IV.

PULMONARY TUBERCULOSIS

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Pulmonary Tuberculosis

Tuberculosis, the most widely disseminated and most chronic of all diseases, was well known to the ancients and, although no special mention was made in the writings of the Egyptians, Babylonians, Chinese, Jews, all primitive races were undoubtedly acquainted with the disease.

Hippacrates, B.C. 464-376, the father of medicine, has handed down to us a good description of pulmonary as well as laryngeal tuberculosis. His classic description of the clinical nature of tuberculosis has not been reached for more than fifteen hundred years (A.C.). Aristotle, B.C. 384-322, mentions that the Greeks considered tuberculosis very contagious and knew also the value of sunshine and fresh air in its treatment. Galen, A.C. 131-201, recognized ulcerative tuberculosis of the larynx and its connections with the lungs. He recommended the free use of milk and a residence in the mountains. In the sixteenth century, Spanish doctors prescribed gold-coated pills for suffers from tuberculosis. An examination of ancient Egyptian mummies has shown the ravage of the disease and the Egyptian boy king, who lived several thousant years ago, and whose tomb has recently been discovered and opened, is believed to have died of tuberculosis.

Klenke in 1843 anticipated the etiology of tuberculosis and Villimin in 1865 definitely proved that the virus as found in tubercular tissue or material was transmissable to both man and animals, but it was left to the master mind of Robert Koch to demonstrate in 1882 the causitive factor, the tubercle bacillus as the active virus of the disease.

In March, 1882, the whole medical world was greatly aroused by the appearance of an article that had been read before the Berlin Physiological Society by Robert Koch under the modest title of "The Etiology of Tuberculosis." Koch had already distinguished himself by numerous experiments on splenic fever and had devised new methods for staining the micro-organisms of disease. These achievements had given him a high standing both among microscopists and mycologists.

For three months Koch had busied himself most diligently seeking the primary, if possible, minute organisms which might perhaps be the cause of the disease. The experimenters of preceding investigations had, indeed, made it probable that the cause of tuberculosis might be found in microscopicable minute organisms.

In view of the results that had been obtained by other experimenters withother diseases, and in view of the great progress that medical science was making in these modern times, Koch was certainly perfectly justifiable in starting out with this idea, and directing his endeavors in this channel. The work and purpose being thus determined, it was only necessary to devise ways and means for rendering the supposed organism visable under the microscope, and for proving indisputably after they had been rendered visible, that they were in reality the specific cause of tuberculosis.

Master as Koch was in the various methods of staining, it did not take him long to find a suitable plan by which he was enabled

to see that which haste of other observers had for many years vainly endeavored to discover. The bacteria thus found exhibited various peculiar characteristics. They had a rod-shaped form and belonged therefore to the group of bacilli; they were very thin, and about one-quarter to one-half as long as the diameter of a red blood corpuscle. Koch found that the bacilli discovered by him were present in large numbers in those places where the tuberculosis process was just beginning or was progressing very rapidly.

Koch now made a series of examinations of tubercular matter of man and animals to detect the presence of bacilli. The tubucle nodules of the lungs were generally investigated, and in not a single case were bacilli absent.

In order to prove and substantiate the supposition that tuberculosis was due to the entrance of bacilli, and to their growth and multiplication, it became Koch's task to isolate the bacilli from the body, to cultivate them through many generations, purifying them completely from every particle of disease product or tissue, and finally to transfer these purified isolated bacilli to animals and to note whether tuberculosis showed itself in consequence, as with inoculation of tubercular products generally.

In this way he endeavored to prove beyond doubt that the bacilli themselves, and not other diseased products, were the actual cause of the disease and that tuberculosis is therefore a specific infectious disease.

After Koch cultivated the bacilli through generation after generation extending over a half a year, he made inoculation experiments with it. All the guinea pigs that had been inoculated with substance containing bacilli were affected with tuberculosis in a high degree after the lapse of only four weeks. Bacilli were also again cultivated from the tubercular materials of the inoculated infected animals and from these exactly similar results were secured. Koch had now shown by his investigations the constant occurance of characteristic bacilli in tuberculosis and had demonstrated that these bacilli could be derived from tubercular organs and isolated and purified by means of cultivation.

Whether the animals were inoculated with culture bacilli in the subcutaneous cellular tissue or received injections into the peritoneal cavity or in to the aqueous chamber of the eye, or directly into the circulation, without a single exception, became tubercular with nodules present, not along in one place or organ, but scattered throughout the organs of the body, depending upon the amount of the infectious material introduced. All these facts taken together led Koch to assert that the bacilli occuring in tubercular substances were not merely the attendants of tubercular process but the cause of them, and that the bacilli actually represented the true tubercule-virus. With this as a criterion, he pronounced in accordance with his observation, miliary tuberculosis, caseous pneumonia, caseous bronchitis, tuberculosis of the intestines, tuberculosis of cattle, and tuberculosis produced in animals by inoculation, to be identical diseases.

After the completion of these experiments, Koch still busied himself trying to solve two questions, where the parasites originated

and how they gained entrance into the body? Thus he found that the bacilli multiplied only at a temperature between 30° and 40° C. He concluded from this that tubercle-bacilli can develope and multiply only in the animal body between certain limits of temperature.

The second question he answered by the conclusion that the majority of tubucles have their beginning in the passages of respiration, the infecting matter generally manifesting itself at first in the lungs or the bronchial glands. It is, therefore, probable that tubercle-bacilli clinging to particles of dust are breathed in with the air at every inspiration. The bacilli undoubtedly scattered throughout the air by the sputum.

He thus inoculated animals successfully with sputum containing tubercle-bacilli. He found furthermore that dried sputum does not lose its virilence. He inoculated guinea pigs with dried sputum two and four weeks old. It has been bound that the tubercle-bacilli will live for about twenty minutes in five per cent carbolic acid. When sputum is being prepared in the laboratory to find out whether tubercular germs are present or not, it is washed with five per cent carbolic acid. This acid bath kills all of the other germs, but does not hurt the tubercle-bacilli.

Thus we owe Koch for a great advance in medical science, for to him belongs the merit of having established beyond despute the fact of the parasitic nature of an infectious disease, the most important one affecting the human family.

Another physician, however, who first really brought tuberculosis out of its first chaos before Koch, was Rene Laënnec, a Frenchman. He lived during the turbulent times of the French revoluation, and finally died of pulmonary tuberculosis at the early age of forty-six in 1826. Up to the time of Laënnec, all forms of tuberculosis were considered as separate diseases. Laennec demonstrated that although tuberculosis attacks many parts of the body such as skin, glands, bones, lungs, etc., yet it was part of a single disease the exact cause which had not been determined. Yet Laennec considered tuberculosis to be infectious.

A second great contribution by Laennec was in the invention of the stethoscope for the diagnosis of tuberculosis. Previously the physician had placed his ear directly against the chest and only an indifferent amount of information was obtained. He developed a method of examination which was so much more efficient than that previously used that he was able to entirely revamp the knowledge of diseases of the chest. He gave the name "stethoscope" to his instrument, an improvement of which is still the constant companion of every chest man. Even though Laennec antidated by sixty years the discovery of the tuberculosis germ, his conception of diseases of the chest was astoundingly modern, that certainly Laennec's name is worthy of remembrance in the fight on tuberculosis.

This disease most frequently attacks the lungs and bronchial tubes, but may involve any part of the body. It gets its name from the fact that it starts work in small spots; as they work they multiply and the body builds up a wall of hard fibrous tissue and minerals around the spot for protection and prevention of its spread. These spots become small hard lumps of various sizes, being called tubercles.

If the disease gets a good start before it is checked or healed, the tissue of which the body is composed breaks down and some of them are consumed. It has then reached a stage which is called consumption because it is actually consuming the body tissue. This consumption is most apparent in the lungs and in many cases the lung tissue is entirely eaten away in spots and holes or cavities are formed. These may heal up and the sick person regain a reasonable measure of health. There is the human and bovine type of tuberculosis, the latter acquired from cattle through drinking infected milk and is apt to attack more the glands or some part of the body other than the lungs. Miliary or quick consumption as the layman calls it, spreads rapidly and runs its course generally within a few months usually being fatal. Chronic tuberculosis is the kind that more or less heals up and then runs for indefinite periods of time, sometimes the duration of a long lifetime.

Now, to consider the symptoms that lead one to believe he may have tuberculosis. In most instances he is likely to become more easily tired. He notices that he carries his work less easily than is his custom. So frequently tuberculosis attacks when one is overworked that this feeling of fatigue is pausibly excused. Eventually he begins to feel that he is more tired than could be accounted for even by his work. He does not recuperate so readily at night and fihally even a slight exertion may leave him exhausted. Often there is a lack of nervous stability. He hasn't the nervous reserve to which he is accustomed. Small things bother him and he is very irritable. Some unusual feeling in or about the chest is very common. It may be a sense of heaviness or depression or frequently what the patient describes as a "crack in the back". It may be most evident on movement or it may be brought about on breathing. Often it is simply a tired feeling between the shoulders at night. Occasionally there is a sharp stabbing pain, made worse by a deep breath or cough. The patient often recognizes this as pleurisy and suspects trouble with the lungs. The other feelings are often associated in his mind with tiredness or muscular pains, strain, and so on, and their relations to the lungs and pleurisy may be overlooked.

The history usually shows poor or slow recovery from illness. So frequently colds, flu or other diseases convalesce so gradually and with such frequent relapses that one's suspicions should be aroused. One doesn't have the come-back which is ordinarily expected. The appetite is likely to become poor. Perhaps the loss of appetite will only be for one or two meals a day, the other meal being enjoyed. With a poor appetite there is also likely to be a loss of weight. Decreasing weight may be independent of the appetite due to the ravages of the disease itself.

A majority will have some slight, hacking cough, but occasionally this symptom is entirely denied. Violent cough in the early stages of tuberculosis is rare. Such a cough frequently indicates more advanced disease or some other condition entirely. Any recurrent cough or one lasting over four weeks demands a diagnosis as it may perhaps be tuberculosis. There may or may not be expectoration, but if present it is likely to be insignificant in amount in the beginning; later it is a most common symptom. A slight afternoon fever at an early stage of the disease is very common. Temper-

ature of 99° to 100° is the usual thing.

Some cases of active tuberculosis usually are ushered in by high temperature, but these are rare. The patient does not realize that he is running a temperature. Upon a check with the thermometer, a surprise is in store for him as there is usually a slight fever in the late afternoon or early evening. The persistence of any of these symptoms should be significant to send one for a careful examination.

The early symptoms of tuberculosis are such that they may escape the notice of everyone but the afflicted, and in him along may rest the possibility of early diagnosis.

Dr. Fred Holmes, the writer of "Tuberculosis, A Book for the Patient", not only daily associated with physicians splendidly equipped by training and by practice in early diagnosis of tuberculosis, developed the disease and surprised all when the diagnosis was made. The significance of the symptoms and mode of development precluded outside observation in the early stages.

Hemorrhage, although often a later sign, occurs during the disease in almost every case. Blood spitting should always be considered as coming from the lungs, never from the throat unless proven so. It should always call for a careful chest examination. Not only does hemorrhage demand a chest examination, but also pleaurisy with or without fluid and fistula around the rectum. It may seem a far cry from pulmonary tuberculosis to rectal abscess, but in a great many instances the latter is also found to be tuberculosis.

Flushed cheeks, rapid pulse, and shortness of breath may occur in either early or late stages of the disease. Thus, those are the significant tuberculosis symptoms and if one has the slightest suspicion of having tuberculosis they should decide immediately to see a physician. Upon having decided to consult a physician, the patient has a momentous decision to make for on this may depend his life or death. Reference is made to the choice of physician as nothing can be of greater importance to the patient than a reliable physician. As there still are very few tuberculosis specialists, the choice of a physician is important because upon his physician the patient must depend on his disgnosis and subsequent advice.

A patient may readily find out the qualifications of the physicians in his community. He may explain his needs to those in authority at a good hospital and request them to recommend a physician. Should there be a medical school in the locality, one may call on them for advice. If there is a local tuberculosis association, social service, or medical society available, good advice can be obtained from such sources.

Before visiting his physician, it would probably be well for the patient to review in his mind the history of his sickness. It is surprising how many important items are forgotten by the patient when he comes for his examination. The purpose of the history is to give the physician the fullest knowledge possible of the condition and thereby make him more efficient in handling the case. Not infrequently the exact diagnosis can be made by the history and only needs confirmation through examination.

After a complete history has been recorded one is ready for the physical examination. A fairly complete examination of the entire body should be made.

Tuberculin tests are usually made on children but not on adults except on certain indications. If the test is negative, it may be repeated with increasing doses. If it remains negative after two repetitions, it is usually useless to increase it further as the results will not be changed except in very rare instances.

Having completed the physical examination the laboratory work is next. The main one is the sputum examination. In many cases, however, tuberculosis is so definite that a sputum examination seems unnecessary for confirmation. But some cases which appear so certain may really have some other germ causing or complicating the disease and so, as it is a procedure taking only a few minutes, it is always wise to confirm the findings. If the tubercle-bacilli are found, the sputum is termed positive for tubercle-bacilli; if they are not found it is called negative. The sputum should be examined repeatedly if found negative in a case where pulmonary tuberculosis is suspected. If the simple smear examination is not positive, a concentrated test may be done whereby the rare tubercle-bacilli is segregated and a much better chance of finding it is afforded. The sputum may also be cultured for tubercle-bacilli, but this is not always satisfactory in all hands.

The injection of the sputum into a guinea pig is probably the most certain method of demonstrating the tubercle-bacilli when in small numbers. The guinea pig has no resistance to the germs and the presence of a very minute number will cause tuberculosis, thus showing their presence in the sputum.

A specimen of the first sputum expectorated in the morning is usually best for examination. The possibility of failing to find the tubercle-bacilli when in small numbers is evident. As Hawes has so aptly put it, "Absence of proof is not proof of absence." The statistics of some investigators give the percentage of positive sputums found in active cases of tuberculosis as high as 95% to 98%. This high percentage is course is only reached by many repeated examinations.

Blood examination is next; if the hemoglobin or red coloring material of the blood is low the condition is called anemia, and often tuberculosis cases are somewhat anemic. However, there is not a satisfactory blood test to be made for tuberculosis.

Almost universally, the flouroscope recommends itself for use. This is an X-Ray machine in which pictures are not taken but the lights and shadows of the chest are thrown upon a flourescent screen in a very dark room. Its obvious advantages are, it is readily available on an instant's notice, it is quick so that there is little delay in the information obtained. The expense is slight as there are no films used nor any cost of developing, and therefore it can be used as frequently as desired. Many views may be obtained of all parts of the lungs.

The inadequacies of the fouroscope are several. No record is made. Very fine shadows cannot be seen under the flouroscope. It is not possible to study the conditions afterwards.

The value of X-Ray in the examination of chest conditions was recognized very soon after Prof. Wm. K. Roentgen discovered this form of radiation in 1895. Due to the long exposure necessary, at that time, to obtain plates, only gross changes could be demonstrated. Interpretations of these plates were often difficult because the shadows were blurred by respiratory movements.

In 1905, Rieder and Rosenthal exhibited X-Ray plates taken while the patient held his breath. With this began a new era in the X-Ray diagnosis of chest conditions. Fine details were shown on plates and slight changes recognized. The use of the Roentgen ray in chest examinations spread quickly and it is now depended upon in a large percentage of cases. Its advantages are it is a permanent record which cannot fade or change with time. Changes in the chest are more accurately recorded by X-Ray than any other known means. The picture also permits the study of intricate cases. The X-Ray diagnosis either confirms tuberculosis or gives an adverse finding. The disadvantage is the use of the X- Ray is chiefly that of expense.

Upon diagnosis of tuberculosis it is of great importance that the patient should know the manner in which the infection from man to man occurs. Most readily it is by the inhalation of bacilli-laden dust. Sputum open to the air has a chance to dry and become pulverized; it is liable to float with the dust in the air and any predisposed individual breathing this air is in danger of contracting the disease by inhalation.

Another method of infection is from close contact with tubercular individuals who are careless when coughing. These small particles or little drops of saliva may contain the bacilli and when taken into the system of a predisposed individual by inhalation or ingestion may cause tuberculosis. This manner of communicating the disease is called driplet infection.

The next way it may be transmitted, however not as important, is through the digestive system. Tubercular milk or meat can give tuberculosis. Inoculation or the penetration of tubercular substances through a lacerated skin or wound is most likely to happen when proper care is not taken. Occasionally physicians and students of medicine become inoculated with tuberculosis by wounds from instruments which have been soiled with tubercular material.

A fect which should tend to cheer the tuberculosis patient is that of all the chronic diseases his is curable the most frequently. It is not only true that as many as eighty per cent of cures several years ago, and no doubt more than that now, are reported when the patient's disease was discovered in time and properly treated, but the post-mortem examinations of hundreds and hundreds of cases which died from accidents or other diseases than tuberculosis have shown the scars of a healed tubercular condition. All this should be proof of the curability of tuberculosis. However, the one most important thing the tuberculosis patient should know of his disease is that unless he follows the instructions of his physician and his orders and has implicat confidence and trust in him, it will be difficult to accomplish a cure. The implicat obedience to physicians orders, the performance with religious punctuality of all the hygenic, dietetic, and other instructions are essential and important for a patient in no matter what stage of the disease.

Tuberculosis usually can be arrested if it is discovered soon enough and if the patient works with the doctor. Treatment may be carried out at home, but a special hospital called a sanatorium is the best place for the patient. There everything is planned with the one object of helping him get well. It is not necessary to go to a sanatorium far away from home in order to get the benefit of a certain climate. We now know that tuberculosis can be successfully treated in any climate in the United States.

The first originator of the sanatorium method was Brehmer in Selicia, Prussia, opening his first sanatorium in 1853, the essence of which was rest first and a daily regulation by the physician of the patient's life and habits. Brehmer, however, had an idea that tuberculosis of the lungs was somewhat dependent on, or at least related to, a small heart, and after the fever had fallen he attached much importance to grade climbing exercises for his patients to strengthen the heart.

Dettweiler, a patient and pupil of Brehmer's, in 1874 built a sanatorium at Falkenstein in Germany, where he followed Brehmer's treatment except that Dettweiler was an ardent advocate of complete rest and he did not believe that a small heart had any special relation to pulmonary tuberculosis.

The first sanatorium in the United States was built in 1885 by Dr. Edward L. Trudeau, a New York physician, who for many years himself had been suffering with tuberculosis. He made up his mind in 1883 to build a sanatorium at Saranac Lake, New York, for patients of moderate means. The idea originated in his reading in 1882 in an English Practitioner magazine an account of a visit to Brehmer's Sanatorium. He became desirous of making a test of this method. It occured to him that a good piece of work could be done in helping these invalids by building a few small cottages where they could be taken at little less than cost and where the sanatorium method could be tried.

The first little cottage was completed and occupied February 1, 1885, the money for it being donated. The humber little building has become somewhat historical now and has always been known at the Sanatorium as "The Little Red." Humble as it undoubtedly is, it was nevertheless the pioneer cottage in the development of the sanatorium treatment in America and has stood for a great principle of treatment, which will long survive the little building.

The Sanatorium now comprises of thirty-six buildings scattered over the entire hillside a distance of about three quarters of a mile. It is comprised of everything for the treatment, cure, and need of the patient. Now there are many sanatoriums for tuberculosis patients from public to privately owned ones and then those run by the state, county or municipal.

The advantages of sanatorium treatment over home treatment are: First, there is usually strict rules and regulations in the sanatorium, thus no constant temptation to do too much and to do it at the wrong time. Second, there is the strict and constant medical supervision which exists in a well run sanatorium. Third, at the sanatorium there is the great help provided by the examples of others who have the same disease and the same problems to meet and who are getting well. Fourth, the greatest advantage is that the patient is where

there are no young children. No matter how careful the tuberculosis patient may be there is a very definite and ever present danger of infecting children in the home in spite of the best of precautions.

The cure of tuberculosis is the point we are now chiefly interested in. Most patients think they can go away for two or three months and get perfectly well. That is entirely wrong. A patient usually leaves home for five or six months, which is a very short time and he simply gets on the road to recovery. He has to go home and finish it up by living carefully for three or four years.

Patients think that after two or three months, they feel better and look better and have gained a good deal of weight, they can go home and return to their old ways of living, but they cannot do it and sooner or later if they do return to the same life with its numerous and hard duties, they are going to relapse and the second attach is harder to treat than the first. To get well from tuberculosis means that a patient must pay attention to every little detail.

All patients will fall into one of three classes. First, those who will never again be able to do much work. For them we can offer but little. Second, those who will be able to do nothing for months or even years. The third group includes those patients who, at the end of six or more months, are going to be able to return to work, many of them to their former occupations. For them we endeavor to supply exercises approximately more or less nearly what they must do on their return to work. We believe that no man or woman should return to their work who cannot take a great deal more exercise while at the sanatorium than will be required at home.

The only way we can attach tuberculosis is by raising the body's powers of resistence to the highest point and then letting it fight against the disease. We cannot cure a patient in six months, but we can get him in such shape that when he returns home he will know how to take the right care of himself and to keep his body in such shape that it cannot only hold its own against the tubercle germ, but that it can also fight against it and in three or four years overcome it. The most important thing it to be able to control one's self. Unless the patient can say no when the occasion arises, his chances for getting well are very slight. He can tear down in one day or in an hour what it has taken him many months to build up.

There are three great medicines in the treatment of tuberculosis, rest, food, and fresh air. The value of rest at the outset of treatment cannot be over-emphasized and for that reason is discussed first. Injury demands rest for repair. In every movement of the body whenever one begins to endure pain it will be relieved by rest. The time that should be devoted to rest and the degree of rest varies, of course, with each individual and must be prescribed by his doctor. In early stages when the disease has just been discovered, the best treatment is without doubt rest in bed. When high fever is present, the patient should be allowed for a time to move neither foot nor hand. All excitement must be absolutely avoided, for anything that quickens the pulse and accelerates the circulation may flush out of the poorly walled-off diseased areas poisons which cause fever and symptoms.

In health, the appetite is a safe guide to follow, but in disease when the body needs food most the stomach craves it least. It is an old adage among patients with tuberculosis that they should eat once

for themselves, once for the germs and once to gain weight. The patient's first object is to regain his lost weight and his second to approximately or slightly exceed his normal weight. The tendency is to overeat and the desire to gain weight quickly is strong but the struggle is to be a long one and no organ must be impaired.

Fresh air has been so deeply stamped upon the mind of the average man that if, there is any one thing he connects with the treatment of pulmonary tuberculosis, it is fresh air. The last half of the nineteenth century saw the institution of the fresh-air treatment of pulmonary tuberculosis, which in the first decades of this century has been extended to the treatment of many other diseases. Fresh air benefits patients with other forms of tuberculosis as much as it does those with the respiratory type.

Leading an outdoor life in summer is a simple enough matter, but during the winter, especially in a cold climate and when one is not exercising, as is usually the case at first in the open air treatment for tuberculosis, some hardships may be expected. If he be clad properly and sheltered from wind, rain, and snow, a person may be quite comfortable sitting outdoors even when the weather is twenty or thirty degrees below zero. While the patient must be outdoors in all kinds of weather for at least eight hours daily, it should be borne in mind that open air does not mean exposure. If any encouragement be needed to brave the severe cold it can be found in statistics, showing that patients improve more rapidly with the onset of winter than in summer. In fact it has come to be said that "One winter is worth two summers."

Exercise is as important as rest in the treatment of pulmonary tuberculosis but more dangerous. We are all so accustomed to regulating our own exercises that it seems the height of folly to listen to anyone who allots to us only a few minutes a day for such a mild form of exercise as walking and this only upon the level. When exercise should be begun depends entirely upon the progress the walling-off has made. When the dots of disease called "tubercles" are so firmly and solidly walled off that exercise with its attendant increase of the circulation produce no evil effects, washes out no more poisons than the body can take care of, then the time for leaving bed or beginning to walk has arrived.

As soon as a patient leaves bed he begins to exercise. It has been found that simply getting out of bed and standing on one's own feet raises the temperature. The question when to get up must be decided by the physician. The rise of temperature produced by the poisons flushed from the diseased areas into the circulation may not occur until the following day. Thus when beginning any form of exercise, it should be tried at first on alternate days.

A tuberculosis patient should cultivate out-door recreations and pleasures whenever possible and as soon as his condition permits him to move about, he should look for outdoor recreations and pleasures. However, only with a physician's order.

The study of weight in pulmonary tuberculosis is of much interest and importance. In general it may be said that a patient should regain his usual weight and, if possible, should exceed it by ten to fifteen pounds. Some patients who have ceased to gain weight begin again when they commence to exercise.

A study of records of the Trudeau Sanatorium will show that more patients gain and that the gain is larger from August to January. This is when the temperature begins to fall. During January, February and March the weight flucuates and gradually begins to lessen, and from March to August there is usually loss of weight.

The value of climate in the treatment of pulmonary tuberculosis rests today largely upon personal belief and experiences, for much has been stated and little proved. Such widely divergent climate as the desert, the mountain top, or the mid ocean, are all good climate and certain patients thrive wonderfully well under their influence. But it is now clearly recognized that proper treatment is more important than climate and further that there is more specific climate.

Now on considering the surgical treatment of tuberculosis, the first and probably most common use of surgery in tuberculosis is that known as the "artificial pneumothorax", or the injection of either nitrogen gas or ordinary air into the chest cavity between the pleural lining of the chest wall and the lungs proper. This is accomplished by inserting a hollow needle between the ribs until the pleura is penetrated, then forcing the gas or air into the opening, the idea being to compress the lung as much as possible and in this way retard its action, the ideal condition being reached when the lung can be completely collapsed, or immobilized. If the complete condition can not be reached, then as much of a collapse as possible is given.

As the chest cavity is divided, it is possible to treat each lung separately. This operation should be resorted to only after a sufficient time has elapsed to see whether healing can be effected and good progress made without help, and then only when one lung is either entirely free of trouble or so near it that it is considered safe to throw additional work upon it. When a tubercular infected part of the body, whether it be a lung or any other member, can be thrown either partially or wholly out of service and kept quiet, the healing progress is greatly hastened.

The amount of gas or air given at a time varies from many causes, the chief one being the extent and locations of adhesions. The capacity varies from a few cubic centimeters to ten or twelve hundred. The gas is administered as often as conditions require, sometimes every few days, at other times weeks or months may intervene between applications.

The length of time necessary to continue the treatment will also depend upon the patient's condition. In some cases artificial pneumothorax produces astonishingly good results in a very short time, bringing about a quick drop in temperature, reduction in the amount of coughing, and raising greatly facilitating the healing process, and so materially shortening the length of time necessary for a "cure".

In other cases the benefits are slow in making an appearance, but do eventually manifest themselves. In still other cases the results are detrimental and it is necessary to discontinue the treatment entirely. The principal bad result is the tendency it has in so many cases to cause fluid, or sometimes pus, to form and settle in the chest cavity. When this occurs it is often necessary to drain

it off by the same manner as that in administering the gas. In some cases no attempt to drain it off is made and it is gradually absorbed. The percentage of cases benefited by this treatment is sufficiently high to justify its continuation.

Phrenicotomy or the nerve operation, is used to some extent in cases where like the procedure for artificial pneumothorax, one lung is either free of trouble or so near it that it is considered safe to put additional burden upon it. It is an operation that requires very little cutting, consequently the shock and after affect from it are slight. It consists in making an incision in the skin from two to three inches long on top of the shoulder close to the neck, separating the muscles that lie there, then locating the nerve that runs from the spine over the shoulder, down the chest and connects with and controls one-half of the diaphram. After this nerve is located it is severed and as much as possible is removed. This causes paralysis of the diaphram on the side upon which the operation is performed. The result of it is that the diaphram ceases to function as an aid in breathing and the lung is partially immobilized.

Through the lessening of the breathing activity and the compression of the lung, less work is required of it, there giving it a better opportunity to heal. This operation, however, throws an added burden upon the other lung. Good results are often obtained immediately from the operation, in others the good results are slow in appearing, and in still others no good results at all are seen. The operation requires about twenty minutes when it is performed by a skilled surgeon, and is done with a local anesthetic.

The bad features of the operation are that the nerve controlling the arm lies close to the nerve that is to be severed and unless the surgeon knows his business he may sever the wrong one and cause paralysis of the arm. There is always a danger too that trouble may appear in the well lung after the operation and, with the added burden it is carrying, it would have a lessened chance to heal. If good progress is made by just the cure, it is best to let nature do the work in her own way, but in cases where progress is either too slow or has ceased entirely, one is justified in trying artificial means to assist the healing. The percentage of cases helped is sufficiently high to justify a trial of it. It should be remembered that the nerve cannot be restored after it has once been removed.

Thoracoplasty, or the rib operation, is one of the most difficult operations performed. It should be used only as a last resort in old and chronic cases and after all other methods of getting the patient started toward recovery have failed and then only when one lung is in reasonably good condition. The operation is performed as follows usually with a local anesthetic. As the shock would be too great to cut all of the ribs at once, it is divided into two, three or four parts, and as each portion of it is performed, several ribs, as many as it is felt the patient can stand, are cut. After the rib sections have been removed, the chest is compressed the idea being to squeeze and immobilize the lung as much as possible. The shock from the operation is severe and sometimes causes death. Its weakness lies in the deformity it may create in the chest and also the possibility of the other lung flaring up, which would leave one in a very bad condition. It is recommended only in cases when one would rather take a gamble with death than become a confirmed invalid.

Lobectomy is a comparatively new operation used only with pulmonary tuberculosis and still very much in the experimental stage. It consists of inserting an electric needle through the chest wall into the lung proper and burning or cauterizing infected areas.

The Tuberculin Test, one of the most important tests in discovering tuberculosis, was discovered in 1890 by Koch. It is a bacillary filtrate of the tubercle bacilli. However, it is now prepared as a commercial product, artificial tuberculin, or in short is designated tuberculin in contra-distinction to the product given off by the bacillus while passing through the human or animal body which is known as the natural tuberculin. This test consists of injecting a d definite quantity of diluted tuberculin into the skin.

At the present time there are offered to the medical profession about one hundred different tuberculins. This in itself speaks for the great uncertaintity and diversified composition of this preparation. The two types most commonly used in tuberculin tests are old tuberculin which is Koch's old tuberculin the original of 1890, also known as extract tuberculin and Purified Protein derivative. This was discovered by Seibert. It bears the same relationship to old tuberculin that morphine does to opium.

A tuberculin reaction indicates that the reacting individual is either already clinically tubercular, that is diseased, or that a previous infection has immunized him, and although a reaction is present he is clinically healthy. Tuberculin in itself never has, never can and, no doubt, never will cure or be used to treat a case of tuberculosis. The most common test used is Mentoux, the intracutaneous or intradermal, test.

Of late years special studies have been devoted to tuberculosis in children, for as evidence had accumulated it had been found that the disease was much more frequent in childhood than was formerly supposed, and that the frequency of its occurance increased with age. The greatest frequency being between five and fifteen years of age.

It is known that most cases of tuberculosis become infected in early life - in childhood and that during this period the disease remains inactive or latent, that is, showing no symptoms. However, when the child undergoes the strict strain of study and confinement of school, or in adult life enters into the struggle of earning a livelihood with all the coincident, depressing, influences upon the health, the tuberculosis infection before latent becomes active and tuberculosis in some form develops.

Children contract tuberculosis as any other common acute infectious disease because they are more susceptible to it. Thus by contact with tubercular people and tubercular contaminated articles, they may contract it very early. However, within the last couple of years tuberculosis of both adult and child has gradually been decreasing, due to the extensive fight by the National Tuberculosis Association, medical societies, and many other national, state and community health groups. A great deal of valuable literature and poster material has been available since the recent National Tuberculosis Association Campaign of Early Diagnosis. This campaign emphasized the need to anticipate tuberculosis before symptoms appeared.

Due to the large per cent of tuberculosis among student nurses, it has been stressed that students need to be taught more about tuberculosis in order that they may protect themselves and that they may know what and how to teach the people who come under their care. Society has become much more tuberculosis conscious, through pamphlets and educational ways than most nurses. This has been primarily due to the ruling of general hospitals prohibiting any tubercular patients and thus offering no practical ward experience to student nurses. However, within the recent years the encouragement of better tuberculosis nursing has been become much interested in and worked upon.

Thus with the coming years I am looking forward to an almost eradication of tuberculosis, due to a better education of nurses, public health nurses, parents and health societies. Although years have been spent on control of tuberculosis, science and society has made rapid progress in this most difficult infectious communicable disease.

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