Lung Tumors
Lung Cancer

• Most common cause of cancer death
  – 27% of all cancer deaths in United States.
• Most common cancer in men and women
• Most common between 40 and 70 years of age
  – 2% occurs before age 40
Etiology and Pathogenesis

• Tobacco smoking
  – Amount, tendency to inhale, duration
• Genetic susceptibility (hereditary factors)
• Industrial hazards
  – Miners of ra ores, asbestos workers, chromium, arsenic, uranium, nickel, mustard gas, vinyl chloride
Smoking and Lung Cancer

- Smokers - 10 fold greater risk
- Heavy smokers - 60 fold greater risk
- Cessation of smoking reduces risk; but risk may never return to baseline
- 96.7% of smokers show some atypical cells in the bronchial tree compared to 0.7% of non-smoker control subjects
Smoking and Lung Cancer

- Bronchial epithelium shows loss of cilia
- Basal cell hyperplasia
- Dysplasia
- Carcinoma in-situ
- Association stronger with squamous and small cell carcinoma
- No experimental animal model
Smoking and Lung Cancer

Basal cell hyperplasia associated with smoking
Smoking and Lung Cancer

- Squamous metaplasia
- Squamous dysplasia
Lung Cancer

- Majority are epithelial in origin
  - Bronchogenic carcinoma (90-95%)
  - Bronchial carcinoid (5%)
  - Mesenchymal/miscellaneous (2-5%)
Classification of Lung Tumors

• Bronchogenic Carcinoma
  – Nonsmall cell carcinoma (70-75%)
    • Squamous cell carcinoma (25-40%)
    • Adenocarcinoma (25-40%)
      – Bronchioloalveolar carcinoma
    • Large cell carcinoma (10-15%)
  – Small cell carcinoma (20-25%)
  – Combined patterns (5-10%)
Lung Cancer Histology

Squamous cell ca

Adenocarcinoma

Small cell ca

Large cell ca
Classification of Lung Tumors

- SMALL CELL CARCINOMA
  - Chemotherapy
- NONSMALL CELL CARCINOMA
  - Surgery
Response to Chemotherapy in Small Cell Cancer

Figure 2. Computed tomographic scan showing right hilar mass in 63-year-old woman with extensive small-cell lung cancer (left). Response (right) after four cycles on protocol of chemotherapy with topotecan hydrochloride and paclitaxel.
Classification of Lung Tumors

• Neuroendocrine Tumors
  – Carcinoid, atypical carcinoid, small cell

• Soft Tissue/Mesenchymal tumors
  – Localized fibrous tumor, hamartoma

• Mesothelial Tumors
  – Malignant mesothelioma

• Lymphoproliferative Diseases

• Secondary Tumors (Metastatic)
Lung Cancer Histogenesis

- **Auerbach theory**
  - Dedifferentiation of normal respiratory epithelial cells

- **Yesner theory**
  - Small cell carcinoma cell undergoing transformation

- **Sell and Pierce theory**
  - Maturation arrest of stem cells
Squamous Cell Carcinoma

- Strong relation to cigarette smoking
- Marked male predominance (male/female ratio 6.6 to 15:1)
- At least 50% arise in the major bronchus: centrally located *(with both endobronchial and invasive growth)*
- *Precursor lesion: Squamous metaplasia/dysplasia*
Squamous Cell Carcinoma

- Centrally located, endobronchial fungating mass
Squamous Cell Carcinoma

- Individual cell keratinization, keratin pearls, intercellular bridges
- Fine needle aspiration Biopsy (FNA)
Squamous Cell Carcinoma

- Individual cell keratinization, keratin pearls, intercellular bridges

Surgical biopsy
Adenocarcinoma

- CT scan shows a 5.0cm mass

- CT guided FNA: Atypical epithelial cell clusters with lumen formation
Adenocarcinoma

- Most common lung ca in women and in nonsmokers
- Usually peripherally located
- Histologically vary from well (predominantly gland forming) to poorly (predominantly solid growth) differentiated
- Precursor lesion: Atypical adenomatous hyperplasia
Bronchioalveolar Carcinoma

- Lobar consolidation mimicking pneumonia
- Well differentiated columnar/cuboidal cells line preserved alveolar septa
- BAC can be seen in all ages
- Men = women
- Has a better prognosis
Large Cell Carcinoma

- 10-20% of all cancers
- Most large cell tumors are peripheral
- Composed of large cells without glandular or squamous differentiation
- Common giant cells or clear cells features
- On EM some differentiation is usually demonstrable
Small Cell Carcinoma

- Highly malignant tumor
- Usually metastasized at the time of diagnosis
- Associated with paraneoplastic and endocrine symptoms
- Strong association with smoking
Small Cell Carcinoma

- Central bulky soft masses with necrosis. Metastases in lymph nodes common.
Small Cell Carcinoma

- Sheets and nests of SMALL cells with scant cytoplasm and nuclear molding
- Azzopardi effect
Carcinoid Tumor

- Kulchinsky cell (neuroendocrine cell)
- 5% of all pulmonary neoplasms
- Regarded as low-grade malignant, 5% metastasize
- Neural (NSE, synaptophysin) and endocrine (chromogranin, ectopic hormone production) differentiation
Carcinoid Tumor

Endobronchial usually pedunculated, polypoid lesion which bleeds easily

A. Carcinoid tumor

B. Postobstructive pneumonia
Carcinoid Tumor

- Nestes and cords of uniform cells
- EM: Neurosecretory granules
Neuroendocrine Tumors

Carcinoid

Atypical Carcinoid

Small Cell Carcinoma
Diagnosis

- History
- Chest x-ray
- Cytology
  - Diagnostic
  - Screening
- Bronchoscopy/ biopsy
- Needle biopsy
- Biopsy of metastatic sites
Lung Cancer Diagnosis

A. Chest x-ray: Right central mass
B. Bronchoscopy: Fungating white endobronchial mass
C. Fine needle aspiration: Squamous cell carcinoma
Clinical Features

• General systemic effects
• Paraneoplastic symptoms (10% of cases)
  – Hypercalcemia: PTH-related hormone (SqCCa)
  – Cushing syndrome: Adrenocorticotropic hormone
  – SIADH
  – Neuromuscular syndromes: Clubbing, MG
  – Hematologic manifestations: DIC (ACA)
Pancoast’s Syndrome:

- Pain in the distribution of the 8th cervical and 1st and 2nd thoracic spinal nerves. Mostly ACAs.
Benign Lung Tumors

- Most common benign lesion is a hamartoma
- Usually discovered as “coin lesion” on routine chest x-ray
- Rarely more than 3-4 cm
- Composed predominantly of mature cartilage
- Occasionally with cysts lined by respiratory epithelium
- Admixture of fibrous tissue, fat, blood vessels
Hamartoma

- Well-circumscribed nodule composed of mature cartilage
Lung Cancer

- The lung is more often affected by *metastatic* tumor than primary malignancy
Staging in Lung Cancer

- Once the diagnosis is made the next step is to stage the patient.
  - Stage I  T1-T2  N0  M0
  - Stage II  T1-T2  N1  M0
    - T3  N0  M0
  - Stage III  T3  N1  M0,  N2 (T1-T3)
    - N3 (T1-T4)  T4(N0-N3)  M0
  - Stage IV  Any T  Any N  M1
Staging in Lung Cancer

• T1: Primary tumor <3cm
• T2: Primary tumor >3cm, invasion of pleura, involvement of main bronchus
• T3: Tumor of any size that directly invades the chest wall, diaphragm, mediastinal pleura, pericardium
• T4: Tumor of any size that directly invades mediastinum, trachea, carina, esophagus, vertebral body, heart, great vessels, satellite tumor within the ipsilateral primary tumor- lobe of the lung
Prognosis/Treatment
Non-small Cell CA

• Stage I: 5 year survival 50%
• Stage II: 25%
• Stage III: 5-10%
• Stage IV: 1%

– Stage I and II: lobectomy
  Medically unfit patients, RT is the therapy of choice
– Stage III: Combinations of surgical resection, CT, RT
– Stage IV: CT/ hospice care
Prognosis/Treatment
Small Cell CA

• Limited Stage (30-40% of cases)
  – Tumor confined to one hemithorax
  – Survival
    • Untreated 12 weeks
    • CT 12-20 months

• Extensive stage (60-70% of cases)
  – Survival
    • Untreated 5 weeks
    • CT 7-11 months
Pleural Tumors
Solitary Fibrous Tumor

- Benign tumor
- Confined to the surface of the lung
- Originates from submesothelial cells
  - CK (-), CD34 (+)
Pleural Tumors: Mesothelioma
• All are malignant
• Strong association with asbestos exposure (smoking is NOT a risk factor)
• Degree of exposure
• Time interval: 20 years after exposure
• Prognosis: Poor, 50% survival at 1 yr
Mesothelioma

Asbestos body in broncho-alveolar washings
Mesothelioma

- Extensive tumor encasing the lung and the heart
Mesothelioma

A. Papillary

B. Epithelial

C. Sarcomatoid
All the best..