

The Diagnosis and Treatment of Pulmonary Tuberculosis

By PAUL DUFAULT, M.D.

*Medical Director of the Rutland State Sanatorium,
Massachusetts Department of Public Health*

WITH A CHAPTER ON PATHOLOGY

BY A. REYNOLDS CRANE, M.D.

*Professor of Pathology, University of Pennsylvania School of Medicine ;
Director, Ayer Clinical Laboratory of the Benjamin Franklin
Clinic and the Pennsylvania Hospital ; Consultant to
Valley Forge Army Hospital*

AND A CHAPTER ON PULMONARY FUNCTION

BY OSCAR FEINSILVER, M.D.

*Senior Visiting Physician at St. Vincent Hospital, Worcester, Mass-
achusetts and Bronchoscopist at the Rutland State Sanatorium*

*Second Edition, Thoroughly Revised,
with 162 Illustrations*

LONDON

HENRY KIMPTON

1957

ALL RIGHTS RESERVED, 1957

Library of Congress Catalog Card Number : 57-10208

Printed in the United States of America

Contents

CHAPTER	PAGE
1. Historical	7
2. The Tubercle Bacillus	17
3. Laboratory Methods in the Diagnosis of Pulmonary Tuberculosis	27
4. Allergy and Immunity	52
5. Modes of Infection	58
6. Pathology of Tuberculosis By <i>A. R. Crane, M.D.</i>	64
7. Primary Tuberculosis in Childhood and Adult Life	100
8. Symptoms of Pulmonary Tuberculosis	111
9. Physical Examination	117
10. Radiological Examination of the Chest	125
11. Evaluation of Pulmonary Function By <i>Oscar Feinsilver, M.D.</i>	154
12. Differential Diagnosis	182
13. General Treatment	232
14. Specific Treatment	244
15. Chemotherapy	252
16. Artificial Pneumothorax	275
17. Artificial Pneumothorax (<i>Continued</i>)	291
18. Closed Intrapleural Pneumolysis	302
19. Surgical Methods	312
20. Complications of Pulmonary Tuberculosis	355
21. Extrapulmonary Tuberculosis	363
22. Tuberculous Meningitis	372
23. Tuberculosis and Associated Diseases	376
24. Tuberculosis in Industry	379
25. Some Social Aspects of the Management of Tuberculosis	391
26. Mental Aspects in the Management of Tuberculosis	401
27. Prevention of Tuberculosis	407

The Diagnosis and Treatment of Pulmonary Tuberculosis

By PAUL DUFAULT, M.D.

*Medical Director of the Rutland State Sanatorium,
Massachusetts Department of Public Health*

WITH A CHAPTER ON PATHOLOGY

BY A. REYNOLDS CRANE, M.D.

*Professor of Pathology, University of Pennsylvania School of Medicine ;
Director, Ayer Clinical Laboratory of the Benjamin Franklin
Clinic and the Pennsylvania Hospital ; Consultant to
Valley Forge Army Hospital*

AND A CHAPTER ON PULMONARY FUNCTION

BY OSCAR FEINSILVER, M.D.

*Senior Visiting Physician at St. Vincent Hospital, Worcester, Mass-
achusetts and Bronchoscopist at the Rutland State Sanatorium*

*Second Edition, Thoroughly Revised,
with 162 Illustrations*

L O N D O N

HENRY KIMPTON

1 9 5 7

ALL RIGHTS RESERVED, 1957

Library of Congress Catalog Card Number : 57-10208

Printed in the United States of America

Preface

THE management of clinical tuberculosis has changed so radically since the advent of modern drugs that this new text is offered as a substitution for the previous one by Stone and Dufault.

The all-important subject of antibiotics and chemicals has been treated with particular care and revised to the last minute, in keeping with the most recent developments.

Special attention is given to the various surgical procedures perfected during the last decade. The logic of their application to the various conditions encountered and the results they are likely to produce are discussed and analyzed.

In presenting the complex matter of the evaluation of the pulmonary function in an eminently practical manner, Dr. Feinsilver's contribution should prove greatly helpful in current practice.

In the chapter on Differential Diagnosis, most pulmonary conditions resembling pulmonary tuberculosis and often mistaken for it are described with accompanying films, and attention is called to the respective features that distinguish them from the latter.

Dr. Crane's chapter on basic pathology adds considerable value to the work, and his well-chosen illustrations complete his lucid text.

It is hoped that all interested in the medical and social aspects of tuberculosis will find concise and practical information in the following chapters. We did not try to be exhaustive, but we hope to have been complete.

P. D.

RUTLAND, MASSACHUSETTS

Contents

CHAPTER	PAGE
1. Historical	7
2. The Tubercle Bacillus	17
3. Laboratory Methods in the Diagnosis of Pulmonary Tuberculosis	27
4. Allergy and Immunity	52
5. Modes of Infection	58
6. Pathology of Tuberculosis By <i>A. R. Crane, M.D.</i>	64
7. Primary Tuberculosis in Childhood and Adult Life	100
8. Symptoms of Pulmonary Tuberculosis	111
9. Physical Examination	117
10. Radiological Examination of the Chest	125
11. Evaluation of Pulmonary Function By <i>Oscar Feinsilver, M.D.</i>	154
12. Differential Diagnosis	182
13. General Treatment	232
14. Specific Treatment	244
15. Chemotherapy	252
16. Artificial Pneumothorax	275
17. Artificial Pneumothorax (<i>Continued</i>)	291
18. Closed Intrapleural Pneumolysis	302
19. Surgical Methods	312
20. Complications of Pulmonary Tuberculosis	355
21. Extrapulmonary Tuberculosis	363
22. Tuberculous Meningitis	372
23. Tuberculosis and Associated Diseases	376
24. Tuberculosis in Industry	379
25. Some Social Aspects of the Management of Tuberculosis	391
26. Mental Aspects in the Management of Tuberculosis	401
27. Prevention of Tuberculosis	407

THE DIAGNOSIS AND TREATMENT OF PUL- MONARY TUBERCULOSIS

Chapter 1

Historical

TUBERCULOSIS appears to be as old as the world. Spinal tuberculous lesions were found in a Neolithic man (Bartels) and in Egyptian mummies. The first allusions to the pulmonary form of the disease appears in some Indo-Aryans (1500 B.C.) directions for the treatment of cough, emaciation, diarrhea and fever. According to the Law of Manu (1000 B.C.) phthisis is an unclean and incurable illness. It was known to the old Chinese who wrote about a condition of the lungs which caused coughing, spitting of blood and pus. It can be inferred from Homer's (900 B.C.) writings that the early Greeks were aware of its existence. Hippocrates (400 B.C.) was the first to mention it specifically and to call it phthisis. About the same time Aristotle recognized its contagiousness.

In Rome, Celsus and Pliny (50 A.D.) speak of cold abscess and of scrofula. Galen (131-201 A.D.) describes phthisis as an ulcer of the lungs, and warns against contact with those suffering from it. With the exception of Avicenna's (980-1037) assertion that tuberculosis was a general disease locally manifested, no notable progress in this particular field of medicine was made from 200 to 1500 A.D. Though adding no original contributions, Arabs, Jews and Babylonians translate old manuscripts and help to perpetuate the knowledge already acquired. Hundreds of monks in European monasteries are also engaged in the same laborious

task, among them the recluse of the famous Monte Cassino, destroyed during the Italian campaign of 1944 and recently restored. To the patience and persistence of these unknown scribes we owe the preservation of much of our ancient data.

The Renaissance and the invention of printing brought a wider distribution of knowledge, stimulated scientific interest and gave new impetus to speculation and research. In 1546, Frascatorius advances the modern theory that contagion is caused by invisible germs which he calls *seminaria*. Tubercles are spoken of for the first time in 1650 by Sylvius, and forty years later their evolution is described by Morton in his *Phthisiologica*.

From 1800 on, scientific methods replace speculation, and pathological anatomy changes the entire field of medical concepts. Bayle, in 1810, declares that tubercles are the manifestations of a disease which he is the first to call tuberculosis. Five years elapsed before Laënnec introduced the stethoscope into medical practice and, in his treatise "*De l'Auscultation Médiate*" (1819), proclaimed the specificity of the tubercle regardless of its location. Some fifty years later (1865), Villemain proves by animal experimentation that tuberculosis is an infection caused by an inoculable agent and that the bovine and human form of the disease results from varieties of the same organism. The contagiousness of tuberculosis, already recognized by previous investigators, is thus demonstrated beyond doubt and an important step forward is taken in the field of public health.

By this time Pasteur's genius had opened to the world the vast realm of bacteriology and hundreds of scientists were focusing their sights on the fields of research. Among them was Robert Koch, who announced his discovery of the tubercle bacillus on March 24, 1882.

In the next thirty years, the knowledge of tuberculosis was to advance more than it had through all the preceding centuries.

The very year that Koch discovered his bacillus (1882) Carlo Forlanini conceived the idea of artificial pneumothorax; three years later (1885) De Cereville performed the first rib resection with the intention of collapsing the underlying tuberculous lung. Three decades passed before the ideas of these pioneers were recognized and their methods adopted. Collapse therapy was not practiced on a large scale until after the First World War. The utilization of the roentgen rays was to know a similar delay. Although discovered in 1895, they were not applied to the study of the chest much before 1920. Since then, radiology has contributed immensely to the development of effective methods of diagnosis and treatment of pulmonary diseases and given us the means of detecting tuberculosis in its early stage.

Despite the fact that the exact nature of the illness was unknown, some attempts had been made to treat it empirically as far back as the days of Hippocrates and even before. Fanciful regimens, impossible diets, unbelievable folk remedies, some indifferent, some definitely harmful, came and went according to the prevailing opinions of the time. That rest and fresh air, however, which are among the accepted mainstays of modern treatment, were advocated thousands of years ago is eloquent testimony to the sharp clinical sense of some of the medicine men of old. The notions of contagion and of prophylaxis also found their way to actual application in some isolated sections. The Republic of Lucca (Italy) issued legislative prophylactic measures in 1699. Ferdinand VI of Spain ordered reporting of phthisis and burning of personal effects of deceased consumptives in 1751.

These edicts, distasteful to the public, could not be enforced and soon fell into disuse. About the middle of the last century, emetics, purges, enemas, and repeated bleedings were standardized throughout Europe for the treatment of pulmonary hemorrhage, while Trousseau in France recommended and used arsenicals.

George Bodington (England, 1840) was the first to apply sanatorium treatment. He paid little attention to rest but he insisted on fresh air and proscribed all drugs. Criticism and abuse from the medical profession forced him to close his establishment. Doors and windows were shut again in consumptives' rooms, and tuberculous infection continued to spread unhampered, to such an extent that, towards the end of the century, Oliver Wendell Holmes could well brand it the "White Plague." He was indeed justified. The death rate from tuberculosis in his own city of Boston reached a peak of 400 per 100,000 at the time the Harvard anatomist was in his forties. The Hub was no worse in this respect than other large American cities, namely, New York and Philadelphia where tuberculosis, which accounts at the present time for about 5 per cent of all deaths, was then responsible for 22 per cent of them. Abroad, conditions were still worse. In Budapest for instance, as late as 1876, the death rate exceeded 800 per 100,000, one of the highest ever reached.

True, a decline became noticeable around 1880 which continued uninterrupted, at least in America, until World War II. Yet, in 1930, tuberculosis still claimed more than 200 victims per 100,000 population in large European cities such as Paris, Leningrad, Madrid, Lisbon, Warsaw, Helsinki, Budapest, Bucharest and Athens. The figures for South and Central America were even higher on account of the Indian and colored population: 217 in Montevideo, 270 in Rio de Janeiro, 431 in Caracas, 455 in Santiago and 654 in Guayaquil!

In Asiatic centers, the death rate hovered around 300, while Manila showed an appalling toll of 650.

When one stops to consider that the morbidity rate is from five to ten times higher than the mortality rate, one realizes that despite considerable progress, much remained to be done in the field of tuberculosis twenty-five years ago.

Much was done and, notwithstanding partial interruption of the antituberculosis work during the Second World

War and the hardships suffered by the populations of Europe and Asia as a result of it, the 1952 mortality rates from the pulmonary form of the disease in European countries were down to 35.5 in France, 20 in Norway, 28.7 in Switzerland, 27.5 in England, and 34.7 (1951) in Italy.

They remained rather high in Finland, Portugal, Eire and Spain, with 73.2, 78.0 63.2 and 82.8 respectively.

The decline has been rapid, not to say spectacular, in the last five years as evidenced by the following:

	1948	1949	1950	1951	1952
Belgium	44.1	36.2	34.1	31 0	
Denmark	21.4	15.9	11.9		
Austria	73.3	60.0	45.5	45 5	
France	61.9	55.4	47.5	49.9	35 5
West Germany	56.5	41.5	32.7	31 3	
West Berlin	155.3	103.4	47.0	44.8	37 7

If Europe on the whole is doing well, some parts of North Africa and of South and Central America lag behind. The North African Spanish possessions of Ceuta and Melilla had a tuberculosis death rate of 184.6 in 1951; the African Portuguese territories of São Tomé and Príncipe show 207.8 in 1950, while Costa Rica and Chili remain at the high level of 167.3 and 126.5 in 1951.

Japan's rate dropped from 142.1 in 1949 to 91 in 1951. No statistics are available for China and India, but the ravages of tuberculosis in these countries are known to be of large proportions.

Regardless of the high figures still in evidence here and there, the general decline in mortality, which manifested itself shortly after the last war, has continued at an accelerated rate up to this day.

It would be erroneous, however, to project this impressive downward curve into the future and to use it as a barometric indicator for tomorrow's tuberculosis weather. A

look at the morbidity rates for the last ten years is rather sobering: they have gone up instead of down.

New cases of tuberculosis reported in:

	1940	1950
United States	100,772	121,228
Canada	10,226	12,429
England and Wales	49,967	52,062
Denmark	2,687	2,507
Scotland	7,722	9,682

While better case-finding methods and intensified surveys may explain this trend in part, they do not seem to account for the whole picture.

The matter of morbidity brings up other points. It has been long recognized that racial and economic factors loom large in the field of tuberculosis infection. American Indians and Negroes, free from the disease until three to four hundred years ago when they were infected by the whites, have not yet built up adequate resistance against it and succumb in far greater numbers than the Caucasians. This explains the high mortality rates among American Negroes and among the Indians of North and South America.

Breaking down the figures for cities into units according to various sections, one finds that both mortality and morbidity are ten and more times higher in the poor tenement areas than in the more fortunate localities.

This tremendous difference between death rates in residential sections and in workmen's quarters points directly to the greater opportunity for contamination resulting from overcrowding. In New York City, a tuberculosis death rate of 19 per 100,000 population in a residential section where the rents average \$200.00 a month, soars to 256 per 100,000 in another area of the same section where the rents fall to \$35.00 a month. Morbidity is five to eight times greater among the homeless, the transient, and the relief

groups, than among the people with a home and a sufficient income.

Seen in this light, tuberculosis is indeed a plague which can be successfully curbed and kept in abeyance only by the direct action of governmental agencies. Campaigns to eradicate the disease must be waged vigorously along the social and economic fronts.

But let us return to our chronological discussion.

In 1859 Brehmer opened the first *successful* sanatorium in Germany, ordering fresh air, exercise and hydrotherapy. Peter Dettweiler, Brehmer's patient and later his pupil, founded the German People's Sanatorium at Faulkenstein (1876), established the rest cure and introduced portable sputum cups.

From there, the sanatorium idea spread to England, France and Italy. In the United States the movement was initiated by Dr. Edward Livingston Trudeau who until 1915, the year of his death, had been for nearly half a century the one great figure in the antituberculosis movement in America and whose memory remains the symbol of our winning fight. Shortly after his graduation from medical school, Dr. Trudeau learned that he had tuberculosis and that he could expect to live only a few months. The story of how he prolonged those few months to well over forty years, as related in his own simple and yet vividly picturesque style, is one which everyone should read. Leaving the city of New York, where he had intended to open an office, he trudged his way to the wilderness of the Adirondacks and spent two winters practically alone in a hunter's lodge.

As his health improved, he decided to extend to others the benefit of his experience and built the Little Red, which became the Trudeau Sanatorium, a small cottage where he received his first two patients in 1884. Hundreds of tuberculous patients soon found their way to this haven in upper New York, and within relatively few years, to similar ones erected all over the North American continent. Following the lead of private enterprise, government agencies began