Imaging Pleural Diseases

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Disclosure

• None

Objectives

Understand the imaging patterns of pleural abnormalities and review benign & malignant pleural diseases with emphasis on CT and MR features

Pleural diseases

<table>
<thead>
<tr>
<th>Benign entities</th>
<th>Neoplasms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleural effusions-</td>
<td>Metastasis</td>
</tr>
<tr>
<td>• Transudate</td>
<td>Salivary gland tumor</td>
</tr>
<tr>
<td>• Exudate (hemothorax, empyema)</td>
<td></td>
</tr>
<tr>
<td>Benign pleural thickening/plaques</td>
<td>Mesothelioma</td>
</tr>
<tr>
<td>Pleural calcification</td>
<td>Invasive thymoma</td>
</tr>
<tr>
<td>Benign masses-</td>
<td>Lymphoma</td>
</tr>
<tr>
<td>• Lipoma</td>
<td></td>
</tr>
<tr>
<td>• Rare: Splenosis, endometriosis</td>
<td>Sarcoma</td>
</tr>
</tbody>
</table>

Parenchymal versus Extra-parenchymal

<table>
<thead>
<tr>
<th>Pleural</th>
<th>Parenchymal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle at the periphery</td>
<td>Obtuse</td>
</tr>
<tr>
<td>Margins</td>
<td>Smooth</td>
</tr>
<tr>
<td>Air-bronchograms</td>
<td>Absent</td>
</tr>
<tr>
<td>Orthogonal views</td>
<td>Changes orientation</td>
</tr>
</tbody>
</table>

Incomplete margin sign

Tapering margins form obtuse angle with mediastinum or chest wall and cause ill-defined margin on en face radiographs
**Split pleura sign - Empyema**

- Fibrin coating of the pleura, increased vascularity of the inflammed pleura
- Increased attenuation of extra pleural fat
- Intercostal and mediastinal lymphadenopathy

**CT Density**

<table>
<thead>
<tr>
<th>Transudate</th>
<th>Exudate</th>
<th>Hemothorax</th>
<th>Chylothorax</th>
</tr>
</thead>
<tbody>
<tr>
<td>10HU</td>
<td>25HU</td>
<td>60HU</td>
<td>-20HU</td>
</tr>
</tbody>
</table>

**Pleural thickening, plaques, calcifications**

**Benign:** Smooth, regular, bilateral/unilateral
- Asbestos exposure
- Hemothorax
- Empyema (TB, Bacterial)
- Fibrothorax
- Talc pleurodesis

**Malignant:** Thickening > 1 cm, asymmetric, irregular, nodular, mediastinal pleura
- Mesothelioma
- Metastasis

**Mimics of pleural thickening**

- Extra pleural fat
- Intercostal veins
- Transversus thoracic muscle

**Holly leaf sign**

**Pleural calcifications**

- Fibrothorax
- Osteosarcoma metastasis
- 6 months later
- Talc Pleurodesis
**Fibrous tumor of the pleura**

**Case 1**
- Size: Variable in size
- Common in mid-lower hemithorax
- Calcification: 20-25%
- Doege-Potter syndrome
  - Hypoglycemia
  - Insulin-like growth factor
  - HOA (5-25%)
  - Relief of symptoms after resection

**Image courtesy: Rahul Renapurkar, MD Cleveland Clinic**

**Fibrous tumor of the pleura- MR**

**Case 2**

**Fibrous tumor- Recurrence**
- Fibrous tumor of pleura with malignant features on histopathology
- 1-year after resection: Presented with right chest pain

**Pleural metastasis**

- Far common than mesothelioma (9:1)
- Lung: 40%
- Breast: 20%
- Lymphoma: 10%
- Gastric & Ovarian: 5%
- Invasive Thymoma- Contiguous or drop metastasis

- Right lower lobe adenocarcinoma with deposits along right major fissure
- Left breast cancer with thickening and enhancement of left pleura from metastasis

**Case:** 59-year man with left chest pain. Denies history of smoking or asbestos exposure

- History of malignant thymoma resection few years back.
- Large left pleural effusion, nodular pleural thickening.
- Right lower lobe adenocarcinoma with metastasis along right major fissure.
Mesothelioma

- Unilateral circumferential or nodular pleural thickening > 1 cm
- Mediastinal pleural involvement
- Ipsilateral hemithorax volume loss
- Pleural effusions
- Associated pleural plaques (25%)
- Chest wall invasion is a late finding

Types:
- Epithelial: Better prognosis
- Sarcomatoid
- Mixed

Survival: 12-18 months

Role of FDG-PET

- Meta-analysis of 11 studies including 212 patients showed pooled sensitivity of 95% and pooled specificity of 82%.
- 18F-FDG-PET and PET/CT are helpful to differentiate between malignant and benign pleural lesions; nevertheless, possible sources of false-negative and false-positive results should be kept in mind.
- SUV alone should not be used to differentiate between malignant and benign pleural lesions.


Role of MR in pleural diseases

- Better evaluation of soft tissue involvement in malignant disease
- Cine MR sequence: Tumor mobility and local invasion
- Diffusion weighted imaging, dynamic contrast enhancement
- Enhances surgical planning

Apical pleural cap

- Etiology:
  - Post infectious
  - Post inflammatory (e.g., Radiation)
  - Traumatic vascular injury
  - Malignancy:
    - Pancoast tumor
    - Lymphoma, mets, mesothelioma

- New unilateral, asymmetric, nodular apical pleural thickening should be evaluated


Pleural Sarcoma- Pleomorphic undifferentiated (Malignant fibrous histiocytoma)

- Extremely rare
- Types:
  - Liposarcoma
  - Ewing's sarcoma
  - Angiosarcoma
  - Synovial sarcoma
  - Pleomorphic undifferentiated sarcoma

2-weeks later

Case- Splenosis
Case - Endometriosis

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