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# DISEASES OF THE CHEST

H. CORWIN HINSHAW, M.D., Ph.D., D.Sc.

Clinical Professor of Medicine

University of California School of Medicine, San Francisco

Director of Medical Services, Harkness Community Hospital and Medical Center,  
San Francisco.

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## PREFACE

The first edition of this volume was completed in 1956 and the second edition in 1963 under joint authorship with the late Dr. L. H. Garland. It has received gratifying acceptance in its Philadelphia and London editions and has also been translated into the Spanish and Italian languages and has been issued from the Hakko Press in Tokyo as an Asian Edition. With the advance of knowledge in the field of Chest Diseases and the growing importance of medical education throughout the world, the need for a third edition has developed. This need was realized and discussed with the publishers and with Dr. Garland prior to his death in November 1966, and it was decided that the series should be carried on under my authorship. I am among the many who shall miss "Harry" Garland, whose keen wit and incisive analysis of every problem had become traditional wherever he appeared, and he travelled widely over the earth. Death has also taken my esteemed friends, Doctor Walter Heck and Doctor William Winn, who contributed chapters to the previous editions. The influence of these deceased collaborators remains in the present edition, although I have rewritten all text previously contributed by these authors, often with a modified viewpoint.

Drs. Carman and Young have made a valuable contribution by preparing Chapter 6. The field of pulmonary physiology and its clinical applications has advanced in complexity beyond the ken of the practicing physician, who must frequently seek consultation with the clinical physiologist as I have done in preparing this textbook.

Dr. Horton C. Hinshaw, Jr., my partner in all my professional pursuits—and my son—has exceptional knowledge and experience in the field of pulmonary diseases and especially those related to occupation, hence this chapter bears his name.

The aim of this book is to serve the needs of medical students and of physicians who are not specialists in chest diseases, to aid them in keeping abreast with developments in this fascinating field of medicine. These advances are of interest and meaning to every doctor, whatever his principal clinical activity. When condensed into a single volume of modest weight it is not possible to supply encyclopedic coverage of every topic; nor is it usually desirable to engage in complicated academic dissertations when addressing the present-day busy student or practitioner.

I have attempted to remain on the practical level at most times and to keep in mind that the reader will often be interested in treatment as well as in diagnosis. Brief philosophical excursions were deemed appropriate when dealing with some issues of universal human concern, such as are encountered in discussions of lung cancer, emphysema and tuberculosis.



The opinions expressed are in general agreement with current Anglo-American medical thought and the literature cited has usually been in the English language. In consulting such international compendiums as *Excerpta Medica*, I find little international dispute or difference of viewpoint in biomedical matters. What a pity that politicians cannot be so agreeable and sympathetic.

It has been my good fortune to have enjoyed intimate association with scholarly physicians and surgeons during my 16 years at the Mayo Clinic, my 10 years with Stanford University, and a similar period with the University of California. During these years, I have organized or participated in regularly scheduled interdisciplinary conferences with surgeons, pathologists and radiologists; not only in the institutions mentioned, but also through consulting and teaching appointments at Letterman Army Hospital, Oakland Naval Hospital, Weimar Medical Center, Harkness Medical Center, Fresno General Hospital and the several Veterans Administration Hospitals of the Western States Area. The vast clinical material of these institutions and that of a busy consulting private practice have enabled me to observe at first hand nearly every one of the hundreds of disease entities described on these pages. Some which are rarely seen by the general physician appear frequently here and are found in various guises. It seems proper that I should share some of these experiences with the readers of this volume.

Relatively few references to medical publications are offered on each topic under discussion. Those chosen generally include sufficient bibliographies to guide the student through the maze of medical literature with minimum intellectual trauma. Many important contributions are not mentioned in this book, being displaced by more recent papers or others which were judged to serve the needs of the student. It is believed that these will provide adequate keys to the literature.

There are many kinds of books, and this is one written largely by a sole author. Most volumes with similar comprehensive titles are collections of monographs by authorities discussing very specialized topics. There are many advantages to such compilations and the student is urged to use them freely, as I have done in the preparation of this book.

Successful physicians look upon their occupation, not as a means of livelihood alone nor as a mission to suffering humanity exclusively, but as a quest—a contest of wits—a solution of mysteries and control over events. It is not exactly a sport—a demeaning word—but still a contest; more like chess than tennis. It is frustrating at times but on other occasions, especially when dealing with chest diseases, it is profoundly satisfying. And satisfaction is most lasting, more real, when the patient shares in the triumph.

Finally, I wish to record the fact that every aspect of my association with the editors and publishers has been pleasant and beneficial. No author could wish for more.

H. Corwin Hinshaw

San Francisco, California

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## Chapter 1

# DIAGNOSTIC PROCEDURES:

## *Clinical History and Evaluation of Complaints*

### INTRODUCTION

Thoracic disorders are the concern of every practitioner of medicine, even those whose primary interest is far removed from diseases of the chest. Success or failure of surgical or medical treatment of many diseases may depend upon the competence of the lungs to deal with the stresses involved. Proper maintenance of the circulation of air and blood through the lungs is essential to the welfare of the entire body and occupies a large share of the physician's attention during every critical illness.

The lungs are peculiarly vulnerable to infection and injury from without. Pulmonary complications are dreaded developments and not infrequently are responsible for fatality under circumstances when every other aspect of the illness was progressing favorably.

Serious study of diseases of the chest is urged upon every surgeon, as well as upon every medically oriented physician and upon specialists in other fields of medical endeavor.

There are unique satisfactions to the pursuit of problems involving either diagnosis or treatment of pulmonary diseases. Therapeutic problems often offer the opportunity of specific and curative treatment of life-threatening conditions. Diagnostic problems are intriguing because of the great frequency with which a precise diagnosis may be achieved, utilizing a number of both simple and sophisticated sources of information.

The thoracic organs are demonstrable with great clarity by the roentgen ray. The fact that the lungs are normally filled with radiolucent air permits clear vision of any abnormality which substitutes more radiopaque substance—exudate, fluid or tissue—for the air. The channels of ventilation can be outlined with extreme clarity by bronchographic contrast media. The circulatory channels are readily portrayed by angiographic methods and may be witnessed in dynamic states by viewing cinematographic recordings. Roentgenology of the thorax, in fact, has more to offer the physician than a similar investigation of any other organ system.

The bronchoscope enables the physician to explore extensively into the



depths of the channels of ventilation at little risk and tolerable discomfort to the conscious patient. These channels communicate to the exterior and carry secretions for study by the microbiologist and the cytologist—studies which are capable of providing absolute diagnostic information. Endoscopy and microscopy have less to offer the physician who is investigating any other organ system.

Diagnostic surgery—including exploratory thoracotomy and less pretentious biopsies—has become practical and reasonably safe, capable of yielding life-saving information when that information cannot be obtained by roentgenography, microscopy, cultural methods, serologic studies or endoscopy. The thoracic surgeon has much to offer the diagnostician.

Finally, physical examination tells the examining physician a great deal about the structure and dynamics of the thoracic organs even though it does not remain the dominant diagnostic procedure that it was believed to be a generation ago. Efficient physical examination is occasionally rewarding but requires patience and is an art worthy of cultivation. The thoracic organs reveal themselves to the senses of the examiner more readily than is true of other organ systems.

Every physician will find his task simplified and his efforts productive if he maintains a personal relation with the radiologist, the bacteriologist, the pathologist and any other physician or technician concerned with his problem. These medical and paramedical partners in diagnostic and therapeutic endeavors can teach the clinician much that is new, and more that he has forgotten. To visit the laboratories and to converse informally or to arrange formal consultations, even at bedside, with radiologists and laboratory physicians is to open a new, intriguing and thoroughly rewarding experience to the clinician who may previously have relied on written reports from these colleagues. And it is a special blessing to the clinician when colleagues in the laboratories and nonclinical departments—even those engaged primarily in research—have experience and understanding about clinical matters, preferably at first hand. Such experience and understanding will come if the clinical physician shares his problems and his achievements with those who have too often remained in the background. Large and complex medical institutions should recognize the importance of opening these lines of communication which are likely to have been neglected in their charts of organization.

## THE CLINICAL HISTORY: INTERVIEWING THE PATIENT

The traditional history, a recital of the patient's complaints, properly precedes all other events. Unlike some conditions encountered in the practice of internal medicine, disorders of the chest are likely to provoke minor or misleading symptoms—an unfortunate circumstance when dealing with some hazardous diseases like tuberculosis or bronchogenic carcinoma. Some significant events or sensations may be overlooked by the patient and must be sought with special care by the inquiring physician. Fortunately the diagnostician is rarely, if ever, entirely dependent upon symptoms in making a diagnosis of chest disease. He can anticipate reliable information from his more objective examinations and will arrive at a secure diagnosis eventually, if disease is present, regardless of what his patient may tell him. The cautious and systematic questioning of the patient may unearth clues from remote or recent events which fully justify this thorough exploration, even though it takes much time and patience.

The physician's skill is often measured by his ability to interpret his patient's complaints in terms of organic pathology and disturbed function. He will use this skill to design a plan of investigation which will confirm or deny all the possibilities which either he or his patient may have imagined. It is this ability to synthesize information which is learned by experience, and it is so difficult to convey that experience through the printed page. Yet it is possible to communicate some measure of one's clinical experience permitting each successive generation of physicians to start at a level of efficacy superior to that of those who went before.

### TYPES OF THORACIC PAIN

Pain in the chest is one of the most frequent conditions that prompts a person to seek medical advice, not necessarily because of its intensity, but through the patient's fear that it might represent evidence of some disorder of the heart or lungs. Distress of equal or greater severity in another portion of the body, such as headache or painful feet, may be tolerated for years without anxiety.

Careful attention to the details of the complaint of thoracic pain may provide the diagnostician with clues that will determine appropriate examinations. When pain in the chest is a prominent complaint it is rarely safe to make a diagnosis without thorough investigation.

#### *Pulmonary Pain and Referred Pain*

The lung and the visceral pleura covering it are insensitive to pain stimuli. Severe inflammatory, neoplastic or other disease may invade the lung parenchyma with devastating results, yet the patient may feel no pain, or at most only a dull distress that is difficult to describe. Pain occurs when there is involvement of the parietal pleura, the chest wall, the diaphragm, or mediastinal structures.

Thoracic pain, like abdominal visceral pain, may be referred to the area of the skin supplied by similar nerve roots arising from the spinal cord. Thus, pain arising within the thorax may cause upper abdominal pain anteriorly where the intercostal nerves innervate the abdominal wall. The most striking example of this reflex is that pain arising in the diaphragmatic pleura which is referred to the trapezius region at the base of the neck and the shoulder, an area supplied by the third, fourth and fifth cervical nerve roots which also make up the phrenic nerve.

Esophageal pain can be disturbing to the patient and perplexing to the physician. Not infrequently, pain referred to the anterior thoracic region caused by esophageal spasm, achalasia, hiatal hernia, esophagitis, or carcinoma of the esophagus may be confused with cardiac pain or incorrectly attributed to other intrathoracic disorders.

#### *Pleural Pain*

Acute inflammation of the pleural membranes may cause symptoms of severe intensity and specific character. Symptoms of pleuritis are often indica-



tive of serious diseases, such as pneumonia, pulmonary embolism, tuberculosis and malignant disease. Pain of pleural origin is restricted in distribution rather than diffuse, is localized to one side or the other, and tends to be distributed along the intercostal nerve zones. A characteristic feature is a clear relation to movements of the thorax. The patient may describe this as a severe "catch" in the side of his chest preventing full and free breathing, and he may have learned that the pain is eased when he restricts chest expansion with his hand. Movement of the trunk (also bending or stooping, and turning in bed) may aggravate the pain, and the movements incident to coughing may cause great distress. When these symptoms are recited, the physician immediately turns to diagnostic possibilities, and the associated circumstances will help to channel his speculation. If severe and convincing pleural pain follows an abdominal operation within several days, pulmonary embolism will rank high among the possibilities. If, on the other hand, such symptoms are in association with an acute respiratory tract infection and are related to fever, cough and expectoration, an acute pneumonia may seem probable. If such an episode is the culmination of a more prolonged illness, preceded by such symptoms as weight loss and depletion of energy, perhaps with persisting and increasing cough, the physician may first consider the possibility of pulmonary tuberculosis or malignant disease within the thorax.

The word "pleurisy" has been used so loosely to indicate any inconsequential thoracic pain that patients are misled when the physician has referred to the pain of an acute pleuritis as pleurisy. The word should be used cautiously or so qualified as to make it clear that true pleurisy is likely to indicate serious disease and that extended effort should be made to reach an exact diagnosis. (Chapter 31 is devoted to diseases affecting the pleura.)

### ***Pain of Intercostal Neuritis***

Intercostal neuritis, especially that of herpes zoster, may cause pain similar to that of pleuritis. The neurologic origin of the pain frequently is suspected when it appears to be superficial in character and related more specifically to coughing, sneezing or straining, and other influences that increase cerebrospinal fluid pressure. The latter symptoms are particularly prominent when the intercostal neuralgia is due to a spinal cord tumor. Also, the pain of intercostal neuritis may be lancinating, with electric shock sensations, and the bolts of pain may be unrelated to the movements of respiration. Hyperalgesia or anesthesia of an area on the chest wall, with segmental distribution, is an indication of intercostal nerve involvement.

### ***Muscular Pain***

Acute myositis occurring in the muscles of the neck and shoulders produces the syndrome of "stiff neck." Myositis may also involve the rhomboid group of muscles and those of the shoulder girdle at the point of their thoracic attachments. Experienced physicians have temporarily mistaken the symptoms of acute myositis of superficial chest wall muscles for evidence of intrathoracic disease.

### ***Costochondral Pain***<sup>1</sup>

Although infrequently recognized and rarely mentioned specifically in medical literature, pain localized to the costosternal cartilaginous linkages is a common complaint. Many patients have feared serious cardiac or pulmonary disease when their symptoms were due to inflammation of the costosternal articulation, and they may have failed repeatedly to receive adequate explanation from physicians. The diagnostic key lies in the fact that the pain is clearly localized to one or more of the cartilages; there is tenderness to pressure, and often palpable enlargement of the cartilaginous bridge between the rib and the sternum. The most frequent sites of costosternal perichondritis are the second, third and fourth cartilages. In developing the history it may be possible to relate this complaint to previous trauma, although this is not invariably the case. The pain is usually dull, with little if any relationship to respiration or movement, and is described as a gnawing, aching pain, often most noticeable when the patient is lying in bed at night. Even though the pain is mild, its persistence over many months or years may lead to a fixation neurosis, which can be resolved by the physician who recognizes and explains the benign character of the symptom.

### ***Other Chest Wall Pain***

The system of joints, muscles and fascias involved in movements of the thoracic wall is complex. Since these structures are in constant motion throughout the patient's life it is surprising that "rheumatic" pains do not occur much more frequently in the chest wall. Fibrositis of the muscle-bone juncture may simultaneously involve the chest wall and other parts of the skeleton. Likewise, spondylitis of the thoracic spine has its chest wall component, and many less definable skeletal disorders may produce discomfort in the chest. Usually, these complaints are not severe but are intensified by the patient's fear of serious pulmonary or cardiac disease. Complete study is often necessary to assure physician and patient that such symptoms are benign.

Occult rib fractures may not be revealed by x-ray examination until callus forms a few weeks later. Sometimes, especially in women, fractures result from minor trauma, even from the mere strain of coughing. Pain may be severe and disabling, but healing can be promised without treatment in most instances. (See chapter on Thoracic Injuries.)

### ***Cardiac, Pericardial and Aortic Pain***

Pain of cardiac origin, especially when due to disease of the coronary arteries, has clear-cut characteristics in typical cases, which permits diagnosis on the basis of history alone, even in the absence of objective findings. Pain localized beneath the sternum and to the left, with radiation into the shoulder, arm or neck, that is caused by physical exertion or acute anxiety and relieved by rest is characteristic of angina pectoris. Sometimes this pain is not intense, so that when the patient is not introspective and has learned to control the pain by restricting activities, he may give it scant attention and not even admit the

<sup>1</sup>Benign, painful swelling of the costal cartilages has sometimes been called Tietze's syndrome.

symptom of typical anginal pain until leading questions are asked by the medical examiner. Every patient should be questioned about thoracic pain or other distress (such as "tightness of the chest") related to unusual physical effort or excitement. The more clearly it is related to stress, and the more promptly it disappears after rest, the more significant it becomes to the physician.

When thoracic pain occurs in a patient who is able to exercise freely without any restriction imposed by pain or dyspnea, it is safe to conclude that the pain is not due to heart disease, provided his activities are sufficient to test his exertion tolerance.

Pain of acute coronary artery occlusion may be confused with other conditions affecting the abdomen as well as the thorax. The retrosternal location of the pain, its character and intensity, its relation to symptoms of shock, and electrocardiographic findings will permit its recognition in most instances.

Pain of pericardial origin may have peculiar qualities that attract the physician's attention. It is retrosternal, extending somewhat to the left side, and, like anginal pain, may be related to exertion. Since it is also related to respiration, it is similar in some respects to pain of both pleural and cardiac origin.

Aortic pain, as in aortic aneurysm, may be difficult to recognize as such, but it is likely to be related to exertion, especially in its earlier phases of development. It is often a deep, boring, agonizing type of distress which patients may compare to that of a severe toothache. The location is retrosternal or, when an aneurysm exerts pressure on the thoracic spine, the pain may be most keenly felt in the interscapular region.

## COUGH AND EXPECTORATION

The patient's estimate of the severity and intensity of cough and expectoration is rarely a dependable guide to the physician. If these symptoms are of long duration, the patient may regard coughing with little more thought than he regards breathing. On the other hand, a person who is apprehensive may exaggerate the severity of his cough and the quantity of his expectoration and mislead the inquiring physician. The patient who inhales tobacco smoke excessively may ascribe his cough to this habit, not recognizing serious pulmonary disease. Often it is helpful to question a close associate of the patient as to the frequency of coughing and to determine if the symptom has increased with passage of time. In nearly all instances it is desirable to inspect a 24-hour sputum collection before attempting any decision as to the character or amount of expectoration.

### *Chronic Bronchitis and Smoker's Cough*

Chronic bronchitis, a precursor of pulmonary emphysema, is an important disease often neglected in the United States. The diagnosis is made on clinical grounds and by exclusion of other conditions. Long-continued cough, increasing over a period of years, associated with either expectoration of thick mucilaginous sputum or physical findings of wheezes and rales should lead the physician to suspect bronchitis.

Patients with a cigarette cough have chronic bronchitis, and such symptoms should not be dismissed as inconsequential. Emphysema and bron-



chogenic carcinoma are to be feared by one who has chronic bronchitis, hence the importance of establishing the diagnosis as early as possible.

### **Acute Bronchitis**

Acute bronchitis of epidemic infectious origin is frequently encountered. Some epidemics of acute respiratory tract infections appear to have a distinct predilection for producing inflammatory reaction in the larynx, trachea and larger bronchi. Undoubtedly, some of these epidemics are specific in character (influenza or mycoplasma infections). Others appear to be of bacterial origin, responding well to appropriate antibacterial drugs. The recognition of acute epidemic bronchitis is not difficult when associated with laryngitis and when other persons in contact with the patient have recently developed similar symptoms. The diagnosis of acute bronchitis can be made with assurance only in retrospect—after symptoms have subsided and other causes of cough have been eliminated.

A descending respiratory tract infection, initiated with symptoms of acute coryza or sore throat, is characteristic of some epidemics. When a similar clinical pattern is observed in several members of a household the symptoms are probably not due to progressive disease. However, many cases of tuberculosis and carcinoma have first resembled acute bronchitis.

### **Bronchiectasis**

In its classic form, bronchiectasis can be strongly suspected by the recital of symptoms. The patient will describe purulent expectoration, perhaps extending as far back as he can remember. Despite many previous medical consultations, the diagnosis of classic bronchiectasis may not have been reached. The crucial point in the history of patients with bronchiectasis is the production of sputum containing pus. The history of productive cough is less likely to be clear-cut in the case of women and children because they are apt to swallow the sputum and may never have seen it. The patient may not have noted the offensive odor so commonly encountered in bronchiectasis, although the sputum need not be offensive or voluminous. The presence of blood in the sputum intermittently over many years without clear-cut roentgenographic evidence of disease is also strongly suggestive of bronchiectasis, as are intermittent attacks of chills and fever, and frequently recurrent "influenza" symptoms. Careful questioning often will reveal that episodes of chills and fever are associated with retention of sputum, but the patient may not volunteer this fact. Direct questioning as to a change in the character of the cough prior to or during febrile episodes is important.

### **Aspirational Bronchitis**

The symptoms of bronchiectasis may be closely simulated in patients who have no true bronchiectasis but who have purulent infection of the paranasal sinuses and who aspirate the pus into the lower respiratory tract, especially during sleep.

Regurgitated gastric contents, in patients with esophageal disorders, may be aspirated and cause bronchial symptoms. Food collecting in a pharyngo-esophageal diverticulum may be aspirated, especially during sleep.

## **Bronchial Asthma and Asthmatic Bronchitis**

Patients with symptoms due to bronchospasm may state that their principal complaint is paroxysmal cough, especially at night, and may not mention the symptom of wheezing. Whenever patients describe paroxysmal cough, especially occurring at night, they should be questioned about wheezing respiration with audible musical squeaking and whistling sounds. At times, other members of the family may be more impressed with the asthmatic features of the attack than the patient. Recurrent attacks of cough may be caused by infectious asthmatic bronchitis or allergic bronchial asthma. The physician must know whether bronchospasm is or is not present when paroxysmal cough is an outstanding complaint.

## **Pulmonary Tuberculosis**

Pulmonary tuberculosis remains a common cause of cough and expectoration, and all patients who raise sputum should submit material to be examined for tubercle bacilli regardless of the character of the x-ray shadows observed, and regardless of other symptoms. The symptoms of pulmonary tuberculosis may resemble those of an acute lower respiratory tract infection, chronic bronchitis, acute pneumonia, smoker's cough, asthmatic bronchitis, bronchogenic carcinoma or any other disease that produces bronchial irritation. The sputum may or may not be voluminous, purulent or contain blood. Asthmatic wheezes are present in some patients with tuberculosis.

## **Bronchogenic Carcinoma**

Cough and expectoration produced by bronchogenic carcinoma may lack specific characteristics. The cough may be a mild, irritative, nonproductive one, or it may produce foul sputum with or without blood. Steady progression in intensity over a period of several months may suggest malignant disease. If the carcinoma involves a main bronchus and produces partial obstruction, the coughing may be related to a respiratory stridor.

Cough and expectoration may be prominent features in bronchogenic carcinoma even before suggestive shadows appear in roentgenograms. Patients with bronchogenic carcinoma have sought medical advice soon after the appearance of cough and expectoration, but negative x-ray examinations have falsely reassured the physician and the patient for a time.

## **Paroxysmal Cough, Vomiting and Syncope**

Coughing begets cough, just as scratching accentuates an itch, and perhaps for the same reason. Paroxysmal coughing, as in pertussis, may terminate in vomiting, which seems to break an acute vicious circle. Others with severe coughing attacks have continued to the point of utter exhaustion and complete unconsciousness. A definite syndrome of cough syncope has been recognized.<sup>2</sup>

<sup>2</sup>A. Kerr and V. J. Derbes (Ann. Int. Med., 39:1240, 1953) describe this condition fully, with 81 references to previous literature. See also the reviews by W. S. McCann et al. (A.M.A. Arch. Int. Med., 84:845, 1949) and H. D. McIntosh et al. (Am. Heart J., 52:70, 1956).