Imaging of Lymphoma in the Chest

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Lymphoma Basics

- Lymphoma basics
- Non-Hodgkin Lymphoma
- Organs specific imaging of Lymphoma
- Staging

Lymphoma

- A malignancy of the lymphocytes.
- Cell types: B-cell, T-cell, natural killer cell
- Typically presents as a solid tumor
- Involves the lymph nodes and solid organs
- Greater than 30 types of lymphoma

Disclosures

- None

Outline

- Lymphoma basics
- Non-Hodgkin Lymphoma
- Organs specific imaging of Lymphoma
- Staging

Lymphoma, Leukemia, Myeloma

<table>
<thead>
<tr>
<th>Disease</th>
<th>Location of proliferating abnormal lymphocytes</th>
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<tbody>
<tr>
<td>Lymphoma</td>
<td>Solid tumor in lymph nodes or other organs</td>
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<tr>
<td>Leukemia</td>
<td>Cells infiltrating bone marrow and circulating in blood</td>
</tr>
<tr>
<td>Myeloma</td>
<td>Plasma cells in bone marrow</td>
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General - Imaging Modalities

- CT: high resolution imaging with limited soft tissue contrast.
- MRI: Current clinical use is primarily for assessing vascular and cardiac invasion.
- PET: High sensitivity for active disease and useful in staging/re-staging.

Imaging of HL and NHL

Hodgkin Lymphoma

- Accounts for 10-15% of lymphoma
- Bimodal Age distribution (30-40yo & >50yo)
- ~60% have mediastinal lymphadenopathy (LAD) at presentation.
- Less than 10% have isolated subdiaphragmatic involvement.
- Usually spreads along contiguous lymph nodes until late in the course of the disease.

HL Imaging Findings

- Often infiltrates the thymus
- Hilar LAD without anterior mediastinal LAD is rare and should suggest another diagnosis.
- Lung involvement is often secondary (extending from hilar regions), but rarely the site of primary disease.

Non-Hodgkin Lymphoma (NHL)

- Heterogeneous group of disorders
- Greater than 30 types of NHL
- Most (85-90%) are derived from B-cells
- Most common types of NHL:
  - diffuse large B-cell (~30%)
  - Follicular (~30%)
- Thoracic manifestations in 45% (usually mediastinal lymphadenopathy)
NHL Imaging Findings

Often presents with bulky anterior mediastinal/paratracheal lymphadenopathy

NHL (Compared to HL)

- Staging more dependent on overall tumor burden and histological type
- More likely to involve noncontiguous sites.
- Lymph nodes often larger at presentation
- Primary pulmonary involvement is more common
- More likely to invade mediastinal structures and involve other organs.

NHL (Compared to HL)

Imaging findings are more variable compared with HL.

Organ Specific Imaging of Lymphoma

Thoracic Organs Involved

- Mediastinal lymph nodes
- Lungs
- Pleura
- Heart

Mediastinal Lymph Nodes
Mediastinal Lymph Nodes

• Most common lymph nodes involved are anterior mediastinal
• Calcification uncommon prior to treatment
• Lymphadenopathy may cause SVC syndrome (lymphoma 2nd most common cancer cause, after lung cancer)
• Isolated hilar involvement uncommon

Mediastinal Lymph Nodes

• Lymph nodes may form conglomerate masses
• Mass usually homogeneous

Mediastinal Lymph Nodes

Large mass occasionally be necrotic/cystic

DDX - Metastases

Metastases – primary malignancy elsewhere

DDX - Goiter

• Contiguous with thyroid
• Attenuation matching thyroid
• May be using iodine uptake nuclear medicine scan

DDX - Sarcoid

• Lymph nodes usually in paratracheal and hilar regions
• Partially calcified
DDX – Thymus (normal)

- Normal configuration: triangular in shape with concave or straight margins
- Diameter less than 15 mm (adults)
- If involved in lymphoma is considered as a nodal site for staging purposes

DDX - Thymoma

- Age > 40
- Anterior mediastinum
- 1/3 cystic
- 1/3 calcified: often thin and linear in capsule
- If pleura involved, usually unilateral.

DDX - Thymoma

Abnormal

Normal

Image(s): Courtesy of Dr. Travis Henry

DDX – Germ Cell Tumor

- Age < 40
- Anterior mediastinum
- May contain fat
- May be cystic
- May rarely contain calcium


DDX – Castleman Disease

- Single enlarged node – matted LAD
- Usually in middle and posterior mediastinum
- Rare in anterior mediastinum
- May demonstrate avid contrast enhancement

Lungs
Lungs

- Pulmonary involvement seen in ~ 10-15%
- More common in HL than in NHL
- Usually secondary to lymphoma elsewhere
- Disease often extends into the lung from adjacent lymph nodes
- Perilymphatic lung involvement

Lungs - Findings

- Consolidation with air bronchograms
- Pulmonary nodules
- Ground glass opacities
- Lymphangitic spread of tumor

Pulmonary Consolidation

Nodular Sclerosing Hodgkin lymphoma

Pulmonary Consolidation

MALT Lymphoma

Pulmonary Consolidation

HL

Pulmonary Nodules

HL
Pulmonary Nodules

Ground Glass Opacities

DDX - Pneumonia
- Tree-in-bud opacities and/or centrilobular nodules
- Lymphangitic pattern not seen

Consolidation with less marked lymphadenopathy

DDX - Metastases

Metastatic endometrial leiomyosarcoma
DDX - Bronchogenic Carcinoma

- Often unilateral mass or consolidation
- Asymmetric lymphadenopathy
- Middle mediastinal and hilar > anterior

DDX - Eosinophilic Pneumonia

- Peripheral consolidation.
- Often increased blood: eosinophil count, IgE, ESR
- Similar to organizing pneumonia but often in upper lung zones.

DDX - Sarcoi

- Architectural distortion and superior hilar retraction
- Partially calcified lymph nodes

DDX – Organizing Pneumonia

- Consolidation often in peripheral or peribronchovascular distribution.
- Lower lung zone predominance.
- Usually no LAD

Lymphangitic Spread

DDX - Lymphangitic

- Pulmonary edema – usually smooth
- Interstitial Lung Disease – usually peripheral
- Sarcoidosis
- Bronchogenic Carcinoma
- Metastases – gastric cancer, breast cancer

Pleura

- Pleural effusions are common (seen in 80% in HL, 50% overall)
- Pleural effusions usually not associated with pleural malignancy unless pleural masses are seen

DDX - Pleura

- Reactive – secondary to infection or inflammation, often uniform thickness
- Asbestos – mild thickening, partially calcified
- Pleurodesis – high attenuation material
- Drop-metastases (Thymoma) – oval/lobular anterior mediastinal mass, mediastinal lesions in other node groups less common, unilateral
- Mesothelioma – LAD less common

Heart and Pericardium
Heart and Pericardium

- Pericardium involved more frequently than the myocardium
- Pericardial effusions are usually associated with pericardial involvement of lymphoma
- Valves lack lymphatic vessels and are usually spared
- Central necrosis less common

Will often extend over epicardial surface encasing the coronary arteries.

Heart and Pericardium- Imaging

If cardiac chambers are involved, the most frequent chamber involved is the right atrium.


Lymphoma Staging

Lymphoma Staging

- Metastases to the heart:
  - Most common
  - Lesions elsewhere
- Cardiac Sarcomas:
  - More likely to involve valves and great vessels
  - Central necrosis more common.
  - Avid contrast enhancement


Lymphoma Staging

Lymphoma Staging – Summary

- I: Single lymph node region or lymphoid structure
- II: Two or more lymph node regions or lymphoid structures on one side of diaphragm
- III: Lymph nodes on both sides of diaphragm
- IV: Extranodal involvement (other than *E)

Treatment Related Findings

- Lymph nodes and other areas of involved with lymphoma decrease in size, often to within normal limits
- Residual foci of scar tissue may occur and may calcify
- PET is a sensitive method for assessing treatment response

Radiation may cause scarring and volume loss

Summary
Summary
Thoracic Lymphoma

- Most common manifestation of lymphoma in the chest is an anterior mediastinal and paratracheal lymphadenopathy
- Lymphadenopathy may coalesce into a homogeneous mass (large masses may show central necrosis)
- Imaging findings are variable, and other organs may be involved.
- Calcification is rare in untreated disease

Helpful References


Questions?

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