ARTIFICIAL PNEUMOTHORAX TREATMENT

WITH SPECIAL REFERENCE TO BILATERAL COLLAPSE*

BY

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The value of artificial pneumothorax treatment for pulmonary tuberculosis is now well established, and the time has come to consider whether the method can be more fully utilized. To render a patient's sputum negative to tubercle bacilli, to arrest the disease, in any case, is a service not merely to the individual but to the community and the State. It deals with a centre and source of infection. I would like to put in a plea to-day for (1) a more widespread use of the treatment in the early and acute types of the disease; (2) ambulatory artificial pneumothorax; (3) bilateral artificial pneumothorax; with special reference to the last-mentioned.

1. Early and Acute Forms of Pulmonary Tuberculosis and Artificial Pneumothorax

Collapse therapy "won its spurs" in the treatment of advanced pulmonary tuberculosis. Forlanini in working out the technique and establishing the reputation of artificial pneumothorax, limited himself to advanced cases of the disease with bilateral lesions. For many years it was looked upon as a last resort—this was due to the fact that in the past it was not without its dangers. It being a principle in the profession that no remedy must be more dangerous than the disease which it is intended to cure, the early, even the acute, case was not considered to be bad enough to subject it to the risk involved. Nowadays, with the technique perfected and the treatment practically safe, should artificial pneumothorax not be looked upon as the method to adopt whenever an early or acute case of tuberculosis presents itself? What may happen to such a case? One of three things:

(i) Great improvement.—Too often that creates a false sense of security, and the patient takes risks and has an exacerbation only to be met with six months or perhaps six years later, hopelessly advanced.

(ii) The lung disease remains more or less stationary, with cough and persistently positive sputum; but the pleura, irritated by its presence, becomes adherent.—This may be a conservative influence on the part of Nature to rest the lung and facilitate the cure of the disease. It, however, may prevent the induction of an artificial pneumothorax later.

(iii) The lung disease becomes worse and the extra-pulmonary complications develop.

The induction of an artificial pneumothorax obviates all these risks in a large proportion of cases. Emulating Nature in the process of cure, it rests the lung and facilitates fibrosis.

Lawrason Brown years ago predicted that "artificial pneumothorax would be used in all early cases in the future." He is a sound and experienced phthisiologist who would not make such a statement without considering it carefully. It is also a conclusion to which many reliable workers have come. The early stage is certainly the ideal

one for effective therapeutic collapse. Adhesions are few, collapse is easily effected, and the sputum is rapidly rendered negative. The bad results are met with when pneumothorax treatment is resorted to in advanced and toxic cases, although even then it may produce marvellous results. It is my considered opinion that whenever a patient presents himself with a unilateral lesion of the exudative or the bronchopneumonic type the induction of an artificial pneumothorax should be attempted without delay. It is the best, the safest, and the shortest method of securing arrest. The "wait and see" policy is disastrous.

With views such as these, it is vexatious to meet with what appears to be callousness, not infrequently on the part of some public health authorities, on this matter. A young adult who cannot afford to go into a private institution is seen to have such a lesion. The case is notified in the usual way, with a request that it be dealt with immediately, as the condition urgently requires treatment. The case is leisurely visited in a week or ten days by a doctor or nurse, and then left alone for six or eight weeks or even longer. During that period the disease probably progresses. It may become bilateral, adhesions may form, and artificial pneumothorax treatment be unavailing. If it were an acute appendix, an acute osteomyelitis, or even an acute pleurisy the patient would be admitted at once to a voluntary hospital and given immediate treatment. Yet these conditions are by no means more serious, or more hopeful if suitable treatment be given, than early tuberculosis.

It is of course true that the official hands are often tied, that accommodation is limited, and that institutional treatment cannot be arranged rapidly. It is, nevertheless, a matter of prime importance for all who are responsible for the treatment of tuberculosis to have adequate accommodation in order that such urgent cases be dealt with without undue delay.

2. Ambulatory Artificial Pneumothorax

In 1928 I was asked to see an Italian with lung disease, and diagnosed pulmonary tuberculosis. The lesion was largely unilateral, and I advised him to go into a sanatorium with a view to having an artificial pneumothorax induced. He refused to do so. As he did not improve after a few months he returned to his native land. There he continued to go downhill. Nearly a year after the diagnosis was made he went to a hospital in Naples to consult Dr. Castillani. He was x-rayed, and was told there was but one cure—artificial pneumothorax. The following day Dr. Castillani attempted the induction in the out-patient department and was successful, although it caused a good deal of pain. The patient was kept resting for two hours, and was then allowed to walk back to his hotel. Refills were given on the second, fourth, and seventh days, and repeated thereafter weekly for two months. At the end of that period he felt fairly well, so he returned to this country to resume work. He was referred to me for treatment, and I gave him fortnightly refills at my rooms. This patient has continued to do well, and has built up a prosperous business.

The facts of this case made me think. I could quite well have given him the same treatment at my rooms or at the dispensary. I determined to follow the procedure in other cases. It had much to commend it, especially in view of the usual difficulty in obtaining early admission to a sanatorium. Further, a certain number of patients refuse to enter such an institution under any circumstances. It is unfortunately true that if it be known that an indi-

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vidual has been in a sanatorium he is frequently handicapped in after-life.

Following upon this, during these past nine years I have carried out ambulatory pneumothorax on a large number of patients with most encouraging results. In fact, when I now meet with a new case of tuberculosis, provided (a) that the lesion is unilateral, (b) that the general condition is not undermined by toxins, (c) that loyal co-operation can be secured, (d) that the patient's home conditions are satisfactory, I make it a rule to advise domiciliary measures and ambulatory artificial pneumothorax. It has undoubtedly proved a most valuable procedure. So far, having carefully selected the cases, they have all done well. The following are examples:

A patient, a dairy farmer, refused sanatorium treatment because he said "no one would buy his milk" if he went to such an institution and his family would be ruined. After a month in a nursing home, as a result of the artificial pneumothorax treatment he lost his cough, and what sputum he produced failed to show any tubercle bacilli. He was able to return to work. During the six years that have elapsed he has kept perfectly well, and has since married.

Another patient, a mother, on the diagnosis of pulmonary tuberculosis being given and sanatorium treatment being recommended, said she could not possibly leave her family with no one to attend to them, and refused to go. A satisfactory collapse was effected at home, and she has done excellently. The disease was arrested.

A bank agent who had recently been appointed to his post broke down. Sanatorium treatment was advocated, but was refused as it would jeopardize his future. He lay off for a few weeks and had a collapse effected, and, losing his cough and sputum, returned to work, the cause of his disability not being suspected by anyone. Such cases could be multiplied.

There is not the slightest doubt that ambulatory artificial pneumothorax treatment could be more extensively carried out than it is at present. If it were practised, in the first place many hospital and sanatoria beds would be freed for acute cases or patients whose home circumstances demand institutional care; secondly, the stigma of being an ex-sanatorium patient and the handicap it involves would be nullified (As I was writing this a patient called to discuss his future. He had had to resign his position, not because he was unfit for work—any disease which he had had was definitely arrested. He had been asked to resign simply because he had been a patient in a sanatorium.); thirdly, the cost to the State for treating tuberculosis would be lessened, although the facilities for out-patient treatment might require to be increased; and, finally, the morale of many patients would be conserved and not undermined as so often happens as the result of prolonged hospitalization. Ambulatory artificial pneumothorax is not a heroic measure provided it is not used in acute, advanced, or toxic cases.

Hitherto I have not emulated Dr. Castellani of Naples and induced artificial pneumothorax in my rooms or dispensary to any large extent, although I have done so on one or two occasions. One usually begins the treatment at home and carries on with it at the consulting rooms or the dispensary after a few weeks.

As I have indicated, this is not an original procedure. It seems to be practised to a fair extent in other countries, America particularly. Whether others practise it in this country I cannot tell. Baum, writing in *Tubercle* in February, 1936, states that he knows several pulmonary tuberculosis patients with positive sputa who had their lungs collapsed while waiting to go into a sanatorium and became sputum-negative. When a vacancy did occur they refused to enter.

The question of x-ray control arises, but that is not a really serious difficulty with the many excellent portable equipments which may be obtained at a reasonable figure. They can be used both for screening the patient and for taking x-ray photographs at the bedside.

3. Bilateral Artificial Pneumothorax

It has always been recognized that cases of pulmonary tuberculosis with bilateral involvement have a definitely bad prognosis. What can artificial pneumothorax do for such? The fact that bilateral pneumothorax is compatible with life has been demonstrated by the bilateral spontaneous cases which have been reported by various workers. Further, the beneficial effects of a bilateral collapse are demonstrated during the later stages of pregnancy in women with advanced pulmonary tuberculosis. In this condition the gravid uterus, pressing the diaphragm upward into the thorax, acts like a bilateral pneumothorax or phrenicectomy. They almost invariably feel better while they are carrying the child. Bilateral artificial pneumothorax treatment has a definite place in the therapeutics of pulmonary tuberculosis.

The honour of introducing the treatment for this purpose must be given to Parry Morgan of Cardiff and Ascoli of Palermo. Parry Morgan administered it to an apparently hopeless case in 1912. Four years later the patient was doing well. Ascoli in the same year, at a conference in Rome, asserted that the high pressures advocated by Forlanini in pneumothorax treatment were not necessary. A low pressure sufficient to cause simple relaxation of the lung often did more good. Further, he asserted that if one used low pressures artificial pneumothorax could be given to both sides simultaneously, and instanced a very serious case with bilateral mischief which he successfully treated in this way.

In discussing bilateral artificial pneumothorax two main types require to be considered: successive and simultaneous pneumothorax.

SUCCESSIVE ARTIFICIAL PNEUMOTHORAX

In successive pneumothorax the treatment begun on one side is stopped before an attempt is made to induce a pneumothorax on the other side. It may be a high- or low-pressure pneumothorax—the presence of adhesions will determine. Forlanini in the year 1911 reported two cases in which he had obtained an arrest of the disease by successive pneumothorax. I, personally, have had most encouraging results with this procedure. Several of my patients who are now working steadily had bilateral disease and had the worse lung compressed, and, later, as the disease remained active in the contralateral lung, had that collapsed, the treatment first being stopped on the side originally dealt with.

Burrell has pointed out that in bilateral mischief, giving pneumothorax on one side even for a week or two, then stopping and giving it on the other side, often stimulates fibrosis. Successive artificial pneumothorax, however, is really unilateral pneumothorax, first on one side and then on the other.

SIMULTANEOUS ARTIFICIAL PNEUMOTHORAX

In simultaneous artificial pneumothorax the treatment is given on both sides simultaneously or alternately. Although a quarter of a century has elapsed since this method was first advocated, simultaneous pneumothorax has not been widely adopted. The reason for this is not far to seek. By most workers it has been looked upon as a heroic measure, and only resorted to when a patient was very ill. Consequently the end-results as published in

various quarters are as a rule not encouraging: usually not more than 10 per cent. respond favourably to the treatment, although a few American workers have reported good results in over 50 per cent. of their cases. In my own experience simultaneous artificial pneumothorax treatment, judged by the end-results over a period of years, was in the first series of cases a record of failure. I carried it out on several cases each year—round about 1920—without the ultimate survival of any: the longest duration of life after treatment was begun was two years. I recognized that I made a mistake in using it only for the serious advanced type of case. In later years I resorted to it with greater confidence in less advanced and less toxic cases, with more encouraging results. Approximately one-third were definitely helped and had the sputum rendered negative. One-third improved symptomatically, and one-third went downhill in spite of the treatment. About half the cases were treated for a flare-up in the contralateral lung, the other half were cases with bilateral mischief from the time of diagnosis. Later experience, therefore, demonstrated that fairly good results could be expected if the collapse were effected before widespread adhesions formed, before the production of thick-walled cavities, and before the toxæmia resulted in cardiovascular debility.

Simultaneous bilateral artificial pneumothorax has a definite though a strictly limited field in the treatment of pulmonary tuberculosis: its indications cover a wide field. It may be considered for: (1) Contralateral lesions occurring during unilateral collapse. (2) Persistent hæmoptysis failing to yield to unilateral artificial pneumothorax treatment. (3) Acute bilateral bronchopneumonia, if limited to the upper lobes. (4) Bilateral cavitation, particularly if it is of the moth-eaten variety. (5) Contralateral pleurisy with or without an effusion. (6) Mobility of the mediastinum, rendering unilateral collapse ineffectual. (7) Hilum lesions with a tendency to remain mesial rather than assume a peripheral distribution. (8) Pregnancy in a woman with bilateral tuberculosis: by it one can keep up the pressure after the delivery of the child and thus lessen the liability to exacerbations occurring at that time.

It cannot but cause disappointment when used: (a) if the patient is dyspnoeic and has a vital capacity under 1,500 c.cm.; (b) when the toxæmia is very marked, particularly if the patient be cachectic, and as a result there are evidences of myocardial degeneration and inability to compensate for increased work; (c) if there are large fibrous cavities adherent to the chest wall. In such cases a thoracoplasty may help.

Advanced disease is not a contraindication provided the general condition is good, nor yet are complications such as tuberculous laryngitis. It may help this condition. Intestinal tuberculosis and genito-urinary disease are usually contraindications. Further, it should rarely be attempted in patients over 45 years of age. The cardiovascular system after that age fails to compensate well.

Technique

In carrying out the treatment the principle of low-pressure technique must be observed and the patient be left always with a definite negative pressure. If, therefore, it be determined on during unilateral pneumothorax treatment for contralateral activity, the pressure on the side already treated must be brought well below the zero level to enable any healthy lung tissue present to function. In cases which have not previously had pneumothorax treatment it must be instituted with great care and con-

sideration. One lung—the one more affected—should be dealt with first, and the patient should be able to go for a week without refills before the other lung is treated. Of necessity the refills have to be small, and therefore have to be given fairly frequently. The two pleural cavities may receive refills simultaneously, but that is rarely advisable, at least until the treatment has been well established.

It is important to aim at having the pressure on both sides equal, or nearly so. If they differ much and the mediastinum is mobile, symptoms suggestive of a spontaneous pneumothorax may be produced. For example, a patient who had a bilateral collapse complained of great pain on the left side of the chest, with marked dyspnoea. The intrapleural pressures were taken; that on the right side showed a much greater negative pressure than the left. The pressures were then equalized and the distressing symptoms passed off.

Some American workers have instituted a bilateral collapse on ambulatory patients: I have not attempted this so far—the risks appear too great. There are two things that always cause not a little anxiety while carrying out the treatment, bilateral treatment more so than in unilateral treatment. These are, first, the risk of puncturing the lung and causing a traumatic pneumothorax or an air embolism; secondly, the production of a fluid effusion which may cause excessive intrapleural pressure and dyspnoea. To ensure safety the x rays should always be resorted to and the patients screened before each treatment. During this a site should be chosen where the needle can be inserted with relative safety; at the same time the presence of fluid may be noted and due care taken. It is well also to screen after treatment to ascertain the degree to which the healthy lung tissue is functioning. The risks involved in puncturing the lung may to some extent be obviated by using a needle with an external diameter of not more than 1.20 mm.

How long should bilateral pneumothorax treatment be continued? Provided that there is an adequately functioning lung and a fair vital capacity it may be continued indefinitely. It is, however, usually advisable to let the less affected lung up as soon as possible: a year is considered a safe period. One patient who had a contralateral flare-up, with evidences of cavity formation, had that lung successfully collapsed. After a year it was allowed to expand. The case later came to necropsy, when it was noted that all evidence of infiltration and cavitation had disappeared and only scar tissue remained.

It is frequently advisable to continue artificial pneumothorax treatment on the worse side indefinitely.

Summary

Summing up, one may firmly assert regarding bilateral artificial pneumothorax:

It is definitely beneficial in selected cases, offering relief of symptoms to many, arrest of the disease to a few. It may give fresh hope to an otherwise hopeless case.

While it may prove useful in advanced bilateral cases, it is particularly indicated in cases with lesions limited to the upper lobes of the lungs or to the perihilar area.

The end-results depend on: (a) The general condition of the patient, particularly his cardiac muscle. (b) The proper selection of cases. (c) The technique of the physician and his skill in dealing with complications which may arise: it is not a procedure which may be left to junior residents or novices. (d) The facilities for adjuvant measures—general rest, good treatment, surgical procedure, etc.