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## Preface

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Federico Venuta

## **Surgery of the Mediastinum: Historical Notes**

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Philip A. Rascoe, John C. Kucharczuk, and Joel D. Cooper

*Surgical management of diseases of the mediastinum ushered in the era of chest surgery, as the risks of exploration of the pleural spaces were prohibitive until the advent of positive-pressure ventilation. Early procedures were undertaken for suppurative and tuberculous bacterial infections. These approaches were subsequently applied for extirpation of primary and secondary neoplasms of the mediastinum. Finally, less invasive techniques for the diagnosis of mediastinal processes and the staging of bronchogenic carcinoma were developed. This article discusses the historical perspectives of mediastinal surgery.*

## **Utility of Positron Emission Tomography in the Mediastinum: Moving Beyond Lung and Esophageal Cancer Staging**

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Varun Puri and Bryan F. Meyers

Functional imaging using positron emission tomography (PET) has been a major advance in tumor imaging over the last decade. Its role is established in breast cancer, colorectal cancer, nonsmall cell lung cancer, and lymphoma. This article discusses the indications and applications of PET to evaluate mediastinal pathology.

## **Genetic Markers of Mediastinal Tumors**

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Matthew D. Taylor and David R. Jones

Most adult mediastinal tumors are thymic in nature, and only more recently has there been scientific inquiry into the molecular biology and genetic alterations associated with these tumors. There is an increasing appreciation of specific genetic polymorphisms in myasthenia gravis and associated thymoma. In addition, thymic tumor progression is regulated by perturbations in expression of specific tumor suppressor genes and signal transduction pathways important in oncogenesis. This article highlights the known genetic and signaling pathway alterations important in the tumor biology of mediastinal tumors, with emphasis on thymic tumors. It also discusses the association of genetic markers with thymoma, thymic carcinoma, germ cell tumors, lymphoma, and neurogenic tumors. New gene-based techniques have enabled scientists to uncover differential gene expression patterns between subtypes of thymomas, correlate tumor marker expression with germ cell tumors, and determine a link between the NF- $\kappa$ B and JAK/STAT pathways with Hodgkin's and non-Hodgkin's lymphoma. Additionally, the use of genetic analysis has uncovered an important role for various tumor suppressor genes in the pathogenesis of paraganglioma and pheochromocytoma.

Hiroshi Date

Many histologically different tumors and cysts that affect people of all ages arise from the multiple anatomic structures present in the mediastinum. The number of diagnostic possibilities can be narrowed by considering the patient's age, tumor location, the presence or absence of symptoms and signs, the association of a specific systemic disease, radiographic findings, and biochemical markers. Pathologic diagnosis is often required to confirm a presumed diagnosis and to select the optimal treatment modality. A variety of biopsy techniques for obtaining tissue from the mediastinum have been described, including ultrasound-guided endoscopic biopsy, percutaneous image-guided needle biopsy, parasternal anterior mediastinotomy, cervical mediastinoscopy, and video-assisted thoracoscopic surgery. The choice of biopsy technique depends on the localization of the lesion, clinical factors such as the age and the condition of the patient, and the availability of special techniques with the required expert and the equipment.

**Infections of the Mediastinum****37**

Kalliopi A. Athanassiadi

Infections of the mediastinum (ie, mediastinitis) are serious, are associated with high morbidity and mortality, and may result from adjacent disease with direct extension, hematogenous spread, or direct introduction into the mediastinal space. The organs and tissues involved determine the manifestations and approach to treatment of these infections. The most common ones are those secondary to perforation of the esophagus or penetrating trauma, and those that extend from an adjacent infection. Today, the most common cause of mediastinitis is direct invasion of the mediastinum after surgical intervention. Cases of mediastinitis can be classified as either acute or chronic. Two broad categories of acute mediastinitis are acute necrotizing mediastinitis and poststernotomy mediastinitis. Chronic mediastinitis has been arbitrarily subdivided into two categories: (1) granulomatous mediastinitis, and (2) fibrosing or sclerosing mediastinitis. However, these likely represent a continuum of chronic infection. In cases of acute mediastinitis, treatment should always be directed toward the primary pathology and the clinical presentation. In chronic cases, surgical treatment is only palliative.

**Mediastinal Tumors and Cysts in the Pediatric Population****47**

Cameron D. Wright

Pediatric mediastinal tumors and cysts are rare disorders that share many similarities with adults, yet which have important differences unique to the child. Posterior mediastinal tumors are relatively more common in children than in adults and are also more likely to be malignant in children. CT imaging facilitates the diagnostic evaluation of mediastinal masses in children. Airway compression is always a concern with large mediastinal tumors in children given their relative softer and smaller airway.

**Multimodality Treatment of Germ Cell Tumors of the Mediastinum****63**

Kenneth A. Kesler and Lawrence H. Einhorn

Germ cell tumors originating in the anterior mediastinal compartment represent a rare but biologically interesting group of neoplasms. Knowledge of the specific biologic behaviors and therapeutic strategies for the three histologic types is important. This article discusses the multimodality treatment strategy for primary mediastinal nonseminomatous germ cell tumors.

Federico Venuta, Erino A. Rendina, and Giorgio F. Coloni

Tumors of the thymus are rather infrequent compared with all the other thoracic neoplasms. They may display a variable clinical presentation and outcome. Although they may present as a capsulated lesion with an indolent course, in other cases they may be locally aggressive, invading the surrounding structures, or show the presence of distant metastases. At these advanced stages, cure and complete resection may be difficult, and only a multimodality approach integrating surgery with induction chemotherapy and adjuvant treatment can contribute to improve outcome.

**Surgical Approaches to the Thymus in Patients with Myasthenia Gravis**

Mitchell J. Magee and Michael J. Mack

Myasthenia gravis is an autoimmune disorder of neuromuscular transmission affecting 2 out of every 100,000 people. Neurologists and surgeons still debate what role surgery should play in its management. Many patients who might benefit from thymectomy are denied the opportunity because of misconceptions, ignorance, or trepidation. By offering effective methods of less invasive thymectomy to these patients, a significant number of patients and treating neurologists previously unwilling to consider surgery may realize the benefits of this established, proven treatment alternative. The surgical approaches reviewed include: transcervical, videothoracoscopic, robotic-assisted, transsternal, and combined transcervical-transsternal maximal thymectomy.

**Vascular Lesions of the Mediastinum**

Percy Boateng, Waqas Anjum, and Andrew S. Wechsler

This article highlights the vascular lesions that present as mediastinal masses. Some radiographic findings represent interesting clinical findings that do not require further intervention, such as a persistent left superior vena cava. Differentiating these findings from true pathologic entities then becomes paramount. In other cases, the clinical presentation will prompt immediate surgical or medical management to mitigate or prevent the mortality and morbidity associated with the condition, such as acute aortic dissection. Although specific details about the management of each clinical or pathologic entity are beyond the scope of this article, a brief mention is made of currently recommended therapy where appropriate.

**Combined Cervicothoracic Approaches for Complex Mediastinal Masses**

Clemens Aigner, Mir Ali Reza Hoda, and Walter Klepetko

The cervicothoracic junction is an anatomical complex region that contains important neurovascular structures as well as the central routes of the airway and upper digestive tract. Masses arising in either compartment—the mediastinum or the cervical region—may extensively involve the other one, requiring a combined surgical approach to achieve complete resection. The choice of the most appropriate approach is therefore crucial and requires careful preoperative planning.

**Intraoperative Strategy in Patients with Extended Involvement of Mediastinal Structures**

Domenico Massullo, Pia Di Benedetto, and Giovanni Pinto

The mediastinum is a virtual space containing several vital organs and structures. Biopsy and resection of lesions located within this region often require several

considerations that bear on intraoperative strategy. To optimize outcome, clinicians must be able to predict which patients are at highest risk of anesthetic complications. Superior vena cava involvement, extensive compression of the airway, and pericardial effusion have a clear impact on the decision-making of the anesthetist and surgeon, who should plan together when forming the surgical strategy.

### **The Role of Surgery in Recurrent Thymic Tumors**

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Enrico Ruffini, Pier Luigi Filosso, and Alberto Oliaro

Mediastinal neoplasms include various malignancies arising from structures anatomically located in this area and from adjacent organs. Treatment options in mediastinal tumors are chemotherapy, radiotherapy and surgery, or a combination of both. Although the role of surgery in the treatment of most mediastinal malignancies is well-established either alone or as part of a combined modality treatment, far less clear is the value of surgical resection for recurrent or chemorefractory mediastinal tumors. In particular, recurrent thymoma may take advantage from surgery that often allows complete resection and long-term survival.

### **Advances in Radiotherapy for Tumors Involving the Mediastinum**

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Kevin S. Choe and Joseph K. Salama

Various malignancies either arise from or spread into the mediastinum. Radiotherapy in the area of the mediastinum is challenging because of the proximity to other critical organs, such as the heart, lungs, esophagus, and spinal cord. With recent advances in imaging, treatment, and the understanding of tumor biology, these diseases now can be treated more effectively and safely. This article reviews such innovations in radiotherapy and discusses their applications in tumors that involve the mediastinum.

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