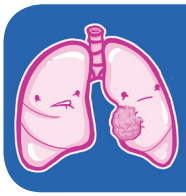

NOTES
RESPIRATORY TUMORS

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Uncontrolled division of epithelial cells lining respiratory tract → formation of solid tumor
- Mutated cells become cancerous
  - Resist inhibitory signals, evade immune surveillance
- Malignant tumors invade basement membrane
  - Carcinoma in situ
- Metastasis
  - Malignant tumors establish secondary tumors at distant site; lung cancer metastasizes quickly
  - *Common sites:* mediastinum, hilar lymph nodes, lung pleura, breasts, liver, adrenal glands, brain, bones

TYPES

Small-cell

- Small, immature, neuroendocrine cells; divide rapidly, spread quickly

Non-small-cell (most common)

- Large cells; divide, spread slowly
  - Adenocarcinoma (goblet cells)
  - Squamous cell carcinoma (squamous cells)
  - Large cell carcinoma
  - Carcinoid tumors (mature neuroendocrine cells)

Nonspecific classification

- Small-cell carcinoma with poorer prognosis

RISK FACTORS

- Age
  - Malignancy more common in older individuals
- Smoking
  - Direct, linear positive correlation between pack years, risk of lung cancer
- Asbestos exposure, radon exposure, ionizing radiation exposure
- Chronic obstructive pulmonary disease (COPD)
- Tuberculosis

MNEMONIC: ABCDE

Presentation of lung cancers

Bronchial **A**irway disruption → pneumonia

Blood: hemoptysis

Cough

Distribution: mestastasis

wh**EE**zing

SIGNS & SYMPTOMS

- Asymptomatic in early disease
- Nonspecific, wide overlap with other noncancerous lung conditions
- Constitutional symptoms: loss of appetite, weight loss, weakness
- If located in certain areas (e.g. upper lobe of lung) → compressive symptoms
  - *Nerve compression:* hoarseness (recurrent laryngeal nerve), Horner's syndrome (sympathetic chain), diaphragmatic paralysis (phrenic nerve)
- Paraneoplastic syndromes
  - Digital clubbing, muscle weakness, syndrome of inappropriate antidiuretic

hormone secretion (SIADH), ectopic adrenocorticotropic hormone (ACTH) secretion, ectopic parathyroid hormone (PTH)-like secretion, hypertrophic pulmonary osteoarthropathy, Eaton–Lambert syndrome
    - Mostly small cell carcinoma (neuroendocrine cells secrete hormones with systemic effects)

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

- Coin lesion

CT scan

- Asymmetrical, expanding nodule; used for staging; can demonstrate extent of metastasis (e.g. hilar lymph node involvement)

PET

- Areas of higher glucose turnover
- Bronchoscope
- Diagnosis of central (near to main bronchus) tumors, not peripheral tumors

LAB RESULTS

- Sputum sample
    - Diagnosis of central (near to main bronchus) tumors, not peripheral tumors
- Fine needle aspiration
    - Histopathologic diagnosis using cytology
- Endoscopic biopsy

TREATMENT

MEDICATIONS

- Simple analgesics, opioids (if severe)
    - Pain management

SURGERY

- Intraoperative frozen section if diagnosis of malignancy uncertain
- If malignancy confirmed, wedge resection performed for small tumors
- Lobectomy performed for larger tumors/ after wedge resection if margins positive

OTHER INTERVENTIONS

- Chemotherapy, immunotherapy, radiation therapy

MESOTHELIOMA

osms.it/mesothelioma

PATHOLOGY & CAUSES

- Cancer of mesothelium; most commonly lungs, chest wall pleural lining (composed of mesothelial cells); sometimes pericardium
- Commonly associated with asbestos exposure
- Asbestos fibers
    - Mineral used as construction, insulation material
    - Jagged in shape, very fine
    - Increases risk of lung cancer, malignant mesothelioma
- Asbestos fibers inhaled → phagocytic cells attempt to phagocytose fibers → unable to destroy fibers → apoptosis of phagocytic cells → release of tumor promoting factors → mesothelial cells of pleura inflamed → DNA damage → mesothelial cells divide uncontrollably → tumor formation
- Mesothelial plaques cover visceral, parietal pleura; extend around chest cavity
- Asbestos fibers can be found in stomach (via swallowing of saliva/mucus containing asbestos)
- Mesothelioma can theoretically affect any organ with mesothelial cells, most commonly found in thoracic cavity

TYPES

Malignant

- Prognosis is poor, unless caught early; extremely resistant to treatment; spread to multiple organs

Benign

- Prognosis is excellent; surgery for isolated lesions usually curative

SIGNS & SYMPTOMS

- Angina, dyspnea, recurrent pleural effusions, weight loss, cough
- If tumor invades blood vessel
  - Blood-tinged sputum

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray, CT scan

- Visualize mesothelioma lesions

LAB RESULTS

Biopsy

- Video assisted thoracoscopic surgery (VATS)
- Tissue sample immunostained with antibody that reacts to calretinin
  - *Calretinin:* calcium-binding protein that regulates calcium levels inside cells
  - Distinguishes mesotheliomas from other tumors
- Cancerous cells have “fried egg” appearance

TREATMENT

MEDICATIONS

- Chemotherapy

SURGERY

- Excision

OTHER INTERVENTIONS

- Radiation

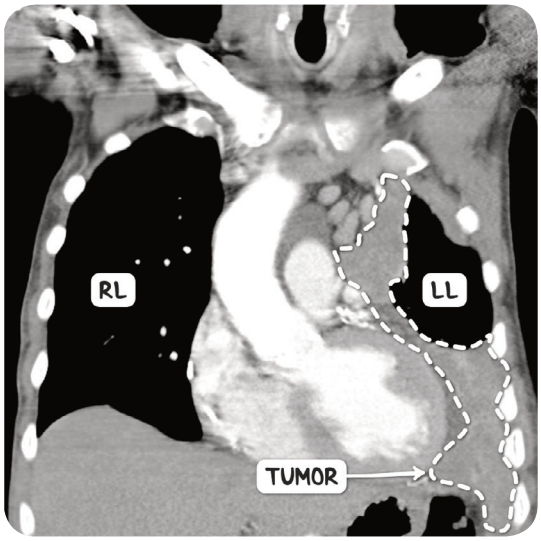

Figure 130.1 A CT scan of the chest in the coronal plane demonstrating a mesothelioma occupying the lower thoracic cavity.

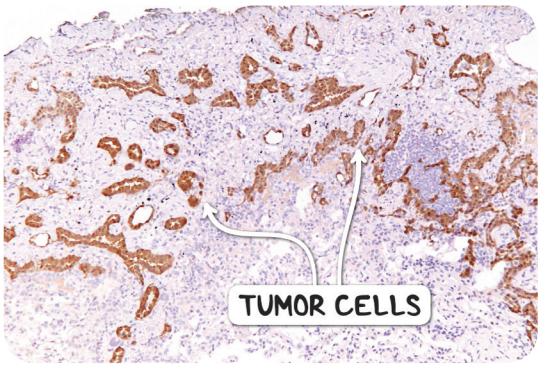

Figure 130.2 Immunohistochemical staining with calretinin reveals the architecture of this pleural mesothelioma.

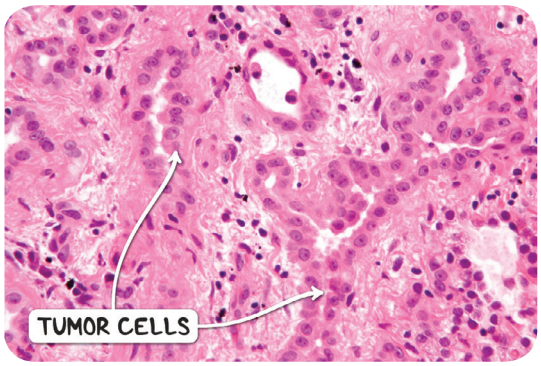

Figure 130.3 The histological appearance of epithelioid mesothelioma. The malignant cells are cuboidal, have moderate amounts of cytoplasm and display conspicuous nucleoli.

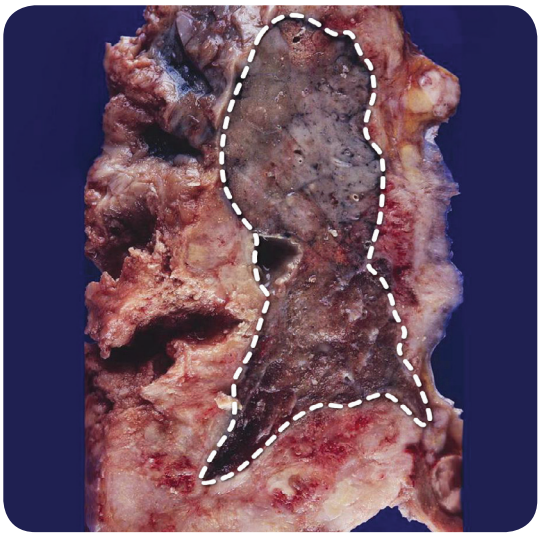

Figure 130.4 The gross pathology of a large mesothelioma of the thoracic cavity. The tumor completely encases the normal lung tissue (outlined).

NASOPHARYNGEAL CARCINOMA

osms.it/nasopharyngeal-carcinoma

PATHOLOGY & CAUSES

- Cancer of nasopharynx (upper throat, behind nose)
- Most common malignant tumor of nasopharynx
- Can be clinically silent for long periods, difficult to detect early
- Often metastasizes to cervical lymph nodes
- Associated with Epstein–Barr virus (EBV)
- Prognosis
  - Five year survival rate, 60% (all types)

TYPES

Keratinized squamous cell carcinoma

- Worst prognosis, least radiosensitive

Nonkeratinized squamous cell carcinoma

- Best prognosis

MNEMONIC: NASOPharyngeal

Types of Nasopharyngeal malignant cancers

Nasopharyngeal
Adenocarcinoma
Squamous cell carcinoma
Olfactory neuroblastoma
Plasmacytoma

Undifferentiated/basaloid carcinoma (lymphoepithelioma)

- Most radiosensitive

RISK FACTORS

- More common in individuals who are biologically male, < 55 years
- Family history
- Common in Asia, Africa (esp. children); in southern China, common in adults, rare in children

- Diets high in nitrosamines (fermented foods), alcohol
- Smoking, certain chemical fumes, formaldehyde

COMPLICATIONS

- Radiation
  - Death of healthy tissue, brain stem injury, blindness, xerostomia

SIGNS & SYMPTOMS

- Altered vision, recurrent ear infections, headache, tinnitus, nosebleeds, sore throat, facial paresthesia
- Lump in neck, epistaxis, nasal obstruction

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan, MRI, PET, X-ray, nasopharyngoscopy/nasal endoscopy

- Visualize carcinoma

LAB RESULTS

Biopsy

- Squamous cell carcinoma/undifferentiated

OTHER DIAGNOSTICS

- Physical exam
  - Neck swelling

TREATMENT

MEDICATIONS

- Monoclonal antibodies
  - Synthetic antibodies, target epidermal growth factor receptors (EGFRs); adverse effects (Type III hypersensitivity infusion reaction, rash, fatigue, headache, fever, diarrhea)

SURGERY

- Surgical resection

OTHER INTERVENTIONS

- Intensity-modulated radiation therapy (standard)
  - High-precision radiation, minimizes damage to surrounding tissues; better outcome, less adverse effects than conventional radiation therapy

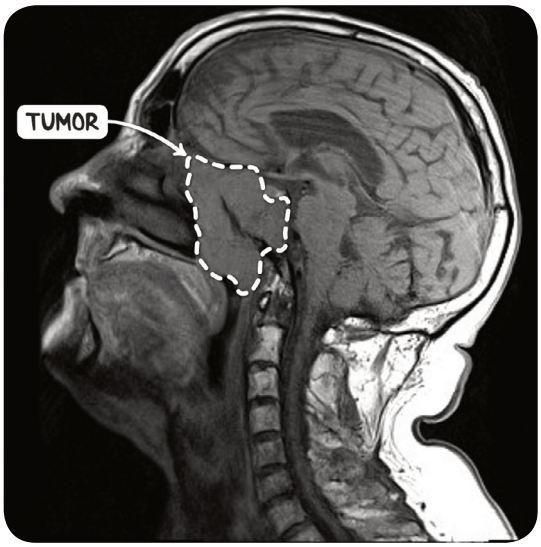

Figure 130.5 An MRI scan of the head in the sagittal plane demonstrating a large nasopharyngeal carcinoma blocking the choanae and invading the skull base.

NON-SMALL-CELL LUNG CARCINOMA

osms.it/nsclc

PATHOLOGY & CAUSES

- Lung cancers not of small-cell type
- Grow, spread more slowly

TYPES

Squamous-cell carcinoma

- Centrally located, strongly associated with smoking

Adenocarcinoma

- Develops peripherally in bronchiole/alveolar sac, no link to smoking

Large-cell carcinomas

- Found throughout lungs; centrally, peripherally
- Diagnosis of exclusion; if criteria for adenocarcinoma/squamous-cell carcinoma not met

Bronchial carcinoid tumor

- Low-grade malignancy of neuroendocrine cells
- Same cell of origin as small-cell carcinoma; malignant potential low

SIGNS & SYMPTOMS

- Cough
- Hemoptysis
- Hoarseness
- Chest pain
- Weight loss
- Neurologic symptoms (brain metastasis is common)

DIAGNOSIS

LAB RESULTS

Fine needle aspiration (lung)

- Cells demonstrate cardinal features of malignancy
  - Variation in nuclear size, shape; irregularly distributed nuclear chromatin; large prominent nucleoli

TREATMENT

SURGERY

- Contraindicated in cases of metastasis outside of chest
- Recurrence likely even after complete resection

OTHER INTERVENTIONS

- Radiation, chemotherapy

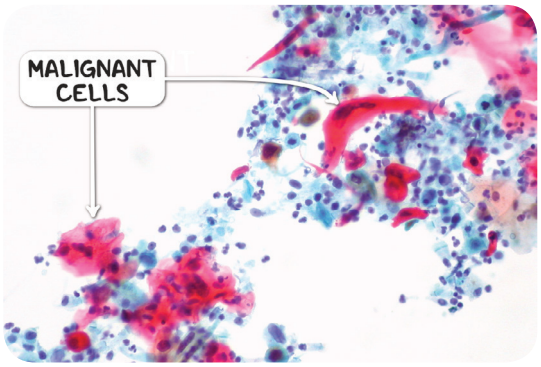

Figure 130.6 A cytological preparation of a bronchial washing containing malignant squamous cells.

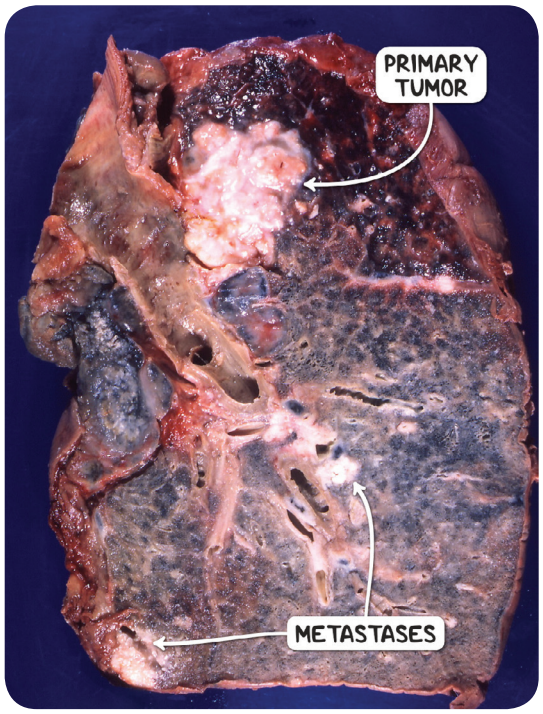

Figure 130.7 The gross pathological appearance of squamous cell carcinoma of the lung. There is a large primary tumor in the upper lobe with intrapulmonary metastases in the lower lobe.

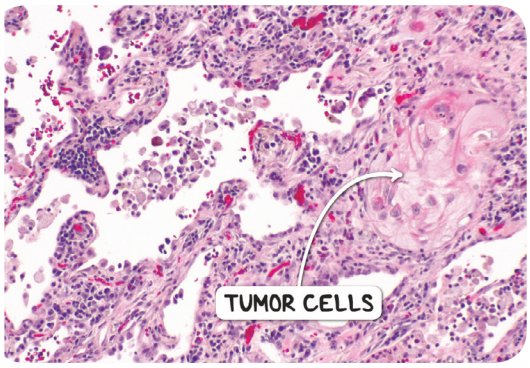

Figure 130.8 The histological appearance of squamous cell carcinoma of the lung. The tumor cells have large amounts of eosinophilic cytoplasm, have irregular nuclear forms and are forming islets. The surrounding lung demonstrates a chronic inflammatory cell reaction.

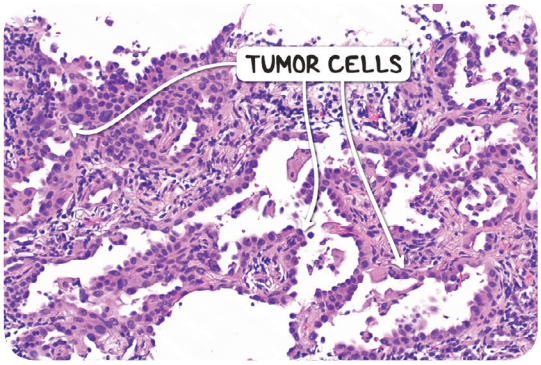

Figure 130.9 The histological appearance of adenocarcinoma of the lung. The tumor is forming slit like spaces called acini, which are lined by malignant cells.

PANCOAST TUMOR

osms.it/pancoast-tumor

PATHOLOGY & CAUSES

- Pulmonary neoplasm located in lung apices
- Location enables them to impinge nerves, vessels
- Majority
  - Non-small-cell lung tumors (adenocarcinoma/squamous cell carcinoma)
- Structures most vulnerable to compression/invasion
  - Cervical sympathetic nerves, brachial plexus, laryngeal nerves, superior vena cava (SVC)

MNEMONIC: Horner has a MAP of the Coast

PanCoast → Horner's syndrome, including:

Miosis

Anhidrosis

Ptosis

SIGNS & SYMPTOMS

- Cough, angina, dyspnea, hemoptysis, wheezing
- Recurrent pneumonia
- Constitutional symptoms
  - Loss of appetite, weight loss, weakness

Local inflammation and compression

- Tumor causes local inflammation, invasion of nearby nerves/vessels, direct compression
- Pain, upper extremity weakness due to brachial plexus impingement
- Compression
  - *Cervical sympathetic nerves:* Ipsilateral Horner syndrome (ptosis, miosis, anhidrosis)
  - *Brachial plexus:* ipsilateral paresthesia
  - *Laryngeal nerves:* voice hoarseness
  - *SVC:* SVC syndrome (facial flushing, edema, dyspnea)

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan/chest X-ray

- Tumor in lung apex

LAB RESULTS

Biopsy

- Confirm tumor type

OTHER DIAGNOSTICS

- Physical examination

TREATMENT

- Impingement of important nerve /vessel; shrink tumor before resection

MEDICATIONS

- Chemotherapy
  - *Late stages:* chemotherapy alone; prophylactic radiation to decrease chance of brain metastases

SURGERY

- Surgical resection

OTHER INTERVENTIONS

- Radiation
  - *Early stages:* used with chemotherapy

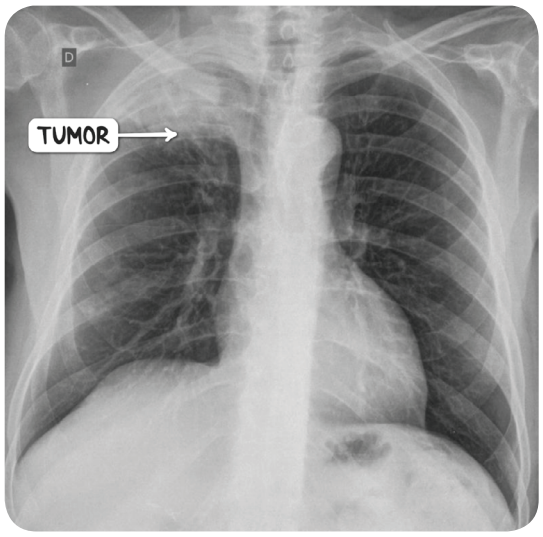

Figure 130.10 The gross pathological appearance of squamous cell carcinoma of the lung. There is a large primary tumor in the upper lobe with intrapulmonary metastases in the lower lobe.

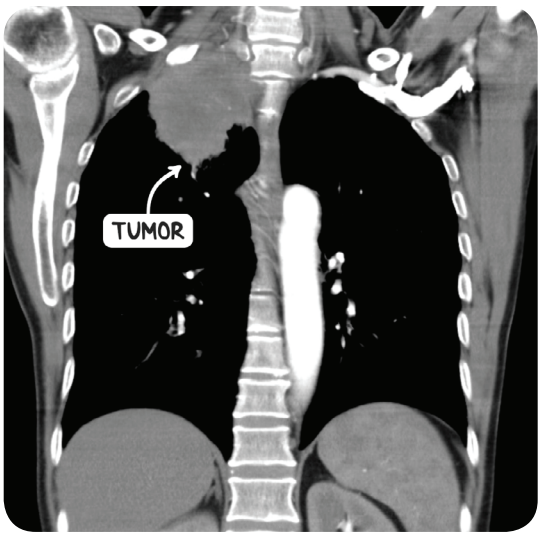

Figure 130.11 A CT scan of the chest in the coronal plane demonstrating a pancoast tumor at the apex of the right lung.

SMALL-CELL LUNG CANCER

osms.it/sclc

PATHOLOGY & CAUSES

- Uncontrolled proliferation of small, immature, neuroendocrine cells
- Strongly associated with smoking
- Usually develops centrally in lung, near main bronchus
- Grows fastest, rapidly metastasizes to other organs; intrapulmonary metastasis also common
- Secretes hormones → paraneoplastic syndromes
  - *Cushing's syndrome:* excretion of cortisol from adrenal glands → elevated blood glucose, high blood pressure
  - *SIADH:* release of antidiuretic hormone (ADH) from tumor → water retention → high blood pressure, edema, concentrated urine
  - *Eaton–Lambert myasthenic syndrome (Type II hypersensitivity):* small-cell carcinoma stimulates production of autoantibodies → destroy neurons

TYPES

Limited

- Contained within one lung, supraclavicular nodes (no extension to cervical/axillary nodes)
- Prognosis
  - Five year survival, 10% (median survival 15–20 months)

Extensive

- Spreads beyond one lung, supraclavicular nodes
- Prognosis
  - Five year survival, 1% (median survival 8–13 months)

SIGNS & SYMPTOMS

- Dyspnea
- Wheezing
- Cough
- Hemoptysis

DIAGNOSIS

LAB RESULTS

- Histology
  - Large cells with limited cytoplasm, nuclear moulding

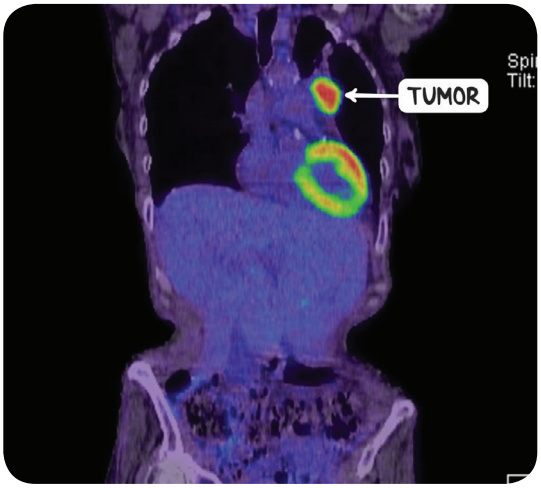

Figure 130.13 A PET-CT scan in the coronal plane demonstrating high-uptake in the left upper lobe, corresponding with a small cell carcinoma of the lung. The left ventricle also demonstrates high uptake, but this is normal.

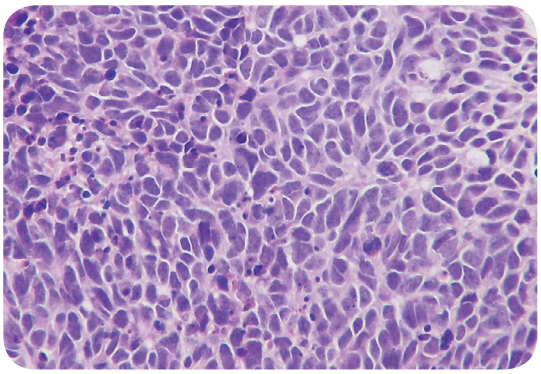

Figure 130.12 The histological appearance of small cell carcinoma. The cells have minimal cytoplasm and moulded nuclei.

TREATMENT

SURGERY

- Usually not curative

OTHER INTERVENTIONS

- Limited
  - Combination of chemotherapy, radiation therapy
- Extensive
  - Chemotherapy, prophylactic radiation

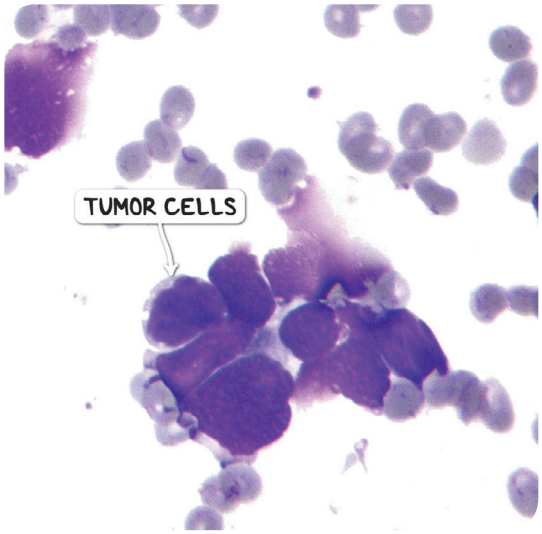

Figure 130.14 A cytology specimen demonstrating the characteristic features of small cell carcinoma; nuclear moulding, salt and pepper chromatin and minimal cytoplasm.

SUPERIOR VENA CAVA SYNDROME

osms.it/svc-syndrome

PATHOLOGY & CAUSES

- Constellation of signs, symptoms when blood flow through SVC obstructed
- Obstruction → increase in venous pressure behind obstruction → blood rerouted through collateral vessels → blood drains into inferior vena cava, right atrium → dilation of collateral veins → venous pressure decreases with full dilation of collateral veins
- Collateral vessels
  - Azygos vein, internal mammary vein, lateral thoracic vein, esophageal venous systems

CAUSES

- Obstruction (external/internal)
  - Tumor invasion, mass effect (inflammation, swelling)
  - Lung cancer most common (e.g. Pancoast tumor), tumor of lymph nodes (e.g. lymphomas)
  - Blood clot (develops in individuals with long-term device; e.g. indwelling central venous catheter)

COMPLICATIONS

- Edema, dysphagia, cerebral ischemia
- Severe cerebral edema → compression of blood vessels in brain → cerebral ischemia

SIGNS & SYMPTOMS

- Edema of face, neck; inspiratory stridor; voice changes; flushed appearance (backup of blood, venous stasis); dilated neck, chest veins; dyspnea (blockage of SVC → decreased return of blood to heart → less blood pumped to lungs); hoarseness of voice (compression of laryngeal nerve/ muscles of larynx from excess fluid)

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray/CT scan/venous angiography

- Visualize tumors, collateral vessel dilation, obstruction

LAB RESULTS

Biopsy

- Evaluate tumor; determine type, staging

TREATMENT

MEDICATIONS

- Steroids
  - Reduce swelling around tumor
- Anticoagulants
  - Treat blood clot

OTHER INTERVENTIONS

- Combination of surgery, chemotherapy, radiation therapy
- Keep head above level of heart to help drain fluid from head, neck to heart

LUNG CANCER OVERVIEW

		PATHOLOGY	COMMON LOCATION
SMALL CELL		Small, immature, neuroendocrine cells, rapid spread; paraneoplastic syndromes common; smoking association; poor prognosis	Central
NON-SMALL CELL	Adenocarcinoma	Associated with pancoast tumor	Peripheral
	Squamous cell	Associated with smoking; pancoast tumor	Central
	Large cell	Diagnosis of exclusion after squamous cell, adenocarcinoma	Central / Peripheral
	Carcinoid	Low grade malignancy of neuroendocrine cells; paraneoplastic syndrome likely	-