New ITMIG CT Classification of Mediastinal Compartments

Brett W. Carter, MD

**DISCLOSURES**

- ACRIN: Research Grant
- St. Jude Medical, Inc.: Consultant
- Amirsys, Inc.: Thoracic Co-Lead

**GOALS AND OBJECTIVES**

- Briefly review the most commonly used mediastinal compartment classification schemes.
- Recognize the need for a mediastinal compartment model based on cross-sectional imaging.
- Understand the basis for and structure of the new ITMIG CT-based classification of the mediastinal compartments.
- Illustrate the prevascular, viscerai, and paravertebral compartments through representative examples.

**INTRODUCTION**

- Differences in terminology and methods have resulted in confusion regarding the compartments of the mediastinum and the contents contained within them.
- Because traditional models are based on the lateral chest radiograph, some mediastinal abnormalities cannot be reliably localized to a specific compartment.
- Numerous methods of classifying the mediastinal compartments have been devised by anatomists, radiologists, and clinicians.
- The classification scheme most commonly used in clinical practice is the Shields’ system.
- Various radiologic models and classification schemes have been proposed:
  - Fraser and Paré
  - Felson
  - Helitzman
  - Zylak
  - Whitten
- Accurate localization of the origin of mediastinal lesions and the extent of disease on cross-sectional imaging techniques such as CT are crucial.
- A CT-based classification scheme for division of the mediastinal compartments has recently been proposed by the Japanese Association for Research on the Thymus (JART).
Consensus regarding a standardized method for dividing the mediastinum into specific compartments based on CT imaging is necessary in order to:
- Appropriately describe mediastinal lesions
- Formulate relevant differential diagnoses

The new CT-based classification scheme of mediastinal compartments devised and adopted by ITMIG is presented here.

Classification schemes have traditionally divided the mediastinum into three or four compartments depending on whether a superior mediastinal compartment is included.
- Both models have distinct strengths and weaknesses.

ITMIG surveyed a multidisciplinary group of experts regarding their opinions on the number of compartments to be included in the CT-based classification system.
- 72% preferred the 3-compartment model, 23% preferred the 4-compartment model, and 5% did not have a preference.

Reasons why the participants chose one model over the other included optimal distinction of disease entities in 67%, similarity to what they currently use in 63%, because it is more anatomic in 53% and because it is easier to use in 48%.

Because establishing a presumptive clinical diagnosis is extremely valuable in guiding the work-up and treatment of a patient with a mediastinal mass, having a reliable way to identify the origin of a lesion is important.

Sometimes very large mediastinal lesions extend from one compartment to another, making it hard to identify the site of origin.

ITMIG recommends the use of two tools:
- Center method
- Structure displacement tool

In this method, the center of a mediastinal lesion localizes the abnormality to a specific compartment.
- The center is defined as the center point of the lesion on the axial CT image showing the greatest size of the lesion.
- In the JART study, this method resulted in classification of all 445 mediastinal masses to specific compartments.

Very large mediastinal masses can displace organs from other compartments, usually those that abut the compartment from which the tumor originated.
- For example, a very large anterior mediastinal mass may displace organs of the middle mediastinal compartment such as the trachea or the heart posteriorly.
**PREVASCULAR COMPARTMENT**

- **Superior:** Thoracic inlet
- **Inferior:** Diaphragm
- **Anterior:** Posterior boundaries of the prevascular compartment
- **Posterior:** Vertical line connecting a point on each thoracic vertebral body at 1 cm posterior to its anterior margin

<table>
<thead>
<tr>
<th>Compartments</th>
<th>Boundaries</th>
<th>Major Contents</th>
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<tbody>
<tr>
<td>Prevascular</td>
<td>Superior: Thoracic inlet</td>
<td>Major Contents</td>
</tr>
<tr>
<td></td>
<td>Inferior: Diaphragm</td>
<td>Major Contents</td>
</tr>
<tr>
<td></td>
<td>Anterior: Posterior boundaries of the prevascular compartment</td>
<td>Major Contents</td>
</tr>
<tr>
<td></td>
<td>Posterior: Vertical line connecting a point on each thoracic vertebral body at 1 cm posterior to its anterior margin</td>
<td>Major Contents</td>
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</tbody>
</table>

**VISERIAL COMPARTMENT**

- **Nonvascular:** Trachea, carina, main bronchi, esophagus, lymph nodes
- **Vascular:** Heart, ascending thoracic aorta, aortic arch, descending thoracic aorta, superior vena cava, intrapericardial pulmonary arteries, thoracic duct

**OVERVIEW**

Representative examples of prevascular compartment masses. (A) Contrast-enhanced axial CT image shows a large heterogeneously enhancing mass (M) in the prevascular compartment consistent with a biopsy-proven thymic carcinoma. (B) Contrast-enhanced axial CT image shows a large heterogeneous mass (M) in the anterior mediastinum consistent with a biopsy-proven thymoma. Note the posterior displacement of the heart and great vessels, confirming its anterior location. A left pleural effusion (E) and right pleural nodule (arrows) represented pleural dissemination.
Representative examples of visceral compartment masses. (A) Contrast-enhanced axial CT image shows a low attenuation mass (M) arising from the esophagus and obliterating the fat plane between it and a portion of the transverse thoracic aorta, confirming its location in the visceral compartment. Endoscopic biopsy revealed esophageal cancer. (B) Contrast-enhanced axial CT image shows a low attenuation mass (M) located within the right ventricle in this patient with an angiosarcoma. The intracardiac location of this lesion confirms its location in the visceral compartment.

Representative examples of paravertebral compartment masses. (A) Contrast-enhanced axial CT image shows a soft tissue mass (M) in the left paravertebral region that extends through the left neural foramen into the spinal canal; thus the origin of this mass is in the paravertebral compartment. CT-guided biopsy demonstrated Ewing sarcoma. (B) Contrast-enhanced axial CT image shows a large mass (M) with calcifications in the left mediastinum. The central portion of the lesion localizes it to the paravertebral compartment. CT-guided biopsy demonstrated ganglioneuroma.

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<thead>
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<th>Compartment</th>
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<th>Major Contents</th>
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<tbody>
<tr>
<td>Visceral</td>
<td>Superior: Thoracic inlet</td>
<td>Inferior: Diaphragm</td>
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<td>Anterior: Posterior boundaries of the visceral compartment</td>
<td>Posterolateral: Vertical line against the posterior margin of the chest wall</td>
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<td></td>
<td>Thoracic spine</td>
<td>Paravertebral soft tissues</td>
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PARAVERTEBRAL COMPARTMENT
### Summary

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<tr>
<th>Compartments</th>
<th>Boundaries</th>
<th>Major Contents</th>
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</thead>
<tbody>
<tr>
<td>Paravertebral</td>
<td>Superior: Thoracic and intercostal spaces Middle: Retroperitoneal</td>
<td>Tumors, cysts, vertebral bodies</td>
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<tr>
<td></td>
<td>Inferior: Retroperitoneal</td>
<td>Soft tissue masses, lymph nodes</td>
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<tr>
<td>Vascular</td>
<td>Superior: Superior vena cava, ascending aorta, and the lateral rim of the aortic arch</td>
<td>Superior and inferior pulmonary veins</td>
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<td></td>
<td>Inferior: descending thoracic aorta</td>
<td>Inferior vena cava, left subclavian and subclavian arteries</td>
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<td>Pleural</td>
<td>Superior: Thoracic inlet</td>
<td>Lung hilum, bronchovascular structures</td>
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<td>Inferior: Inferior diaphragm</td>
<td>Thoracic and abdominal viscera</td>
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### Conclusions

- Accurate localization of the origin of mediastinal lesions and the extent of disease on cross-sectional imaging techniques such as CT are crucial.
- Consensus regarding a standardized method for dividing the mediastinum into specific compartments based on CT imaging is necessary in order to appropriately describe mediastinal lesions and formulate relevant differential diagnoses.
- Because of the increasing number of patients in whom a mediastinal abnormality is first discovered on CT, and because of its simplicity, this straightforward division can be adopted by physicians.
- It is the hope that this system will improve tumor localization, help generate a focused differential diagnosis, and assist in tailoring biopsy and treatment plans.

### References


### New ITMIG CT Classification of Mediastinal Compartments

![New ITMIG CT Classification of Mediastinal Compartments](image-url)