The main symptoms of pulmonary diseases

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Pulmonary physiology

- IRV (~3.3 L)
- TV (~0.5 L)
- ERV (~1.0 L)
- RV (~1.2 L)

- Total lung capacity: IRV+TV+ERV+RV
- Vital capacity: IRV+TV+ERV
- Inspiratory capacity: IRV+TV
- Functional residual capacity: ERV+RV
- Respiratory minute volume 6 L/min
- Alveolar ventilation 4.2 L/min
- Maximal voluntary ventilation 125-170 L/min
- FEV 1”: proportion of VC during 1 sec. of forced expiration
Pulmonary physiology

• 16-20x/min
• Diffusion capacity: $\text{CO}_2/\text{O}_2 = 20:1$
• Triggers
  – $\text{pCO}_2$ (NB! in case of severe hypercapnia, hypoxia will drive breathing)
  – pH
  – $\text{PO}_2$
Main signs and symptoms

- History taking
- Dyspnea
- Coughing
- Expectoration of sputum
- Chest pain
History taking

- Smoking (active/passive; PY)
- Chronic pulmonary diseases (asthma bronchiale, COPD, emphysaema)
- Infectious hazard
- Profession
- Known broncho-pulmonary neoplasms
- Trauma
- Immunocompromised hosts (congenital/acquired immundeficiency)
- Congenital broncho-pulmonary diseases (bronchiectasia, CF)
Dyspnea

- Disbalance between actual respiratory necessity and support (increased metabolism, decreased cardio-respiratory function)
- Perception: asynchrony between neural stimulation and muscle contraction/pulmonary expansion (delay)
- Subjective feeling – "short of breath" (Borg, visual analogue scale 1-10)
- Objective signs
  - Frequency, depth, rhythm of breathing are changing (best detectable during speaking)
  - Accessory muscles are used
  - Patient is in a special position
- Can be normal (during extreme physical exercise)
- In case of smaller exercise: effort dyspnea
Dyspnea

• Tachypnea/bradypnea
• Respiratory volume can ↓ (bad efficacy!) / ↑ (eg. Kussmaul)
• Cheyne-Stokes, Biot-Savard
• Hyperventillation due to psychiatric causes → respiratory alkalosis, tetany

• Useful tests:
  – pletismography or other test of respiratory volumes
  – Astrup (respiratory/metabolic aspects)
Dyspnea

• Acessory muscles
  – Inspiration: M.SCM, serratus, trapezius, scaleni, pectorales
  – Expiration: abdominal, internal intercostal muscles
Dyspnea

- Orthopnea: (half)-sitting position (diaphragm↓ → greater VC) + accessory muscles
- Patient suffering from lobar pneumonia or pleural effusion is laying on the affected side.
Dyspnea

- Inspiratory ~:
  - Upper airway stenosis
  - Muscle palsy

- Exspiratory ~:
  - Asthma bronchiale (→ air trapping, inflation of the lungs; volumen pulmonum auctum acutum)

- Mixed ~: cardio-respiratory disfunction
Main causes of dyspnea

- Heart failure (cardiac ~)
- Respiratory ~
- Acidosis (diabetic ketoacidosis, uraemia)
- CNS problems (cerebrovascular, meningitis), gasping
- Psychiatric
- High altitude (partial $O_2$ pressure↓)
- Anaemia (Hgb↓)
Respiratory dyspnea

- Chest rigidity, deformity, muscle palsy
- Upper airway stenosis (bradypnea, stridor, inspiratory dyspnea, epigastrial retraction)
- Low (small) airway stenosis: bronchial asthma (exspiratory, normo/bradypnoe, wheezes, ronchii)
- Decreased alveolar surface (hampered expansion (high diaphragm, hydrotx, ptx), pulmonary infiltrates (pneumonia), atelectasia): tachypnea, superficial (low amplitudo)
- COPD
  - Alveolar surface
  - Bronchospasm, bronchial hypersecretion → air trapping
Orthopnea
Coughing

- Closed glottis, explosive expiration
- Reflectory, normal cleaning function
- Productive/improductive
- Main trigger points: pharynx, larynx, bifurcation (no from lower airways!); pleura
- Acute
  - Infections, foreign body, aspiration, PE, ptx, inhalation of irritants
- Chronic
  - Postnasal drip
  - Asthma
  - GERD
Coughing

- Inflammation of mucous membranes: pharyngitis, laryngitis, tracheitis, bronchitis
- Diseases with concomittant bronchitis: pneumonia, bronchiectasia
- Pleural diseases: pleuritis sicca, tumor
- „Mediastinal tumor sy."
- Asthma bronchiale
- Pulmonary stasis – heart failure
- Pulmonary infarction
- Pertussis (whooping cough)
- Psychiatric
Coughing

- Decreased triggering: unconsciousness, coma, ITN, neurologic diseases → retention of bronchial secretes + aspiration → hypostatic / aspiration pneumonia → respiratory failure → death
Sputum - inspection
„Homo sum, humani nihil a me alienum puto” Terentius

- Daily volume, consistency, color, odour
- Clear, mucous: upper airway
- Mucous, later purulent: bronchitis
- Mucous „as a glass”, clam, Curschmann’s mucous spirals
- Purulent, clam, sometimes brownish-reddish (decomponated blood): pneumonia; in viral pneumonitis: fresh reddish (bloody)
- Voluminous, thin, pinkish, foamy: pulmonary edema
- Voluminous, morning, sometimes odorous (gangareneous): bronchiectasia, pulmonary abscess
- Bloody: bronchial tumor
- Fresh, foamy, bloody: pulmonary infarction
Sputum – further exams

- **Light microscopy**
  - Charcot-Leyden cristals
  - Elastic fibers
  - Leukocytes (eosinophils!)
  - Alveolar epithel cells containing hemosiderin (heart disease cells)
  - Tumor cells
  - Bacterias

- **Microbiology**
  - Cultivation of bacterias; AB resistance
  - Z-N and specific cultivation for TBC
Haemoptea, haemoptysis

- Haemophylic condition (congenital, acquired)
- Non-respiratory origin (epistaxis, haematemesis)
- Respiratory
  - Brochial tumor
  - Other tumors (nasopharyngeal, oral cavity, metastatic)
  - Bronchiectasia
  - TBC
  - Pneumonia (viral – influenza!), pulmonary abscess
  - Pulmonary embolism
  - Aspiration of foreign body
  - Rare causes (aspergilloma, sarcoidosis, Goodpasture sy., WG, coagulopathies, anticoagulants, endometriosis, atreriovenous malformation, pulmonary contusion)
Chest pain

• Parietal pleura
  – Lateral, circumscribed, sharp, parallel with breathing, the pain stops breathing, most prominent on the base of the lung (greatest movements), can be very severe (ptx, PE)

• Neuralgiform
  – Pleural or pulmonary tumors involving the intercostal nerves or the brachial plexus
Sleep apnea syndrome

- Middle aged, obes male
- Snoring, due to upper airway obstruction
- Apnoe → asphyxia ($CO_2 \uparrow$, $PO_2 \downarrow$), respiratory acidosis
- $P \uparrow$, $RR \uparrow$
- Headache, tiredness, narcolepsy, polyglobulalia
- Th.: special device helps to keep the airways opened
Hoarsness

- Vocal cords
- Acute/chronic inflammation, physical „over use”
- Vocal cord palsy (recurrent laryngeal nerve)
- Refer to ORL specialist if >2 weeks
Cyanosis

NORMAL

2.6g/dl

HHb

HbO2

HYPOXIA

≥5g/dl
Cyanosis
Clubbing of nails