Diagnostic Imaging Pathways - Mediastinal Mass (Suspected)

Population Covered By The Guidance

This pathway provides guidance on the imaging investigation of an adult patient with a mediastinal mass.

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Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the **PINK** text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

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Pathway Diagram
Image 1a and 1b (Plain Radiographs, PA and Lateral): A large circumscribed mass is seen arising from the mediastinum and projecting over the right hilum. The lateral confirms its location in the anterior mediastinum (arrow). Histological assessment revealed a thymoma.

Image 2 (Plain Radiograph): There is a large circumscribed opacity projected over the superior mediastinum and over the right upper lung zone (arrow) displacing the trachea to the left (arrowhead). The features suggest a large retrosternal goitre.
Retrosternal Goitre

Image 3a and 3b (Computed Tomography): The right lobe of the thyroid is considerably enlarged with retrosternal extension and deviation of the trachea to the left (arrows). There are a few mediastinal nodes which measure around 1cm in the short axis.

Multinodular (Colloid) Goitre

Image 4a: Post-mortem specimen showing bilaterally enlarged thyroid lobes with coarse nodularity externally in keeping with a multinodular goitre.

Image 4b (H&E, x2.5): Histological section of a multinodular goitre showing the usual features of variously sized, colloid-containing follicles lined by uniform epithelial cells, patchy areas of haemorrhage and fibrosis.

Teaching Points

- CT of the chest is the imaging modality of choice in the assessment of a suspected mediastinal mass
- Often based on CT characteristics of the mass, a diagnosis can be made
- In cases of diagnostic uncertainty, further imaging with MRI or PET scan (particularly if there is a high clinical suspicion of malignancy) may be warranted

Angiography

- Largely rendered unnecessary by contrast CT and MRI
- Useful in the evaluation of vascular lesions (aneurysm, haemangioma, and arteriovenous malformation) and to clarify vascular invasion by tumour masses
- May be used to determine the blood supply in large masses of questionable origin prior to surgery
- Role in the embolisation of highly vascular lesions prior to surgery

Biopsy

- As mediastinal masses may represent metastatic disease, biopsy can be vital for making a
definitive diagnosis and guiding further management. The best method for biopsy depends on the location of the mass and adjacent structures.

- The vast majority of transthoracic image-guided biopsies are performed percutaneously using CT guidance. Complications may include bleeding and pneumothorax. Up to 10% of patients require the placement of a catheter post-biopsy for evacuation of a pneumothorax.

- Endoscopic ultrasonography (EUS) is a relatively recent method of imaging the mediastinum, and is performed during endoscopy. In particular, it can accurately image the aortopulmonary window, subcarinal nodes, inferior and posterior mediastinum, which on CT, may not be clearly seen or may miss small lymph nodes.

- EUS may be used to guide fine needle aspiration of mediastinal masses. This procedure involves the use of ultrasound guidance to acquire mediastinal lymph node samples through the oesophagus during endoscopy. It can be performed under local anaesthetic, and has a very low complication rate (0.5-2.3%), with negligible risk of infection or bleeding.

- In a recent meta-analysis of 76 studies (9310 patients), the sensitivity and specificity of EUS alone was 84.7% & 84.6%, respectively. When combined with FNA, the sensitivity and specificity of EUS-FNA was improved to 88.0% & 96.4%, respectively.

- Hirdes et al. found that even in low volume EUS centres, EUS-FNA of mediastinal lymphadenopathy changed management in 84% of cases and reduced total diagnostic costs.

- Another recent development is endobronchial ultrasound (EBUS) and EBUS transbronchial needle aspiration (EBUS-TBNA). This technique utilises a specialised bronchoscope with an integrated convex ultrasound transducer at its distal end. The ultrasound can be used to evaluate masses within and adjacent to the airway, and allow for real-time guided biopsy.

- Yasufuku et al. used EBUS-TBNA to investigate patients with mediastinal masses of unknown aetiology. They found that EBUS-TBNA was diagnostic in 131/140 patients (93.6%), and altered management for 112/140 patients (80%). It was also well tolerated, with no recorded complications.

- With further development of these techniques, EUS-FNA and EBUS-TBNA may allow for complete access to all mediastinal lymph nodes.

**Computed Tomography (CT)**

- Imaging modality of choice for evaluation of a suspected mediastinal mass.

- Provides useful information in regards to:
  - Location of the mass (anterior, posterior, middle mediastinum)
  - CT characteristics of the mass (fat, fluid, solid)
  - Likely origin (neural, oesophagus, airways, nodes etc)
  - Mode of extension or spread

- Measurement of CT density increases the specificity of differential diagnosis of mediastinal masses.

  -Lesions that may contain fluid-density areas include goitres, thymic cysts, thymomas, teratomas, lymphomas, necrotic nodes from inflammatory or malignant causes, pericardial cysts, bronchogenic and oesophageal duplication cysts. Low-density appearance may also be produced by lesions that contain fat, such as thymolipomas and teratomas

  -Lesions containing calcifications include goitres, thymomas, lymphomas (usually treated), carcinoid tumours, inflammatory masses (tuberculosis, histoplasmosis, rarely sarcoid), aneurysms, occasional neurogenic tumours of the ganglion series, and oesophageal leiomyomas

- Contrast enhancement on CT scan helps narrow the radiographic differential diagnosis and provides clinically significant information on compression, encasement, or obstruction of mediastinal vessels. Lesions showing significant enhancement after contrast injection include...
goitres, parathyroid adenomas, Castleman's disease, vascular lesions, paragangliomas, and some metastases.

- Further investigation/management will depend on the above CT findings.
- Advantages of CT (compared to MRI):
  - Spatial resolution
  - Detection of calcification and bone destruction
  - Screening of lung, liver and adrenal metastases in a single study
  - Useful in guiding needle aspiration biopsy of masses
  - Wider availability
- Disadvantages
  - Exposure to ionising radiation
  - Involves use of contrast agent

**Magnetic Resonance Imaging (MRI)**

- Largely used as an adjunct to CT scanning in the evaluation of mediastinal abnormalities.
- Often provides additional information about the nature, location, and extent of disease.
- Useful in confirming the cystic nature of mediastinal lesions that appear solid on CT, and by revealing small amounts of intrallesional fat, can suggest the diagnosis of haemangioma, teratoma, or extramedullary haematopoiisis.
- Preferred modality for imaging neurogenic tumours which account for 75% of posterior mediastinal masses.
- Advantages
  - Multiplanar imaging
  - High contrast resolution
  - Does not involve use of contrast agent
- Disadvantages - limited availability and high expense

**Positron Emission Tomography (PET)**

- In general malignant tumours have a higher rate of metabolism compared to normal tissue and benign tumours which is reflected in the amount of FDG uptake.
- Largely used as an adjunct to CT scanning in the evaluation of mediastinal abnormalities and provides additional information about the metabolism and extent of disease.
- Sensitivity and specificity for differentiating benign from malignant lesions ranges from 90% to 95%.
- In patients with lymphoma, FDG PET was able to diagnose hilar/mediastinal involvement with a sensitivity of 96% and specificity of 94%.
- Disadvantages - limited availability and relatively high expense

**Plain Chest Radiograph (CXR)**

- Erect posteroanterior and lateral chest radiographs, taken after a good inspiratory effort, are required to assess the presence and location of a mediastinal mass.
- Comparison with old chest films is important to help establish if the abnormality is new.
References

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

10. Strollo DC, Rosado-de-Christenson ML, Jett JR. Primary mediastinal tumours: part II. Tumours of the middle and posterior mediastinum. Chest. 1997;112:1344-57. (Review article)

Further Reading

## Information for Consumers

<table>
<thead>
<tr>
<th>Information from this website</th>
<th>Information from the Royal Australian and New Zealand College of Radiologists’ website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consent to Procedure or Treatment</td>
<td>Angiography</td>
</tr>
<tr>
<td>Radiation Risks of X-rays and Scans</td>
<td>Computed Tomography (CT)</td>
</tr>
<tr>
<td>Angiography (Angiogram)</td>
<td>Contrast Medium (Gadolinium versus Iodine)</td>
</tr>
<tr>
<td>Computed Tomography (CT)</td>
<td>Gadolinium Contrast Medium</td>
</tr>
<tr>
<td>Magnetic Resonance Imaging (MRI)</td>
<td>Iodine-Containing Contrast Medium</td>
</tr>
<tr>
<td>Positron Emission Tomography (PET)</td>
<td>Magnetic Resonance Imaging (MRI)</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Plain Radiography/X-rays</td>
</tr>
<tr>
<td>Chest Radiograph (X-ray)</td>
<td>Radiation Risk of Medical Imaging During Pregnancy</td>
</tr>
<tr>
<td></td>
<td>Radiation Risk of Medical Imaging for Adults and Children</td>
</tr>
<tr>
<td></td>
<td>Ultrasound</td>
</tr>
<tr>
<td></td>
<td>Nuclear Medicine</td>
</tr>
<tr>
<td></td>
<td>PET Scan</td>
</tr>
</tbody>
</table>

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