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Chronic Obstructive Pulmonary Disease



edited by

Thomas L. Petty

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Alvan L. Barach, M.D. (1895-1977)

“Our mission as physicians is not simply to prolong life, but to contribute to making it absorbing, too. . . .”

Alvan L. Barach

DEDICATION

It is a fact that I was just beginning to review the page proofs of Chapters 5 and 6, major contributions to this monograph by Alvan L. Barach, just before sunrise December 14, 1977. As I settled in to the pleasant task of rereading these chapters I received word of Al's death, which occurred the evening before. At that moment, if not subconsciously before, I decided to dedicate this book to Al.

Dr. Barach, as this monograph clearly reveals, was fascinated by the breathless patient. This near obsession, he revealed a short time ago, originated with fears over his mother's bouts of laryngospasm which he witnessed at the age of five. He was already making rounds with his physician uncle at age 11 and with the help of a scholarship enrolled in the Columbia University College of Physicians and Surgeons in 1915. His impatience to begin medical studies is revealed in the fact that he applied after only 2 years of college and without a bachelor's degree. (It was extremely unusual to enroll without a bachelor's degree). He interned at Columbia Presbyterian Hospital in New York in 1919 and immediately began the first systematic use of oxygen in this country. He followed this training with a fellowship at the Massachusetts General Hospital and expanded his oxygen studies. He returned to Presbyterian Hospital a year later to pursue a career in both clinical investigation and private practice, a dual ambition mastered by very few before or since! In 1924 he introduced an oxygen tent of his invention for the treatment of severe pneumonia and other hypoxic states. His understandings of the physiologic basis for breathlessness and the advantages of skills in both the science and art of medicine are revealed in two early articles [*JAMA*, 77: 1217-1222 (1921); *JAMA*, 79:693-699 (1922)]. Commenting upon symptomatic treatment for pneumonia, he stated that this may "be either empiric or rational; the latter, of course, is the method of choice." How appropriate for this monograph! He quickly recognized the value of arterial blood gases in guiding oxygen therapy and the fact that hypoxic states could be effectively and safely treated with oxygen. He learned and taught before anyone else that the slow compensated rise of carbon dioxide was adaptive rather than deleterious in patients with advanced COPD (see Chapter 6).

He was a creative scientist in every sense. He had an unending stream of ideas leading to innovative approaches to management, many of which were so revolutionary as to stimulate criticism from slower thinkers. He was chided that research was the pearl of the academician and was insulted by so-called "purists" of the day who somehow felt that poverty was a fundamental requirement for discovery.

Al was an astute observer and he recognized the significance of what he saw. He referred to the need to cite "Nature et al.," as a coauthor on all clinical research. In truth he was the founder of the field of respiratory therapy, but more than this he conceived of and tried most of the good ideas important to our field today, including end expiratory pressure and techniques of rehabilitation. In fact, it was in these two areas that our friendship began following a substantial chastisement by Al that I had either failed to appreciate his original report on continuous positive pressure breathing (similar to our positive end expiratory pressure—PEEP) published in 1938 or had been too lazy to consult the earlier literature on pressure breathing. Earlier he had warned that our scientific approach to the management of emphysema patients failed to deal effectively with the subject of dyspnea which was (is) what brings the suffering emphysema patient to the physician in the first place! Following a visit in New York more than a decade ago I returned home full of advice and admonitions; thus we became constant correspondents, colleagues, and friends.

Al wrote more than 300 scientific papers and six books including a novel. He awoke early and pondered before writing (something advisable to modern day writers). He told me once of his secret study. "It was a place I went to; if I was not tired I would ponder, if I was tired I would write a paper," he said.

In 1977 the American Thoracic Society awarded Al its highest honor, the Trudeau Medal, in San Francisco. Earlier in 1962 the American College of Chest Physicians had awarded him its Gold Medal. The Sugarloaf Conference on the scientific basis for respiratory therapy, which led to many contemporary studies cited Dr. Barach's early work more than anyone else's in its deliberations on the state of the art of respiratory therapy [*Am. Rev. Resp. Dis.*, 110(Pt. 2):1202 (1974)].

Through the many pleasant meetings I had with Al, often with his wife Frederica whom he married in 1933, I realized that it was not just science and art of medicine that made Al great, it was his humanism based upon deep understandings of the human spirit, its failings and its strivings. One had only to make rounds with him and observe his approach to his patients to realize that he had it all.

Until the last days of his life he engaged in clinical research and the practice of medicine. For those who are dizzied by the pendulum swing of emphasis on scientific discovery and later to practical application, I strongly recommend the review of Dr. Barach's career which kept both in balance.

His recent concerns focused on social and economic problems which face us all such as safe and available energy for our industries, cities, and people.

Though his friendship and warmth never failed, he did not hesitate to speak firmly when he was sure of his correct opinion. Al Fishman (University

of Pennsylvania) once suggested that Dr. Barach was a distant descendant of a salmon, referring to his "uncanny ability to run successfully upstream, against the current" (personal communication). "I offered it to him admiringly as a salute to a lifetime of swimming upstream and enjoying the process of encountering obstacles and resistances. He swam in style."

Al was the first to agree to contribute to this monograph, the subject of his life's work in research and the practice of medicine. His two chapters were the first to arrive. They bear witness to his experience, wisdom, and daring and his zest for living!

"Let's stay on earth til our cup is full
Of love and grief and morning sky;
Until glory, splendor and power are dull;
Yes, let's wait til then to die" . . .

Alvan L. Barach

Thomas L. Petty

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FOREWORD

I would be hard put to say whether the expansion of research on the lung and on respiratory disease is a precursor or a result of increasing public awareness of the importance of pulmonary illness. Whatever the case, we have undoubtedly witnessed both phenomena within a relatively short period of time, and with them a rather sobering realization of the limitations in both scientific and general public knowledge of lung disease. New concerns about the impact of environmental and occupational hazards on lung function—impacts that may only manifest themselves in frank disease after decades of seemingly innocuous exposure—serve to remind us all that society pays a heavy price when knowledge lags behind action, and moreover that society looks to science for solutions.

This series of monographs is, therefore, most timely and important. The substantial increase in the number and variety of scientific reports on respiratory and pulmonary topics makes it all the more critical that work in this field be subjected to thorough and comprehensive review as a service to the scientist and the physician who find it virtually impossible to “keep up,” let alone to assimilate and evaluate a rapidly growing body of knowledge in an area of human health that is of mounting importance.

Chronic and acute lung diseases are among the major causes of disability and death in all age groups. From a public health standpoint, prevention of these diseases is a goal that amply justifies an increased commitment of research resources. For it is clear that the most effective paths toward prevention will emerge out of disciplined study in many fields, from the physiology and biochemistry of the respiratory system to the pathology and therapy of respiratory disorders.

I feel sure that this series of publications will continue to make a substantial contribution to the science and practice of medicine and to the hopes we have for more effective concepts and methods of preventing a major segment of human disease.

Theodore Cooper, M.D.
Former Assistant Secretary for Health
Department of Health, Education, and Welfare

PREFACE

The past two decades have brought major progress in understanding the clinical features, course and prognosis, and pathology of the disease spectrum commonly called chronic obstructive pulmonary disease (COPD). Correlations relating lesions of the conducting airways and alveoli, to clinical features of disease, although imperfect, have helped define the anatomic basis of chronic airflow obstruction, the physiologic signal of advanced disease. Epidemiological studies have clearly identified risk factors related to smoking behavior, occupation, environmental air pollution, and at least one host factor, the heritable deficiency of a glycoprotein believed to be an important lung defense mechanism. This discovery had added momentum to research interests into the basic nature of chronic lung injury resulting in the clinical disease state.

The early natural history, however, remains largely unknown, and experimental models, though interesting, have not accurately produced a syndrome closely resembling the human disease process.

Therapeutic advances directed mostly to very advanced disease, though beneficial, are clearly not the answer to this major health problem which has assumed epidemic proportions in all industrialized nations of the world.

Thus, it is time to assess our knowledge of the subject and consider the age old question, "Where do we go from here"?

Collectively my co-authors and I benefit from nearly 200 years of experience of the study and treatment of COPD. We have approached our task from a clinical vantage point since too little is known about the early asymptomatic stages of disease and the basic mechanism of lung injury. We direct our message to all physicians, nurses, and therapists who care for sufferers of COPD and especially to those students of the respiratory system who will be the restless investigators of the future seeking tomorrow's solutions to the problems we struggle with today.

The splendid assistance of Mrs. Sandy Blegebron in manuscript preparation and indexing is gratefully acknowledged.

Thomas L. Petty

INTRODUCTION

This volume, edited by Thomas L. Petty, is the first "clinical" volume of the series "Lung Biology in Health and Disease." It is quite appropriate that its subject is chronic obstructive pulmonary diseases as, considering all their aspects, they are the most important pulmonary disorders affecting the people of our country. The reported mortality from these diseases has been increasing steadily during the last two decades, although this may be due in part to better recognition. They now rank eighth among the main causes of death in the United States and account for direct and indirect economic costs that exceed the staggering sum of twelve billion dollars each year. The suffering caused by the chronic obstructive pulmonary diseases is immeasurable: they usually start relatively early in life and have a lingering incapacitating course.

The research effort devoted to these diseases is of greatest importance, offering hope that someday curative regimens will be developed and made available when prevention is not possible. Today, however, we are still unable to treat patients effectively and, although we know the causes of chronic obstructive pulmonary diseases, we are even less able to prevent and control them because of existing environmental and social conditions and life-styles that are not readily amenable to change. Hence, it is essential that what we already know about chronic obstructive pulmonary diseases be continuously restated and information updated in order to reach and inform a larger number of clinicians, researchers, and students of human biology.

We are fortunate that Dr. Petty accepted the task of editing this volume: few have had his interest in and experience with these diseases. He has written extensively on the subject, and this new contribution is an asset to this series of monographs. In addition, Dr. Petty chose authors with outstanding qualifications and remarkable reputations: the authors of this volume represent a cumulative experience of more than 200 years in the clinical investigation and care of patients with chronic obstructive pulmonary disease. As the reader will see, their views are sometimes diverse, if not opposed, but all share the same genuine concern: to do the best for their patients.

I feel especially privileged that Dr. Barach contributed two chapters to this book: he himself brought more than half a century of innovative and

cumulative thinking vis-a-vis chronic obstructive pulmonary diseases. These two chapters are his last writing; his death in December 1977 is the end of an era. His peers, his students, and his patients alike will all share a feeling of great loss.

Claude Lenfant, M.D.
Bethesda, Maryland

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1

Definition, Identification, Assessment, and Risk Factors

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This chapter presents an overview of the clinical manifestations, x-ray features, and physiologic abnormalities of chronic obstructive pulmonary disease (COPD). It serves as an introduction to subsequent chapters, each written from the perspective of a clinical investigator who has extensive experience in studying and caring for large numbers of patients with advanced disease.

I. Definition

The definition of COPD has been difficult and thus confusing, and today many students of this subject suggest a redefinition (see Chapter 2). Historically, two terms, chronic bronchitis and emphysema, have been loosely used to refer to large numbers of patients with cough, dyspnea, expectoration, and progressive respiratory impairment. The collaborative studies of both American and British clinicians helped establish the fact that similar clinical types of disease were found in both America and Britain. Today nonspecific designations are commonly used to refer to both chronic bronchitis and emphysema. Historically, chronic obstructive lung disease [1], chronic airways obstruction [2], chronic obstructive bronchopulmonary disease [3], and COPD [4] became widely