THE PHYSICAL SIGNS OF INCIPIENT PULMONARY TUBERCULOSIS AND ITS TREATMENT BY CONTINUOUS ANTISEPTIC INHALATIONS.

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THE object of this paper is to advocate an unusual method of treatment in the early, and especially in the earliest, stage of pulmonary tuberculosis. Incidentally it will be necessary to describe the earliest physical signs of a tuberculous infection of the lungs, which are inadequately and incorrectly described in the textbooks.

The treatment most in favour at the present time for cases of pulmonary tuberculosis consists of absolute rest while pyrexia is present, abundance of fresh air, abundance of nutriment, and graduated exercise under medical supervision when pyrexia has ceased. It is certain that these measures have aided in the recovery of many. They place the patient under the most favourable circumstances for fighting his battle with the invading bacilli. But there is one obvious defect: they do not include any organized attack on the bacilli themselves. They place the patient under favourable circumstances, but they leave him to fight alone. Attempts have, indeed, been made to give actual assistance by the injection of tuberculin. But this treatment is by no means devoid of risk. If used at all, it can only be slowly, in carefully regulated minimal doses, and under constant observation of the opsonic index. It is very questionable whether such injections are ever justifiable in the early stage of pulmonary tuberculosis, for the opsonic index is then constantly varying in consequence of the autoinoculation produced by the local disease.

Attempts to combat the tuberculous infection by means of antiseptic substances, such as creosote or iodoform given by the mouth, have attained very little success, and these drugs may produce gastro-intestinal irritation. The idea of administering antiseptic drugs by the air passages suggested itself to physicians thirty years ago. In 1877 Sir William Roberts claimed good results in phthisical cases from the use of antiseptic inhalation by means of a "respirator-inhaler," which covered the mouth only, and which he directed to be "worn for fifteen, thirty, or sixty minutes several times a day." Dr. Coghill also employed a similar apparatus, and laid stress on the necessity that the patient should practise inspiration by the mouth and expiration by the nose. "Each inhalation should last from fifteen to twenty minutes, and may be with advantage frequently repeated." The formula which he recommended in 1881 was: *R. Tinct. iodi aetherealis ʒij, acidi carbolic ʒij, creosoti vel thymoli ʒj, sp. vini rect. ad ʒj*; and he also said that "where cough is urgent or breathing embarrassed chloroform or sulphuric ether may be added at discretion." The quantity of the solution to be used was "10 to 20 drops twice a day at least," and he left the frequency of use largely to the decision of the patient himself. He adds: "A great many of my patients have of their own accord come to use the respirator almost continuously day and night, from their experience of its good effects."

Dr. Burney Yeo, in a lecture delivered in King's College Hospital in 1882, advocated a new and simple oro-nasal inhaler constructed of perforated zinc, and for use therewith he advised a mixture of "creosote, carbolic acid, eucalyptol, or turpentine, with equal parts of spirits of chloroform." He pointed out that such an inhaler is extremely cheap, that it is light and comfortable to wear, that patients find no difficulty in sleeping with it on, and that cough is rapidly relieved. He preferred a mixture of equal parts of creosote and spirit of chloroform, though he sometimes employed carbolic acid or eucalyptol, and occasionally iodine. He found turpentine useful in cases of haemorrhage. He advocated "continuous or almost continuous inhalation." He stated that many cases under his care had improved remarkably by using this inhaler, and he gave the particulars of one very striking case. But he does not claim that by the use of this method it is possible definitely to arrest the disease in its early stage.

Dr. Hassall, in his treatise on *The Inhalation Treatment of Diseases of the Organs of Respiration, including Consumption*, published in 1885, endeavoured to prove that oro-nasal inhalers, and especially Dr. Yeo's, were practically useless; that a very small amount of the carbolic acid or other antiseptic used really found its way into the lungs; and that the only effective method was to place the patient in a chamber filled with antiseptic vapour. His objections, however, were founded on theory and on calculation, not on observation of clinical results. His inhalation chamber is practically impossible in most instances, but his criticism seems to have been accepted by the profession, and to have produced a scepticism which resulted in an almost complete disuse of the method. Yet that excellent clinical observer, Dr. Wilson Fox, wrote: "The antiseptic effect has been doubted by Hassall, but there can be no question that inhalations practised in this manner, with creosote, thymol, eucalyptus, iodoform, iodine, or terebene, tend to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages."

If a treatment by inhalation of antiseptics is to be really effective, three conditions are essential:

1. It must be continuous and constantly in operation during the whole of the twenty-four hours, except at meal times.

2. The inhaler employed must be light and capable of being worn both in the daytime and during sleep; it must not hinder respiration, and it should be cheap.

3. The solution employed should be as strong as possible, and it may with advantage be composed of a combination of several volatile antiseptic substances.

During the last four years I have treated all my cases of early pulmonary tuberculosis by this method, and the results have been so remarkable that I desire to bring them before the profession, in the hope that the method may be generally used. The inhaler employed has been the simple oro-nasal cage of perforated zinc advocated by Dr. Burney Yeo. It is worn over the nose and mouth, and is kept in place by elastic bands behind the ears; it contains a piece of sponge or felt on which the solution is dropped. The only precaution necessary is to take care that the edges of the inhaler, which rest on the skin, are not wetted, lest the skin should be stained or made sore. The antiseptic solution which I have employed has been: *R. Acidi carbolic ʒij, creosoti ʒij, tinct. iodi ʒj, spir. aetheris ʒj, spir. chloroformi ʒij*. Of this solution, 6 to 8 drops are poured on the felt of the inhaler every hour during the daytime, and two or three times during the night if the patient is awake. The odour of the solution is not unpleasant, and patients appear to derive great benefit from its use. Cough is rapidly relieved without any sedative or expectorant medicines, and sputum, if any, is more easily expectorated and is lessened in quantity. The use of this solution has no irritating tendency, nor does it cause haemoptysis. If haemorrhage should occur, it might be well to remember Dr. Yeo's suggestion and to add turpentine to the solution. The absolutely continuous use of the inhaler (except at meal-times) must be rigidly required, and it is very desirable to keep the patient at rest in bed for a week at least, the windows of his bedroom being widely open. During the second week he may be allowed to rise for an hour or two daily, but the continuous use of the inhaler is essential. When the temperature is normal, after the first ten days or so, he may be allowed to omit the inhaler for an hour every morning and to take a walk in the open air. Gradually the periods of exercise may be increased and the number of hours during which the inhaler is used may be very gradually diminished.

Two other points claim attention from the outset. The first is the condition of the teeth, gums, and throat. After every meal the mouth should be rinsed with sanitas fluid and water in equal parts. As soon as possible decayed stumps of teeth should be extracted and carious teeth filled or removed. If the tonsils or fauces are unhealthy, they may be sprayed with a solution of perchloride of mercury of the strength of 1 in 2,000. If there is any nasal obstruction it is advisable to spray the nostrils thoroughly two or three times daily with *R. Cocain gr. iv, ol. eucalypti ʒss, parolein ʒj*, by means of a parolein-spray apparatus. If the patient is a smoker, it is

necessary that he should give up the use of tobacco at once and permanently.

The second point which claims attention is the question of nutriment. It is essential to administer a sufficiency of easily-digested and nutritious food. I insist on every patient taking four times daily, in addition to his ordinary meals, a half-pint of (scalded) milk to which from a dessertspoonful to a tablespoonful of "malted milk" has been added.

Before relating the 30 cases of incipient or early pulmonary tuberculosis which I have treated by continuous antiseptic inhalation I insert a temperature chart taken from a case of advanced phthisis in which the employment of this method caused an immediate reduction of the hectic temperature, with arrest of sweating and slight gain in weight.

W. C., aged 32, was admitted into St. Mary's Hospital during my autumn holiday in 1905. When I resumed charge of the wards in October I found his bed placed on a sheltered balcony, with open windows to allow continuous fresh air as fully as possible. Removal from this to a hospital ward, with the use of continuous antiseptic inhalation, produced the striking effect shown by the chart. The course of the disease became much less acute, and finally so chronic that it was necessary to transfer him to an infirmary.

The following cases have been treated by this method:

1. I. B., aged 19, was admitted into St. Mary's Hospital under my care on March 8th, 1907, with signs of early tuberculous affection of both upper and lower apices of both lungs and evidence of fluid effusion into the left pleura. There was persistent pyrexia, the temperature being between 101° and 102° F.; twice in the first week it fell to 99° F., and once rose to 103° F. The antiseptic measures I have mentioned were begun at once, and she wore the inhaler day and night. There was no sputum. The pulse-rate varied from

84 to 100, the respiration-rate from 28 to 36. On March 17th 33 oz. of clear fluid were aspirated from the left pleural cavity; this fluid was found to be sterile. On March 18th her weight was found to be 8 st. 10½ lb. The antiseptic measures were continued. During the second week her temperature varied from 99° to 101° F.; it first fell to normal on March 23rd. It was a little irregular from March 25th to March 27th, and again from April 2nd to April 7th, but after this it remained persistently normal. On March 27th her weight was only 8 st. 5½ lb., showing a loss of 5 lb. in nine days. From March 27th to April 6th she had diarrhoea, so that I feared she might have tuberculosis of the intestine, and her weight fell to 7 st. 13 lb.—a total loss of 11½ lb. But the inhaler had been worn persistently day and night from the first, and now came the turn of the tide. After April 7th, the temperature remained normal, and she began to improve rapidly. On April 10th her weight was 7 st. 13½ lb.; on April 18th, 8 st. 6½ lb.; on April 25th, 8 st. 11½ lb.; on May 1st, 9 st. 2½ lb.; on May 6th, when she was discharged, 9 st. 5½ lb.—a gain of 20 lb. in twenty-six days. The difference in her appearance was extraordinary. One would hardly have known her to be the same patient.

2. Mr. S., a medical student, was under my care in St. Mary's Hospital for several weeks in the summer of 1906. He had pyrexia, cough, and marked signs (with crepitant sounds) at all four apices. On two separate occasions the sputum was found to contain large numbers of tubercle bacilli. His opsonic index was found to vary from 0.9 to 1.2. He was kept at rest in bed, an icebag was applied over the affected areas of lung, and the antiseptic measures described above were employed at once, the inhaler being worn night and day from the first. His temperature soon fell to normal, his physical signs improved, and before he left the hospital he had gained 2 lb. in weight. Though the first and second examinations of his sputum showed large numbers of bacilli, on the third examination they were rather difficult to find. He now spent several weeks at Llandrindod Wells, wearing his inhaler most conscientiously, living as far as

possible in the open air, and taking plenty of milk. When he returned to London in October he had gained 20 lb. in weight. His sputum was very scanty, but it still contained a very small number of bacilli. His improvement was so marked that I decided that it was unnecessary for him to go to Davos for the winter, as he was willing to do, and that he might gradually resume work. This he did cautiously, and with excellent success. His weight continued to increase, and on March 16th, 1907, it was 11 st. 1½ lb.—a total gain since his illness of 30 lb. At this date he was still using the inhaler about an hour daily; he had recently passed safely through an attack of influenza. This gentleman still continues in excellent health, looks extremely well, and has done hard work and gained distinction in his hospital classes.

3. Mr. E., aged 34, was seen by me in consultation with Mr. Jessett, F.R.C.S., and Dr. English on June 17th, 1907. Five weeks previously Mr. Jessett had removed a chain of caseous tuberculous glands from the right cervical region. The wound healed well, but two days after the operation the temperature rose gradually and became of hectic type. The pyrexial period lasted seventeen days. For six days the temperature was nearly normal. This was followed by another pyrexial period of ten days; it was now again normal. The pyrexia was accompanied by increasing dyspnoea, he was expectorating thick mucoid sputum, and some night sweats were present. No tubercle bacilli could be found in the sputum, but the physical signs were quite typical of a tuberculous infection of both lungs. The patient was at this time in a nursing home in South London, but he determined to go back to his lodgings near Westbourne Park Station. I saw him again, in consultation with Dr. Thoresby Jones, on June 29th. He occupied two rooms on the first floor in a rather narrow street on a motor omnibus route—by no means an ideal place for the treatment of such a case. His bed was in the back room; the folding doors were thrown back, and both windows of the front room were constantly widely opened. He was fortunate in obtaining the help

of a most excellent nurse. It was found that the physical signs had considerably increased during the twelve days, and there was now a pleural effusion on the right side. This fluid was drawn off and proved to be sterile. After the aspiration the side was strapped and an icebag applied. A Yeo's inhaler was worn constantly day and night, in accordance with the method already de-

scribed, and he was fed almost exclusively on milk and malted milk. The sputum increased rapidly in amount, and became muco-purulent, the temperature continued at 102° F., and there was discomfort about the larynx. An icebag was applied over this region, and two others over the lung. The very copious and purulent sputum was examined bacteriologically, and was found to be full of streptococci. This fact, indicating a streptococcal infection of a tuberculous lung, seemed to me to render the prognosis almost hopeless. On July 11th a very violent paroxysm of coughing occurred, lasting five or six hours, when he brought up much purulent material and some blood. The temperature rose to 103° F., and the pulse to 130 for a short time, but this soon subsided, and he seemed better. He was assiduously nursed and carefully fed, and his appetite began to improve. The inhaler was worn persistently. From June 26th to July 4th the temperature was from 100° to 102.3° F.; from July 4th to July 10th, 99.5° to 101° F.; from July 10th to July 14th, 99° to 100° F.; and on July 14th it became normal permanently. On July 23rd he was still improving, and was obviously gaining flesh; sputum much less, but still copious and muco-purulent; one or two slighter paroxysms of coughing. There was now resonance in the right axilla (where the fluid had been), but an area of dullness existed at the right anterior base and the right posterior base, with some bronchial breathing and moist sounds—clearly a basic cavity. On August 16th he had sufficiently recovered to come to my house, and I found that there were still signs, though less marked, of a cavity at the right base. He looked decidedly stouter. His weight was found to be 11 st. 10½ lb., his weight in health having been 12 st. 6 lb. He was sent into the country, and persisted in the use of his inhaler. After this his recovery was uninterrupted, and he resumed his work. I examined him again on April 28th, 1909, after an interval of a year and eight months. All the old dull areas could be detected, but there was no bronchial breathing, no prolonged expiration, and no crepitant sound—in short, no

sign of activity. His weight had increased to 15 st. 6 lb.—an increase of no less than 52 lb.! He looked so well that I hardly recognized him at first sight. He had done full work for more than eighteen months, from 9 a.m. to 7 p.m. each day, in an ill-ventilated shop, and had enjoyed a summer holiday in France.

These three cases give sufficient proof of the curative influence of continuous antiseptic inhalation in a tuberculous, and even in a streptococcal, invasion of the lungs. They justify the hope that if this treatment can be adopted in the earliest stage of a pulmonary tuberculosis, we may be able definitely and completely to arrest the disease. If we are to have any prospect of abolishing pulmonary phthisis—one of the greatest scourges of the human race—we must attack it long before any bacilli can be found in the expectoration. In the great majority of cases of pulmonary tuberculosis, definite and characteristic physical signs are present for weeks or months before the patient begins to expectorate. To wait for tubercle bacilli in the sputum before diagnosing pulmonary tuberculosis is like delaying the diagnosis of cancer until the glands are involved. It is therefore essential to acquire accurate ideas as to the exact localization in the lung of an incipient pulmonary tuberculosis and as to the physical signs which are caused by it. For a statement of the current teaching on this subject I turn to the latest authoritative monograph, the article on Tuberculosis of the Lung in *Green's Encyclopaedia and Dictionary of Medicine and Surgery*, vol. vi, published two years ago. In this article, written by a physician of wide experience, there is a section on page 35, under the title Physical Signs of Incipient Tuberculosis, which states that "The early determination of pulmonary tuberculosis by physical signs affords scope for great refinement of methods. In proportion to the earliness of the process the physical signs are slighter; they are, consequently, apt to be missed. Reliable skill can only be obtained after prolonged and careful practice. Auscultation affords the more delicate tests. The auscultatory phenomena include slight modifications of the normal respiratory murmur—for example, enfeeblement, harshness, interrupted or cogwheel or jerky respiration, prolonged expiration, blowing expiration (broncho-vesicular). When the respiration is actually bronchial, the process is something more than incipient merely. . . . Percussion yields results of importance even at early stages. All portions of the lung must be examined. Corresponding portions must be compared with care; more especially, the two apices must be tested comparatively in respect of percussion sound and extent of resonant area."

This statement as to the earliest physical signs in an incipient pulmonary tuberculosis, and similar statements in the textbooks, seem to me both erroneous and very inadequate—erroneous in assigning greater importance to auscultation than to percussion, and quite inadequate in the information given as to the regions of the thoracic wall where we may expect to find the earliest changes. Yet it is now nearly twenty years since Dr. Kingston Fowler pointed out that tuberculosis of the lungs begins, in an overwhelming majority of cases, at certain definite localities in the lung, and that the disease progresses by well-defined routes. This statement was founded on Dr. Fowler's experiences of autopsies at the Brompton Hospital. It has found its way into some of the textbooks, and is recognized as conveying true information of pathological fact; but it has produced little or no modification of the descriptions of the clinical picture of the disease. Dr. Fowler showed that the earliest lesion occurs not at the very summit of the lung, but at a spot about 1 in. to 1½ in. below the summit, in the lung as seen in the *post-mortem* room. This will correspond to a greater distance, probably quite 2 in., in the expanded air-containing lung. From this site the process may extend either backwards towards the suprascapular fossa, or downwards and outwards into the second intercostal space. Clinically this can quite easily be recognized by careful percussion. The earliest physical signs (dullness and lessened air-entry) may usually be first detected in the innermost part of the first intercostal space on one or both sides, extending from one to three fingerbreadths from the sternum, and possibly also in the second space at about one fingerbreadth from the sternum. Posteriorly they may be detected quite close to the uppermost dorsal vertebrae on either side, a region which normally is quite resonant. Dr. Fowler also pointed

out that less commonly the site of the earliest lesion was situated more externally, and this also is recognized clinically by dullness in the outermost part of the first, and sometimes of the second, intercostal spaces; posteriorly it can be detected in the outer part of the suprascapular fossa, occasionally also in the upper axilla. This area of dullness often exists along with that first described, while the mid-clavicular region remains much more resonant.

In the lower lobe also a similar tuberculous focus is apt to be developed at a very early stage, with, or very soon after, the focus in the upper lobe. Dr. Fowler stated that in the lower lobe also the situation of this early lesion is about 1 in. to 1½ in. below the summit of the lower lobe, and that it is apt to spread downwards and outwards along the lower edge of the interlobar fissure. He described the position at the back of the chest where this lesion was to be looked for. Clinically it is quite easy to verify these facts if careful percussion is practised over the inner extremity of the spine of the scapula and the adjoining region.

These areas at the four apices are the most frequent and characteristic, but occasionally small areas of dullness may be found in front in the right middle lobe, and in the antero-lateral region of the anterior base of the left lung; posteriorly, at the posterior scapular edge, at the scapular angle, or near the posterior base of the lung. The existence of dullness and lessened air-entry at these various localities is quite easy to detect. All that is required for their discovery is care, patience, a correct method of percussion, and a little practice. Anyone who is willing to take a little trouble can satisfy himself of the accuracy of what I have stated. Over these dull areas auscultation often reveals nothing but a defective air-entry, though very slight crepitant sounds may be present; such sounds may or may not be removed by a cough. At a slightly later stage the inspiration may be a little harsh or interrupted; the expiration slightly prolonged. When bronchial breathing, bronchophony, and distinctly audible whisper are present, there is either consolidation around a bronchial tube or a definite cavity.

I may point out the similarity of the earliest physical signs in pulmonary tuberculosis to the earliest physical signs in pneumonia. On the first day of a pneumonia, before any sharp crepitation or any bronchial breathing is developed, it is often possible to detect by careful percussion a small area of diminished resonance or actual dullness, over which the only auscultatory sign is deficiency of air-entry. In both tuberculosis and pneumonia the similar phenomena are due to a similar cause, a local microbic invasion and a local arrest of pulmonary function.

The typical localization of these areas of dullness and lessened air-entry at the four apices is, in itself, almost proof of a tuberculous infection of the lung, but in young subjects they may be simulated (though not often exactly) by simple collapse, and occasionally by bronchopneumonia or by enlarged bronchial glands. They are not necessarily proof of an active tuberculous lesion; they may be the abiding result of a former lesion which has recovered or become quiescent. Local crepitant sounds over these dull areas, pyrexia, hacking cough, haemoptysis, or local tenderness, would indicate an active lesion. These physical signs are the earliest obtainable evidence of the existence of pulmonary tuberculosis. They are long antecedent to the appearance of any sputum, and therefore to any possibility of microscopical examination. They are also quite distinct long before any evidence can be obtained by the use of Roentgen rays; the statements which have been made to the contrary are founded on inaccurate percussion. But a variability of the opsonic index may exist along with the earliest pulmonary signs: of this I have twice had proof. A worker in the bacteriological laboratory was found to have a varying opsonic index to tubercle, though he felt quite well. He came to me and requested me to examine his lungs. I found minimal areas in the characteristic positions, measuring from a half to one fingerbreadth—that is, 1 to 2 cm. He did not practise inhalations, but went to a sanatorium, where two months later he had a pyrexial attack lasting a week, and a few tubercle bacilli were found in his (very scanty) sputum. He remained in the sanatorium four months, and gained 8 lb. in weight. I examined him again on his return, and found all the dull areas distinctly larger but quiescent, and he seemed to be in good health. The second case is the converse of the

first. A patient who had had a brief attack of pleurisy on the left side, and who quickly recovered, was found to have minimal characteristic areas in the left lung only. There was also slight enlargement of cervical glands. An investigation of the opsonic index to tubercle was suggested and carried out; it was found to be varying. The variability fortunately lasted only a few days.

The dull areas of pulmonary tuberculosis differ much in size. They may be detected when they measure only half a fingerbreadth, or 1 cm., but they often measure about two fingerbreadths. In a severe case they may reach three fingerbreadths, and as much as four in the latest stages of the illness. The auscultatory signs will be determined by the amount of implication and destruction of the pulmonary structure. The possibility of accurate measurement by percussion makes it easy to construct a rough diagram showing the localization of these areas, and the number of fingerbreadths in each can be recorded by figures. Thus, the condition at one visit can be compared with that found at a subsequent visit. The areas may be found to be smaller when the case is improving, and larger if the disease has progressed. I find these records quite trustworthy, and of the greatest assistance in helping to determine whether improvement or deterioration has occurred.

I now add a brief description of 27 other cases of incipient or early pulmonary tuberculosis treated by the method of continuous antiseptic inhalation:

4. Mr. M., aged 33, seen with Dr. Mowll, of Surbiton, July 3rd, 1905. After a sharp attack of influenza he was found to have signs of tubercle at all four apices. Loss of weight 7 lb. Recovered under constant use of inhaler, and gained weight, 14 lb. Went back to work, and in December, 1906, was examined for life insurance and accepted as a "first-class life." But in January, 1907, he had a fresh attack, chiefly in the left lung. He was again kept at home for a fortnight, and used his inhaler persistently; again regained the weight lost, and resumed his occupation, which involves both mental and physical strain. He has remained quite well and is fully equal to his duties.

5. D. B., aged nearly 13, the son of a medical man, had been sent home from boarding school because ill. Tall, but $2\frac{1}{2}$ lb. under average weight for age. Short cough. Signs (November, 1906) at all four apices. Under continuous antiseptic inhalation his cough vanished in a few days; he gained 6 lb. in weight in five weeks, and looked better than for two years. Advised still to use the inhaler three hours daily. He continued to improve; a year later he had gained 14 lb. more, and a year later still an additional 9 lb. In November, 1909, Dr. B. writes: "My son Douglas keeps well, loses no time at school, enjoys the games, and writes home for large cakes to be sent."

6. Miss V., a hospital sister. Signs in left lung only at first, later at all four apices and one lower area. Loss of weight, 7 lb. No sputum. Weight gained in first three weeks of treatment, $3\frac{1}{2}$ lb.; in the next month, 5 lb.; total gain, 8½ lb. Recovered completely, and for eighteen months has fulfilled her arduous duties with conspicuous ability and success.

7. Miss M., M.B.Lond. Signs at all four apices. Weight lost, 4½ lb. No sputum. Weight gained in first three weeks of treatment, 2½ lb.; during the next month, 12½ lb.; subsequent gain, 15 lb.; total gain, 30 lb. (Her weight rose from 114 lb. to 144 lb.) She has been quite well for two years, and is now doing school inspection work six hours daily for five days a week; is giving ambulance lectures, and has private practice.

8. Miss M., aged 28. Signs in left lung only at first, afterwards at all four apices and four lower areas. No sputum. Had lost weight. During first three weeks of treatment lost ½ lb., and afterwards regained it; during the next month gained another pound. She then felt much better, and her cough had disappeared. I have heard from her recently that she is still well.

9. Admiral X., aged 50, seen in consultation with Dr. G. A. Simmons, of Westminster, April 11th, 1907. Eight months previously a little pleurisy on left side; four months ago another attack on right side, with a little hæmoptysis. Yesterday again pain in side and slight hæmoptysis. Signs of tubercle in right lung only. Under continuous antiseptic inhalation he rapidly recovered, and in June, 1908, was "in excellent health," and doing important public work.

10. Mrs. R., aged 38. Signs at all four apices, and a small cavity at left lower apex; sputum mucoid; no tubercle bacilli found. Weight gained in first three weeks of treatment 4 lb., and during the next month 8 lb.; total weight gained, 12 lb. Cough and sputum much less; looks much better. I have not heard from her during the last two years.

11. K. S., aged 17, housemaid. Signs at all four apices; subsequently developed a small cavity at right apex; no sputum. Her weight was not taken until after six weeks' treatment; it was then 97 lb.; she gained 6 lb. Recovered and remained well for six months, then caught fresh cold from a wetting, and developed a few fresh signs, but two months later she was "much better."

12. Mr. C., aged 25, brought by Dr. G. A. Simmons, of Westminster. Four years previously, after an attack of influenza, was ill for three weeks with pyrexia of hectic type. Recovered slowly, and after this had cough each winter, and some sputum

with occasional streaks of blood. Loss of weight, 7 lb. Frequent short cough. Tubercle bacilli not found in sputum. Signs at all four apices and two lower areas. Under continuous antiseptic inhalation his cough ceased in a week, and his first remark on his second visit was: "I can't think where my cough has gone to!" Gain of weight in first three weeks of treatment, 2½ lb.; during the next month, 4½ lb.; subsequent gain, 2½ lb.; total, 9½ lb. He spent some months of the winter of 1907-8 at a high altitude station in the Rhone Valley, under the observation of Dr. Tidey, of Montreux, using his inhaler six hours daily and at night, and returned to England in excellent health. I have recently heard from him that he has gained 7 lb. in weight since I last saw him.

13. Mr. P., aged 36, sent by Dr. Wilson, of Boston. Signs at all four apices and four lower areas. Sputum scanty. Tubercle bacilli not found. Has lost 2 lb. in weight during the last three weeks. Under inhalation treatment he gained 5 lb. in four weeks. He continued to improve, and six months later was quite well, except for some chronic nasal obstruction. He has remained well.

14. H. C., aged 19, brought by Dr. Hickley, of South Lambeth Road. Slight hæmoptysis two years ago, with signs at right apex. Two more attacks of slight hæmoptysis recently. Signs at all four apices and five lower areas. Under inhalation treatment he gained 1 lb. in the first three weeks. He used his inhaler for some months, and a year after his first visit to me, Dr. Hickley reported that he had been "quite well for some time." I have recently heard that he continues well.

15. K. P., aged 15, sent by Dr. Brooks, of Felixstowe, under whose care he had been for a month on account of pleurisy at the right base. His illness began two months ago. He had improved in general condition, having gained 7 lb., but the physical signs were stationary. A sister of his father's had died of phthisis after an illness of only ten weeks. His weight when he came to me on September 18th, 1908, was 9 st. 7 lb.; he showed signs of tubercle at all four apices and five lower areas, including two large ones at the right base, but apparently no pleural effusion. The treatment by continuous antiseptic inhalation was adopted at once, under the supervision of Dr. Baggins and Dr. Adams, of Hartley Wintney, Winchester, Hampshire, and a very thorough open-air treatment was at the same time carried out by them, the boy living in an open shelter in his father's garden. Sputum very scanty. Twelve days later Dr. Baggins wrote that the cough was almost gone, and that he had gained 7 lb. in weight. In another month he gained 10 lb. more, and subsequently 3 lb.; total gain, 20 lb. In December, 1908, he looked fat and well, and had not coughed for a long time. His weight was then 10 st. 13 lb. In November, 1909, Dr. Baggins writes that he had recently examined the boy's chest very carefully, and could find no evidence of any disease of the lungs; he considered him cured.

16. Mr. H., aged 20, a patient of Dr. Nettell, of Shirebrook, Mansfield. He had no cough, but had suffered from repeated attacks of tonsillitis. Four years previously he had suffered from pleurisy; he had lost 3 lb. in weight; he had signs at all four apices and four lower areas, the largest being at the right lateral base—doubtless the remains of the former pleurisy. No sputum. Under the antiseptic treatment by inhalation and sprays to throat and nose he rapidly improved, gaining 3½ lb. in weight. He returned to his work as a mining engineer, and he continued well. It is doubtful whether some of his dull areas were not of old standing, the legacy of his attack four years previously, but they appeared to diminish slightly while he was under treatment.

17. A. W., aged 26, marine engineer; sent by Dr. Beaumont, of East Ham. He had had cough for four months, and had been taken ill on shipboard. He was admitted into hospital at Sydney, Australia, and remained there ten weeks. He had been back in England for one week. He showed signs at all four apices and five lower areas, with a cavity at the right apex; he looked very ill, and had lost more than 3 lb. in weight. Under treatment by antiseptic inhalation he rapidly improved, and when I next saw him, four months later, he had gained 15½ lb. in weight. Three months later still there had been a further gain of 3 lb.; total gain, 18½ lb. He looked quite a different man, and had very slight cough in the morning only. There were still signs of a cavity at the right apex. I have heard no more of him.

18. C. G., aged 40, had suffered from occasional slight attacks of hæmoptysis since 28 years of age, with slight cough. When he came to me on February 14th, 1909, he had had a "cold" for five weeks, followed by an attack of hæmoptysis more severe than ever before. He showed signs at all four apices and two lower areas, with possibly a small cavity at his right apex. After a week in bed, with continuous antiseptic inhalation, he returned to his work. He was able to wear the inhaler in his office for seven hours daily, also at night. During the first three weeks of treatment he gained 3½ lb.; during the next month, 3 lb., and subsequently 2 lb.; total gain, 8½ lb. His friends, he stated, "never saw him look so well." After giving up the inhalations he had a small extension of physical signs in the right second space, and lost 1½ lb., but a return to the treatment soon arrested this. He is now in excellent health and doing full work.

19. Miss T., aged 18, sent by Dr. Wilson, of Boston. Cough for three months, but no sputum. Signs at all four apices and two lower areas. Under treatment by continuous antiseptic inhalation the cough soon disappeared, and she gained 2½ lb. in weight. I heard last month that she was very well "and growing quite fat."

20. Miss H., aged 22, sent by Dr. Leeson, of Twickenham. Signs at first only in left lung posteriorly, but afterwards at all four apices and two lower areas. She had lost 2½ lb. in the last three weeks. Under treatment by continuous antiseptic inhalation there was steady improvement; the cough rapidly diminished, and she told me that "life was now worth living." She gained 2 lb. in the first three weeks; 1½ lb. during the next month, 2½ lb. subsequently; total gain, 6 lb. Is still using the inhaler, and is "wonderfully better" and very active.

21. Mr. B., aged 36, sent by Dr. Grove, of St. Ives, Hunts. His illness began eight months previously, with catarrh and haemoptysis. Dr. Grove found signs of tubercle at the right apex, but no bacilli in the sputum. Cough worse for four months. Had lost 4 lb. Dr. Grove found tubercle bacilli for the first time the day before the patient came to me. There had been phthisis in his mother's family, and his father died of rheumatic fever. The patient had had pains in his knees, and was found to have a moderately dilated heart, a systolic apex murmur, and a short presystolic. He had signs of tubercle in his lungs at all four apices and two lower areas. After two weeks' rest in bed and continuous use of the inhaler he was able to return to his office, wearing the inhaler while at his work, and altogether about twenty hours out of the twenty-four. During the first three weeks he lost ½ lb.; but in the next month gained 4½ lb., and subsequently 14½ lb., a total gain of 18½ lb. He is now doing full work without fatigue, and gradually lessening his use of the inhaler. He feels very well.

22. Mr. P., aged 38, sent to me by Case 3. Cough for four months. Felt ill and unequal to his work for one month. Signs at all four apices and four lower areas; no sputum. After a week's rest in bed with continuous antiseptic inhalation he returned to his work, and was able to wear his inhaler for several hours daily, and at night. The cough disappeared within a week. Gain of weight in first three weeks, 4 lb.; during the next month, 5 lb.; total gain, 9 lb. During July he had to work twelve hours a day, and he lost ground a little; but he persevered with the inhalations, and by September had quite recovered. He was doing his full work without fatigue, and had had no cough for three months.

23. Mr. H., aged 32, also sent by Case 3. Illness began four months previously, and he lost weight rapidly. He also suffered from hydrocele, which was tapped several times. Temporary improvement occurred, but a fortnight ago he went to Germany for a week and experienced "shocking weather." Came back feeling ill. Showed signs at all four apices and two lower areas, with a cavity at his right apex. Evening temperature 99.8° F.; sputum scanty, but containing numerous tubercle bacilli. A week after his first visit to me he had haemoptysis twice, and his temperature rose to 103° F. I saw him again six days later at his own home, in consultation with Dr. Rudd of Acton. The temperature had fallen to 101° F. I found a quite new dull area above the left nipple, with sharp crepitant sounds, and the former physical signs were more marked. Evidently the disease was progressing rapidly; but under persistent antiseptic inhalation he improved more than we had dared to hope, the temperature fell to normal, and remained normal. He kept his bed for five weeks. There was no more haemoptysis, and the cough became much less. He gradually increased in weight, and had gained 5 lb. in the eight weeks in spite of his severe attack. The physical signs were more advanced, and in addition to the cavity at his right apex there were signs of cavitation in three other situations. He was gaining strength, and was walking about two miles daily; cough not troublesome, still some sputum. He was advised to go to Bournemouth, and to wear his inhaler six hours daily and at night. I have not heard from him again, but I have heard indirectly that he is purposing to emigrate to South Africa, and that he has grown so much stouter that he has been compelled to have his clothes enlarged.

24. Miss M. R., aged 13, the daughter of a medical man (deceased), had suffered from a "tuberculous finger" at 6 months of age; it was opened surgically, and healed slowly. For about a year she had had cough and some pain in her side. Sputum scanty, and did not contain bacilli. Signs at all four apices and four lower areas. Under the use of continuous antiseptic inhalation her cough ceased in a week, and in six weeks she gained 14 lb. in weight. I saw her again five months later, and found a further increase of 11 lb.; total gain, 25 lb. She looked and felt extremely well.

25. Mr. A., aged 37, brought by Dr. Higgins, of Hornsey Road. Cough five weeks; loss of weight, 7 lb. Signs at all four apices and four lower areas, with a cavity at the right apex. No sputum. Under treatment by continuous antiseptic inhalation he improved steadily. Gain of weight in the first three weeks, 5½ lb.; during the next month, 5 lb.; subsequently, 7 lb.; total, 17½ lb. His employers having generously allowed him a complete holiday, he was able to use the inhaler during nearly the whole of the twenty-four hours for the period of five months. When last examined, on August 4th, he was perfectly well, the cavity having become obliterated. Since then he has gained 2½ lb., and for three months has done his full work without fatigue.

26. Rev. W. W., aged 42, a patient of Dr. Wilkin, of Newmarket. Ill eight weeks; loss of weight, 4 lb. Haemoptysis ten days ago. Two brothers had died from phthisis, aged 38 and 48. Signs at all four apices and three lower areas. Under treatment by continuous antiseptic inhalation he gained 9 lb. in the first three weeks, and 11 lb. during the following month. He improved rapidly, and when examined on October 13th there were no active signs in his lungs, and he had gained 6 lb. more: total gain, 26 lb. Was doing full clerical duty without fatigue.

27. Miss S., aged 34, sent by Dr. Havell, of Felixstowe. Aching pain in her right chest, with sense of constriction and some dyspnoea for nine months previously; worse during the last six weeks. Very slight haemoptysis. Signs at all four apices and two lower areas, with a cavity at the right apex. No sputum. Under antiseptic inhalation, continuous so far as her duties would allow, she has slowly and steadily improved. She has gained 3½ lb. in weight, her cavity has slowly decreased, there has been no cough for some time, and only occasionally any pain. She is doing her full share of work without fatigue.

28. C. H., aged 9, the ill-developed and half-starved child of very poor parents, living over a stable, was found on April 30th, 1909, to have signs of tubercle at both apices of the right lung and at the upper apex of the left. His weight was only 3 st. 6½ lb., or 12 lb. below the average weight for his age. He had enlarged cervical glands and many carious teeth. My colleague, Dr. Willcox, kindly admitted him into St. Mary's Hospital, and treated him by continuous antiseptic inhalation. The carious teeth were extracted. He improved rapidly. When I examined him again on July 5th he had gained 3½ lb. in weight, the dull areas were smaller, and the signs of active lesion had subsided. But his conditions of life are most unfavourable. On October 5th his weight was still 3 st. 10 lb., as in July; his cough had returned, and I found evidence of fresh implication of the left lung, the right lung being no more involved. Dr. Willcox kindly again admitted him into hospital, and he has once more improved and again gained weight. But one cannot but fear that the domestic conditions will prove too hard for him.

29. Mr. N., aged 28, sent by Dr. Wilson, of Boston, May 7th, 1909. Cough for six weeks; loss of weight, 2½ lb. His sister, aged 25, died from phthisis after an illness of two years. Signs at all four apices and two lower areas, with some evidence of cavitation at the right apex. Gain of weight after three weeks of continuous antiseptic inhalation, 7 lb. A month later, after a stay at Margate, where he did not feel well, he was found to have lost 3 lb. The physical signs were stationary, but he had brought up some blood. This was due to bleeding gums round some very loose teeth. These teeth were extracted, and he again improved. On October 15th he was found to have gained 14 lb. since his first visit; there was no sign of activity in his dull areas of lung. He felt and looked very well, and was doing his full work without fatigue. He was dismissed as cured, but advised to wear his inhaler for two hours daily during the next three months.

30. Mr. R., aged 30, seen at his home in East Ham, with Dr. McKettrick, July 27th, 1909. Cough for two months; haemoptysis, lasting several days, two weeks ago. Sputum mucoid. Extensive signs of tubercle in both lungs, at all four apices, and five other areas, with some signs of cavity at the right upper apex and moist crackles at the left lower. I formed a very unfavourable opinion of his prospects. We at once instituted treatment by continuous antiseptic inhalation. On October 16th Dr. McKettrick wrote to me that "Mr. R. is now in Devonshire, putting on flesh rapidly, and his lung condition has improved very much."

P.S., November 30th, 1909.—Mr. R. wore his inhaler day and night persistently for a month. For eleven weeks he has lived in the open air at Lyme Regis. He has gained twelve pounds in weight, has hardly any cough and almost no expectoration, and has been able to climb the Dorset hills. There is still a cavity at his right apex with slight local tenderness and slight occasional local pain, but there is hardly any crepitant sound, and all his dull areas are much smaller. He feels well and hopes to resume work in January.

This is, I think, a complete list of all the cases of incipient or early pulmonary tuberculosis which I have treated by continuous antiseptic inhalation, and in which I have been able to watch the progress or to ascertain the result. Every one of these 30 cases has shown marked improvement. This is surely a most encouraging fact. I consider 22 out of the 30 as certainly cured. In 13 of them the cure has stood the test of time, for they have all remained well and in active work for a whole year. These are Cases 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, and 16. To these may probably be added Case 1. Eight other cases, Nos. 18, 19, 21, 22, 24, 25, 26, and 29, are apparently quite well, but they have not yet stood the test of time. Five cases—Nos. 10, 11, 17, 20, and 27—I look upon as nearly cured. Only 3 cases remain about which one feels any doubt as to the favourable issue; they are Nos. 23, 28, and 30, and all these 3 cases have improved very considerably.

In the later stages of pulmonary tuberculosis the treatment by antiseptic inhalation will sometimes relieve cough and diminish expectoration, but it cannot be expected to cure. Let no one make trial of this method in advanced phthisis and then report that he "has obtained negative results." Of course he will obtain negative results. When the whole house is burning the most strenuous efforts of the fire brigade may be powerless, yet at its beginning the fire might have been extinguished by a mere pailful of water. If we are to succeed in arresting pulmonary tuberculosis we must attack it in its earliest stage. At present cases are too often allowed to drift into a serious

and even into an irremediable condition simply because the practitioner has not learned how to diagnose an early tuberculous infection by means of careful percussion. Yet this possibility is within the reach of all if a correct method be adopted. And here let me lay stress on the necessity for a complete relaxation of the patient's muscles. For the front of the chest, the patient must lie on his back on a comfortable couch and be placed completely at his ease. With the patient standing or sitting up it is impossible to ascertain the facts correctly, and some of the published pictures illustrating the "method of percussion," with the patient erect, are excellent examples of "how not to do it!" For the posterior aspect of the thorax, the patient should be sitting with his back to the physician; he should place his hands on the anterior aspect of the opposite shoulders, and should bend gently forwards.

In this paper I have endeavoured to maintain two propositions. The first is that the detection of pulmonary tuberculosis before any bacilli appear in the sputum is within the reach of any medical practitioner who is willing to take a little trouble. The second is that pulmonary tuberculosis detected at this stage can always be arrested by treatment by continuous antiseptic inhalation. It may be that some exception to both these statements may be found, but if these two propositions can be established, or if they are even approximately true, it is not too much to say that the practical extinction of the disease known as pulmonary phthisis is within our grasp. Since the essential point is a careful percussion, we may say that the secret of success is very literally in our own hands. I believe that within three or four years an enormous reduction of the mortality might be effected.

SEVERE PERSISTENT HAEMOPTYSIS

CHECKED BY INTRAVENOUS INJECTION OF
NORMAL SERUM AFTER OTHER MEANS
HAD FAILED: SUBSEQUENT
COMPLICATIONS: RECOVERY.

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ONE of the most mortifying experiences which can befall a physician after piloting a case of pulmonary tuberculosis to an apparently satisfactory recovery is to lose his patient from a sudden haemorrhage. It is admitted that in presence of this catastrophe we are virtually helpless, and

It is unnecessary to detail the insidious onset of pulmonary tuberculosis in a man of 43, its sudden outburst coincidentally with an attack of pneumonia, or its steady passage to a widely disseminated infection with bilateral pleurisy, cavity formation at one apex, and constant pyrexia. Suffice it to say that after a long fight the fever abated, the lungs dried up, and tubercle disappeared from the sputum (microscopically). The treatment adopted was intravenous injections of an ethereal solution of iodoform diluted with from 20 to 30 per cent. of liquid paraffin (a 15 per cent. solution of lecithin in ether being occasionally substituted for the paraffin). All treatment had been discontinued for about eight months, and the patient appeared quite well and had returned to work. The haemorrhage broke out on June 21st, 1909, as he was sitting down to supper. The following remedies were tried:

- (a) Complete rest in bed in a cool room semi-recumbent.
- (b) Not allowed to speak.
- (c) Icebag over cavity.
- (d) Cold packs to abdomen and hot bottle to feet.
- (e) Three grains of calomel followed by 3j of castor oil.
- (f) Morphine and atropine hypodermically.
- (g) Inhalations of nitrite of amyl.
- (h) Hypodermics of ergotinine.
- (i) Calcium chloride in large doses orally.
- (j) Calcium chloride in large doses (enemas).
- (k) Suprarenal gland.
- (l) Ten c.cm. of normal serum by the mouth thrice a day.

In spite of these, the haemorrhage went on in increasing amount, and having continued uninterruptedly for sixteen days he was blanched and in a state of great prostration. After immersing his hand in a ewer of hot water and applying a handkerchief tightly round his forearm, I managed to distend the radial vein at the wrist sufficiently to introduce a needle and injected 20 c.cm. of normal serum. The result was gratifying. Bleeding seemed to stop almost at once, as any further expectorations were dark and evidently the remains of the blood already effused. These soon became mixed with mucopus and in a few days all traces of blood had disappeared. The injections of 20 c.cm. were administered every day for six days and apart from their styptic effect seemed to benefit the patient in every way. But our troubles were by no means ended. An acute attack of "serum disease" supervened. On the sixth day of the intravenous injection of normal serum a slight rash appeared on the cheek and soon invaded the whole body, appearing, disappearing, and reappearing in a most tantalizing way. In character it was a mixture of erythema and urticaria. There was also a rash on the buccal mucous membrane and fauces, great swelling in the pharynx, and from his altered voice and breathing evidently some oedema of the glottis. The sterno-mastoids were swollen and hard. He could not move his head, swallowing was exceedingly painful, and his efforts to clear his throat of the glairy mucus exactly simulated a quinsy at its height. His jaws became locked, so that nothing could be done locally to relieve his distress, and but for the comfort that the bleeding had stopped there was little to congratulate oneself upon. The itching was intolerable, and even morphine gr. $\frac{1}{2}$ with atropine hypodermically, in addition to 1-gr. pills of opium three times

in the multitude of treatments advised, that meeting with anything like general acceptance is smart purgation, sedatives hypodermically, and the local application of ice. The method employed in the case to be described, and only as a last resort, seems therefore to justify a short note.

a day, failed to secure restful sleep. Hyoscine gr. $\frac{1}{100}$ hypodermically induced great cerebral excitement but no sleep. Veronal in 5 and 7½ gr. doses in conjunction with sodium salicylate and sulphonal in 10-gr. doses were also tried as hypnotics, but the only result was delirious nights and abject misery in the mornings. After veronal and sulphonal he