**Situation Problem 1**

Patient N., a 20-year-old, height - 164 cm, body weight - 65 kg, complains of periodic choking attacks with difficulty in exhalation, accompanied by thick, glassy sputum. The attacks started occurring in the last two years, after family had brought a dog, and are often triggered by inhaling of cold air or by strong emotions. The mother suffers from urticaria, and the brother has pollen allergy (pollinosis).

Blood count:

Erythrocytes – 4,5× 1012 /L

Hb – 136 g/L

Haematocrit– 48%

Leucocyte– 12×109 /L

basophiles– 1%,

eosinophile– 9%

segmented neutrophils - 55%

nonegmented neutrophils– 5%

lymphocyte– 25%

monocyte – 5%.

ESR– 20 mm/ hour.

ventilatory parameters:

FR (breathing rate) - 20/min,

TV (tidal volume) - 0,4L,

RV (respiratory volume) Maxim - 60L/min,

TLC (total lung capacity) - 3,7L,

FRC (forced residual capacity) - 3,8L,

FEV1 (forced expiratory volume per second) - 2L,

RV (residual volume) -1,8L,

inspiration/expiration ratio -1:1,5.

**Questions:**

**1. Explain the occurrence of choking and difficulty in expiration in the patient.**

**2. What is the role of corneal inflammation in the pathogenesis of bronchial asthma?**

**3. What is the mechanism of expiratory dyspnoea?**

**4. What does the Tiffneau index mean?**

**5. Calculate the Tiffneau index in the given patient. Characterise the Tiffneau index in obstructive and restrictive pathologies.**

**6. What are the features of pneumogram in the obstructive respiratory diseases?**

**7. Are there pulmonary perfusion disturbances in lower obstructive diseases (as bronchial asthma)? Argument answer.**

**Situation Problem 2**

Patient K., 43 years old, presented to the doctor with complaints of weakness, shortness of breath, high fever, and mucopurulent sputum with a rusty tint. Sputum microscopy revealed leukocytes and erythrocytes. On auscultation – wet rales in the lungs.

Blood count:

Erythrocytes – 4,8× 1012 /L

Hb – 132 g/L

Haematocrit – 48%

Leucocyte – 15×109 /L

basophiles – 1%,

eosinophile – 9%

segmented neutrophils – 52%

nonegmented neutrophils – 5%

metamielocite – 3 %

lymphocyte – 25%

monocyte – 5%. ESR – 26 mm/ hour.

Blood gases:

PaO2 – 50 mm Hg, PaCO2 – 42 mm Hg

ventilatory parameters:

FR (breathing rate) – 30 /min,

RV (respiratory volume) – 0,25 L,

inspiratory reserve volume– 1L,

vital lung capacity– 2,5 L,

forced vital capacity– 2,3 L,

FEV1 (forced expiratory volume per second) – 2 L,

RV (residual volume) – 3,7 L,

anatomical dead space capacity– 150 ml.

**Questions:**

**1. What type of ventilatory disorder has this patient?**

**2. What type of Respiratory Failure has this patient according to pathogenesis?**

**3. How do you explain the pulmonary ventilation dysregulation in this patient?**

**4. How do you explain the dysregulation of gas diffusion in this patient?**

**5. How do pulmonary ventilation indices change in restrictive conditions?**

**6. Explain the mechanism of dyspnoea in this patient.**

**7. Explain the presence of leucocytes and red blood cells in the sputum.**

**Situation Problem 3**

Patient K., aged 66 years, 5 weeks after a myocardial infarction, had frequent, increased shallow wheezing, during which a cough with a small amount of sputum and a mixture of blood occurred. The ECG showed characteristic signs of left ventricular posterior wall infarction.

Spirographic dates: RR = 26 pe min; forced vital capacity (FVC) = 3,23 l; total lung capacity (TLC) = 3,0 l; tidal volume (TV) = 0,7 l; FEV1 = 2 l/s; PaO2 in arterial blood before and after hyperventilation was 93 and respectively 92 mmHg.

Normal lung volume values:

Respiratory rate (RR) = 16-18/min

Forced vital capacity (FVC) = 3,5 L

Total lung capacity (TLC) = 3,5-6,0 L

Tidal volume (TV) = 0,3-0,9 l

Respiratory volume per minute (RVM) = 4,8 - 16,2 l

Forced expiratory volume per second (FEV1) = 3,2 l/s

Tiffneau index = 75-90%

**Questions.**

**1. Explain the emergent respiratory compensatory mechanisms present in this patient.**

**2. How do you explain the breathing disturbances in this patient?**

**3. How do you explain the productive cough with a small amount of sputum and a mixture of blood?**

**4. Calculate and evaluate: RVM, Tiffneau index**

**5. What type of pulmonary alveolar ventilation disorder?**

**6. Does the patient have pulmonary diffusion disturbance?**

**7. Give a general conclusion about the condition of the patient's respiratory system.**

**Situation Problem 4**

Patient, 57 years old. Smoker for 20 years, complaining of shortness of breath appeared during physical effort, fatigue. Objective: skin rose-pale, the rib cage is enlarged, the depth of respiration is decreased, respiratory rate 28 per minute. On chest palpation the intercostal spaces are enlarged. On comparative percussion of the rib cage is sound hypersonority of the entire lung surface. The lower pulmonary boundaries are lowered. Respiratory excursion reduced. On auscultation of the lungs - forced breathing. Comparative chest percussion shows hyperresonance over the entire lung surface. Absolute cardiac dullness is absent

**Questions.**

**1. How do you explain "feeling of air insufficiency".**

**2. What is the general mechanism of dyspnea?**

**3. How do you explain that the rib cage is enlarged in this patient?**

**4. What do we call emphysema and what is the general characteristic of pulmonary emphysema?**

**5. What is the pathogenesis of emphysema?**

**6. What impact does cigarette smoke have on the pathogenesis of pulmonary emphysema?**

**7. How do pneumogram indices change in pulmonary emphysema?**