MEDIASTINAL AND LUNG TUMORS

Speaker:
Assistant professor - Surgical Department - Taibah University
Dr. Samer AL-Sawalhi (M.D-MRCS)
Figure 3.14. Lateral view of the lungs.
Introduction

Carcinoma of bronchus is the most common malignancy in men & second most common in women
Benign tumors

* Uncommon < 15%
Symptoms different either peripheral location ▪
(no symptoms) or ▪
centrally (may present with haemoptysis & bronchial ▪
obstruction)

*IF not increase in size in duration of two years or
has some calcification

* Its mandatory to take a biopsy
Examples: T.B, Histoplasmosis

The most common benign tumor is the pulmonary Hamartoma
1- Epithelial tumor: The airways become infected with HPV at birth → small stalk papilloma develop

*Treatment*: Bronchoscopic resection & F/U by bronchoscopy due to chance of malignancy

2- Fibroma: most occurs in the bronchi rather than the trachea

3- Hamartoma: Disorganized mass of tissue within the lung parenchyma
Malignancy chance is rare
**4-Bronchial adenoma:**

- Are mainly carcinoid tumor which derived from neuroendocrine cells
- 80% are found in major bronchi-slowly growing, but highly vascular
- It secrets (ACTH), melanocyte-stimulating hormones, insulin, PGs, 5HIAA

The patient come with recurrent chest infection, haemoptysis, persistent cough & occasionally chest pain

**Treatment:**

- Surgical excision
- Octreotide & regular F/U
Malignant tumors

1-Carcinoma of bronchus:

It’s the most common malignancy in men & the second most common in women

30’000 deaths/year in U.K

1 year survival rate 20%

Proper staging & diagnosis of tumor are vital
Risk factors

1. Smoking (index)
2. Atmospheric pollution
3. Occupations (Radioactive RTX, chromium mining)
Regular smoking $\rightarrow$ change bronchial epithelium $\rightarrow$ hyperplasia $\rightarrow$ squamous metaplasia to premalignant carcinoma insitu

* If smoking is stopped these changes could be (reversible)
Histological types

1- Squamous cell carcinoma:

* >60%
* Located centrally
* Common in smokers
* There is tendency to cavitate & metastasize outside the thoracic cavity
2- Adenocarcinoma

* 15% in U.K
* More common in non-smoker & females
* Peripheral in location
* Metastasize widely to liver, brain & adrenals
* The typical histological appearance is that of gland formation & the only worthwhile treatment (surgical excision if feasible)

***It’s important to exclude metastasis***
3- Small cell cancer:
* Aggressive tumor
* Metastasis widely (early)
* Irresectable
* All need palliative CTX & RTX

These associated with paraneoplastic syndrome & Ectopic hormones production (ACTH, ADH)

**** Poor prognosis (5-year survival <5%)
4- **Alveolar cell carcinoma:**

* Arise in distal airway
* If it’s focal $\rightarrow$ excision $\rightarrow$ good prognosis
* Multicentre pneumonic type $>$ good prognosis
Clinical features

It depends on

1 - Site of the lesion
2 - Invasion to adjacent structures
3 - Extent of metastasis

*It resolves with excision primary lesion*
Reluctant cough
Weight loss
Chest pain

Haemoptysis < 50% as first presentation
Severe chest pain if tumor infiltrate an intercostals nerve

*Pan coast syndrome* - if invade apical part

*Large pleural effusion* - lymphatic seeding, if bloody this indicate that cancer invade the pleura
Hypertrophic pulmonary osteoarthropathy & clubbing in S.C.C

* Hoarseness of voice → recurrent laryngeal nerve
* Dysphagia

*S.V.C obstruction

** Eaton-lambert syndrome (myopathy) specially in S.C.C weakness tends to improve with repeated movement

* Ectopic hormones: Cushing-ACTH-ADH
Note cyanotic lips. Neck veins distended and non-pulsatile.

SVC syndrome
Diagnosis & staging

1- Detect primary lesion
2- Tissue diagnosis
3- Assessment of metastasis
1- Chest x-ray (A-P, Lateral views)
   - Raised hemidiaphragm
   - Pleural effusion
   - Lobar collapse

2- C-T scan:
   - If the lesion resectable
   - Involvement of mediastinal L.Ns
   - If > 2cm (highly suspicious)
   - Look to liver

3- Sputum cytology: false –ve rate is high
Fig. 47.14 Computerised tomogram of the upper thorax showing a Pancoast tumour invading the adjacent vertebra, making the tumour inoperable.
**Superior Mediastinal Nodes**

1. Highest Mediastinal
2. Upper Paratracheal
3. Pre-vascular and Retrotracheal
4. Lower Paratracheal (including Azygos Nodes)

\[ N_2 = \text{single digit, ipsilateral} \]
\[ N_3 = \text{single digit, contralateral or supraclavicular} \]

**Aortic Nodes**

5. Subaortic (A-P window)
6. Para-aortic (ascending aorta or phrenic)

**Inferior Mediastinal Nodes**

7. Subcarinal
8. Paraesophageal (below carina)
9. Pulmonary Ligament

**N₁ Nodes**

10. Hilar
11. Interlobar
12. Lobar
13. Segmental
14. Subsegmental
Table 47.2 The international TNM staging system

**Primary tumour (T)**
- **TX** – tumour proven by the presence of malignant cells and bronchial secretions but not visualised by radiography or by bronchoscopy
- **T0** – no evidence of primary tumour
- **TIS** – carcinoma *in situ*
- **T1** – a tumour that is 3 cm or less in greatest dimension, surrounded by lung or visceral pleura and without evidence of invasion proximal to a lobar bronchus at bronchoscopy
- **T2** – a tumour more than 3 cm in greatest dimension or a tumour of any size that either invades the visceral pleura or has associated atelectasis or obstructive pneumonitis that extends to the hilar region, but does not involve an entire lung; at bronchoscopy, the proximal extent of demonstrable tumour must be within a lobar bronchus or at least 2 cm distal to the carina
- **T3** – a tumour of any size, with direct extension into the chest wall (including superior sulcus tumours), diaphragm, mediastinal pleura or pericardium without involving the heart, great vessels, trachea, oesophagus or vertebral body, or a tumour in the main bronchus within 2 cm of the carina without involving the carina
- **T4** – a tumour of any size, with invasion of the mediastinum, or involving the heart, great vessels, trachea, oesophagus, vertebral body or carina, or the presence of malignant pleural effusion

**Nodal involvement (N)**
- **N0** – no demonstrable metastasis or regional lymph node
- **N1** – metastasis to lymph nodes in the peribronchial or the ipsilateral hilar region or both, including direct extension
- **N2** – metastasis to the ipsilateral mediastinal and subcarinal lymph nodes
- **N3** – metastasis to contralateral mediastinal lymph nodes, contralateral hilar lymph nodes, ipsilateral or contralateral scalene or supraclavicular lymph nodes

**Distant metastasis (M)**
- **M0** – no known distant metastasis
- **M1** – distant metastasis present
<table>
<thead>
<tr>
<th>Stage</th>
<th>Tumour</th>
<th>Nodal involvement</th>
<th>Distant metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occult carcinoma</td>
<td>TX</td>
<td>N₀</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage 0</td>
<td>TIS</td>
<td>N₀</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage I</td>
<td>T₁</td>
<td>N₀</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage II</td>
<td>T₁</td>
<td>N₁</td>
<td>M₀</td>
</tr>
<tr>
<td></td>
<td>T₂</td>
<td>N₁</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage IIIa</td>
<td>T₃</td>
<td>N₀</td>
<td>M₀</td>
</tr>
<tr>
<td></td>
<td>T₃</td>
<td>N₁</td>
<td>M₀</td>
</tr>
<tr>
<td></td>
<td>T₁-3</td>
<td>N₂</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage IIIb</td>
<td>Any T</td>
<td>N₃</td>
<td>M₀</td>
</tr>
<tr>
<td></td>
<td>T₄</td>
<td>Any N</td>
<td>M₀</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Any T</td>
<td>Any N</td>
<td>M₁</td>
</tr>
</tbody>
</table>

Operable

Inoperable
Bronchoscopy

1-Flexible:
* Awake pt, local anesthesia, flexible
* Biopsies are relatively small
* Suction facility may not be adequate

2-Rigid
* G.A

* Ideal for therapeutic due to
  a-Removal F.B
  b-Aspiration thick secretion & blood
  c-Stent replacement
  d-Laser resection (Argon beamer)
  e- Good sample for BX
Operability is determined by

1- The proximity of a lesion to the carina
2- Widening carina or not

*Bronchoscopy may not visualize the lesion unless it’s in the main airways
***Percutaneous needle BX:***
Under L.A, specially large & peripheral lesion
30% pneumothoraces

Seeding in tract & hemorrhage are also reported
VATS, Thoracoscopy & Mediastinoscopy

To determine resectability

*Mediastinoscopy is advisable on patients who have >1 cm enlarged L.Ns
Video-assisted thoracoscopic surgery (VATS). In general th
Mediastinotomoy

An incision made through second intercostal space

*Look for

lymphoma
Ant mediastinal mass
Thymoma
Sarcoma
Fig. 47.16 Diagram of mediastinoscopy. The mediastinoscope slides
**Thoracoscopy:**

Double lumen G.A

**Open lung BX:** Minithoracotomy

**PET-scan**
Treatment of lung Cancer

Only 10% of patients have potentially curable lesions on presentation.

*You must determine operability by staging

*Lung cancer behave & spreads in progressive manner by local invasion of the lymph nodes & then to blood stream

*Most lung cancer are beyond curative treatment at the time of presentation
**Pre-op assessment:

1- Resectibility
   - If the tumor fix to the aorta
   - Horner’s syndrome
   - Phrenic nerve invasion

2- Fitness of the patient

3- Lung function test

4- If smoker, elective physiotherapy may be worthwhile
### Table 47.4 Staging of carcinoma of the lung

<table>
<thead>
<tr>
<th>Stage</th>
<th>Tumour</th>
<th>Nodal involvement</th>
<th>Distant metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occult carcinoma</td>
<td>TX</td>
<td>N(_0)</td>
<td>M(_0)</td>
</tr>
<tr>
<td></td>
<td>TIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 0</td>
<td>T(_1)</td>
<td>N(_0)</td>
<td>M(_0)</td>
</tr>
<tr>
<td>Stage I</td>
<td>T(_1)</td>
<td>N(_1)</td>
<td>M(_0)</td>
</tr>
<tr>
<td></td>
<td>T(_2)</td>
<td>N(_1)</td>
<td>M(_0)</td>
</tr>
<tr>
<td>Stage II</td>
<td>T(_3)</td>
<td>N(_0)</td>
<td>M(_0)</td>
</tr>
<tr>
<td></td>
<td>T(_3)</td>
<td>N(_1)</td>
<td>M(_0)</td>
</tr>
<tr>
<td></td>
<td>T(_1)-T(_3)</td>
<td>N(_2)</td>
<td>M(_0)</td>
</tr>
<tr>
<td>Stage IIIa</td>
<td>Any T</td>
<td>N(_3)</td>
<td>M(_0)</td>
</tr>
<tr>
<td>Stage IIIb</td>
<td>T(_4)</td>
<td>Any N</td>
<td>M(_0)</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Any T</td>
<td>Any N</td>
<td>M(_1)</td>
</tr>
</tbody>
</table>

Operable

Inoperable
Surgical treatment

5-10% of thoracotomies are exploratory without resection

*Simple wedge excision

*Segmentectomy

*Lobectomy

(One lung anesthesia)
Double lumen tube for separate control of the lungs Is used to facilitate dissection.
At completion of the operation, the remaining lung is reinflated to detect air-leak
Two drains were inserted (Apical & Basal)
7.19 The theory behind single lung anaesthesia.
Pneumonectomy

*Removal of whole lung
*MR( 5-10%).

Pre-op assessment if the tumor centrally located or straddle the fissure

Before doing pneumonectomy, clamp the main pulmonary artery & check tolerance→ resection

*Artery, Vein & bronchus over sewn tightly to avoid broncho-pleural fistula

*Check by test
*The air in the pneumonectomy space is gradually absorbed & the fluid level within the space rises
fluid level in the left haemothorax.
Right Thoracotomy with Completion of Pneumonectomy

**PRE-OPERATIVE CONDITION**
- Subclavian Artery
- Subclavian Vein
- Area of previously resected upper right lobe of the lung now pulled with massive, dense adhesions
- Middle Lobe
- Tumor of the right lower lobe of the lung

**INTRA-OPERATIVE CONDITION**
- Removal of the middle and lower lobes is attempted.
- Orientation of the patient and incision site
Thoracoscopic lung resection (VATS)

1- Lung biopsy, staging of lung & esophageal cancer
2- Recurrent pneumothorax
3- Drainage of empyema
4- Lobectomy
5- Sympathectomy
Complications

1- Bleeding
2- chest infection
3- Persistent air leak
4- Hypoxemia
5- Atelactasis
6- Broncho-pleural fistula: Dehiscence of bronchial stump & tissue fluid is expectorated in large quantities
Treatment

1- Tissue glue

2- Thoracotomy & muscle flap (intercostal muscle)

3- Omentum

4- Fenestration procedure to allow drainage of the fluid by rib resection
Prognosis & survival

5-year survival < 2% in advanced irresectable tumor

<table>
<thead>
<tr>
<th>Table 47.5 Survival table for carcinoma of the bronchus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Five-year survival according to presurgical staging</strong></td>
</tr>
<tr>
<td>Stage I</td>
</tr>
<tr>
<td>Stage II</td>
</tr>
<tr>
<td>Stage IIIa</td>
</tr>
<tr>
<td>Stage IIIb</td>
</tr>
<tr>
<td><strong>Five-year survival according to cell type</strong></td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
</tr>
<tr>
<td>Adenosquamous carcinoma</td>
</tr>
<tr>
<td>Undifferentiated carcinoma</td>
</tr>
<tr>
<td>Small cell carcinoma</td>
</tr>
</tbody>
</table>
The mediastinum

Anatomy
Figure 3.16. Subdivisions of the mediastinum.
Fig. 47.24 Mediastinal pathology. Subdivisions of the mediastinum with the most common mediastinal masses.
Primary tumors of the mediastinum

1- Thymoma:
* Most common type
* 25% of total mediastinal tumors

* These are tumors of the thymic epithelial cells of Hassall’s corpuscles & sited in anterior & superior mediastinum
* Generally occur after childhood

* Capsulated & associated with autoimmune disease (Myasthenia gravis)
It’s behavior varies from completely benign to aggressive malignant. 80% of them are benign. The only indicator of malignancy is invasion to the capsule.

**Treatment:**
Complete thyroidectomy for DX & RX. RTX is the only option if it’s advanced. If cancer, the prognosis is bad.
Germ cell tumour

* 13%
* Located in anterior mediastinum
* Young adult
* 75% are benign
* Cause compression
* 3 cell types (mesoderm, endoderm & ectoderm)
*Investigations:
α-fetoprotein, HCG, CEA (elevated)

*Treatment: surgical excision

**Lymphoma**

*Anterior mediastinum
*S.V.C syndrome
*HL, NHL
**Mesenchymal tumours:**
- Lipoma, fibroma
- Liposarcoma, mesothelioma
- Fibrosarcoma

**Thyroid:**
- Ectopic thyroid & parathyroid
  In ant mediast
- Medullary thyroid cancer
**Neural tumours:**
Derived from sympathetic nervous system or peripheral nerves

*Common in young age group* <10 years

**Neuroblastoma:** poor prognosis

**Ganglioneuroma:** good prognosis

**Ganglioneuroblastoma:** intermediate prognosis

**Schwanonnomas**

**Neurofibromas**  MEN 2B

**Pheochromocytoma**
Symptoms

If the mass presented with symptoms in particular pain are much more likely to be malignant

*Symptoms are generally secondary to compression or invasion to adjacent structure

1-S.V.C obstruction:
Most common cause cancer of bronchus
Radiotherapy will alleviate the symptoms
2- **Tracheal & oesophageal compression**: Dysphagia, dyspnoea & stridor
RX: intraluminal stent & RTX

3- **Neural invasion**: Recurrent laryngeal nerve on LT side —> Hoarseness of voice & bovine cough
Phrenic nerve —> paradoxical
Horner’s syndrome —> sympathetic chain
4- **Pericardial invasion:**
Pericarditis, ECG changes, arrhythmia, chronic tamponade

5- **Neural tumours:** invasion to S.C.C  → paraplegia

**Investigation & RX**

*Mediatinotomy + mediastinoscopy + chest C-T scan
Either median sternotomy or posterio-lateral thoracotomy
THANK YOU