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Alessandro Brunelli, Michael R. Gooseman, and Cecilia Pompili

Modern surgical practice places increased emphasis on treatment outcomes. There has been a paradigm shift from paternalistic ways of practicing medicine to patients having a major involvement in decision making and treatment planning. The combination of these two factors undoubtedly leaves the surgeon open to greater scrutiny in respect of results and outcomes. In dealing with this it is important that the surgeon, wider multidisciplinary team, and patient appreciate the idea of surgical risk. This article reviews the latest evidence relating to risk assessment in thoracic surgery and suggests how this should be incorporated into clinical practice.

**Lung Cancer Screening** **509**

Humberto K. Choi and Peter J. Mazzone

Lung cancer is the leading cause of US cancer-related deaths. Lung cancer screening with a low radiation dose chest computed tomography scan is now standard of care for a high-risk eligible population. It is imperative for clinicians and surgeons to evaluate the trade-offs of benefits and harms, including the identification of many benign lung nodules, overdiagnosis, and complications. Integration of smoking cessation interventions augments the clinical benefits of screening. Screening programs must develop strategies to manage screening-detected findings to minimize potential harms. Further research should focus on how to improve patient selection, minimize harms, and facilitate access to screening.

**Intraoperative Detection and Assessment of Lung Nodules** **525**

Feredun Azari, Greg Kennedy, and Sunil Singhal

Lung cancer is the most frequent cause of cancer-related death worldwide. Despite advances in systemic therapy, the 5-year survival remains humbling at 4% to 17%. For those diagnosed early, surgical therapy can yield potentially curative results. Surgical resection remains a cornerstone of medical care. Success hinges on sound oncologic resection principles. Various techniques can be used to identify pulmonary nodules. A challenge is intraoperative assessment of the surgical specimen to confirm disease localization and ensure an R0 resection. The primary tool is frozen

section. Understanding the options available enhances the arsenal of thoracic surgeons and leads to better patient care.

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Jenalee N. Coster and Shawn S. Groth

Locally advanced non–small cell lung cancer is a heterogeneous group of tumors that require multidisciplinary treatment. Although there is much debate with regard to their management, a multimodal treatment strategy for carefully selected patients that includes surgery can extend survival compared with nonoperative definitive therapy. As the role of targeted therapies and immune checkpoint inhibitors for these tumors becomes better defined, practices will continue to evolve.

**Emerging Therapies in Thoracic Malignancies—Immunotherapy, Targeted Therapy, and T-Cell Therapy in Non–Small Cell Lung Cancer** 555

Boris Sepesi, Tina Cascone, Stephen G. Chun, Mehmet Altan, and Xiuning Le

Immunotherapy, targeted therapy, and adoptive T-cell therapy have been revolutionary advancements in cancer research. Some of these therapies have become the standard of care for lung cancer and replaced older treatment algorithms; some continue to be studied in clinical trials. This article discusses the current state of novel treatment options for non–small cell lung cancer patients with metastatic and locoregional disease, with focus on immunotherapy, targeted therapy, and adoptive T-cell therapy.

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Amanda R. Stram and Kenneth A. Kesler

Primary mediastinal nonseminomatous germ cell tumors represent a rare but important malignancy that occurs in otherwise young and healthy patients. Treatment is challenging and involves cisplatin-based chemotherapy followed by surgery to remove residual disease. Avoiding bleomycin-containing chemotherapy in the treatment of primary mediastinal nonseminomatous germ cell tumors is important. Pre-chemotherapy and postchemotherapy pathology as well as postoperative serum tumor markers are independent predictors of long-term survival.

**Thymic Malignancy—Updates in Staging and Management** 581

Jesse M.P. Rappaport, James Huang, and Usman Ahmad

Thymomas are relatively indolent tumors that present with locally advanced disease in 30% of the patients. Thymic carcinoma is a more aggressive histology with shorter disease-free and overall survival. Early-stage tumors are managed best with complete resection. Multimodal therapy is the standard of care for locally advanced tumors and neoadjuvant therapy may help improve respectability. Stage and complete resection are the strongest prognostic factors for long-term survival. Based on early experience, targeted and immunotherapies have shown limited promise in advanced disease.

**Updates in Staging and Management of Malignant Pleural Mesothelioma** 603

Andrea S. Wolf and Raja M. Flores

While without treatment, malignant pleural mesothelioma (MPM) confers poor survival, cancer-directed surgery as part of multimodality treatment is associated with a 15% 5-year survival. Extrapleural pneumonectomy (EPP) and radical or extended pleurectomy/decortication (P/D) are the 2 types of resection performed in this context. Preoperative staging is critical to patient selection for surgery; P/D is recommended over EPP in most cases. Adjuvant therapy with intraoperative platforms, traditional chemotherapy, hemithoracic radiotherapy resection, and new immunotherapy agents are instrumental in achieving durable long-term results. We outline the latest understanding of disease staging and describe the current state of literature and practice.

**Multidisciplinary Evaluation and Management of Early Stage Esophageal Cancer** 613

Amit Bhatt, Suneel Kamath, Sudish C. Murthy, and Siva Raja

Early esophageal cancer involves the mucosal and submucosal layers of the esophagus. Early esophageal cancer is a heterogeneous group, and achieving optimal outcomes requires a multidisciplinary approach to align patients to their optimal treatment. Although organ-sparing endoscopic resection has become the preferred management option for superficial esophageal cancer, it is not adequate in all tumors, such as high-risk lesions with poorly differentiated pathology, lymphovascular invasion, or deep submucosal invasion. In such high-risk lesions, surgery, chemotherapy, and/or radiation may be required. In this article, we present our multidisciplinary approach to early esophageal cancer.

**Management of Locally Advanced Esophageal Cancer** 631

Nicolas Zhou, Ravi Rajaram, and Wayne L. Hofstetter

Management of locally advanced esophageal cancer is evolving. Trimodality therapy with chemoradiation followed by surgical resection has become the standard of care. However, the value of planned surgery after response to therapy is in question. In this article, we discuss the current practice principles and evidence for the treatment of locally advanced esophageal cancer. Topics will include various neoadjuvant therapies, trimodality versus bimodality therapy, and outcomes for salvage esophagectomies. In addition, emerging novel therapies, such as HER2 inhibitors and immunotherapy, are available for unresectable or metastatic disease, enabling a greater armamentarium of tumor biology-specific treatments.

**Siewert III Adenocarcinoma: Still Searching for the Right Treatment Combination** 647

Andrew Tang, Davendra Sohal, Michael McNamara, Sudish C. Murthy, and Siva Raja

It remains uncertain whether Siewert III tumors should be treated as esophageal or gastric cancers. Neoadjuvant therapy has been shown to improve survival in both esophageal and gastric trials. Randomized control trials comparing neoadjuvant chemotherapy versus chemoradiation should help define the most optimal treatment regimen. Surgical treatment

follows general oncology principals: resect to negative margins with complete lymph node dissection, and, the extent of resection often extends more proximal onto the esophagus in addition to the total/subtotal gastrectomy.

### **Surgical Management of Chest Wall Sarcoma**

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Nathan W. Mesko, Alejandro C. Bribriescio, and Daniel P. Raymond

Chest wall sarcoma is a rare and challenging pathology best managed by a multidisciplinary team experienced in the management of a multiple different pathologies. Knowledge of the management sequence is important for each sarcoma type in order to provide optimal treatment. Surgical resection of chest wall resections remains the primary treatment of disease isolated to the chest wall. Optimal margins of resection and reconstruction techniques have yet to be determined.

### **Current Indications for Pulmonary Metastasectomy**

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Monisha Sudarshan and Sudish C. Murthy

The lung is one of the most common sites of metastatic disease. Assessing patients for pulmonary metastasectomy includes ensuring they are suitable surgical candidates for single-lung ventilation and pulmonary resection. Complete resection of metastases and control of primary tumor and oligometastatic disease are key tenets for metastasectomy. Negative prognostic factors include short disease-free interval, presence of lymphadenopathy, and multiple lesions. Primary tumors are associated with excellent outcomes. With modern high-resolution scans, minimally invasive approaches to metastasectomy are preferred. Consideration of extended resections should take place in a multidisciplinary manner. Nonoperative options include stereotactic body radiation therapy, radiofrequency ablation, and microwave ablation.