

A
PRACTICE
OF
THORACIC
SURGERY

SECOND EDITION



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A PRACTICE OF THORACIC SURGERY

BY

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PREFACE

In choosing the title of this book I deliberately selected the words "A Practice" rather than "The Practice of Thoracic Surgery". A real system of thoracic surgery requires several volumes and several authors to achieve any degree of comprehensiveness. In attempting to clear my views as to my own practice, I have reluctantly discarded descriptions of obsolete techniques and views, being only too conscious that by the time this volume appears, many of these may have been revived even if in altered form; for this is common in the history of surgery, which is always punctuated by advances real or ill-conceived, and retreats which may be wise or misguided. In many places, no doubt, the obvious is reiterated with sickening monotony and the difficult is ignored. I have attempted to stress the points of difficulty that puzzled me when I first encountered them, and to answer the questions so often put to me by physicians, general practitioners or young surgeons in the course of their training, whether they be studying abdominal or thoracic surgery. I have failed to summarize the vast literature on thoracic surgery, and many omissions are obvious. In a developing field of surgery, information is passed largely by word of mouth, and I owe a great deal to conversations at the meetings of the Association of Thoracic Surgeons of Great Britain and Ireland. I must apologize for unrecorded acknowledgements to surgeons whose opinions have frequently guided me. At all events I can say that this book is not for my own colleagues in the thoracic field, for all in it is known to them, but I should like to dedicate it to the members past and present of that Association and ask their indulgence for any imperfection.

The thoracic surgeon is dependent largely on the help of his colleagues, and I acknowledge with gratitude the encouragement and assistance that I have received from a wide circle of physicians, surgeons, radiologists and pathologists. There is a danger of thoracic surgery becoming segregated from Teaching Hospitals; if this trend progresses such isolation will be injurious to undergraduate and post-graduate clinical education as well as to thoracic surgery. Professor F. A. R. Stammers has always arranged for its inclusion in the Department of Surgery in the University of Birmingham, and I acknowledge with gratitude his constant help and influence. I am especially grateful to Dr. Brian Taylor, who, in addition to developing and encouraging the spread of thoracic surgery in this area, has written the introduction and provided helpful criticisms of many sections of the book. I must thank Professor Melville Arnott, Professor of Medicine in the University of Birmingham, for his constant advice and encouragement, and his colleagues Dr. K. W. Donald and Dr. Paul Davison for the sections respectively on Lung Function and Cardiac Catheterization; also Dr. Roy Astley, radiologist to the Children's Hospital, Birmingham, for a thorough and lucid account of Angiocardiography. Mr. Robert Brain, a loyal colleague and friend and now on the staff of Guy's Hospital, has provided invaluable assistance in many sections, notably those on post-operative treatment and the nutrition of the surgical patient.

I am indebted to Mr. T. F. Dee, clinical photographer to the Queen Elizabeth Hospital, Birmingham, for the major portion of the photographs and reproductions of radiographs, which has entailed a great deal of work on his part. I must also thank Mr. J. G. Williamson, A.I.B.P., A.R.P.S., clinical photographer to the Children's Hospital, Birmingham, for providing the work illustrating conditions in childhood.

I acknowledge with pleasure the assistance given by the Genito-Urinary Manufacturing

Company for their kind loan of blocks to illustrate the beautiful instruments which have a world-wide fame of their own.

Many colleagues have generously placed their clinical material at my disposal; in addition to those already mentioned I must thank Dr. J. E. Geddes, the head of the Birmingham Tuberculosis Service, Dr. Clifford Parsons of the United Birmingham Hospitals, Dr. D. J. McIlveen of Hill Top Thoracic Surgical Hospital and my surgical colleagues Mr. S. J. MacHale and Miss Ruth Richardson for much help. I owe a great deal of gratitude to many surgical registrars and house officers who have provided a great stimulus to me, and to many members of the nursing profession for something much more than devoted service to my patients.

Miss Mary Jones, a former house surgeon, has indefatigably checked and re-checked the references, and I am grateful for her untiring and painstaking efforts.

My present registrar, Mr. Keith Roberts, has made the index for me and I am grateful to him for the hours of devoted labour he has given to this task. The method of numbering the illustrations has been copied quite unashamedly from Dr. Paul Wood's book on " Diseases of the Heart and Circulation " (Eyre and Spottiswoode).

But for Miss Mary Bowers, my former secretary, this book would never have reached the printers: not only did she type the manuscript, but she provided most of the drawings presented and laboured with the greatest energy and good humour over a difficult task, and this expression of thanks is quite inadequate. To Miss Margaret Wilkie, my secretary, I am grateful for her great help over the present edition.

I must also acknowledge my deep gratitude to my wife for her constant encouragement while writing this book and for her unfailing and unselfish support during the toils of its production.

In this second edition, I have attempted to bring the material up to date. In the last few years, great advances have been made in the surgery of the heart and great vessels; the position in pulmonary tuberculosis has altered radically so that perplexing difficulties have arisen over the question of selection of patients for surgery. The steady increase in lung cancer has provided a challenge which is being met better than many doctors think, as in most centres over 30 per cent of the patients who have undergone pneumonectomy or lobectomy are alive five years later. Such a survival rate must encourage all to seek early diagnosis of this serious disease. Newer views on the oesophagus and the treatment of its disorders are many. In this edition, I have attempted to supply information on these changing fields of thoracic medicine.

INTRODUCTION

By A. BRIAN TAYLOR, M.D., F.R.C.P.

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The development of thoracic surgery during the past 30 years has been one of the most striking and exciting features of medical progress in this century—a period when progress has been fast and remarkable in many fields. Chest injuries in the first world war, and the effects of the influenza pandemic after it, set the stage, and in this country Morriston Davies, Tudor Edwards and Roberts were the leading actors to rise to the occasion. From them the mantle has fallen on a modern generation which has not stood still, but has extended the field and advanced the technique that this branch of surgery offers. At this moment it is wise to survey the position that has been reached and to take stock. Mr. d'Abreu has done this in his book—both by describing the widest aspects of thoracic surgery and by critically reviewing the values of the methods and techniques from his own wide experience.

Mr. d'Abreu is particularly well fitted for this task. He has worked with and enjoyed the intimacy of all the leading thoracic surgeons in this country. His contacts in Europe and America have been numerous and frequent both during the war and in civil practice. His experience in the Welsh National Memorial Tuberculosis Service, in which he was fortunate to work under the kind and friendly guidance of Mr. Morriston Davies and Sir Clement Price Thomas before the war, in the Army throughout the whole war and in many of the most active fields, and in his development of thoracic surgery in the Midlands since the war have given him exceptional experience of which he has taken the fullest advantage. He therefore writes with the authority of an experienced surgeon, a brilliant teacher and a keen supporter of research both practical and theoretical into all the disorders within the chest.

Accompanying and making possible all these advances have been the notable extensions of the ancillary subjects and methods. The physiology of cardio-respiratory function is perhaps hardly to be described as ancillary: it is fundamental, though it is only in recent years that it has caught up and accompanied practical therapeutics. Radiology, perhaps, has pride of place in having brought an understanding of thoracic function and disease which the traditional methods of clinical examination could never by themselves achieve. Advances in anaesthesia, and particularly the closed circuit methods, have enabled thoracic surgeons to embark safely on operations within the chest. One must also include the help given by nursing and physiotherapy in the management of thoracic disease and the pre- and post-operative treatment.

It will be apparent that the thoracic surgeon is in the centre of a large team of experts—specialists in particular methods, who have all advanced with him in knowledge, research and technique. This book amply supports this basis of the team, and gives credit to the numerous members of the team. The physician in the team may think of himself in several ways—as the collector and diagnostician to bring the patients to the team at the right time and in the right way; as the co-ordinator of the members of the team, perhaps as their controller and guide. In practice, he is probably the adviser and student. This admirable state of affairs has been achieved in Birmingham, and Mr. d'Abreu's thesis underlines the co-ordinated working of his team.

At the Queen Elizabeth Hospital in Professor Arnott's Department of Medicine, research

and practice in cardio-respiratory physiology has kept the feet on the ground. The stimulus of teaching, the wide opportunities for research and research workers, and the influence of University and Hospital departments with their critical and helpful staffs, have supported the organization. Fortunately, too, the closest liaison has been reached with the development of thoracic surgery under the Birmingham Regional Hospital Board, who have recently opened a special hospital for thoracic surgery. In the last analysis, the help given to the patients with thoracic disease is the criterion of the success of the method, and with this effective organization now in its stride one can watch this with confidence.

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PART I

ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS

INTRODUCTION

A surgeon entering into a new field of surgery has the privilege and advantage of starting at a point already reached by his masters and teachers. In 1934, largely through the kind encouragement of the late Professor Lyle Cummins, the Professor of Tuberculosis in the University of Wales, I started the study and practice of thoracic surgery. Conversations with colleagues convince me that many members of our profession believe that thoracic surgery is of recent origin, an error that is corrected if the original work of the pioneers is studied. In 1934 a wide literature was available, and an account of the surgery of the chest up to that date would fill a large volume. Assuming that much of that knowledge has become part and parcel of the modern practice of surgery, I have attempted in this book to outline the present position of a subject that continues to advance in a most exciting way, in the physiological as well as the technical field. After much strenuous work by pioneers such as Sauerbruch, Lilienthal, Alexander, Morriston Davies, Roux, Murphy, Tudor Edwards, J. E. H. Roberts, and a host of others, a rational treatment had evolved for the care of empyema and certain forms of chronic pulmonary tuberculosis. Shennstone and Janes (1932) had developed a one-stage technique for lobectomy in bronchiectasis and the tourniquet form of that operation, now abandoned, had given an enormous impetus to surgery. Total pneumonectomy for bronchiectasis and for neoplasms of the lung developed rapidly, greatly helped by notable improvements in thoracic anaesthesia and in the readier application of blood transfusion. Operations across a free pleura became commonplace. The outbreak of war in 1939 found the newer surgical techniques ready to be applied to the war wounds of the chest: a better understanding of the physiological disorders of the wounded chest and later the availability of the new antibiotics enabled thousands of chest casualties to make full recoveries. The lessons learnt in the conflict were applied coincidentally to other thoracic diseases and in spite of the confusion of the days thoracic surgery made great progress. Those of us who were engaged solely in military surgery were astonished but none the less delighted to find that a host of new techniques had to be learnt on returning to civilian surgery. In resection of lung tissue the addition of dissection lobectomy to the already established method of individual ligation of the great hilar structures for the eradication of malignant disease of the lung represented the greatest advance, for it could be applied to the common diseases of pulmonary tuberculosis, bronchiectasis and chronic lung abscess. Its superiority over the older cumbrous and unsafe method of tourniquet lobectomy was obvious. The logical extension of this type of resection operation was the development of safe methods for the removal of segments and subsegments of the lung when these were the seat of isolated eradicable disease. The coincident improvements in anaesthesia and in the pre- and post-operative phases were such that published series of resection for bronchiectasis often reported a mortality rate of under one per cent.

The application of thoracic surgery to the treatment of lung cancer, pulmonary tuberculosis, bronchiectasis and chronic lung abscess was no longer limited by hesitancy on the part of physicians to refer patients in a way that was noticeable before the war, but by the lack of thoracic surgeons and anaesthetists and by the poverty of institutional provision for the care of such patients.

The oesophagus had ceased to be regarded as a deeply placed, unapproachable organ and new chapters had been written on the management of its neoplastic disease and in the detection and relief of non-malignant lesions such as oesophagitis, peptic ulceration, cardiospasm and diverticular formation. The free incision of the diaphragm by the thoracotomy incision of the military surgeon for the treatment of many thoraco-abdominal wounds found an equally favoured civilian use for the approach to carcinoma of the stomach, for portal hypertension and for splenectomy.

The persistent ductus arteriosus, the coarcted aorta, the mitral, aortic, tricuspid and pulmonary valves have all been subjected to surgical treatment : the treatment of congenital obstruction to the outflow tract of the right ventricle and at the pulmonary valve level has become commonplace by indirect method (the Blalock anastomosis) or direct method (the Brock operation) and blind and open closure of septal defects are being used increasingly. The surgeon has called in the aid of hypothermia and mechanical extra-corporeal circulations in these fields and in other cardio-vascular disorders so that open cardiac operations have achieved a permanent place in surgery. The thoracic surgeon is now concerned with the treatment of pathological and disordered physiological states of the cardio-vascular, respiratory, alimentary and neurological systems ; he must therefore be a general surgeon working in a wide region ; he must be able to examine endoscopically the larynx, trachea, bronchus and oesophagus ; thoracoscopy though scarcely ever used for division of adhesions in artificial pneumothorax helps in the diagnosis of some thoracic lesions. The recognized surgical approaches may include the exploration of the neck and abdomen as well as of the thorax ; splenectomy or thyroidectomy may be done as individual operations or as part of more extended procedures such as total gastrectomy for cancer or the excision of malignant growths of the upper end of the oesophagus.

The pre-war tendency to separate the surgery of pulmonary tuberculosis from that of other thoracic disease has receded with the increased adoption of resection operations in the treatment of pulmonary tuberculosis, and this has emphasized the similarity of techniques required in the management of both groups of diseases.

The general principles of surgery naturally govern the practice of chest surgery and the thoracic surgeon must have had an adequate post-graduate training in general surgery before concentrating on this work ; the application of recent advances in chemotherapy, resuscitation, the maintenance of correct fluid and electrolyte balances, and physiotherapy, are adopted vigorously in major thoracic surgery, and the meagre reference to them in this book implies that the readers have an understanding of them and because they are not peculiar to this branch of surgery. In recent years surgical techniques and aims have become more physiological and the particular position of thoracic physiology requires a more lengthy exposition than the anatomical and pathological accounts presented. The advances in thoracic physiology have been too extensive to allow an adequate account of them to be presented and only an outline of that fascinating adventure can be given.

Through empirical trial and error and with the support of the anaesthetist, at least a working knowledge of the physiology of the open pneumothorax has been achieved, but only in recent days have the scientific approaches of the physician engaged in the study of human respiratory physiology been applied to our craft ; centuries of perplexing errors and fears

in the management of wounds of the thorax have led at last to a simple solution of the treatment of the sucking open wound and infection of the pleural cavity ; in the recent conflict, the application of physiological knowledge insisted on the early closure of the sucking wound, and after that, excision of the damaged area of the thoracic parietes which surgical experience has shown to be the essential prophylaxis against crippling infection ; but the story did not end there and the insistent demand of physiological principles called for early resort to methods that would improve lung function ; hence the early aspiration of traumatic effusions, the decortication of the strangled lung, the use of physiotherapy, the warding off of anoxia by rational oxygen therapy and the use of blood transfusion, all measures designed to correct a disorganized physiology. The technical advances in lung or lobe excision, in the treatment of pulmonary tuberculosis and cancer and in the surgical endeavours to improve the function of the physiologically and anatomically deformed or diseased heart are not enough.

“ Surgeons who stand on the threshold of the surgery of the lung today will not find prestige and fame in treading the easy pathways that were open to the older members of this Association. We enjoyed for a brief period the heyday of rapid technical development that follows the initial conquest of a new territory. Advance in the surgery of the lung will not be derived from technical experience alone ” (Churchill, 1949).

The investigation of the cardio-respiratory system by modern methods has passed the stage of providing fundamental basic conceptions and is being increasingly applied to the treatment of the thoracic surgical patient, as will be seen by a reference to the chapters written by Dr. Donald, Dr. Davison and Dr. Astley, which they have kindly revised in this edition.

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CHAPTER 1

ANATOMICAL CONSIDERATIONS

Accurate diagnosis and the execution of safe surgical techniques depend largely on the unravelling of distorted anatomy in the thorax: the anatomical picture presented at thoracotomy for the removal of a lung with an early carcinoma differs vastly from that seen when extreme pleural and pulmonary disease has apparently destroyed all anatomical planes and dispositions as in chronic empyema, advanced bronchiectasis or tuberculosis. But the dissection of planes through organized fibrous tissue ultimately displays an anatomy of remarkable regularity and nowhere is this more noticeable than in the deliberate exposure of the vessels and bronchi of a lung, lobe or segment preparatory to its resection. But notable abnormalities do present: these provide a host of conditions in the lungs, heart, great vessels, oesophagus, mediastinum and diaphragm, which frequently require surgical treatment and are discussed in the appropriate chapters.

Exact descriptions of bronchial anatomy are provided by Brock (1946, 1950), and the recent attempt to obtain international acceptance of a universally recognized nomenclature for the various broncho-pulmonary segments (*Thorax*, 1950) have simplified the descriptions of lung operations. False ideas on facts so fundamental as the location of the great fissures of the lung have only slowly been abandoned. The great oblique fissure of the lungs, formerly considered to start posteriorly at the level of the fourth rib or the third thoracic spinous process, is actually at a much lower level, usually that of the fifth or sixth rib, a piece of knowledge vital to those planning a thoracic approach to the various segments and lobes of the lung.

THE ANATOMY OF THE LUNG

Although most lungs show a clear division by definite fissures between the lobes, such lines of cleavage may be obliterated in whole or part by well-defined bridges or by inflammatory adhesion of lung tissue; areas of true fusion are seen best between the apex of the lower lobe and the posterior segment of the upper lobe and between the upper and right middle lobes. In surgical resections of lobes or segments this continuity of lung parenchyma between one lobe and another may hamper the dissection and exposure of hilar vessels, but once the vessels and the appropriate bronchi (lobar or segmental) have been isolated and divided the segments of lung to be removed can be peeled out along the relatively avascular segmental or lobar boundaries. If the lung is kept fully ventilated by the anaesthetist after the bronchus of the area to be removed has been clamped and divided, the line of demarcation between the aerated and non-aerated areas will be obvious unless pathological air drift is present (see p. 10). In such operative dissections the intersegmental vein is an excellent guide to the excision as it follows the line of the boundary between the segment to be removed and its neighbour.

The bronchial and vascular supply to the main lobes

The different anatomical arrangements of the two lungs have surgical significances; in general, pneumonectomy is technically easier on the left side than on the right because

of the greater length of the vessels and main bronchus and because the superior vena cava partly overlies the right main pulmonary artery; on the other hand the removal of the right upper lobe is simpler than that of the left where the arterial supply is arranged more awkwardly from a surgical point of view because of the sweep of the left main pulmonary artery behind its bronchus. These apparent anatomical difficulties are, however, readily overcome in both instances if dissection of the perivascular sheath is thorough and adequate.



FIG. 1.1

FIG. 1.1.—Lateral radiograph of a child.

The interlobar fissures show up well after a previous pleurisy. Note especially the posterior projection of the great fissure.



FIG. 1.2

FIG. 1.2.—Segmental collapses due to infected muco-pus.

Bronchoscopy was negative for neoplasm and the segments rapidly re-expanded. The areas collapsed are the apex of the right lower lobe and the anterior and posterior segments of the right upper lobe. Note the position of the apex of the lower lobe.

The bronchial supply (Fig. 1.3)

(A) *The left side.* The main stem bronchus from the carina of the trachea to the upper lobe orifice is much longer and has a more oblique course than the right-sided one. The upper lobe bronchus leaves the outer side of the main stem and divides into the apical, the posterior, the anterior and lingular segmental bronchi: often the apical and posterior bronchi have a common stem and this has led to the description of an apico-posterior segment in some works. The left intermediate bronchus is that portion of the main bronchus between the origin of the upper lobe bronchus and the branches to the lower lobe and is extremely short because the lower lobe apical bronchus arises much on the same level as the lingular bronchus when exposed in the main fissure as in the operation of left lower lobectomy and lingulectomy. The subdivisions of the bronchus into segmental branches is considered later.

(B) *The right side.* The right main stem bronchus leaves the carina more vertically than the left one and is wider and shorter. The upper lobe bronchus leaves it at a distance less than 2 cm. from the trachea, is more horizontal in direction than the corresponding bronchus of the left upper lobe and lies at a higher level than the main pulmonary artery; hence its older description, now discarded, as the eparterial bronchus. As the bronchus descends it is covered in part by the main stem of the pulmonary artery which is partially covered anteriorly by the superior pulmonary vein. The middle lobe bronchus arises from the anterolateral surface of the main stem and is usually opposite the bronchial opening of the apical segment of the right lower lobe as that leaves the posterolateral surface of the main bronchus. The main bronchus then passes on to divide into the four segmental bronchi of the lower lobe.

THE NOMENCLATURE OF THE BRONCHO-PULMONARY SEGMENTS

Various authors in presenting their individual accounts often gave different names to the segments, so that a confused nomenclature evolved. A recent attempt at an internationally accepted classification was reported to the Thoracic Society of Great Britain (1950) and this nomenclature will be adopted here. As it displaces many commonly accepted terms some of these will be given in brackets.

THE RIGHT LUNG

The three lobes of this side have ten main segments distributed as follows:

(A) *The right upper lobe*

1. Apical segment
2. Anterior segment (Anterolateral or pectoral)
3. Posterior segment (Posterolateral)

(B) *The middle lobe*

4. Medial segment (Superior)
5. Lateral segment (Inferior)

(C) *The right lower lobe*

6. Apical segment (Dorsal lobe, superior segment)
7. Medial basal segment (the cardiac lobe)
8. Anterior basal segment
9. Lateral basal segment (Mid-basal segment)
10. Posterior basal segment

(These are "major" segments: subdivisions occur of which perhaps the most commonly described is the sub-apical segment of the apical division of the lower lobe.)

THE LEFT LUNG

This has nine main segments.

(A) The left upper lobe

Upper division, i.e. that portion of the lobe bronchus before the lingular bronchus has left it, has three segments:

1. Apical segment
2. Posterior segment
3. Anterior segment (Anterolateral or pectoral)

} (Apico-posterior bronchus)

(B) The lingula (Lower division bronchus)

4. Superior segment
5. Inferior segment

(C) The left lower lobe

6. Apical segment
7. (Absent when compared with right side, i.e. no cardiac lobe)
8. Anterior basal segment
9. Lateral basal segment (Mid-basal segment)
10. Posterior basal segment

The chief alterations in this nomenclature are that the terms "medial" and "lateral" are preferred to "internal" and "external", that the use of "axillary" has been abandoned, and that "dorsal lobe" is no longer used as descriptive of the upper segment of the lower lobe. No classification is likely to please everyone and the one quoted fails to indicate certain other segments that are at times additionally present, but it has certain merits of simplicity and is of value to the clinician.

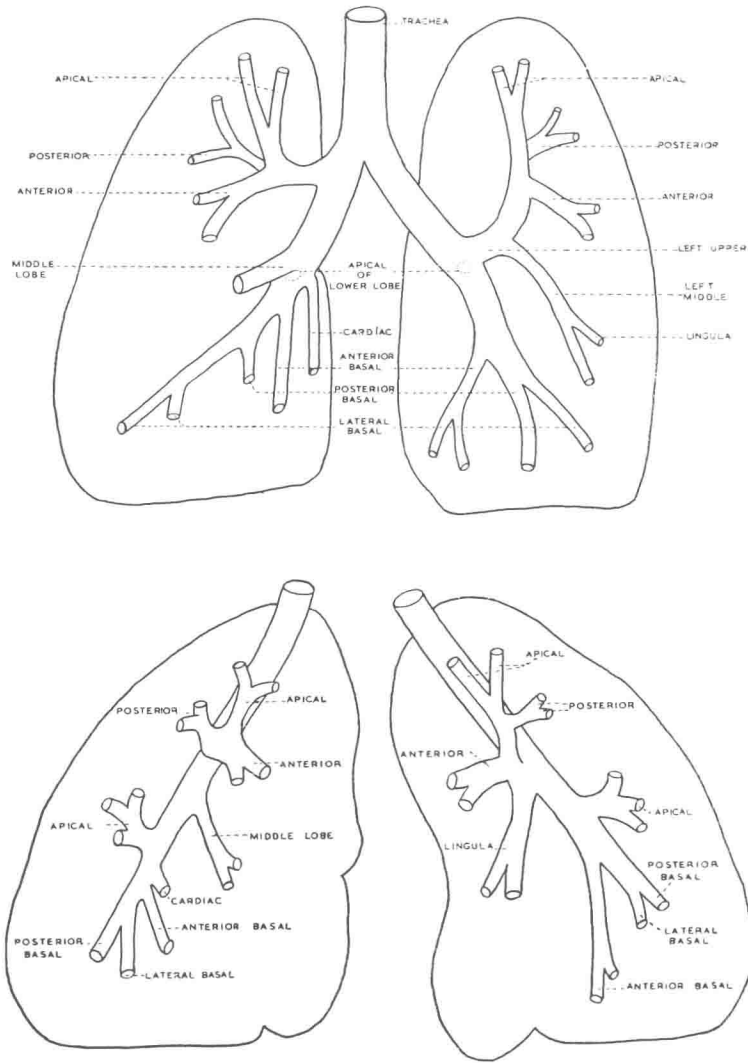
Anatomy of the broncho-pulmonary segment

The stimulus given to the development of better techniques for the removal of diseased lobes by the careful anatomical expositions of workers such as Brian Blades and Kent (1940, 1942 and 1943) was followed by many clear publications on the anatomy of the hila of each individual segment and the surgical removal of isolated diseased segments became an established procedure. This conservative resection, first practised on the lingula segment of the left upper lobe (Churchill and Belsey, 1939), was soon adopted in the treatment of bronchiectatic and tuberculous segments of a diseased lung so that unisegmental or multi-segmental excisions avoided the unnecessary sacrifice of healthy lung tissue, a conservatism of especial value when the disease is bilateral (Pilcher, 1941; Overholt, 1948).

Each segment has a fairly constant anatomical arrangement of its bronchus and artery, but the veins and lymphatics have frequent communications with those of the adjacent lung areas.

Intersegmental veins

Because of the important influence these have on the technique of segmental resection, a special account of their anatomy is necessary. Boyden and Scannell (1948) described clearly the existence of these veins: in addition to each individual segment having a clearly defined vein, blood passes to another vein that lies in the plane between two adjacent segments. If this vessel is ligated during a segmental resection the venous return of the healthy adjacent unit is largely obstructed so that passive congestion follows and this may be sufficient to produce post-operative haemoptysis. It is not always easy to define the trunk of this intersegmental vein at the hilum and in the actual operation it is wiser whenever possible to divide the artery and bronchus, apply gentle traction to them and so open up



(a)

FIG. 1-3

- (a) Diagrammatic representation of the bronchi: the upper drawing represents the anterior view, the lower diagram illustrates the lateral aspects.
- (b) Shows the segments of the left lung as seen from the lateral and mediastinal aspects.
- (c) Segments of the right lung as seen from the lateral and mediastinal aspects.
- (d) Segments of the right and left lungs seen from the anterior aspect.