MEDIASTINAL AND LUNG TUMORS

by

Dr. Amr Allama

Assistant professor of Cardiothoracic Surgery
Faculty of Medicine
Taibah University
Learning objectives

By the end of the lecture you should:

1. Describe different divisions of the mediastinum.
2. List different types of tumors affecting each mediastinal compartment.
3. Understand how to diagnose and treat thymoma, teratoma, lymphoma, germ-cell tumors, and neurogenic tumors.
4. Know different tumors affecting the pleura.
5. Describe different treatment options for malignant pleural mesothelioma.
6. List different tumors affecting the lung.
7. Know the epidemiology and clinical presentation of lung tumors.
8. Evaluate different investigations for lung tumors.
9. Describe pathological types of important lung tumors.
10. Understand different treatment modalities for lung tumors.
Mediastinal Tumors

Divisions of the mediastinum:

1. Four compartments
2. Three compartments
Four compartments

- Superior compartment
- Anterior compartment
- Middle compartment
- Posterior compartment
Four compartments
Three compartments

- Anterior compartment
- Posterior compartment (paraventral sulcus)
- Middle (visceral) compartment
Three compartments
Diagnosis of mediastinal tumors

- X-ray, CT, MRI, PET, PET-CT
- CT-guided biopsy
- Bronchoscopy
- Esophagoscopy, EUS, EUS biopsy
- Mediastinoscopy
- Thoracoscopy
- Anterior mediastinotomy
- Tumor markers
Mediastinoscopy
Thoracoscopic
Anterior mediastinotomy
Anterior mediastinal tumors

**Thyroid:**
- Retro-sternal goiter
- Ectopic thyroid tissue
Anterior mediastinal tumors

**Thymus:**
- Thymic hyperplasia
- Thymoma
- Thymic carcinoma
- Thymic carcinoid
- Thymic small-cell carcinoma
- Thymic cysts
- Thymolipoma
Anterior mediastinal tumors

Lymphoma

Ectopic parathyroid adenoma

Germ cell tumor:
- Teratoma
- Seminoma
- Embryonal cell carcinoma
- Choriocarcinoma
- Yolk sac tumors
- Teratocarcinoma
Anterior mediastinal tumors

Hemangioma
Lipoma
Liposarcoma
Fibrosarcoma
Thymoma

- The most common thymic tumor.
- It may be completely encapsulated or invasive.
- Association with myasthenia gravis.
- **Histological classification:** lymphocytic, epithelial, and mixed.
- **Muller-Hermelink classification:** cortical, medullary, and mixed.
Masaoka classification:

Stage I- Encapsulated tumor may have microscopic capsular invasion.

Stage II- a) microscopic transcapsular invasion.

b) macroscopic invasion into thymus or adherent to but not through the pleura or pericardium.
Stage III- Macroscopic invasion of neighboring organs.

Stage IV- a) pleural or pericardial dissemination.
   b) lymphatic or blood spread.
Surgical excision is the keystone of therapy.

Radiation therapy is believed by many to have an essential role in stage II and III disease.
Chemotherapy has a secondary role in obvious locally nonresectable disease or in the presence of distant metastatic spread.

Neoadjuvant chemotherapy may have a role for initially advanced local disease or in locally recurrent disease before reoperation.
Lymphomas

- Lymphomas account for approximately 20% of lesions in the anterior and middle compartments but are uncommon in the posterior area.
- Among the lymphomas, about one third are Hodgkin's disease and two thirds are non-Hodgkin's lymphomas.
In pediatric patients, up to 45% of anterior mediastinal tumors are lymphomas.

Hodgkin's lymphoma is a very chemosensitive and radiosensitive disease. High cure rates can be obtained in newly diagnosed patients and in recurrences.
Non Hodgkin`s lymphoma
Hodgkin`s lymphoma
Teratoma

- 60% of mediastinal germ cell tumors.
- Usually asymptomatic in adults.
- In children, airway compression is present.
- On CT, well circumscribed with variable enhancement.
- Differentiation from teratocarcinoma can be made only by resection.
Mediastinal teratoma
The treatment of choice for benign teratoma is **total resection** before complications ensue.

Resection may be accomplished via thoracoscopy, median sternotomy, lateral thoracotomy, or, rarely, a clamshell incision.
Malignant germ-cell tumors

- **Seminoma** has normal AFP and is radiosensitive.
- **Nonseminomaous** tumors have elevated AFP, B-HCG, and LDH and are treated by chemotherapy with resection of residual masses.
Teratocarcinoma
**Middle mediastinal tumors**

**Lymph nodes:**
- Metastatic lung, esophageal, or tracheal carcinoma
- Lymphoma
- Sarcoidosis
- Pneumonia, interstitial lung disease, or other non-specific inflammatory lung diseases
- Mycobacterial infections
- Fungal infections
- Congestive heart failure
- Castleman’s disease
Trachea:
- Squamous cell carcinoma
- Adenoid cystic carcinoma

Esophagus:
- Leiomyoma
- Squamous cell carcinoma
- Adenocarcinoma
Cysts:

- Bronchogenic cyst
- Esophageal cyst
- Pleuropericardial cyst
Bronchogenic cyst
Esophageal cyst.
Pericardial cyst
Posterior mediastinal tumors

**Neurogenic tumors:**

- **Intercostal nerve tumors:** neurolemoma (Schwannoma), neurofibroma, neurofibrosarcoma, & neurosarcoma.
- **Sympathetic ganglia tumors:** ganglioma, ganglioneuroblastoma, & neuroblastoma.
- **Paraganglia cell tumors:** paraganglioma.
Others:

- Oesophageal tumors
- Thoracic spine tumors
- Lymphoma
Posterior mediastinal mass (lateral view)
Neurofibroma
Neuroblastoma
Pleural Tumors

Benign pleural tumors:
- Solitary or localized fibrous tumor
- Calcifying fibrous pseudotumors
- Pleural cysts
- Pleural plaques

Malignant tumors of the pleura:
- Malignant pleural mesothelioma
- Sarcoma, Thymoma, & Metastatic cancer
localized fibrous tumor (B-10 years later)
Affects any body cavity lined by mesothelial cells.

Asbestos exposure, radiation, and genetics may have a role.

Diffuse pleural thickening affecting both visceral and parietal pleurae.

Differentiation between it and metastatic carcinoma.

Epithelial, spindle, and mixed types.
**Staging:**

I- Disease confined to the capsule of the parietal pleura.

II- As with stage I with positive intrathoracic LN.

III- Local extension of the disease into the chest wall, the mediastinum, or through the diaphragm.

IV- Distant metastasis.
Malignant pleural mesothelioma
Malignant pleural mesothelioma
Malignant pleural mesothelioma
Malignant pleural mesothelioma
Treatment:

- Extrapleural pneumonectomy
- Pleurectomy
- Palliative procedures
- Radiotherapy
- Chemotherapy
- Immunotherapy
Pleurectomy

Stripping tumor off lung

Lung with tumor elevated from surface

Visceral pleural specimen
Extra pleural pneumonectomy
Extra pleural pneumonectomy
Extra pleural pneumonectomy
Extra pleural pneumonectomy
Extra pleural pneumonectomy
Usual primary lung tumors

Squamous cell carcinoma:
- Well differentiated
- Moderately differentiated
- Poorly differentiated
Usual primary lung tumors

Adenocarcinoma:
- Well differentiated
- Poorly differentiated
- Bronchoalveolar
Primary Lung Tumors

Usual primary lung tumors

Large cell undifferentiated carcinoma:

- Undifferentiated
- Giant cell
- Clear cell
Primary Lung Tumors

Usual primary lung tumors

Small cell undifferentiated carcinoma:
- Oat cell type
- Intermediate cell type

Combined squamous and adenocarcinoma
Primary Lung Tumors

Unusual primary lung tumors

Carcinoid tumors:
- Typical carcinoid
- Atypical carcinoid
- Unusual carcinoids:  - tumorlets
  - melanocytic
  - oncocytic
Primary Lung Tumors

Unusual primary lung tumors

Mucous gland and salivary gland type tumors:

- Adenoidcystic carcinoma
- Mucoepidermoid carcinoma
- Mixed tumor of salivary gland type
Primary Lung Tumors

Unusual primary lung tumors

- Sarcoma
- Pulmonary blastoma
- Pulmonary lymphoma
- Teratoma
- Melanoma
- Carcinosarcoma
Epidemiology

- Cigarette smoking is the primary cause of lung cancer.
- Two lung cancer cell types, squamous cell carcinoma and small cell carcinoma, are extraordinarily rare in the absence of cigarette smoking.
- Only 15% of lung cancers are not related to smoking, and the majority of these are adenocarcinomas.
Other causes of lung cancer include exposure to a number of industrial compounds, including:

- Asbestos
- Arsenic
- Chromium compounds
Patients with chronic obstructive pulmonary disease (COPD) are at higher risk for lung cancer than would be predicted based on smoking risk alone.

A previous history of tuberculosis with secondary scar formation also leads to a higher risk of primary lung cancer.
Clinical presentation

- Cough
- Dyspnea
- Wheezing
- Hemoptysis
- Pneumonia
- Chest pain
- Hoarseness
- Pancoast or SVC syndromes
Paraneoplastic Syndromes:
Hypercalcemia, Cushing's syndrome, Gynecomastia, Hypoglycemia, Hyperthyroidism, Encephalopathy, Peripheral neuropathy, Optic neuritis, Pulmonary osteoarthropathy, Clubbing, Anemia, Nephrotic syndrome, .............

Metastatic symptoms
Investigations

- X-ray
- CT
- MRI
- US
- Sputum cytology
- Fiberoptic bronchoscopy
- Biopsy
- Bone scan
- PET scan
- Mediastinoscopy
Chest X-ray and CT
Chest X-ray and CT
Liver and bone metastasis
CT and PET scan
Squamous cell carcinoma

- 90% arise in segmental or larger bronchi.
- Fungating gray, yellow, or white slowly growing masses.
- They grow endobronchially and invade adjacent peribronchial tissue.
- Multicentricity is a common cause of treatment failure.
- Pleural effusion is not common.
Adenocarcinoma

- It is the most common type in women.
- Hard gray or white mass in the periphery of the lung covered by fibrotic pleura.
- They grow more rapidly than squamous cell carcinoma and metastasize early.
- Pleural effusion is more common.
- More than 80% present with metastases.
- Occult metastases is a common cause of treatment failure.
Bronchoalveolar

- It is a subtype of adenocarcinoma.
- It arises in the periphery of the lung in the terminal bronchoalveolar region.
- It grows along intact alveolar septa.
- It starts as local nodule or infiltrate and frequently appears unchanged for years, so it may be misdiagnosed as scar, TB, or chronic pneumonia.
- Its end stage is progressive respiratory failure.
Large cell undifferentiated carcinoma

- 50% central and 50% peripheral.
- Bulky soft masses with extensive necrosis.
- These are aggressive tumors that grow rapidly and patients present in stage III or IV at diagnosis.
- It has a very poor prognosis.
Small cell undifferentiated carcinoma

- It arises from the small basal cells of the bronchial epithelium.
- They metastasize early and widely, so the clinical manifestations are frequently due to metastases rather than the primary lesion.
- Even with extensive invasion, endobronchial changes may be minimal or absent.
Carcinoid tumors

- They were formerly called bronchial adenomas.
- They belong to a large spectrum of tumors called *neuroendocrine* tumors.
Neuroendocrine tumors

I- Lesions that never metastasize
   (typical carcinoid)

II- Lesions that occasionally metastasize
   (atypical carcinoid)

III- Lesions that often recur after resection
    (large cell neuroendocrine carcinoma)

IV- Lesions that so commonly metastasize
    (small cell carcinoma)
- They may be central (hemoptyisis, pneumonia, wheezing) or peripheral (asymptomatic).
- They may present by endocrinopathies (carcinoid syndrome, Cushing syndrome, acromegally, polyuria, hypoglycemia).
- Rigid bronchoscopy is preferred for biopsy to control the risk of bleeding.
• Bronchoscopic brushing or washing are non diagnostic because the overlying mucosa is intact.

• Effective drug therapy for metastatic carcinoid is limited, and resection is the only hope for cure.

• Endobronchial resection with or without Laser ablation are used when complete resection is unlikely.
Treatment modalities of lung tumors

- Surgical resection
- Chemotherapy
- Radiotherapy
- Paliative procedures:
  - Brachytherapy
  - Photodynamic therapy
  - Laser ablation
  - Stents
Secondary lung tumors

- **Selection criteria for metastasectomy:**
  1. Local control of the primary tumor.
  2. Radiological finding consistent with metastatic disease.
  3. Absence of extrathoracic metastases.
  4. Ability to perform complete resection of the metastases.
  5. No significant comorbidity.
  6. No alternative therapy that is superior to surgery.
Bilateral multiple metastases
Lt solitary metastasis
Lt solitary metastasis