

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY

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

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

Faculty, course Medical 6th year

Academic discipline Surgery
(name of the discipline)

PRACTICAL CLASSES

Practical class № 19

Topic: “Surgical pathology of the lungs and pleura. Principles of diagnosis
and treatment”

Approved:

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

Odesa National Medical University**Protocol № 2 of '02' September 2024**

Head of Department _____



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PRACTICAL CLASSES

Practical class № 19

Topic: “Surgical pathology of the lungs and pleura. Principles of diagnosis and treatment” – 6 hours

1. Relevance of the topic. Among the most common pathologies, respiratory diseases, especially chronic nonspecific processes of the bronchopulmonary system, account for a large proportion. The prevalence of these diseases, their severity and duration lead to the fact that they are increasingly becoming a factor in disability and mortality.

Improving medical care for people suffering from respiratory diseases requires extensive targeted research. There is no doubt that it is important to improve and introduce into the practice of healthcare facilities such diagnostic methods as endoscopic and cytological, improve the quality of conservative and surgical treatments, and provide specialized care for emergencies.

2. Objectives:

Learning objectives:

- to familiarize the applicant with the relevance of the problem of surgical pathology of the lungs and pleura, the causes of their occurrence, features of clinical manifestations, severity of the course, the threat of possible severe, life-threatening complications, and the level of modern methods of diagnosis and treatment. To create an idea of the need for full rehabilitation of patients in order to restore their ability to work as soon as possible, reduce disability and mortality;
- The higher education student should know the factors contributing to the occurrence of acute purulent diseases of the lungs and pleura, the pathogenesis of surgical diseases of the respiratory system, features of the clinical course, complications, modern diagnostic methods and their interpretation. To master the plan for examination and differential diagnosis for the purpose of further use of modern methods of treatment of this pathology, to predict the consequences and rehabilitation of patients;
- to provide higher education students with the opportunity to supervise patients in order to improve the physical examination of the patient, analyze the data of laboratory and special research methods, use the radiological archive of the most indicative changes in various pathologies with a comparison of specific data in each clinical case; master the technique of performing pleural punctures, drainage of the pleural cavity, methods of rehabilitation of the tracheobronchial tree, emergency thoracentesis;
- to provide higher education applicants with the ability to master clinical research methods, laboratory diagnostics, to study the functional characteristics of the respiratory system and evaluate the statistical parameters of the respiratory system, to navigate the pathomorphology of major surgical diseases of the respiratory system; to clinically characterize and use modern methods of radiology, radioisotope and endoscopic diagnostics in practice. To

think clinically in each specific situation, to make the main and concomitant diagnoses, to justify the necessary methods of therapy.

Educational objectives are connected with:

- formation of the individual personality of a practicing doctor with the cultivation of a sense of professional duty in accordance with the Hippocratic Oath;
- educating young doctors in the relevant aspects of deontology, ecology, legal and psychological responsibility for their actions.

3. Interdisciplinary integration.

Disciplines	To know	To be able to
1	2	3
<u>1. Previous disciplines</u> Normal anatomy Normal physiology Pathological anatomy	The anatomical structure of the respiratory system and the structure of the bronchi. Biomechanics and functional characteristics of the respiratory system. Pathomorphological changes in surgical diseases of the lungs and pleura.	Distinguish pathological changes from the norm. Estimate the statistical parameters of the external respiratory system. To characterize morphological signs of damage, elements of inflammatory reactions and bronchiectasis dystrophic processes.
<u>2. Next disciplines:</u> Pathological physiology	Mechanisms of violations	Determine the type and
Propaedeutics of internal diseases	of external respiration in surgical pathology of the respiratory system. Methods of physical examination of patients.	the degree of impaired external respiration. Perform an objective examination of the patient.
1	2	3

Roentgenology and radiology	Modern special research methods to clarify the diagnosis.	Evaluate the signs of surgical lung and pleural diseases based on the results of research.
Microbiology	Characterization of infectious agents in surgical pathology of the respiratory system.	Collect pathological material for examination.
Immunology	Specificity of immune disorders and nonspecific immunological reactions of the body.	To prescribe a comprehensive immunologic examination with its evaluation.
<u>Inter-subject integration</u>		
Private radiology	The main radiological signs of the pathology under study.	Evaluate the radiographic picture with a preliminary diagnosis.
Bronchology	Endoscopic methods of examination in pulmonology.	To navigate in the endoscopic topography of the bronchi.
Functional diagnostics	The main physiological parameters of external respiration.	Assess the degree of impaired external respiratory function according to spiograms.
Thoracic surgery	The main methods of operational	Recommend a specific type
	treatment of surgical pathology of the respiratory system.	Of intervention after the diagnosis of surgical pathology of the respiratory system.

4. Content of the class

For the differential diagnosis of acute surgical diseases of the lungs and pleura at the beginning of the examination of patients, the most important are the signs that determine the main clinical picture of the disease:

1. Acute chest pain.
2. Acute shortness of breath.
3. Pulmonary blood loss or hemoptysis.
4. Acute onset cough.
5. Purulent intoxication.

1. Acute chest pain

The most common factors are:

- spontaneous pneumothorax;
- PE;
- bronchial foreign body;
- mediastinitis;
- lung abscess;
- bronchiectasis;
- pleural empyema;
- gangrene of the lung;
- damage to the esophagus;
- chest trauma.

Due to the predominant chest pain, the following should be excluded first:

- acute myocardial infarction (ECG);
- dissecting aortic aneurysm (Ultrasound, CT);
- shingles;
- pathological fractures of ribs and vertebrae;
- perforation of the esophagus by a foreign body;
- diaphragmatic hernia entrapment (X-ray with contrast or EGDFS).

Changes in the lungs in acute chest pain are more often manifested radiologically by extensive lucency syndromes and changes in the lung pattern.

2. Acute shortness of breath – sudden shortness of breath in the absence of heart failure.

It is most often manifested as an external manifestation of the following pathological conditions:

- foreign body of the bronchial tree
- spontaneous pneumothorax;
- PE;

X-ray changes: extensive lucency of the lung field, with extensive opacification of the lung field, change in the lung pattern.

Two radiological signs are of the greatest importance in the differential diagnosis of these pathological processes: the position of the mediastinum and the nature of the opacification:

1. The mediastinum is shifted to the side of the lesion - atelectasis, cirrhosis of the lung, absence of a lung.
2. The mediastinum is shifted in the opposite direction – accumulation of a large amount of fluid in the pleural cavity, diaphragmatic hernia, large tumors.
3. The position of the mediastinum is normal – the pathological process is not accompanied by changes in the volume of the chest cavity.

Spontaneous pneumothorax – significant lucency of the peripheral lobe of the hemothorax with a complete absence of pulmonary pattern in this area.

PE – in case of occlusion of any branch, radiologically manifested by a wide lumen syndrome. The symptom of acute pulmonary heart is also characteristic. A triangular shaped opacity with the apex directed to the lung root.

Foreign body in the airway – extensive lucency syndrome in cases of valvular occlusion of the main bronchus.

3. **Pulmonary blood loss or hemoptysis** – changes in the lungs are more often reflected in the form of:

- limited (partial, segmental) obscuration;
- cavity formation;
- changes in the pulmonary pattern.

Pulmonary bleeding and hemoptysis are usually caused by intrapulmonary diseases:

1. Central lung cancer.
2. Hollow form of peripheral lung cancer.
3. Destructive forms of pulmonary tuberculosis;
4. Abscess and gangrene of the lungs.
5. Complicated air cysts of the lungs.
6. Bronchiectatic disease.

4. **Acute onset cough** – caused by a foreign body in the bronchial tree.

The possibility of this condition cannot be ruled out even in the absence of anamnestic indications of aspiration: firstly, it could occur unnoticed by the patient, especially if he was unconscious, and secondly, the foreign body may be of endogenous origin.

Radiologically, a foreign body in the bronchial tree is reflected by a limited opacification syndrome, which is strictly partial (segmental) in nature. The leading diagnostic method is bronchial examination.

5. **Purulent intoxication.** - can be a manifestation of infectious pathological processes in any organ. Regardless of the clinic, a chest X-ray should always be performed. If no pathological changes are detected, lung involvement can be ruled out.

The most characteristic radiological changes in purulent intoxication are manifested by extensive or limited opacification and a combination of opacification and lucency.

Extensive opacification syndrome - pleural empyema, characterized by homogeneity of opacification and mediastinal displacement in the opposite direction.

Limited opacification syndrome - fluid accumulation is possible in different parts of the pleural cavity (it can be free or constricted).

The syndrome of opacification in combination with lucency is most characteristic of pyopneumothorax, which occurs when an abscess breaks through into the pleural cavity.

5. Plan and organizational structure of the class

№	The main stages of the class, their functions and content	Learning objectives in terms of mastery levels	Training and control tools	Materials for methodological support of class visibility, control of students' knowledge	Time (in minutes or %) of the total training time
1	2	3	4	5	6
1.	Preparatory stage	<p>1. Control of the initial level of knowledge</p> <p>Discussion of the etiopathogenesis of surgical diseases of the lungs and pleura.</p> <p>3. Special diagnostic methods</p> <p>4. Types of pathology complications</p> <p>5. Principles of complex treatment</p>	<p>Test Control</p> <p>Oral survey</p> <p>Analysis of the X-ray archive</p> <p>Oral survey</p> <p>Oral survey</p>	<p>Tests</p> <p>Demonstration of the patient</p> <p>Demonstration of the video</p> <p>A set of surgical instruments</p>	25%
2.	Basic stage	<p>Mastering the principles of subjective examination according to the pathology under study.</p> <p>Objective examination of the patient</p>	Supervision of a patient in a specialized hospital department under the supervision of a teacher	Patient data from laboratory and special research methods	60%
1	2	3	4	5	6
		<p>Analysis of laboratory and special research methods</p> <p>Formulation of a clinical diagnosis</p>	<p>Registration of microcuration</p> <p>Participation in the operation</p>	Presentation of the X-ray archive	
3.	Final stages	<p>Establishment of the final diagnosis.</p> <p>Modern methods of treatment for rehabilitation and ability to work</p>	Discussion with the participation of the teacher	Monitoring the level of professional skills and surgical procedures. Summarizing the results of the class	15%

6. Materials for methodological support of the class.

6.1. Control materials for the preparatory class:

6.1.1. Questions:

1. Syndromic characterization of surgical diseases of the pleura and lungs.
2. Methods of special studies in diagnostics.
3. The main radiological symptoms of surgical
4. pathology of the lungs and pleura.
5. Etiology, pathogenesis, clinic and classification of surgical diseases of the lungs and pleura.
6. Complications arising from surgical diseases of the pleura and lungs. Modern methods of complex treatment of surgical pathology of the lungs and pleura.
7. Indications for conservative and surgical treatment.
8. Methods of performing surgical procedures.
9. Types of surgical interventions.
10. Issues of prognosis and rehabilitation of patients after discharge from the hospital.

6.1.2. Tests:

- 1) What does increasing suffocation in spontaneous pneumothorax indicate?
 - a) damage to the lung tissue in case of detachment of a part of the visceral pleura by cord-like adhesions;
 - b) multiple limited pneumothorax;
 - c) total pneumothorax;
 - d) subtotal pneumothorax (+)

1) 1) Spontaneous pneumothorax occurs more often in:

- a) children under the age of 18;
- b) elderly people;
- c) men aged 20-40 years; (+)
- d) women aged 20-40 years;
- e) in all of the above categories.

2) What diseases can be complicated by exudative pleural effusion?

- a) pulmonary infarction; (+)
- b) pneumonia; (+)
- c) pleural carcinoma; (+)
- d) acute pancreatitis; (+)
- e) trauma to the chest and lungs. (+)

3) Differentiate between exudate and transudate according to the

laboratory test data:

- a) protein > 30 g/l; (+)
- b) protein < 30 g/l;
- c) PH < 7,3; (+)
- d) PH > 7,3.

4) Which symptom is not characteristic of pleural effusion?

- a) pain in the side;
- b) increase in body temperature; c) respiratory disorders (dyspnea);
- d) dysphagia; (+)
- e) cough;

f) weakness.

5) Name the types of pleural empyema by localization:

- a) apical; (+)
- b) intersectional; (+)
- c) lateral; (+)
- d) basal; (+)
- e) paramediastinal. (+)

6) What diagnostic method should be used to determine the point for puncture or drainage of the pleural cavity in case of pleural empyema?

- a) Laparoscopy;
- b) CT;
- c) radiography (front + side);
- d) tomography in the bronchial area;
- e) multiaxial fluoroscopy. (+)

7) What is the characteristic of pyo pneumothorax in case of infection with anaerobic microorganisms?

- a) peptic fever; (+)
- b) fever and cold sweat; (+)
- c) weakness and loss of appetite; (+)
- d) deterioration of cardiac activity; (+)
- e) impaired liver and kidney function. (+)

8) Name the pathogenetic factors of purulent-destructive lung diseases:

- a) complications of hospital-acquired pneumonia;
- b) impaired bronchial patency and atelectasis of parts of the lung; (+)
- c) microcirculatory disorders in the atelectatic lobe; (+)
- d) the presence of pathogenic microflora;
- (+)
- e) congenital malformations of the lungs.

9) Which of the following symptoms is not characteristic of cavitary lung cancer?

- a) hemoptysis;
- b) increase in body temperature;
- c) X-ray cavity with fluid level;
- d) production of large amounts of sputum; (+)
- e) polyarthralgia (Pierre-Marie-Bamberg syndrome).

6.1.3. Tasks:

1. Patient K., 43 years old, complains of chest pain, fever up to 39⁰, weakness, shortness of breath during physical activity. He considers himself sick for 3 days. A month and a half ago, he injured his sternum in a fight. He did not seek medical care. The X-ray shows a wide level of fluid in the posterior-inferior hemithorax. What is your preliminary diagnosis? What method can be used to confirm it?

Answer: 1. Traumatic limited empyema. 2. Pleural puncture.

2. Patient Z., 63 years old, is in the clinic with an acute abscess of the right lung. The duration of the disease is 3 weeks. He produces up to 400 ml of purulent

sputum per day. On the radiograph - in S6 cavity destruction up to 10 cm in diameter with a level of fluid. What manipulation should be performed?

Answer: puncture of the abscess cavity.

3. Patient Yu., 43 years old, had an acute abscess of the upper lobe of the right lung three years ago. Every year 2-3 times he is treated by a pulmonologist for fever, mucopurulent sputum, periodic hemoptysis. X-ray examination revealed a cavity up to 5 cm in diameter with thick walls in S2. What is your diagnosis? What method of treatment should be prescribed?

Answer: 1. Chronic abscess. 2. Surgical treatment (lobectomy).

4. Patient D., 68 years old, underwent a right pleural puncture for cardiogenic pleural effusion with aspiration of up to 2 liters of serous fluid. The next day, during the control fluoroscopy, the right lung is $\frac{1}{2}$ the volume, with a wide horizontal level of fluid above the diaphragm. What complication did the patient have?

Answer: Iatrogenic pneumothorax.

5. 5Conscript V., 18 years old, was sent from the military registration and enlistment office for further examination. He complains of shortness of breath during physical activity. Two years ago, he was treated for a limited spontaneous pneumothorax on the left. What method of investigation should be performed?

Answer: CT scan of the lungs.

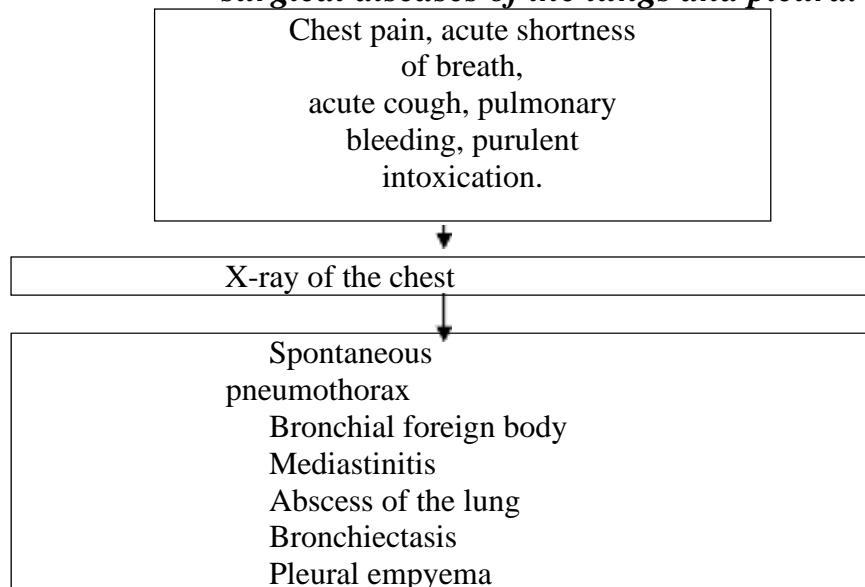
6.2. Materials for methodological support of the main stage of the class:

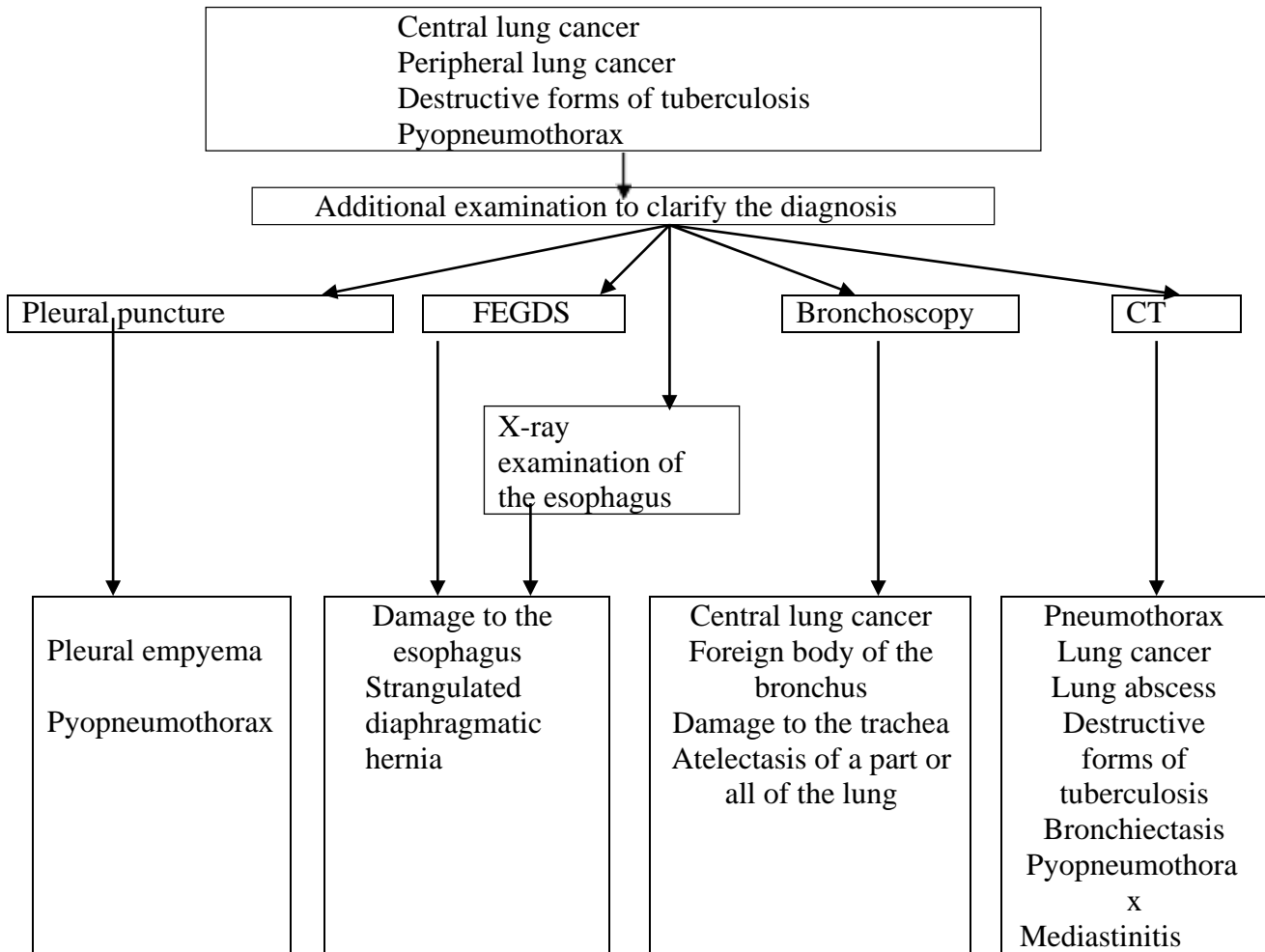
Learning objectives:

1. Based on the data of the educational radiological archive of the studied topic, navigate typical clinical cases.
2. Formulate the stages of the recommended surgical procedures and be able to perform them under the supervision of the teacher.
3. Visit the operating room during surgical interventions in case patients.

Professional algorithms and orientation maps of practical skills:

Algorithm for the examination of patients with suspected acute surgical diseases of the lungs and pleura.





Dependence of the nature of the pathological process on the leading clinical and radiological syndromes

Leading clinical syndromes	Radiological syndromes and pathological conditions				
	Extensive eclipse	Limited eclipse	Cavity formation	Extensive enlightenment	Changes in of the lung pattern
Acute suffocation	Foreign body of the main bronchus. Pulmonary atelectasis.			Spontaneous pneumothorax of the PE Foreign body of the large bronchus with valve stenosis	PE Foreign body of the large bronchus with ventilatory stenosis
Pulmonary bleeding (hemoptysis)		Central lung cancer	Destructive forms of tuberculosis. Peripheral decaying cancer.		Bronchiectasis

Acute pain in the chest				Spontaneous pneumothorax	PE
Acute onset cough		Foreign body in the bronchus			
Purulent intoxication	Empyema of the pleura	Empyema of the pleura		Enlightenment + darkening: pyopneumothorax	

6.3. Control materials for the final stage of the class:

Tests:

- **Which diagnostic method is the most informative for detecting pneumothorax?**
 - A. **X-ray of the chest.**
 - B. Spirometry.
 - C. Electrocardiography.
 - D. CT.

- **What is the main cause of pleural empyema?**
 - A. **Bacterial infection.**
 - B. Viral infection.
 - C. Chronic bronchitis.
 - D. Allergic reaction.

- **What treatment method is used to remove pus from the pleural cavity in case of empyema?**
 - A. **Drainage of the pleural cavity.**
 - B. Antibiotic therapy.
 - C. Physiotherapy.
 - D. Spirometry.

- **What is the most common cause of pneumothorax?**
 - A. **Chest trauma.**
 - B. Pneumonia.
 - C. Bronchial asthma.
 - D. Pulmonary embolism.

- **What symptom most often indicates the development of pneumothorax?**
 - A. **Sudden shortness of breath.**
 - B. Pain in the abdomen.
 - C. Headache.
 - D. Elevated temperature.

- **What is the most effective treatment for recurrent pneumothorax?**
 - A. **Pleurodesis.**
 - B. Chemotherapy.
 - C. Antiviral therapy.
 - D. Laser therapy.

- **What treatment method is used for massive hemothorax?**
 - A. **Surgical drainage.**
 - B. Drug therapy.
 - C. Laser therapy.
 - D. Physiotherapy.

- **Which diagnostic method is best suited for detecting pleural effusion?**
 - A. **Ultrasound examination (ultrasound) of the chest.**
 - B. CT.
 - C. ECG.
 - D. Spirometry.

- **What is the most characteristic symptom of pleural empyema?**
 - A. **Fever and chest pain.**
 - B. Cough with hemoptysis.
 - C. Headache.
 - D. Nausea and vomiting.

- **What diagnostic method is most often used to detect bronchiectasis?**
 - A. **CT.**
 - B. X-ray of the chest.
 - C. Spirometry.
 - D. Echocardiography.

Objectives and tasks:

1. In a patient with the first degree of pulmonary bleeding (up to 300 ml per day), in 3 days there were: vomiting of the “coffee grounds” type and ground vomit. There is no history of peptic ulcers. How to explain this condition?
Answer: swallowing blood during pulmonary bleeding.
2. A patient, 40 years old, was delivered by ambulance to the emergency department with severe shortness of breath at rest. Since childhood, he has suffered from polycystic lung disease. He is a group I disabled person. On the plain radiograph on the left there is a pneumothorax of ½ volume, on the right - total lucency, no pulmonary pattern is traced. What is your diagnosis and tactics?
Answer: Polycystic lung disease. Bilateral spontaneous pneumothorax. Drainage of the pleura on both sides.
3. A patient with total right-sided pleural effusion during a pleural puncture with removal of 2 litres of exudate deteriorated sharply: dizziness, decreased blood pressure. What should be done first?
Answer: Stop the puncture, place the patient in a supine position, and elevate the lower limbs.
4. During a pleural puncture, the patient turned pale, had a cough with blood in it, and lost consciousness. What is the most likely cause of this condition?
Answer: lung damage, air embolism of cerebral vessels.
5. After drainage of the pleural cavity due to pleural empyema, the drainage stopped functioning, subcutaneous emphysema appeared, and the patient's condition worsened. What is the cause?
Answer: dislocation of drainage into the soft tissues of the

chest wall.

6. Tell us about the course of the operation - drainage of the pleural cavity.
7. What complications can occur during a pleural puncture?
8. How is the pleural cavity drained after lung resection?
9. Why is a single drainage inserted into the pleural cavity after pneumonectomy and no active aspiration system is established?
10. How can active aspiration of the pleural cavity contents be ensured?

6.4. Materials of methodological support for self-study of higher education

applicants:

- A set of surgical instruments;
- A set of radiographs on the topic of the lesson;
- Videos;
- Educational literature;
- Tests and case studies.

L Literature:

1. https://www.saudedireta.com.br/catinc/tools/e_books/Oxford%20Handbook%20of%20Clinical%20Surgery,%204th%20Edition.pdf
2. <https://www.gutenberg.org/cache/epub/17921/pg17921-images.html>
3. <https://www.gutenberg.org/ebooks/17921>
4. https://dal.primo.exlibrisgroup.com/discovery/fulldisplay?context=L&vid=01NOVA_DAL: DAL&search_scope=Everything&isFrbr=true&tab=Everything&docid=alma990052517440107190
5. https://dal.novanet.ca/discovery/fulldisplay?context=L&vid=01NOVA_DAL: DAL&search_scope=Everything&tab=Everything&docid=alma990056009660107190
6. https://dal.novanet.ca/discovery/fulldisplay?context=L&vid=01NOVA_DAL: DAL&search_scope=Everything&tab=Everything&docid=alma990065199090107190