General Thoracic Surgery

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Foreword

At long last, here is a text written primarily for the general thoracic surgeon. While the classic volumes of the past—Lilienthal in 1925 and Graham in 1935—gave some space to cardiac affections, nearly all thoracic surgical texts of recent years have been heavily weighted with reports on cardiovascular disease. This should not be surprising considering the romance and appeal which have attended the astounding developments in the surgical treatment of cardiac and thoracic vascular disease during the past two decades. By contrast, the glamour surgery of the late thirties through the early fifties was primarily concerned with the opened chest. But it must be emphasized that advances have continued in the surgical treatment of noncardiac thoracic disease and injury, even if at a more modest and less publicized pace. This volume includes accounts of these advances in considerably more detail than do other extant texts.

Dr. Shields has picked his 56 contributors for their specialized knowledge, their professional reputation, and their ability to write. I have known many of these surgeons well and for a long time. I would expect their best efforts and have not been disappointed in their contributions. The result is a satisfying whole. As might be expected from a multiauthored work, there is a great variety in style and structure, but this adds, I believe, a bit of zest, a change of pace.

I was at once impressed with the close attention to anatomy and physiology. Obviously more emphasis has been placed on these facets than would ordi-

narily be expected in a surgical text. Considered judgment suggests, however, that the general thoracic surgeon of today must have greater knowledge than ever before of the nonsurgical aspects of his art. Details of embryology, the latest information on the ultrastructure of the lungs, an exquisite description of the lymphatics of the lung, and newer advances of electron microscopy in the study of bronchial carcinoma are clearly presented.

Pulmonary gas exchange is covered comprehensively. There are other chapters in which the clinical applications of pulmonary physiology and function are well depicted—"making the patient safer for the operation." Prominent among these is the one on bullous and bleb diseases of the lung.

One of the most exciting developments of thoracic surgery in recent years involves the ability to accept patients with borderline pulmonary reserve for surgical treatment and to guide these patients safely through various procedures including lung resection. Preoperatively there must be an astute determination of function, assessment of ventilation-perfusion abnormalities, and meticulous respiratory care. Tracheostomy may be required at the close of the operation or nasotracheal intubation may be necessary postoperatively. Frequently, prolonged mechanical support of respiration must be included in the treatment. All aspects of these advances are considered in this volume.

The section on radiographic evaluation of the chest embraces the facets of value to the thoracic surgeon. New material on isotope studies of the lung is included.

A welcome section is that on operative procedures. Here, each of several "classic" thoracic operations is discussed in detail and the varied indications succinctly stated.

The chapter on thoracic trauma comes from the pen of a famous thoracic traumatologist. This author has again stressed the many basic principles in the management of thoracic trauma which were originally enunciated during World War II and has highlighted the advances in treatment that have occurred during the intervening years. Finally he has filed a unique report on favorable long-term results in nearly 200 soldiers wounded in World War II, originally cared for by him and whose histories he followed for as long as 17 years.

The chapter dealing with pleural effusions and infections also emanates from an author whose previous writings are well regarded. This author notes that the course of pleural infections, both pyogenic and fungal, has been vastly changed by antibiotic treatment. He stresses, however, that the old surgical principle of adequate dependent drainage must not be forgotten. He also discusses the indications for decortication alone, or in combination with pulmonary resection.

The author of the section on surgery of the trachea is widely known for his researches on the trachea and for his clinical experience. He describes the basic anatomy and portrays the surgical considerations lucidly. It would seem that the trachea is just now emerging as a surgical organ. In particular, the rash of tracheal stenoses resulting primarily from cuffed tracheostomy tubes has speeded the necessity for more precise repair. The development of successful surgical reconstructive techniques has ensued, obviating the necessity for prostheses.

The section on the lungs is particularly broad and virtually all inclusive. It embraces chapters on esoteric infections not usually covered so thoroughly in an American text. Wise, I believe, was Dr. Shield's selection of guest contributors from South America for the chapters on amebiasis and hydadid disease. The au-

thor of the chapter on bacterial infection of the lungs has developed a fresh approach in that he focuses attention on the residue of persisting disease which has felt the impact of drug therapy. His point that patients with nonresolving pneumonitis frequently undergo resection because the possibility of bronchial carcinoma cannot be ruled out is sound. Furthermore, he is correct in his assertion that bronchiectasis is not the same disease that many of us knew "way back when." The inclusion of a chapter on lung transplantation indicates that this section is completely up-to-date.

The treatment of thoracic neoplasia requires much time and effort on the part of the general thoracic surgeon. As might be expected, this volume abounds in considerations of neoplasms peculiar to each thoracic component. Thus, tumors of the chest wall, the pleura, the trachea, the lung, and the mediastinum are described in some detail. In addition, there is a chapter dealing with surgery of the thymus gland based on a wide experience with this interesting and but only recently understood organ. Then, as befits its surpassing importance, bronchial carcinoma is exhaustively reviewed. I consider this to be an excellent chapter, in part perhaps because I agree with such a large proportion of what the author has to say. I could not discover any basic aspect of the entire subject which was omitted or even slighted.

The final chapter of the book will give the reader access to the latest philosophy and methods of treatment in the radiation field as they affect organs of the thorax.

In summation, this volume will be a welcome and valued addition to the libraries of all thoracic surgeons whose practice includes other than cardiovascular surgery.

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Preface

This volume was prepared to present a comprehensive text on the surgical diseases of the chest wall, pleura, diaphragm, trachea, lung, and mediastinal structures. Initially, an overview of the anatomy and of the physiology of these structures is given. The investigation of the patient's disease and the management of the patient in the perioperative period are considered next. The various operative approaches and the standard surgical procedures are discussed and these are followed by chapters concerned with the disease entities of the aforementioned structures.

The major objectives are to present a summation of the current knowledge and the clinical concepts of the surgical management of trauma and diseases of the thorax. The pathophysiologic alterations produced and the correction of these by appropriate intervention are emphasized throughout. Presentations of the clinical features, pathologic changes, surgical management, operative results, and prognosis of the various disease states are included as an integral part of the whole.

Outstanding surgeons, physicians, and scientists have cooperated in the preparation of the text. As with most multiauthored books, repetition could not be completely eliminated; however, I have tried to keep it at a minimum. In most instances, the repetition serves to emphasize important information relative to the entire subject. Interestingly, conflicting statements are few, and only an

occasional footnote has been appended to point out such differences in opinion.

This book hopefully will serve as a source of information for the young thoracic surgeon and the person in surgical training. It also should serve as a reference for surgeons, as well as physicians, outside the field of general thoracic surgery who wish to ascertain the current views held by the specialty.

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SECTION 1

Anatomy

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Embryology of the Lungs

Leslie B. Arey

EVOLUTIONARY ADVANCES

The first appearance of lungs among vertebrates was in *Dipnoi,* or lungfishes. With the exception of the *Dipnoi,* lungs occur only in tetrapods and are a basic characteristic of all such vertebrates. The proximal segment of the trachea in tailed amphibians and higher vertebrates specialized as a larynx, and the wall of the trachea became strengthened by cartilage. The actual respiratory portion of the system shows progressive complexity in the several classes of vertebrates through bushlike branching and reduplication of the mucosal lining. The interior of the lungs in some urodeles is wholly smooth; in others, the lining is only partially smooth. Anuran amphibians have internally ridged lungs, and the resulting recesses are lined with still smaller recesses, the alveoli. In some lizards, and in all turtles and crocodiles, septa extend inward and subdivide the lung into a spongy mass supplied by branching ducts. The lungs of birds are not arranged as blind-ending respiratory trees. Instead, anastomosing tubules produce complete air circuits, and, additionally, smoothly lined extensions—the so-called air sacs—invade every major part of the body. Successive reduplication of the inner respiratory surfaces achieves the high degree of complexity of the mammalian lung, which is characteristically lobated except in some types such as whales and elephants. The mechanisms by which air is made to enter and leave the lungs differ in the several groups of tetrapods, and only in mammals are there