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Editor

Lung Cancer Imaging

Humana Press

Editor

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This book is dedicated to the memory of Carolyn E. Reed, M.D. (1950–2012). Carolyn epitomized the principles of patient care and humanism that is so often lost in today's world of technology. A thoracic surgeon by trade, her primary focus was on doing what was right for each individual patient and was at the heart of the multidisciplinary thoracic oncology practice at the Medical University of South Carolina. Her goal was simple: to ensure that everyone came together to render the best possible evidence-based treatment for each patient. She touched the lives of so many nurses, physicians, and patients and her spirit lives on through the memories and skill of those she trained.

Foreword

Lung cancer is the paradigm disease of the first 2 decades of the twenty-first century. It was once seen as a single, monolithic, self-inflicted entity, nearly always caused by smoking, and usually viewed by patients (and often their families and their physicians) as a death knell at the time of diagnosis.

Today we know much more about lung cancer and almost always have more options to provide to patients with the disease. Tobacco exposure is still recognized as the leading cause worldwide. In the United States more lung cancer cases occur in former smokers than current smokers. Smoking cessation programs are working and, happily, there are fewer new smokers as well. At the same time, an increasing number of never-smokers with lung cancer are part of our more textured and deeply scientific appreciation of the range of entities that fall squarely under the lung cancer rubric.

Among significant developments in lung cancer diagnosis and treatment:

- Data from large and well-constructed screening trials have shown that the risk of death from lung cancer can be reduced by approximately 20 % when multiyear CT screening is applied to carefully defined, higher risk patient populations.
- The iterative emergence of more probing, sensitive, imaging technologies—CT scanning, magnetic resonance imaging, and the still quite early technology of PET and PET/CT—has allowed us to better understand the apparent distribution of disease and apportion therapy recommendations accordingly.
- Improvements in minimally invasive staging, e.g., image-guided transthoracic tissue acquisition, thoracoscopic diagnosis and staging, and esophageal or endobronchial ultrasound assessments of nodal involvement, have allowed more accurate pathologic staging to guide surgical interventions, multimodality treatment approaches, and sequencing of systemic management.
- Adjuvant chemotherapy can significantly improve survival for patients in selected disease settings. Evidence-based recommendations improve post-operative care. Improved systemic therapies significantly prolong survival in patients with advanced stage disease.
- Improved therapeutic radiation technologies, such as image driven target volume determinations, 3D treatment planning, IMRT, respiratory gating, and stereotactic brain or body radiosurgery, enhance efficacy, decrease

radiation-related toxicities, and expand the utility of radiation for both palliative management and potentially curative interventions.

- Interventional radiology now offers radiofrequency ablation of specific lesions as a beneficial addition to the therapeutic armamentarium.
- Several chemotherapy combinations appear about equally active. Each has been shown to provide overall survival benefits compared to prior systemic therapy standards. In addition, oncogene science and the recognition of molecular drivers of lung cancer proliferation are the bedrock of our new capacity for targeted therapy with its breathtaking rapidity of effect and durability of response in the majority of individuals who receive treatment based on their tumor's molecular profile.
- Early introduction of palliative care as a component of systemic management for patients with advanced disease has been shown to improve quality of life and may actually contribute to prolonged survival.

Quality staging continues to be the principal driver for the selection of the best lung cancer care regimen for every individual patient. As a result, "tissue remains the issue." Pathologists play the central role in tissue handling and assessment. Initially, they utilize the traditional histopathologic classification of lung cancer, dividing the "monolith" into small cell, adeno-, large cell, and squamous cell subgroups. While inter- and even intra-observer reproducibility of subgroup designation is far from perfect, clinical decision making can be driven by these sub-histology designations. For example, pemetrexed and bevacizumab are considered "contra-indicated" for patients with advanced lung cancer of the squamous cell type based on either poorer activity (pemetrexed vs. gemcitabine) or increased toxicity (increased hemorrhagic risk among patients with squamous cell subtype treated with bevacizumab). At the same time basic research and patient-tumor tissue-based translational science investigations have revealed striking new and actionable information about critical molecular drivers (biomarkers), further defining lung cancer subgroups and directing clinical management with "targeted therapy." Even patterns of molecular marker evolution after initial therapy can now be ascertained and used to direct salvage therapy recommendations, making repeat tissue acquisition yet another new element of our current lung cancer paradigm.

Another critical piece of this new lung cancer paradigm is an intensely interactive, collaborative, multidisciplinary team approach. When present in an ongoing way, it allows patients and their cancer care providers to receive and to deliver the best that committed care providers and medical science together can offer. Each patient's experience with their disease and their therapy is distinct. What seems clear to one specialist may become more textured and seen differently when reviewed and discussed in the multidisciplinary setting.

- Primary care clinicians practice their art and separate the less common but more threatening scenarios from the more common but self-limited or less threatening chronic entities with which they are most often dealing. This type of triage is not easy, but it is key.
- Imaging specialists, thoracic surgeons, and pulmonary medicine physicians work together to correlate underlying risks and current physiology, assess new signs and symptoms of disease, and radiographic findings to

determine the imperative for a diagnostic intervention vs. careful observation.

- Tissue acquirers (radiologists, pulmonologists, and thoracic surgeons), tissue assessors (surgical and molecular pathologists), and therapy providers (physicians, nurses, and other professionals) driven by both the art of medicine and the available data must discuss (and optimally meet) together on a regular basis. Such patient by patient, multidisciplinary discussions insure that optimal therapy directing information can be acquired with maximized efficiency and minimized patient risk. Multi-specialty collaborations to define timing and type of iterative assessments for response status and restaging are also critical parts of the continuum of optimized care.

In this textbook on lung cancer, Dr. Ravenel and his contributing authors, many who are now or have been on the faculty at the Medical University of South Carolina, have built on their own deep understanding of the lung cancer continuum, fashioned in no small part by their active participation as a multidisciplinary thoracic oncology team, to provide a superbly well-informed, clinically focused, user-friendly, and up-to-date data source for every constituency interested in or touched by this paradigm disease of these first 2 decades of the twenty-first century.

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Mark R. Green, MD

Preface

Despite all the advances in knowledge and detection, lung cancer remains the leading cause of cancer deaths in the United States. I would be remiss if I did not mention the devastating effects that tobacco has had. However, even if quit rates improve and better yet fewer people take up the smoking habit, we are still left with a long lag time of risk. Although lung cancer appears to have plateaued for men, tobacco-related cancer deaths continue to climb in women. As we have improved our ability to diagnose and treat the disease, it remains that the majority of people diagnosed with the disease will not be curable at the time of detection. Screening over time may change the equation, but even with screening, we will still be left with a large population of people with incurable lung cancer.

My paternal grandfather succumbed to lung cancer in the late 1950s; I was robbed of the opportunity to meet him. Many others, alike, struggle with the loss of friends and relatives to lung cancer. Screening and treatment unfortunately are not enough. If we are to truly put a dent in lung cancer deaths, it will take a coordinated approach of tobacco control, education, and smoking cessation.

For over a decade, I have been privileged to work in a multidisciplinary thoracic oncology setting to discuss difficult cases with dedicated thoracic oncologists, pulmonologists, pathologists, thoracic surgeons, and radiation oncologists. I have seen this not only optimize the care of individuals but also improve each and every team member's knowledge. This flow of information across specialties is critical in tailoring therapy. It is from this experience that I undertook this book in hopes that the wisdom and pearls learned in such a setting could help those who may not have easy access to a multidisciplinary care team. Many of the authors are colleagues and friends from the Thoracic Tumor Board at the Medical University of South Carolina.

While a group of specialists often guide the care for lung cancer patients in large institutions, it is often a general radiologist, general practitioner, and internist in smaller communities who are on the front line of the diagnosis and initial discussions. In many cases, these can be the most difficult and trying days for both physician and patient. It is my hope that this book can provide a guide to the diagnosis, staging, and management of lung cancer that can aid in these initial discussions and help patients understand the following steps and what to expect when they come for treatment.

While the focus of this book is on lung cancer, the disease, we must never forget that on the other side of the diagnosis there is a person with hopes, fears, and dreams. They often are scared and confused. There is a family who wants their loved one to be cared for, to be listened to. For all the new technology, procedures, and drugs described, these must be seen as aids to care for the patient and not a replacement for the eyes, ears, and touch. I would like to end with the final two paragraphs of Dr. Carolyn Reed's Presidential Address at the 54th Annual Meeting of the Southern Thoracic Surgical Association:

We have to realize when technology is a hindrance, not a help. Tests, machines, and procedures cannot supplant listening, experience, and intuitiveness.

Patient versus customer, technology versus touch, organ versus soul: where has humanism gone? It has not gone. Humanism is why we chose medicine and why young people enter medical school. We cannot let the light flicker, but must keep the beacon bright. If each one of us keeps the individual patient as the primary focus, and if we remember that medicine will always be an art as well as a science, humanism can never be lost. [1]

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Reference

1. Reed CE. Patient versus consumer, technology versus touch: where has humanism gone? *Ann Thorac Surg.* 2008;85:1511–4.

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