the clavicular-thoracic joint, shingles.

2. Diseases of the gastrointestinal tract:

• esophagus: esophagitis, spasm, reflux;
• gallbladder: colic, cholecystitis, cholelithiasis, cholangitis;
• peptic ulcer disease;
• pancreatitis.

3. Mental disorders:

• neurocirculatory dystonia;
• hyperventilation syndrome;
• panic attacks, depression, somatoform disorders.

4. Chest pain associated with an extracardiac cause may be due to pathology of the chest organs

- pathology of large vessels (PE, dissecting aneurysm of the thoracic aorta)
- diseases of the bronchopulmonary apparatus and pleura (pneumonia, pleurisy, lung abscess, bronchial and lung tumours)

Pulmonary embolism

The development of PE is facilitated by the presence of chronic thrombophlebitis, phlebitis of the pelvic veins, congestive heart failure (especially in atrial fibrillation), infectious endocarditis, prolonged bed rest after surgery.

Chest pain in PE is observed in 50-90% of cases, occurs acutely, and in its intensity and localization (behind the sternum or parasternal) can resemble the painful variant of myocardial infarction. A very common symptom of PE is shortness of breath, which also occurs suddenly. Severe weakness is characteristic, and loss of consciousness is possible in case of massive PE. Some patients have hemoptysis. On objective examination: pallor, cyanosis, tachypnea, weak or thready pulse, falling blood pressure, accentuation of the second tone and systolic noise on the pulmonary artery. Shortness of breath, moist wheezing, and pleural friction noise are possible.

The diagnosis of thrombosis is quite complex and requires a comprehensive approach. In addition to anamnesis and objective examination, it is necessary to evaluate ECG data, chest radiography, and angiopulmonography.

There are 5 possible ECG variants during PE:

1. Signs of acute right ventricular overload (SL-QIII, deep Sv5_6 and negative Tv1-4) - McGinn-White syndrome (is characteristic of PE).

2. Positional changes (deep Sv5_6).

3. ST segment depression or elevation in the left chest leads.

4. Blockage of the right or anterior branch of the left leg of the bundle of His, P-pulmonale.

5. No changes in the ECG.

Chest radiography may reveal a pulmonary vascular pattern and increased transparency of the lung tissue on the side of the lesion, disappearing after 24-36 hours from the moment of embolism (Westermarck's symptom); dilation of the inflow pathways to the right heart; dilatation of the right heart cavities; increased diameter of the trunk and main pulmonary arteries; appearance of pleural effusion and disc-shaped atelectasis.

Angiopulmonograms show central or marginal filling defects, “amputation” of vessels, areas of depleted blood supply, dilation of the pulmonary artery diameter, asymmetry of contrast of the lung root and slowing of blood flow on the side of the lesion. To clarify the diagnosis, a CT scan of the chest is also possible.

Dissecting aneurysm of the thoracic aorta, occurs more often in the setting of prolonged hypertension, severe aortic atherosclerosis, syphilitic aortic lesions, Marfan syndrome, and severe chest trauma. There are proximal and distal dissection of the aneurysm. Intimal tearing in proximal aortic dissection occurs most often at 2.5 cm from the aortic annulus. Extension in the proximal direction leads to hemopericardium, aortic valve detachment, severe aortic insufficiency, and occlusion of the coronary arteries (more often the right one). In distal dissection, intimal tearing most often occurs immediately after the left subclavian artery has left. Extension of the dissection in the proximal direction is uncharacteristic; hemopericardium and aortic insufficiency usually do not occur.

The pain is usually intense, refractory to nitrates and not associated with physical activity. It is characterized by localization in the sternum, with possible radiation to the neck, lower jaw, and both halves of the chest. The pain syndrome is very similar to that of myocardial infarction and severe angina pectoris. The pain can last from an hour to several days. Objectively, the expansion of the borders of the vascular bundle, cardiac dullness, pronounced deafness of heart sounds are determined; cyanosis, swelling of the jugular veins are possible. The prognosis is often unfavourable.

Diagnosis is difficult, and the correct diagnosis is made only in 50% of cases. There are no specific electrocardiographic signs of the disease. In the case of hypertension and aortic disease, the ECG may show signs of left ventricular hypertrophy. With the development of hemopericardium, a sharp decrease in the voltage of the R wave is possible. X-ray examination of the chest reveals enlargement of the aortic shadow. CT scan can detect the site of intimal detachment, main and false canals, fluid in the pericardial cavity. Transesophageal echocardiography has a high diagnostic value, the sensitivity and specificity of the method is above 90%. Hypochromic anemia is possible in the blood test.

Diseases of the respiratory system.

Pain syndrome in lung disease:

1. Pain onset or intensification during deep breathing or coughing.
2. Acute short-term pain, usually limited, without a tendency to radiate.
3. Presence of other pulmonary symptoms (cough, sputum production, shortness of breath or dyspnea of any kind).
4. Acute or chronic pulmonary disease in history, pleural friction noise, dry or wet rales, percussion findings suggestive of emphysema, cavities or lung tissue compaction.

It should be noted that pain in lung diseases, although common, is usually not the leading clinical syndrome. More specific are cough, sputum production, shortness of breath, hemoptysis, cyanosis, fever, and signs of intoxication.

A spontaneous pneumothorax is an accumulation of air in the pleural cavity that is not associated with traumatic injury to the chest or a therapeutic effect. It can develop in diseases with destruction of lung tissue (tuberculosis, abscess, bronchiectasis, tumor, bullous emphysema, echinococcal cyst). Sometimes pneumothorax is possible in practically healthy individuals.

Clinically, the disease is characterized by sudden acute chest pain. As a rule, shortness of breath, frequent shallow breathing, agitation, and sweating occur. Dyspnea is inspiratory. Objective examination reveals tympanitis on the side of the lesion, absence of noticeable excursion of the lower lung border, lowered blood pressure, tachycardia. X-ray examination - the presence of air in the pleural cavity.

Pleurisy occurs with pain of various localization. In case of pleural effusion, the pain is usually localized in the lower and lateral chest. It is determined by its intensification during deep breathing and coughing. Pain in the area of the scapula and shoulder may be due to damage to the parietal pleura of the upper lobes of the lungs. With apical pleurisy, pain in the arm is possible due to irritation of the brachial plexus. Abdominal pain, sometimes vomiting and pain when swallowing is observed in diaphragmatic dry pleurisy.

In the diagnosis of pleurisy, one is guided by a characteristic pain syndrome, fever, signs of intoxication, pleural friction noise, percussion and auscultatory signs of pleural effusion. An X-ray examination can reveal pleural effusion, which requires a pleural puncture to verify the etiology. Pleural biopsy is also possible.

In croupy pneumonia, the pain is more often stabbing, aggravated by deep breathing and coughing, and therefore patients tend to suppress it. There is a possibility of pain radiation to the abdominal cavity. Pain in croup pneumonia is detected in 96% of cases, in focal pneumonia - in 88%. Chronic inflammatory lung diseases, pneumoconiosis, tuberculosis are characterized by prolonged pain. In case of lung abscess, the pain is intense, its intensification is determined by pressing on the rib or intercostal space when the abscess is located close to the cortical layer of the lung. In addition, the pain increases before the abscess breaks through into the bronchus.

Decisive in the diagnosis of pneumonia is the detection of crepitating or small-bubbly moist rales on auscultation, dullness of the percussion sound. X-ray examination reveals signs of inflammation in the lungs.

Pain often accompanies tumorous lung lesions - from 50 to 88% of cases. The pain is quite different: dull, aching, pressing, burning, drilling. It can radiate to the shoulder, neck, abdomen, head, and worsen with coughing and deep breathing. It is localized more often on the affected side, but radiation to the healthy side of the surrounding area is possible. The pain is usually constant.

Tumour pain can be associated with the involvement of the parietal pleura, diaphragm, chest, trachea and large bronchi, displacement of the mediastinal organs, stretching of the mediastinal pleura, which largely determines the nature of the pain. The most severe pain is caused by the pressure of the tumour on the nerve trunks and their germination by the tumour.

The presence of a lung mass can be assumed in the presence of pain, cough, shortness of breath, hemoptysis. The diagnosis is confirmed by X-ray examination,

CT scan, bronchoscopy and lung biopsy.

Diseases of the abdominal cavity

Pain syndrome is characteristic of many diseases of the abdominal cavity.

-Esophagitis is characterized by a constant burning behind the sternum, pain along the esophagus, aggravated by swallowing, associated with the intake of cold or hot, solid food. Diagnosis is based on a typical pain syndrome and signs of dysphagia. X-ray examination reveals motor disorders, uneven contours of the esophagus, the presence of barium depots with erosions, fibroesophagoscopy - hyperemia of the mucous membrane and erosions.

-In case of cardiac achalasia (cardiospasm, idiopathic esophageal dilatation), the pain is localized behind the sternum, clearly associated with dysphagia and regurgitation of food. A pain episode can be triggered by eating. In addition to clinical manifestations, an X-ray examination is important in the diagnosis, which shows retention of barium suspension, significant esophageal dilation and spindle-shaped narrowing in the distal esophagus.

-Pain in hiatal hernia is most often localized in the lower part of the sternum. It is characterized by its appearance or intensification after eating, in a horizontal position, pain decreases with a rapid change in body position. The disease is diagnosed on the basis of X-ray and endoscopic examination.

- Pain due to gastric ulcer and duodenal ulcer, chronic cholecystitis can sometimes radiate to the left side of the chest, which creates certain diagnostic difficulties, especially if the diagnosis of the underlying disease has not yet been established. Fibrogastroduodenoscopy and ultrasound examination of the abdominal cavity can identify the true cause of chest pain.

Chest pain associated with neurological diseases

Chest pain is caused by various neurological diseases. First of all, these are diseases of the spine, anterior chest wall and shoulder girdle muscles (spinal osteochondrosis and various musculofascial syndromes), in addition, cardialgia is distinguished in the structure of psychovegetative syndrome.

Characteristics of various pain syndromes in diseases of the spine and muscles:

Muscle-fascial or rib-vertebral pain syndrome (not visceral):

1. Rather constant localization of pain.
2. The unconditional connection of pain with the tension of the corresponding muscle groups and the position of the torso.
3. Low intensity of pain, absence of concomitant general symptoms in chronic course or clear determination of the onset in acute trauma.
4. Clear palpation findings that allow identifying the pathology: local tenderness (limited) when palpating the corresponding muscle groups, muscle hypertonicity, the presence of trigger zones.
5. Reduction or disappearance of pain with various local actions (mustard plasters, pepper plasters, electro- or acupuncture, massage or electrophysiotherapy, infiltration of trigger zones with novocaine or hydrocortisone).

Radicular pain syndrome (including intercostal neuralgia):

1. Acute onset of the disease or a clear exacerbation in the chronic course.
2. Preferential localization of pain in the area of the corresponding nerve root.
3. A clear connection with the movements of the spine (in radicular pain) or trunk (in neuralgia).
4. Neurological symptoms of cervical or thoracic radiculitis.
5. Sharp local pain at the exit points of the intercostal nerves.

Osteochondrosis of the spine.

This is a degenerative-dystrophic lesion of the intervertebral disc, in which the process, starting more often in the nucleus pulposus, progressively spreads to all elements of the disc with further involvement of the entire segment (bodies of adjacent vertebrae, intervertebral joints, ligamentous apparatus). Degenerative changes in the spine lead to secondary damage to the nerve roots, which causes chest pain. The mechanism of pain is associated with compression of the root by a displaced intervertebral disc with symptoms of cervical and thoracic radiculitis, inflammatory changes in the nerve roots, irritation of the borderline sympathetic chain, which is accompanied by vegetative disorders along with pain.

The nature of pain syndrome in cervical spine osteochondrosis can be different and depends on the localization of the lesion, the degree of compression of the roots. Radicular pain can be cutting, sharp, shooting. It increases with exertion, coughing, bending and turning the head. With the defeat of the C6 root, pain in the arm, spreading from the upper arm along the outer surface of the shoulder and forearm to the I-II fingers, hyperesthesia in these areas, hypotrophy and decreased reflexes from the biceps brachii muscle. When the C7 root is compressed, the pain spreads along the outer and posterior surface of the shoulder and forearm to the third finger. The spread of pain along the inner surface of the shoulder and forearm to the IV-V fingers is characteristic of the defeat of the C8 root. With osteochondrosis of the thoracic spine, pain is usually first localized in the spine and only then symptoms of thoracic radiculitis develop. The pain syndrome is associated with movement, provoked by turning the torso.

The diagnosis is based on neurological radicular symptoms, functional tests, and instrumental examination methods (radiography, CT).

- Musculofascial syndrome occurs in 7-35% of cases. Its occurrence is provoked by soft tissue trauma with hemorrhage and serous-fibrous extravasates, pathological impulsion in visceral lesions, and vertebrogenic factors. As a result of several etiologic factors, a muscle-tonic reaction develops in the form of hypertonicity of the affected muscles. Pain is caused by muscle spasm and impaired microcirculation in the muscle. The pain is characterized by the appearance or intensification of pain during contraction of muscle groups, movement of the arms and trunk. The intensity of the pain syndrome can vary from discomfort to severe pain.

- Tietze syndrome is characterized by sharp pain at the junction of the sternum with the cartilage of the II-IV ribs. The genesis of the syndrome may be associated with aseptic inflammation of the rib cartilage. Xiphoid is manifested by sharp pain in the lower part of the sternum, which increases with pressure on the xiphoid process. In manubriosternal syndrome, there is a sharp pain over the upper part of the sternum or laterally. Scalenus syndrome is caused by compression of the

neurovascular bundle of the upper extremity between the anterior and middle staircase muscles, as well as the normal I or accessory rib. In this case, pain in the anterior chest is combined with pain in the neck and shoulder joints. At the same time, vegetative disturbances in the form of chills and pallor of the skin may be observed.

The diagnosis of musculofascial syndrome is based on the detection of soreness and indurations during muscle palpation, the identification of trigger points, and the association of pain with the tension of certain muscle groups.

-Psychogenic cardialgia is a frequently occurring variant of heart pain, which means that the phenomenon of pain itself, being the leading one in the clinical picture at some stage of the disease, is simultaneously in the structure of various affective and autonomic disorders pathogenetically associated with heart pain. The pain is most often localized in the area of the apex of the heart, the precardiac region and the left nipple. “Migration” of pain is possible. The variability of the nature of pain is determined. There may be aching pain, stabbing, pressing, squeezing, burning or throbbing, more often it is undulating, not relieved by nitroglycerin, at the same time it may decrease after validol and sedatives. The pain is usually prolonged, but short-term pain is also possible, which requires the exclusion of angina pectoris.

Cardiac reasons

1.Typical angina pectoris

Sternal pain or discomfort of characteristic quality and duration. It occurs during physical exertion or psycho-emotional stress. It goes away at rest or after taking nitroglycerin.

2. Atypical angina pectoris

There are a number of CVDs characterized by syndromic angina and requiring differentiation from angina as a clinical form of CAD. The most significant of them are listed below:

- mitral valve prolapses;
- aortic heart disease (aortic stenosis, aortic insufficiency);
- mitral stenosis;
- myocarditis (focal and diffuse);
- Hypertrophic subaortic stenosis;
- aneurysm (hematoma) of the ascending aorta, which dissects;
- aortic aneurysm;
- rheumatic heart disease with coronary artery disease;
- infective endocarditis (with bacterial thrombotic emboli);
- pericarditis (acute and chronic);
- systemic connective tissue diseases (systemic lupus erythematosus, nodular periarteritis, scleroderma, etc;)
- primary and secondary pulmonary hypertension;
- aortic panarteritis (Takayasu disease);
- obliterating thrombangitis (Burger's disease);
- paroxysmal tachycardic cardiac arrhythmias: ventricular tachycardia, supraventricular tachycardia, atrial fibrillation.

Among the listed diseases of the cardiovascular system, the

following are of great practical importance in terms of differential diagnosis, in our opinion.

1. Acquired heart disease: aortic, aortic-mitral, mitral stenosis. In aortic insufficiency, the appearance of anginal pain is due to low diastolic pressure, a decrease in coronary blood flow in the hypertrophied myocardium of the left ventricle (LV). With aortic stenosis, pain in the heart occurs due to a decrease in systolic and minute blood volume in the conditions of increased demand for it by the hypertrophied LV myocardium, which leads to a decrease in coronary blood flow. In mitral valve disease, anginal pain is caused by blood stasis in the coronary sinus as a result of increased pressure in the right atrium, decreased stroke volume and its inadequate increase during exercise.

2. Acute fibrinous pericarditis. It is characterized by intense persistent chest pain of various atypical localization, which increases with deep breathing. ECG data also allow to exclude the coronary genesis of pain in the heart (concordant ST-segment elevation with the subsequent formation of a negative T wave, the absence of pathological Q waves, rapid positive dynamics).

3. Chronic pericarditis. It is characterized by prolonged pain syndrome, aggravated by changes in position, false cardiomegaly with sometimes lime deposits, persistent negative T wave, etc.

4. Myocarditis. It is characterized by the association of the disease with a viral infection, cardialgia is prolonged, persistent, pain of moderate intensity. It does not have an attack-like course, ECG changes have a certain ST-T evolution, not characteristic of CAD.

Chronic forms of myocarditis often occur with cardiomegaly, heart failure, and rhythm disturbances.

5. Mitral valve prolapses. It is more common in women, pain in the left side of the chest occurs spontaneously at rest, various degrees of mitral regurgitation, palpitations, interruptions, and multiple skeletal abnormalities are determined.

6. Hypertrophic cardiomyopathy (variant of subaortic stenosis). It often has a

hereditary in nature, characterized by a peculiar auscultatory and ECG pattern, ventricular arrhythmia.

2. Clinical manifestations of acute respiratory and cardiac failure

A. Definition. Respiratory failure is indicated if the patient has hypoxemia (arterial pO2, <50 mm Hg) when inhaling a mixture containing 50% oxygen, hypercapnia, accompanied or not accompanied by hypoxia (arterial pCO2 > 50 mm Hg). In domestic practice, a different definition of respiratory failure and its division by degree is adopted. The given criterion for respiratory failure (pO2 below 50 mm Hg) is the 3rd degree, which requires the patient to be transferred to artificial lung ventilation.

Etiology. There are many reasons for the development of acute respiratory failure. The most common causes of respiratory failure are listed below.

1. Obstructive disorders

a. Upper airway obstruction can occur in case of developmental abnormalities (choanal atresia, Pierre Robin syndrome, laryngeal adhesions, supra-ligamentous stenosis, vascular rings), aspiration of stomach contents or foreign

body, infection (epiglottitis), allergic laryngospasm, tissue growth (tumours, cysts, tonsil hypertrophy).

b. Lower respiratory tract obstruction can occur in case of developmental abnormalities (bronchomalacia, emphysema), aspiration (in the presence of tracheoesophageal fistula, inconsistency of pharyngeal muscle contraction), infection (whooping cough, bronchiolitis, pneumonia), inflammation, bronchospasm (asthma, bronchopulmonary dysplasia), and foreign bodies.

2. Restrictive disorders

a. With lung parenchymal damage. Pulmonary hypoplasia, pneumothorax; hemorrhage, pulmonary edema and exudative pleural effusion.

b. With damage to the chest wall. Diaphragmatic hernias, absence of ribs, hypoplasia and aplasia of the sternum, deformity of the chest (rickets), abdominal distension, kyphoscoliosis, traumatic restriction of chest mobility, severe pseudo paralytic myasthenia gravis, muscular dystrophy and obesity.

3. Diseases leading to inadequate gas exchange between alveoli and capillaries

a. Diseases with diffusion disorders. Pulmonary edema, interstitial fibrosis, collagenosis, pneumonia (Pneumocystis carinii), sarcoidosis, desquamative interstitial pneumonia. The clinic of adult RDS can develop in shock, sepsis or in children who have suffered drowning.

b. Diseases due to depression of the respiratory centre. Traumatic brain injury; CNS infections; overdose of sedatives; severe asphyxiation and tetanus.

4. Other circumstances contributing to the development of acute respiratory failure

a. Increase in hydrostatic pressure.

b. Congestive heart failure.

c. Excessive fluid administration.

d. Intestinal obstruction.

e. Chronic pulmonary and bronchial diseases

C. Clinical picture

Clinically, acute respiratory failure is manifested primarily by a disturbance in the frequency, rhythm, and depth of breathing:

1. Apnea (complete respiratory failure). It is observed in case of cardiac arrest, electrical trauma, acute exogenous, including drug poisoning, traumatic brain injury

2. Stenotic breathing is a pronounced inspiratory (inspiratory) dyspnea involving all auxiliary respiratory muscles. It occurs in case of upper airway obstruction (foreign body, Quincke's edema, trauma, laryngeal compression)

3. Cheyne-Stokes, Biot breathing (rare, irregular periodic breathing). It manifests itself, as a rule, in the agonal stage, with lesions of the brain stem.

4. Bradypnea. It is observed in case of poisoning (especially with barbiturates, narcotic analgesics).

5. Tachypnea. It is determined in case of acidosis, fever, circulatory failure, mental overexcitement.

Any manifestations of respiratory failure are characterized by severe cyanosis of the mucous membranes.

1. Pulmonary symptoms

a. Tachypnea, disturbance in the depth and rhythm of respiratory movements,

retraction of intercostal spaces, dilatation of the wings of the nose, cyanosis, and excessive sweating.

b. Auditory phenomena may be diminished or absent; dyspnea and wheezing may be present.

2. Neurologic symptoms. Due to hypersensitivity of the brain to hypoxemia, headache, anxiety, irritability, convulsions, and sometimes coma develop.

3. Symptoms of the cardiovascular system. Bradycardia and hypotension. Severe and prolonged respiratory failure can lead to heart failure and pulmonary edema.

3. Acute heart failure

Acute heart failure (AHF), which is a consequence of impaired contractile myocardial contractility and a decrease in systolic and cardiac output, is manifested by extremely severe clinical syndromes: cardiogenic shock, pulmonary edema, and acute pulmonary heart failure.

The main causes and pathogenesis

Decreased myocardial contractility occurs either as a result of myocardial overload or as a result of a decrease in myocardial mass, decreased myocyte contractility, or decreased chamber wall compliance. These conditions develop in the following cases:

- in case of myocardial diastolic and systolic dysfunction in case of heart attack (the most common cause), inflammatory or dystrophic myocardial diseases, as well as tachy- and bradyarrhythmias;
- in case of sudden myocardial overload due to a rapid significant increase in resistance in the outflow tract (in the aorta - hypertensive crisis in patients with compromised myocardium; in the pulmonary artery - thromboembolism of the pulmonary artery branches, prolonged bronchial asthma attack with the development of acute pulmonary emphysema, etc.) or as a result of volume loading (increase in circulating blood mass, for example, with massive fluid infusions - a variant of hyperkinetic hemodynamics);
- in acute intracardiac hemodynamic disorders due to rupture of the interventricular septum or development of aortic, mitral or tricuspid insufficiency (septal infarction, infarction or detachment of the papillary muscle, perforation of the valve leaflets in bacterial endocarditis, chordal rupture, trauma)
- in case of increased load (physical or psychoemotional stress, increased tidal flow in the horizontal position, etc.) on the decompensated myocardium in patients with chronic congestive heart failure.

Classification

The following clinical variants of AHF are distinguished depending on the type of hemodynamics, which ventricle of the heart is affected, as well as on some features of the pathogenesis.

1. With a congestive type of hemodynamics:
- right ventricular (venous congestion in the large circulation);
- left ventricular (cardiac asthma, pulmonary edema)
2. With hypokinetic type of hemodynamics (low ejection syndrome - cardiogenic shock):
- arrhythmic shock
- reflex shock;

- actual shock.

Possible complications

Any of the variants of AHF is a life-threatening condition. Acute congestive right ventricular failure that is not accompanied by low ejection fraction syndrome is not as dangerous as diseases that lead to right ventricular failure.

Clinical picture

- Acute congestive right ventricular failure is manifested by venous congestion in the large circulation with increased systemic venous pressure, swelling of the veins (most noticeable in the neck), enlarged liver, and tachycardia. Edema may occur in the lower parts of the body (with prolonged horizontal position - on the back or side). Clinically, it is distinguished from chronic right ventricular failure by intense pain in the liver, which increases with palpation. There are signs of dilatation and overload of the right heart (expansion of the heart borders to the right, systolic murmur over the xiphoid process and protodiastolic gallop rhythm, emphasis of the second tone on the pulmonary artery and corresponding ECG changes). A decrease in left ventricular filling pressure due to right ventricular failure can lead to a decrease in left ventricular minute volume and the development of arterial hypotension, up to a picture of cardiogenic shock.

In case of pericardial tamponade and constrictive pericarditis, the picture of stagnation in a large circle is not associated with a lack of myocardial contractile function, and treatment is aimed at restoring diastolic filling.

Biventricular failure, a variant of congestive right ventricular failure combined with left ventricular failure, is not discussed in this section, as the treatment of this condition is not much different from the treatment of severe acute left ventricular failure.

- Acute congestive left ventricular failure is clinically manifested by paroxysmal dyspnea, painful shortness of breath and orthopnea, which occur more often at night; sometimes - Cheyne-Stokes breathing, cough (first dry, and then with sputum discharge, which does not bring relief), later foamy sputum, often colored pink, pallor, acrocyanosis, hyperhidrosis and accompanied by agitation, fear of death. In acute congestion, wet rales may not be heard at first or a small number of small-bubbly rales over the lower lungs are determined; swelling of the mucous membrane of the small bronchi may be manifested by a moderate picture of bronchial obstruction with prolonged expiration, dry rales and signs of pulmonary emphysema. The differential diagnostic feature that allows to distinguish this condition from bronchial asthma can be the dissociation between the severity of the patient's condition and (in the absence of a pronounced expiratory character of dyspnea, as well as “silent zones”) the scarcity of the auscultatory picture. Ringing, multicaliber moist rales over all lungs, which can be heard at a distance (crackling breath), are characteristic of an extended picture of alveolar edema. There may be acute left heart expansion, a systolic noise at the apex of the heart, a protodiastolic gallop rhythm, as well as a second tone accent on the pulmonary artery and other signs of right heart load up to a picture of right ventricular failure. Blood pressure can be normal, elevated or decreased, and tachycardia is characteristic.

The picture of acute stagnation in the small circle of blood circulation that develops with stenosis of the left atrioventricular orifice is essentially left atrial

failure, but is traditionally considered together with left ventricular failure.

- **Cardiogenic shock** is a clinical syndrome characterized by arterial hypotension and signs of a sharp deterioration in microcirculation and tissue perfusion, including blood supply to the brain and kidneys (lethargy or agitation, decreased diuresis, cold skin covered with sticky sweat, pallor, marbled skin); sinus tachycardia is compensatory.

A drop in cardiac output with a clinical picture of cardiogenic shock can be observed in a number of pathological conditions not related to myocardial contractile failure, such as acute obstruction of the atrioventricular opening by an atrial myxoma or balloon/balloon prosthesis thrombus, pericardial tamponade, and massive pulmonary embolism. These conditions are often combined with the clinical picture of acute right ventricular failure. Pericardial tamponade and atrioventricular annulus obliteration require immediate surgical assistance; drug therapy in these cases can only worsen the situation. In addition, the picture of shock in myocardial infarction is sometimes imitated by a dissecting aortic aneurysm, in which case differential diagnosis is necessary, since this condition requires a fundamentally different therapeutic approach.

There are three main clinical variants of cardiogenic shock:

- arrhythmic shock develops as a result of a drop in the minute volume of blood circulation due to tachycardia tachyarrhythmia or bradycardia bradyarrhythmia; after the rhythm disturbance is stopped, adequate hemodynamics is quickly restored;

- reflex shock (painful collapse) develops as a reaction to pain and arising from a reflex increase in vagal tone of sinus bradycardia and is characterized by a rapid response to therapy, primarily analgesic; it is observed in relatively small infarct sizes (often of the posterior wall), with no signs of congestive heart failure and deterioration of tissue perfusion; pulse pressure usually exceeds the critical level;

- true cardiogenic shock develops with a lesion volume exceeding 40-50% of myocardial mass (more often in anterior-lateral and recurrent infarctions, in patients over 60 years of age, with arterial hypertension and diabetes mellitus), characterized by a detailed picture of shock, resistant to therapy, which is often combined with congestive left ventricular failure; depending on the selected diagnostic criteria, the mortality rate ranges from 80-100%.

In some cases, especially when it comes to myocardial infarction in patients treated with diuretics, the developing shock is hypovolemic, and adequate hemodynamics is relatively easily restored by replenishing the circulating volume.

Diagnostic criteria

One of the most constant signs of acute heart failure is sinus tachycardia (in the absence of sinus node weakness, complete AV block, or reflex sinus bradycardia); the heart borders are characterized by left or right expansion and the appearance of a third tone at the apex or above the xiphoid process.

In case of acute congestive right ventricular failure, the following are diagnostic:

- swelling of the cervical veins and liver;
- Kussmaul's symptom (swelling of the jugular veins on inspiration);
- intense pain in the right hypochondrium;
- ECG signs of acute right ventricular overload (SI-QIII type, depression STI, II, VL and elevation STIII, VF, as well as in the branches V1, 2;

possible formation of a blockade of the right leg of the bundle of His) and signs of right atrial overload (high pointed teeth PII, III).

Acute congestive left ventricular failure is detected on the basis of the following signs

- Dyspnea of varying severity, up to suffocation;
- paroxysmal cough, dry or foamy sputum, discharge of foam from the mouth and nose;
- Orthopnea position;
- presence of moist rales heard over the area from the posterior and lower parts of the chest over the entire surface of the chest; local small-bubbly rales are characteristic of cardiac asthma, with extensive pulmonary edema, large-bubbly rales are heard over the entire surface of the lungs and at a distance (rales).

Cardiogenic shock at the prehospital stage is diagnosed on the basis of:

- a drop in systolic blood pressure of less than 90-80 mm Hg (or 30 mm Hg below the "working" level in patients with hypertension)
- decrease in pulse pressure - less than 25-20 mm Hg
- signs of impaired microcirculation and tissue perfusion - a drop in diuresis of less than 20 ml/h, cold skin covered with sticky sweat, pallor, marbled skin, in some cases - peripheral veins that have collapsed.

5. Plan and organizational structure of the class

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

Questions

1. Describe the anatomical structure of the lungs and heart.
2. Describe the physiology of the lungs and cardiovascular system.
3. Describe the methods of examination of the lungs and heart.
4. Name the parameters of the function of external respiration in the norm.
5. The parameters of a normal electrocardiogram

№	Basic tasks	Instructions (to name)
1.	Name the main causes of of chest pain syndrome	- cardiac - non-cardiac
2.	Non-cardiac causes of chest pain syndrome	- Diseases of the chest wall and spine - Diseases of the gastrointestinal tract - Mental disorders - Pathology of the chest organs
3.	Chest pain associated with an extracardiac cause may be due to pathology of the chest organs	-large blood vessels (PE, thoracic aortic dissection aneurysm) -diseases of the bronchopulmonary apparatus and pleura (pneumonia, pleurisy, lung abscess, bronchial and lung tumours)
4.	Cardiac causes of chest pain	-typical angina pectoris -atypical angina pectoris

5.	Acute respiratory failure	-Etiology -pathogenesis -clinical signs
6.	Acute heart failure	- etiology - pathogenesis - classification - clinic
7.	Cardiogenic shock	-classification -clinical picture

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

A. Questions for self-control

1. Name the main causes of chest pain syndrome
2. Name the non-cardiac causes of chest pain syndrome.
3. Name the diseases that cause chest pain associated with an extracardiac cause, due to pathology of the chest organs.
4. Name the clinical manifestations of TELA, acute dissection of the thoracic aorta.
5. Name the clinical signs of lung disease with the presence of chest pain.
6. Name the clinical manifestations of acute lung failure.
7. Name the clinical manifestations of acute heart failure.

Б. Tasks for self-control

Task №1.

Patient A., 65 years old. Urgently admitted to the hospital in a very serious condition. Coma, pulse 120 beats/min, respiratory rate 28, blood pressure 110/70 mm Hg. The chest X-ray showed a triangular-shaped area of opacification in the lower lungs. The ECG showed no signs of myocardial infarction. No neurologic deficits were detected. Name the most likely diagnosis of the patient:

A. Thromboembolism of the pulmonary artery.
B. Acute cerebrovascular accident.
C. Myocardial infarction.
D. Pneumonia.
E. Pneumothorax.
Correct answer – A.

Task №2.

Patient K., 27 years old. He was admitted with complaints of sharp pain in the left half of the chest cavity, shortness of breath, 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. What is the most likely diagnosis of the patient:

A. Left-sided

pneumothorax. B. Left-sided pleural effusion. C. Right-sided pneumonia. D. Cancer of the right lung. E. Pulmonary emphysema. Correct answer – A.

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

1. Correct reading of the chest radiograph.
2. Correct interpretation of ECG for the recognition of acute myocardial infarction.
3. Be able to formulate an algorithm for the treatment of pneumothorax.

8. Tests.

- **Which of the symptoms is most often associated with heart pain in angina?**

A. Squeezing pain behind the sternum, radiating to the left arm.
B. Sharp pain that worsens with breathing.
C. Acute stabbing pain in the right side of the chest.
D. Burning sensation in the stomach after eating.

- **What is the main cause of respiratory failure in chronic obstructive pulmonary disease (COPD)?**

A. Airway obstruction.
B. Reduction of blood volume.
C. Blockage of the coronary arteries.
D. Increased blood pressure.

- **What test is most often used to confirm the diagnosis of pulmonary embolism?**

A. CT angiography.
B. Heart ultrasound.
C. ECG.
D. Chest X-ray.

- **What diagnostic test helps to distinguish heart pain from pain associated with diseases of the esophagus?**

A. Esophagoscopy.
B. Daily ECG (Holter).
C. Spirometry.
D. Angiography.

- **What disease causes acute chest pain that worsens with inhalation and is accompanied by pleural friction?**

A. Pleurisy.
B. Angina pectoris.

C. Gastroesophageal reflux.
D. Pulmonary hypertension.

- **Which test method is the most informative for diagnosing heart failure?**

A. Echocardiography.
B. Spirometry.
C. X-ray examination of the chest.
D. Magnetic resonance imaging (MRI).

- **What is the main sign of respiratory failure in pneumonia?**

A. Shortness of breath and decreased blood oxygen levels.
B. Increase in heart rate.
C. Pain in the lower back.
D. Loss of appetite.

- **Which method is most often used for differential diagnosis between angina pectoris and myocardial infarction?**

A. ECG.
B. Spirometry.
C. Blood gas analysis.
D. Heart MRI.

- **Which of the following diseases is characterized by chest pain that does not decrease with nitroglycerin?**

A. Pericarditis.
B. Angina pectoris.
C. Gastroesophageal reflux.
D. Thromboembolism of the pulmonary artery.

- **Which of the following methods will help determine the degree of respiratory failure?**

A. Oxygenometry.
B. Electrocardiography.
C. Glucose test.
D. Fibrobronchoscopy.

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