THE PHYSICAL DIAGNOSIS OF COMMON PLEURAL AND PULMONARY SYNDROMES, BRONCHIECTASIS, LUNG ABSCESS, LUNG CANCER

THE PHYSICAL DIAGNOSIS OF COMMON PLEURAL AND PULMONARY SYNDROMES

Percussion notes and their characteristics

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<th>Intensity</th>
<th>Pitch</th>
<th>Duration</th>
<th>Example</th>
<th>Pathologic examples</th>
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<tr>
<td>Flatness</td>
<td>soft</td>
<td>high</td>
<td>short</td>
<td>Thigh</td>
</tr>
<tr>
<td>Dullness</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>Liver</td>
</tr>
<tr>
<td>Resonance</td>
<td>loud</td>
<td>low</td>
<td>long</td>
<td>Normal lung</td>
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<tr>
<td>Hyper-resonance</td>
<td>very loud</td>
<td>lower</td>
<td>longer</td>
<td>Abnormal lung</td>
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<tr>
<td>Tympany</td>
<td>loud</td>
<td>high</td>
<td></td>
<td>Gastric air bubble</td>
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Breath sounds

**Vesicular breathing**
Quiet respiration produces a soft, low-pitched noise. The inspiratory phase is longer, no pause between insp. and exp. Can be heard over the entire lung surface, except beneath the manubrium sterni and the upper interscapular region. Origin: distal from the trachea but proximal from the alveoli.

**Bronchial breathing (tubular breathing)**
Louder, higher-pitched, expiratory phase is longer, short pause between insp. and esp. Can be heard over the trachea (suprasternal notch and the 6th-7th cervical spines). Does not occur in the normal lung, it results from consolidation or compression of pulmonary tissue that facilitates transmission of sound from the bronchial tree.

**Bronchovesicular breathing**
Intermediate. Normally heard at the manubrium sterni and in the upper interscapular region. In other parts it is pathological and indicates a small degree of consolidation or compression of lung tissue that transmits sounds from the bronchial tree.

**Tracheal breathing**
Very loud, high-pitched.

**Asthmatic breathing**
Short inspiration, long, forced expiration, often accompanied by musical rales.
Amphoric breathing
Occurs when air blows over the mouth of a bottle. In the lungs it is produced by a large empty cavity that communicates with a bronchus or an open pneumothorax. Cavernous breathing - low-pitched and hollow sound.

Note: The ear can be trained to recognize sounds more accurately. Look for patterns of pitch and overtones! Find a quiet place for auscultation.

Rate and rhythm abnormalities of breathing
Normally 14-20/min in adults, up to 44/min in infants.

Tachypnea
Rapid, shallow breathing. Occurs in restrictive lung diseases, pleuritic pain, elevated diaphragm.

Hyperpnea or hyperventilation
Rapid deep breathing. Occurs during exercise, anxiety, hypoxia, in comatose patient affecting midbrain or pons, metabolic acidosis (Kussmaul breathing is deep with different rate).

Bradypnea
Slow breathing. Occurs in drug-induced breathing depression, diabetic coma, increased intracranial pressure.

Cheyne-Stokes breathing
Deep breathing alternates with periods of apnea. Occurs in heart failure, uremia, drug-induced respiratory depression, brain damage.

Ataxic breathing (Biot's breathing)
Unpredictable irregularity in brain damage, respiratory depression.

Sighing respiration
Punctuated by frequent sighs in hyperventilation syndrome.

Auscultation of the lung and the pleura

Special maneuvers
Simple walk with the patient (maybe upstairs) to observe rate, regularity, depth, and effort of breathing.

Forced expiratory time longer than 5 sec in obstructive diseases.

Identification of fractured rib(s) with antero-posterior compression.

Voice sounds
Pectoral fremittus, pectoriloquy. Palpation of the vibration chest wall generated by whispered or spoken words. Increased in consolidation, decreased in pleural effusion.

Bronchophony. Auscultation of the chest generated by whispered or spoken words. Ask patient to say „ninety-nine“ or „one-two-three“ and listen to symmetrical areas. Increased in consolidation, decreased in pleural effusion.
Physical findings in some common pulmonary disorders

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<td>Hyperinflation (use of accessory muscles)</td>
<td>Impaired expansion; decreased fremitus</td>
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<td>Prolonged expiration; inspiratory and expiratory wheezes</td>
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<td>Pleural effusion (large)</td>
<td>Lag on affected side</td>
<td>Decreased fremitus; trachea and heart shifted away from affected side</td>
<td>Dullness or flatness</td>
<td>Absent breath sounds</td>
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<tr>
<td>Atelectasis (lobar obstruction)</td>
<td>Lag on affected side</td>
<td>Decreased fremitus; trachea and heart shifted toward affected side</td>
<td>Dullness or flatness</td>
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Consolidation (pneumonia) Possible lag or splinting on affected side Increased fremitus Dullness Bronchial breath sounds; bronchophony; pectoriloquy; crackles

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<td>• $R_{aw}$</td>
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**BRONCHIECTASIS**

**Definition**
Congenital or acquired disorder of the large bronchi. Permanent, abnormal dilatation and destruction of bronchial wall.

**Causes**
• Primary
• Secondary
  o Cystic fibrosis
  o Lung infection: tuberculosis, fungal infections, lung abscess, pneumonia
  o Abnormal lung defense mechanisms: α-1-antitrypsin deficiency with cigarette smoking
  o Immunodeficiency: primary: panhypogammaglobulinemia, selective IgA, IgG, IgM subclass deficiencies, cytotoxic therapy, AIDS, hematologic disorders (multiple myeloma, leukemia, lymphoma), chronic renal failure, hepatic disease
  o Mucociliary clearance disorders, rheumatic disorders
  o Localized airway obstruction (foreign body, tumor, mucoid impaction)

Symptoms and signs
• Chronic cough, production of copious amounts of purulent sputum, hemoptysis, recurrent pneumonia. Weight loss, anemia, other systemic manifestations of chronic inflammation.
• Physical findings: nonspecific. Persistent crackles at the lung bases are common. Clubbing: infrequent. Copious, foul-smelling, purulent sputum that separate into three layers in a cup. Obstructive pulmonary dysfunction with hypoxemia: in moderate or severe disease.

Laboratory findings
• Leukocytosis, high % of PMN-s with shift to the left.
• Panhypergammaglobulinemia: in the majority of patients, presumably reflecting an immune system response to chronic airway infection.

C. Imaging
• Chest x-ray: crowded bronchial markings related to peribronchial fibrosis, small cystic spaces at the bases of the lung
• Thin layer CT scanning: detection of moderate or severe cases
• Bronchography: only if surgery is planned, evaluate hemoptysis, rule out obstructing airway lesions.

Treatment
• Antibiotics: Selected on the basis of sputum smears and cultures. In an acute exacerbation if a specific bacterial pathogen cannot be isolated: empirical oral antibiotic therapy for 10-14 days (amoxicillin, ampicillin, tetracycline, trimethoprim-sulphamethoxazole. Sometimes, for patients with copious, purulent sputum: alternating cycles of 2 or 3 of these antibiotics, orally, for 2-3 weeks.
• Daily chest physiotherapy with postural drainage. Chest percussion.
• Inhaled bronchodilators.
• Bronchoscopy: to remove retained secretions.
• Surgery (resection, hemoptysis).

Complications
• Cor pulmonale
• Amyloidosis
• Secondary visceral abscesses at distant sites (e.g., brain).

LUNG ABSCESS

Definition
Lung parenchyma in an area of infection undergoes necrosis When it communicates with bronchi cavitation with formation of air-fluid level occurs. Chronic process.
Causes

- Aspiration. During aspiration of the contents of the mouth, material plugs off a bronchus or bronchiole. This will eventually result in an anaerobic environment. Anaerobic bacteria that are always present grow:
  - During an episode of unconsciousness (alcohol, drug overdose, head trauma, anesthesia, seizure, coma from any cause)
  - Neuromuscular disease of the oropharynx or the esophagus
  - Following operative procedure in the mouth
  - Poor oral hygiene
  - Gag reflex may be absent
- Obstructive disease of the bronchus: tumor (Lung abscess in edentulous patient with normal oral hygiene - tumor suggested)
- Bronchiectasis: predisposing factor
- Subdiaphragmatic process: e.g., amebic abscess of the liver breakthrough the diaphragma results in right lower lobe infection
- Metastasis from suppurative pelvic or jugular thrombophlebitis (usually caused by anaerobes)
- Metastasis from right-sided endocarditis (Staphylococcus - IV drug abusers)
- Metastasis from bacteremia from other sites

Causative agents

- Most commonly: combination of anaerobe and microaerophilic bacteria (Fusobacterium nucleatum), often in association with aerobes
- Common in staphylococcal, Klebsiella, Pseudomonas, pneumococci, Haemophilus influenzae and other pneumonias, except for those caused by Mycoplasma pneumoniae

Symptoms and signs

- Development of pulmonary symptoms about 1-2 weeks after possible aspiration, bronchial obstruction, or previous pneumonia
- Septic fever and sweats, anorexia, weight loss, malaise
- Periodic sudden expectoration of large amount of purulent sputum (sometimes hemoptysis)
- Cough for days or weeks or even months, with or without an initial acute onset. Cough productive of purulent sputum with or without blood, pleuritic chest pain (if empyema developed)
- Physical examination of the chest: dullness, amphoric breathing, rales (but often negative)
- Clubbing of the fingers may occur. Usually chronic (in bronchiectasis, lung abscess, emphysema, chronic bronchitis). When develops acutely (within 6 months), lung cancer should be suspected.

Laboratory findings

- Microscopic examination of the sputum: many PMN leukocytes, a mixed flora of gram positive cocci in chain, gram negative bacilli, gram negative cocci, and/or gram positive bacilli.
- Culture of the sputum: "normal flora" (no value!). Most commonly isolated: Fusobacterium, Peptostreptococcus, Peptococcus organisms, microphilic streptococci, Bacteroides melaninogenicus, Streptococcus pneumoniae.
- Blood culture.

Imaging

- Chest X-ray and CT: Infiltrate of pneumonia, often necrotizing, often with well-defined, multiple cavities with a rim of infiltrate.
• Density with central radiolucency and air-fluid level is characteristic
• Association with pleural effusion suggests empyema

**Differential diagnosis**
• Cavitating carcinoma
• Tuberculosis
• Fungal infection
• Wegener granulomatosis

**Treatment**

- **Antibiotics:**
  - Penicillin G: 1 - 2 million units IV every 4 hours.
  - Penicillin V: 0.5 - 1 g p.o. every 6 hours (after improvement with IV penicillin G).
  - Clindamycin: 600 mg IV every 8 hours until improvement, then 300 mg p.o. every 6 hours.
  - Other antibiotics: ampicillin, cephalotin, cefazolin, cephalexin, ampicillin-sulbactam, cefotaxin, penicillin G + metronidazole or ticarcillin-clavulanic acid.
  - Antibiotics should be continued until the chest x-ray stabilizes - a month or more.

- Postural drainage
- Bronchoscopy: free airways
- Empyema should be drained!
- Septic phlebitis: heparin therapy, vein ligation
- Surgical treatment: lobectomy

**Prognosis**

- Depends on the underlying disease
- Overall mortality: 15%

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**LUNG CANCER**

**Epidemiology**
Lung cancer is the most common malignant tumor, comprising 15-22% of all malignancies. Its mortality is higher than breast, prostate and colon cancer together. Overall 5-year survival rate is 14%. Most patients are recognized at advanced, inoperable stages.

**Etiology**

- Smoking (active, passive). More than 90% of patients are smokers. Risk of cancer is 13-times higher in active and 1.5 times in passive smokers. Frequency increases with smoking in women, too
- Dominant oncogenic mutations increase in number:
  - ras, myc
  - rb (retinoblastoma) + p53
- Environmental carcinogens and cocarcinogens (dust, ionizing radiation)
- Pre-existing lung diseases: tbc, granulomatosis, bronchitis

**Pathology**

**Histological subtypes**
Adenocarcinoma, Bronchioalveolar carcinoma, Squamous cell (epidermoid) carcinoma, Small cell carcinoma, Large cell carcinoma, Carcinoid, Mucoepidermoid carcinoma, Adenoid cystic carcinoma, Sarcoma and other soft tissue tumors
Clinical aspects and treatment

- Small cell lung cancer (SCLC) - 15-20%
- Non-small cell lung cancer (NSCLC) - 80-85%

Symptoms

1. Local symptoms
   - Chronic cough, chest pain, shoulder pain, dyspnea, hemoptysis, stridor
   - Pancoast tumor (in the apex)
   - Horner’s triad: myosis, ptosis, enophthalmus
   - Cardiac symptoms: arrhythmia, stenocardia
   - Respiratory insufficiency

2. Symptoms caused by metastases
   - Vena cava superior syndrome
   - Hoarseness
   - Dyspnea due to paresis of n. phrenicus
   - Singultus
   - Pain
   - Dysphagia
   - Altered mental state (brain metastasis: headache, nausea, vomiting, visual disturbance, diplopia, aphasia, hemiparesis, ataxia )
   - Pathologic fractures
   - Icterus
   - Lower limb edema

3. General symptoms
   - Hypotension, tachycardia
   - Fever (pneumonia, brain metastasis)

4. Paraneoplastic syndromes
   - Clubbing of fingers
   - Hypertrophic pulmonary osteoarthropathy (HPO)
   - Deep vein thrombosis, migratory thrombophlebitis
   - Ectopic ACTH production (Cushing’ syndrome)
   - Anemia, leukocytosis, eosinophilia, leukemoid reaction
   - Neuropathy, encephalopathy, dementia
   - Lambert-Eaton syndrome
   - Carcinoid syndrome (flushing, diarrhea, wheezing, cardiac failure)

Laboratory findings

- Usually normal
- Elevated LDH reflects poor prognosis

Imaging techniques

For detection of primary lung tumor
- Chest X-ray, CT, MRI
- CT-guided fine needle aspiration cytology

For staging
- Abdominal ultrasound, CT
• Brain CT or MRI - when relevant complaints are present
• Positron emission tomography (PET)
• Bone marrow scan

Others, when necessary
• Barium swallowing (trachea-esophageal fistula)
• Spirometry, blood gases

Staging

<table>
<thead>
<tr>
<th>Stage</th>
<th>TNM</th>
</tr>
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<tbody>
<tr>
<td>Occult carcinoma</td>
<td>TxN0M0</td>
</tr>
<tr>
<td>0</td>
<td>TisN0m0</td>
</tr>
<tr>
<td>IA</td>
<td>T1N0M0</td>
</tr>
<tr>
<td>IB</td>
<td>T2N0M0</td>
</tr>
<tr>
<td>IIA</td>
<td>T1N1M0</td>
</tr>
<tr>
<td>IIB</td>
<td>T2N1M0, T3N0M0</td>
</tr>
<tr>
<td>IIIA</td>
<td>T3N1M0, T1N2M0, T2N2M0, T3N2M0</td>
</tr>
<tr>
<td>IIIB</td>
<td>T4(any N)M0, (any T)N3M0</td>
</tr>
<tr>
<td>IV</td>
<td>(any T)(any N)M1</td>
</tr>
</tbody>
</table>

Abbr.: 1: tu < 3 cm and/or outer than 2 cm from bifurcation carina; T2: tu > 3 cm and/or closer than 2 cm to bifurcation carina; infiltration of visceral pleura; T2, T3: infiltration of the chest wall or mediastinal pleura or organs. N1: ipsilateral peribronchial or hilar lymph node; N2: ipsilateral mediastinal lymph node, N3: contralateral hilar ad/or mediastinal lymph node. M1: distant metastasis

Treatment

Treatment of NSCLC
1. Surgical therapy - 1st line therapy
   • Segmentectomy, lobectomy, bilobectomy, pulmonectomy, explorative thoracotomy, etc.
   • >50% of cases are inoperable at diagnosis
   • 25% of cases that seem operable turn out non-resecable

2. Chemotherapy - 2nd line therapy
   • Cytostatic drugs: cisplatin, carboplatine, etoposide, mitomycin C, isosofsmine, epirubicine, docetaxel, paclitaxel, gemcitabin
   • VGEF-targeted therapy: bevacizumab
   • EGFR-targeted therapy: erlotinib

Radiotherapy

Teletherapy, brachytherapy (brain metastasis): curative, palliative

Treatment of SCLC
Chemotherapy - 1st line therapy, may be followed by surgery only in early stages
   • etoposid, cisplatin, cyclophosphamide, epirubicin, vincristin, ifosfamide, carboplatin

Radiotherapy
   • brain metastasis
**Metastatic lung cancer**

In osteogenic, soft tissue sarcomas, colon, rectal, uterine, cervix and corpus tumors, head and neck, breast, testis, salivary gland cancer, melanoma, bladder and kidney cancer.

Treatment: sometimes resection