However, should it really happen, the patient need not even be taken to the operating room, as through-and-through silk sutures can be inserted under novocain infiltration anaesthesia while she is still in the ward. After the skin edges are infiltrated the sutures are carefully inserted, but not tied until they have all been placed. Then with the patient encouraged to relax and breathe easily, the sutures are tied starting from both ends of the incision and progressing toward the centre, the last suture being tied in the middle of the wound.

Wound infection: After the first seventy-two hours the dressing is changed for the first time. By then signs of local irritation usually disappear, but if wound infection is starting a conspicuous red area encircles each suture. The guilty stitches should be removed and sulfanilamide powder sprinkled over their site. After the incision has been covered heat should be applied. If serum accumulates and becomes noticeable after the sutures and wound clips have been removed, it should be aspirated with a large-size needle, attached to a glass syringe.

Conclusion

While the technique outlined above has been found useful in practically all of the author's cases, it is to be assumed that every experienced surgeon will find it necessary to make certain modifications which will not materially alter the technique, nor affect the results.

Note:—I am indebted to my sister, Miss Bertha de Hellebranth, for illustrating the above article.

THE TREATMENT OF ASTHMA

By G. Sanderson, M.D., M.R.C.P.
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During the past century it has been demonstrated that a large number of diseases have a specific cause; typical examples are tuberculosis, syphilis, and malaria. But even in these conditions, as Ryle has pointed out, the specific cause is not the whole etiology of the disease. "The Pneumococcus," he says, "may be essential to the development of lobar pneumonia; but seasonal and climatic conditions, poverty, and other environmental accidents, and inborn susceptibility—to mention only a few associated causes—can also play their part. Susceptibility again is often related to age, sex, physical type, and habits. Features of this kind have suffered neglect through preoccupation with ideas relating to the microscopic organism which we accept and name as the <i>causa causans</i> of the disease."

The success which attended the search for specific causes of disease, led to a fallacious belief that all diseases must have a cause in the specific sense; so that there followed a search, which still goes on, for the "cause" of peptic ulcer, the "cause" of rheumatism, the "cause" of cancer, and so on. But it does not follow, because a certain number of diseases have a specific cause, that all are brought about in this way, and there are many disease-states which appear to be due, not to any one specific cause, but to a summation of non-specific causes, and these not necessarily the same in every case, and not necessarily the same in the same case at different times. Among the conditions which almost certainly arise in this way is the condition we call asthma.

One tends to think that the world might be divided into those who have asthma, and those who do not; but the truth may well be that everyone has an asthma threshold, a certain greater or lesser inborn susceptibility to the condition—much in the same way that everyone might be said to have a sea-sickness threshold. The individual in whom this constitutional tendency is high is the patient with clinical asthma; when this tendency is low, as it is in the majority, it is unlikely that the condition will ever occur, although such powerful irritants as phosgene suggest that nearly all are potential asthmatics. This attitude of mind has an important therapeutie implication—namely that we should regard the asthmatic, and teach him to regard himself, not as an abnormal person, but as an essentially normal person with a functional disability, within the limits of which he must learn to live his life.

The first diagnostic problem in asthma is to assess the level of this constitutional tendency. Its exact mode of production is unknown, but much of it is probably genetic, for hereditary factors are of great importance. This natural tendency is assessed firstly by enquiring for a family history of asthma and allied conditions; also by noting the age of onset and the ease with which attacks are provoked. The presence of eosinophilia, and the general tissue sensitivity as shown by skin tests, are also of some help in this connection.

It is interesting to note that this constitutional tendency waxes and wanes from time to time, sometimes to a remarkable degree. Usually, although by no means always, it tends to wane if actual attacks can be prevented. It is not unknown for asthma to return after many years of complete freedom, but in general, if the attacks can be prevented for a year or two—and this is especially true of children—lifelong freedom may follow, and
the individual may then be able to expose himself with impunity to influences which were previously asthmogenic.

The asthmatic therefore is endowed with a certain fluctuating tendency to bronchial spasm, and thereafter—and it is in this connection that a wide concept of aetiology is important—thereafter no event in his life or his environment is without its influence, for good or for bad or for both, on the occurrence or otherwise of asthma attacks. And asthma is successfully treated—or managed is perhaps a better word—when the patient's life and environment are so disposed that attacks do not occur.

There are certain predisposing factors of asthma which are of frequent occurrence and demand special review in every case. Firstly there is the nasal factor. The general rule here is one which holds good in many comparable problems in medicine—careful examination is essential, but if abnormality is present it should be treated mainly on its own merits. The treatment of nasal factors provides an interesting sidelight on evaluating the results of therapy. If one cauterises the nose of an asthmatic and his attacks cease, it is perhaps a pardonable conceit to think that one has cured his asthma. But what in fact one has done is simply remove one non-specific cause so that attacks no longer occur; the asthma tendency remains, and indeed the word cure has no place in discussing the results of treatment. More dangerous, and equally common, is to conclude that the nasal condition was the cause of the asthma, using the word cause in a specific sense. And very dangerous indeed, is to conclude that not only this case of asthma, but all cases of asthma, are caused in the same way, and to embark on wholesale measures of treatment. This is to undo many times the good done in a particular case. This quite illogical and unjustified process of reasoning is widespread in the diagnosis and treatment of asthma—and indeed in diagnosis and treatment of a host of medical conditions. One recalls wholesale dental extractions for peptic ulcer, colonic lavage for rheumatism, and the like.

Cauterisation of the normal nose in cases of asthma is admittedly sometimes undertaken with apparent benefit. It is most successful in young patients whose asthma attack is heralded by bouts of sneezing and running from the nose—a condition resembling hay-fever but occurring without exposure to pollens.

The second important precipitating factor in asthma is the broncho-pulmonary factor. Any lung disease will obviously tend to aggravate asthma, and of particular importance in this connection are acute respiratory tract infections. It is very common, especially in children, to hear that a cold is the usual beginning of an attack, and in addition that the child is particularly susceptible to colds.

A group of asthmatics which is large and in some way separate from the others is the adult bronchitic group. These are patients with a long-standing history of chronic bronchitis, worse as a rule in the winter months, who eventually complain also of wheezing. Hereditary and hypersensitivity factors are insignificant, and the asthma appears to be part and parcel of the chronic bronchitis. The asthma symptoms themselves differ from the ordinary type—not for them the acute nocturnal attack, but weeks or months of wheezing and tightness of the chest. In these patients also a cold is often the beginning of the asthma period.

Thirdly is the question of hypersensitivity to proteins, and less commonly to non-protein substances, especially drugs. It is important to stress that there are many asthmatics who do not display any hypersensitivity factor, and conversely hypersensitivity does not per se cause asthma; it gives rise to asthma only in individuals with an asthmatic tendency, and in the absence of this it will show itself in some other way—for example urticaria, hay-fever, or gastro-intestinal disturbances—or not at all.

The recognition of hypersensitivity is pre-eminently a matter of careful cross-examination and of trial and error. Even better with the intelligent patient is to explain the problem to him, and let him undertake the detective work for himself.

The investigation of hypersensitivity by means of skin-tests is disappointing. Patients react to substances to which they can expose themselves naturally with impunity, or with which they never come in contact; conversely they fail to react to their recognised asthmogenic agents. The condition in which skin-tests give the most consistent results is hay-fever; in this condition a positive reaction to pollens is usually obtained, but this tells one little one did not already know. The most that positive skin-tests indicate in asthma is that hypersensitivity of a kind unspecified is a probable feature of the case.

Fourthly there is the endocrine factor. Menstrual asthma, aggravation or alleviation in pregnancy, onset or cessation at puberty or the menopause—are well recognised occurrences. The striking effect of adrenalin, and to a less extent of pituitrin upon the attacks indicates two other endocrine glands that must be closely associated with asthma.

The fifth important factor is the gastro-intestinal. Gastro-intestinal disturbance, apart from food hypersensitivity, is often of importance in determining asthma attacks. The most common relationship is the heavy meal late in the evening.
followed by an attack in the early hours of the morning. Functional dyspepsias—especially achlorhydria, visceroptosis, and constipation are common; it is difficult to know how far they are causative, and how far they are part and parcel of the asthma personality.

Sixthly is the important environmental factor in its several aspects. Certain places suit the asthmatic, and certain places do not. In general, high, dry localities with clear unsullied air are beneficial, and low-lying, damp and smoky places are detrimental. But there is no constant rule, and each patient tends to be a law unto himself. For example, the asthmatic with a marked pollen sensitivity may be at his best in the middle of a city. Once again the patient's history is the best guide. Often he can say which places suit him and which do not; sometimes he will have noted that ever since he came to live in a certain area his asthma has begun or has been aggravated. It is always difficult to dissect the broad geographical factor from more detailed environmental influences, from sensitivities, and from psychological aspects. But when it is prominent, it points to one of the most satisfying therapeutic suggestions.

A patient's house and his place of work are environmental influences which must be considered. Dusty occupations are as a rule unsuitable, as are those where the risk of colds and chills is high. For many reasons, not the least of which is his usual high intelligence level, the asthmatic is best-off in one of the so-called black-coated occupations. A dry modern house is better than a damp old one and sometimes removal only to the next street will end attacks. Here, again, it is extremely difficult to decide where the precise difference lies. A few years ago this principle was carried to extremes and air-conditioned houses were recommended for asthmatics; these, like so many other cures, are no longer with us.

When attacks are dominantly nocturnal, the lay-out of the bedroom should be reviewed. Simplicity should be the keynote, but not eccentricity. Elimination of feather beds and pillows is always worth while. It is striking how rare are asthma attacks in the plain surroundings of hospitals; here, again, many factors co-operate, but simplicity of environment is probably one.

Lastly, and most important, is the psychological factor. When a condition is described as functional, it means, or ought to mean, simply that it is due predominantly to a disturbance of function; usually it implies also that organic disease is either absent or at most incidental. Since the autonomic nervous system plays an important part in the genesis of most such disturbances, they have been labelled neuroses. It is unfortunate in the present context that the word neurosis, and still more the adjective neurotic, have acquired an unsavoury flavour, because it is only if they are used in their correct sense that they can be applied to the condition of asthma, as also, for example, to the condition of sea-sickness. One is compelled so to use them, as there is no convenient alternative.

In common with other neuroses, asthma has important psychological aspects. To begin with there is an asthma personality, although not all asthmatics have this personality, and when it occurs the individual does not necessarily have asthma. It is indeed mainly the neurosis personality, and so far as asthma is concerned is best seen in the asthmatic child. The question belongs really to the constitutional side of the equation, which has a mental as well as a physical component, but for convenience it will be considered here.

The typical asthmatic child is intelligent above the average. In spite of absenteeism from school, he usually manages to keep his place near the top of the class. That sensitivity which affects his bronchial musculature, and so often his nose and skin, seems to extend also to his brain. He may be an only child, and his reactions are not helped by the frequency of a similar make-up in one or both parents. He is restless, excitable, and over-anxious, and often a poor mixer. With great constancy he is not allowed to play with other children.

The most important psychological influence in the course of asthma is fear of an attack, or expectation of an attack. It is largely for this reason that the patient should have an effective remedy in his own hands, and the very having of it will prevent attacks, and stop a mild attack becoming severe.

Attacks are often brought on by worry and mental upset. Asthma is the asthmatic's locus minoris resistentiae—his spot of least resistance—and anything which disturbs his equilibrium is liable to bring on an attack. During the air-raids, asthmatics fared badly; they mostly complained of increased numbers of attacks, and in general found shelter life intolerable.

These then are some of the factors which operate in asthma, although many others might be added to the list, such as genito-urinary and cutaneous stimuli, general debility, anaemia, and acidosis. Whatever influences the mental or physical life of the individual will influence his asthma also.

How then shall asthma be treated? Firstly—the attacks themselves. For severe attacks adrenalin by injection is the best remedy, and often the only effective one. Any patient who experiences severe attacks, unless his level of intelligence precludes this, should know how to
administer adrenalin to himself. It is wise to warn him to sit down while having the injection, and to give it slowly. He will quickly discover for himself what is an effective dose which can be taken without unpleasant side-effects. Collapsible metal ampoules, with an attached needle and a glass cover can be purchased; they enable an injection to be given without any display—for example, in church or in a public hall. They are also suitable for patients who only require adrenalin very occasionally.

The psychological value of having adrenalin at hand is not to be despised, and is often an insurance against its being needed. The converse of this—the severe attack which occurs when the asthmatic breaks his syringe—is well known.

For less severe attacks there are a multitude of remedies, official and unofficial. The most generally effective is ephedrine, either in tablet form or as a mixture. Tablet drugs have great advantages in accuracy of dosage, palatability, and portability; they have disadvantages in that one cannot introduce correctives against possible side-effects as one can with a prescription, and that their disintegration and absorption is less certain. It is a fact that patients who do badly on ephedrine tablets may respond to ephedrine mixtures, as it is a fact that patients with malaria who have failed to respond to tablet quinine may do so immediately to the same drug in liquid solution. It is also a fact that tablets of various kinds are sometimes found in stool specimens.

The xanthine group of drugs—caffeine, theobromine, and related compounds, are also of great value. The beneficial effect of strong coffee has been known for many years. More recently, a series of theobromine derivatives have been introduced—most of them proprietary preparations and including aminophylline, euphyllin, deriphyllin, perphyllon, and cardophyllin. These compounds are a valuable alternative for patients who cannot tolerate ephedrine; the most useful are perhaps theobromine itself, theobromine with phenobarbitone, or cardophyllin.

The iodides are of particular value in the chronic bronchitic group. Many of these patients give the impression that their chest-tightness is mechanical rather than spasmodic in origin, and due to bronchial blockage by tenacious mucus. A little iodide will help to liquefy this and enable it to be expelled. In contrast to ephedrine, iodides are most valuable in tablet form, but they should be chewed rather than swallowed—nibbled is an even better word. Sometimes the effective dose is extremely small—a fraction of a grain—and a larger dose will give rise to undue secretion.

Inhalations and sprays are most suitable for cases in which a nasal factor is prominent, and particularly when attacks occur at night, as their effect is in general more speedy than that of oral medication. They are somewhat cumbersome and conspicuous for day-time use.

The common official drugs might therefore be summarised as follows:—sprays for nasal and hypersensitivity cases, especially at night; ephedrine by day, initially as tablets, but as a mixture if tablets are unsatisfactory; theobromine or cardophyllin in patients who are upset by ephedrine; iodides for the chronic bronchitic group; and for severe attacks, adrenalin injections, which the patient should learn to give himself.

Many patients pin their faith to their own particular fancy in patent medicines. So important is the psychological side of asthma that in some cases it is necessary to turn a blind eye to this practice, which the patient will probably continue anyway. There is no doubt that for mild attacks the remedy in which the patient believes is the best remedy.

It is important to cultivate the right psychological atmosphere during attacks. The patient should learn to accept them philosophically, and should not be allowed to get excited or anxious. The attitude of those around him, and especially of the doctor, should be calm and matter-of-fact. This is of particular importance with children, and must be emphasised to the parents. They should not let the child feel that they are alarmed, although he should not be left alone while the attack is on. Attacks of asthma are not a reason for invalidism. After a nocturnal attack the patient should get up as usual next morning, and go to school or work. Uncomplicated asthma is not a reason for staying in bed, although an associated respiratory tract infection is a very different matter.

The treatment of the actual attacks is, or should be, the lesser problem in asthma. The greater problem is to prevent them or to reduce their frequency, and the key to this is the full aetiological diagnosis on the lines already laid down. It is a useful conception to take a mental figure of 100 as representing the level at which attacks occur, and to try and apportion the importance of the several factors involved. Thus in a particular case, one might assess the constitutional factor at 30; the psychological at 25; 15 each for colds and hypersensitivities; 5 for going to the pictures, and so on. The object of treatment is firstly to reduce the level below 100, so that the actual symptoms disappear; and secondly to reduce it as low as possible, so as to minimise the likelihood of small adverse influences precipitating an attack. The problem is always an intensely individual one. Each case must be judged...
on its own merits, and it is possible to do no more than point out certain broad general indications.

Quite the best treatment for the asthmatic child is a boarding school, and almost always it is possible to find one where he is free from attacks. If the asthma habit can be broken in this way for a year or two, permanent freedom is likely. Alternatively the child can go to relatives or friends in some area which suits him, but a short visit is inadequate—certainly not less than six months, and preferably two or three years is necessary. During this time his schooling must be safe-guarded. Living with relatives has the disadvantage that it may introduce further complications into an already abnormal family relationship. A third alternative, often necessary in poor-class patients, is the special school. Very good results are often obtained from this method, but there are several serious objections. There is an atmosphere of invalidism which is undesirable with asthmatics; period of stay is usually limited; and the education-standard is considerably below that of the ordinary school. This last objection is very real; the child with a physical disability—heart disease or chest disease or whatever it may be—needs not a lower but a higher standard of education than the healthy child if he is to hold his own in due course in the struggle for existence. The child most suitable for the special school is the child whose asthma is an event in chronic bronchitis, rather than the child with true "primary" asthma.

Psychological factors probably loom large in explaining the beneficial result of treatment of this kind, but at any rate it works in practice. That the effect is not wholly psychological is shown by the response that may follow removal of the whole household to a more healthy environment. The choice between these possible alternatives will be governed by the physician's impression of the psychological factors present, and of course very largely by expediency.

When the asthmatic child is first seen, a suitable régime is as follows:—General advice to the parents to look for predisposing causes, and to conduct themselves suitably in relation to the child and especially in relation to the attacks; simple deep-breathing exercises for five minutes morning and evening; ephedrine for attacks; a vitamin preparation if the child is susceptible to colds; glucose or citralka if acidosis seems to be a possible factor; and finally, right at the beginning, raising the question of the child's going away. In some cases this may have a psychological value, as a sort of threat to stimulate the parents to do their best. In any case it will be a big decision for them to make, and they deserve as much time as possible to consider the problem.

A little later is the adolescent asthmatic, who presents a very great responsibility to the medical adviser. It is vitally important to steer these young people into a suitable career, and often very difficult to decide what form it should take. Often the parents suggest an out-door life on the popular assumption that an out-door life is a healthy one. What the asthmatic needs essentially, however, is a protected life, a healthy environment, the right to take time off if necessary, and more money than average—and in addition it is to be remembered that he is often of high intelligence. Out-door life is presumably contra-indicated if pollen or animal hypersensitivity is present, but in any case it is often less attractive in practice than in theory, and a better choice for the asthmatic would appear to be one of the so-called black-coated occupations. The possibility of a career abroad is always worthy of consideration.

Even among older patients change of environment should always be carefully considered—change of job, change of house, and change of geographical area. Change of job is a serious matter for an adult, but should not be shirked on that account. The sooner the chronic bronchitic gets out of a dusty occupation, whatever the cost, the better. The new Ministry of Labour resettlement schemes offer opportunities for adjustments of this kind.

Change of house, either in the same or in a different area, is best decided by history and by trial and error. Change of environment in general is probably the most satisfactory single solution of asthma. When successful it fulfils the adage that the best treatment of asthma is not to have it.

When recurrent colds are a feature of asthma, they suggest important therapeutic measures. Especially is this the case with the chronic bronchitic whose cold in the autumn is followed by symptoms persisting into the spring or early summer. It is astonishing how, year after year, these patients refuse to take the initial cold seriously. It should be treated with full textbook ritual—bed in a warm, well-ventilated room with a southerly aspect, and so on, going on until the condition has completely cleared up. These patients should respect the old-fashioned principles of keeping their feet dry, avoiding sitting in wet clothes, wrapping themselves up well, keeping out of draughts, and even wearing red flannel. Some people believe that the fat-soluble vitamins will reduce the incidence of colds, and they are worth administration throughout the winter.

The action of desensitising injections, autohaemotherapy, peptone, tuberculin, and the like, seems to be mainly psychological. They are not necessarily to be despised on that account, and
they have a real place in the treatment of highly suggestible patients, but the available evidence suggests that the scientific basis upon which they were based is unacceptable. The psychological aspects of asthma enter constantly into all other forms of treatment. Indeed they are increasingly identified as the common denominator of many apparently successful asthma cures. This is not necessarily to disparage such lines of treatment, although once the physician loses faith in them himself they have lost much of their efficacy.

Simple positive psychotherapy is always worth while. It consists in general in telling the patient something about his complaint, how it arises and how attacks are to be avoided; in assuring him that—unpleasant and even frightening as the attacks may be—they are not a cause for alarm; and in general in encouraging him to have a philosophical outlook on his disability.

The distressing condition called "status asthmaticus" is a condition in which severe asthma continues uninterruptedly for many hours, days, or even weeks. When asthma is fatal, as seldom it is, death is usually brought about in this way. It seems likely, however, that in some of these cases at least the asthma is no more than a mode of dying, or at most only a contributory cause of death. The only fatal case of status asthmaticus I have seen with a subsequent post-mortem, had an underlying pneumonia, which had been masked clinically by the patient's asthmatic state, together with his known asthma history. In retrospect, the diagnosis was clear, and it should be a rule in status asthmaticus, as it is, for example, in diabetic coma, to look for a cause. It is easy to see that if an asthmatic develops intercurrent disease, and especially an acute respiratory-tract infection, then his presenting symptom may well be asthma, and that this may mask more or less completely the underlying trouble.

A severe uncomplicated attack of asthma, if neglected, may pass into the condition of status asthmaticus. There are a great variety of drugs which are effective in mild asthma, but the majority are valueless in severe attacks. This is a further reason why every intelligent asthmatic should be able to give himself an adrenalin injection, for the longer the delay in administration, the more difficult it is to break the spasm. If every asthmatic knew how and when to give himself adrenalin, the majority of cases of status asthmaticus would never occur.

The best treatment of status asthmaticus is Hurst's method of continuous adrenalin administration. A 2 c.c. syringe, charged with adrenalin, is strapped to the arm, an initial injection of $\frac{1}{2}$ to 1 c.c. is given, and thereafter a minin a minute until the attack passes off. Hurst says that the injection may be continued "even for half an hour or more," but a much longer period is sometimes necessary, and it is an advantage to follow the minim-a-minute stage with a smaller dosage—say 2 minims every 5 minutes and then 2 minims every 10 to 15 minutes for a further hour or two; unless this is done recrudescence is very likely to occur.

Recently there has been described a small mechanically-acting syringe designed for the gradual administration of small quantities of Penicillin. If apparatus of this type is perfected it will be of considerable value in the administration of adrenalin for status asthmaticus, which at present demands the continued presence of a skilled attendant.

Will this treatment always control severe asthma? The answer to this question is that it will not, although failure is rare. Failure occurs most often, perhaps, from misdiagnosis—either an underlying condition is missed, or cardiac asthma is mistaken for bronchial asthma. Cases of cardiac asthma respond well to morphia with atropine, and in desperate cases of bronchial asthma this treatment is sometimes given. The risk of undue depression of the respiratory centre is very real, and whenever possible morphia should be avoided. The same applies, with perhaps a little less force, to hyoscine. A reasonable attitude to adopt is that very occasionally a stage is reached in asthma where morphia can no longer be withheld; but it is best reserved for those cases in which it has been decided that the prognosis is practically hopeless, and that it is a duty to ease the patient's passing.

In this review, one particular aspect of the asthma problem has been deliberately stressed—namely, the broad view of its aetiology and the therapeutic implications of this. This outlook tends to be lost in the welter of modern discoveries, not only in asthma but in a large number of other conditions. A similar outlook is applicable to conditions such as peptic ulcer, epilepsy, chronic heart disease, and a great many other chronic disease states. Asthma illustrates exceptionally well the fundamental principles involved.

Sir Arthur Hurst, at the end of a lifetime of subjective and objective experience of asthma, summed up his creed as follows:

"I am no believer in asthma cures . . . I regard most of the popular treatment of to-day, like that of ten, twenty, or thirty years ago, as nothing more than gross suggestion; yet I know that every asthmatic can derive much benefit from good advice. He can be taught a way of life, and among other things, how to avoid the exciting
causes of his particular brand of asthma, how to control attacks which he is unable to prevent, and above all how to be happy, in spite of the bad luck of having been born with the asthma diathesis."

THE ART OF ARTIFICIAL PNEUMOTHORAX

By E. K. PRITCHARD, M.R.C.S., L.R.C.P., D.P.H.

(Tuberculosis Officer, Metropolitan Borough of Southwark.)

It is the fashion in medical writing to give at the end of a paper, a list of references of those people to whom the writer is indebted. I propose to reverse the procedure and start by thanking my friends in the tuberculosis world, not entirely for their written work but also for their help, advice, and the numerous hours of discussion which have enabled me gradually to crystallise my thoughts on this subject.

Artificial pneumothorax is no new notion. It is on record that an ingenious physician attempted to introduce air into the pleural cavity as long ago as 1822. Unfortunately he met only with a succès d’estime. The father of "A.P." treatment was one Forlanini whose efforts were successful in 1888. Through his work and subsequently that of many others, the treatment of pulmonary tuberculosis by artificial pneumothorax, particularly during the past thirty years, has become increasingly the first line of offence.

Most people are under the impression that artificial pneumothorax treatment blows the lung down. This is quite wrong. It should be remembered that there is always a negative pressure (about -5 to -15 cms. of water) in the pleural cavity. If this were not so, the lungs would not follow the contour of the chest wall during normal respiration. The introduction of air into the pleural cavity reduces this negative pressure and, in the absence of pleural adhesions, the lungs relax and so occupy a much smaller volume. They are also not subjected to the full stretching involved in normal respiration. By a dispensation of providence the diseased lung loses its elasticity and so becomes more collapsed than the sound lung. This results in the "selective collapse" in which sound lung remains expanded and partly functional while diseased lung becomes increasingly collapsed.

The principal value of artificial pneumothorax therapy is the closure of tuberculous cavities. But there are other advantages which must not be forgotten. The treatment may extend over years and the frequent refills accompanied by regular screening of the chest ensure adequate supervision of the patient. Thus any extension of the disease or deterioration of the patient's general condition is noticed at the earliest possible moment. Furthermore, there is the by no means negligible psychological value to the patient who feels that something is being done for him. This I regard as most important, and in my opinion frequently justifies the maintenance of a mechanically imperfect pneumothorax, which from the consideration of radiological appearances alone should be abandoned. This is a controversial point, but I maintain that if the pneumothorax is carefully kept up with small refills and without raising the intrapleural pressures even to zero, the dismal prognostications of the surgeons—viz. infected effusions and broncho-pleural fistulae, etc., do not often occur.

Pneumothorax may have to be assisted by ancillary measures:

I. Phrenic evulsion or "crush," causing paralysis of the diaphragm either permanently or temporarily, and allowing further relaxation of the lung and some relief from the concertina movement involved in normal respiration.

II. Division of pleural adhesions (Intrapleural Pneumolysis). This is performed with an operating thoracoscope, using either a diathermy or cautery.

III. Pneumoperitoneum—particularly with phrenic paralysis on the more affected side, to increase the diaphragmatic elevation. Thus it will be seen that there are many permutations and combinations of treatment which come under the broad heading of Artificial Pneumothorax.

The treatment of tuberculosis by pneumo-thorax is, rightly, the only form of collapse therapy which has been left to the tuberculosis physicians by the thoracic surgeons. It is a simple procedure to induce a pneumothorax and simpler still to do a refill, but it is essential that it should be a painless operation. The induction is done with a fairly wide bore needle (Heaf's induction needle is my own choice) with a local anaesthetic.

After the collapse has become well established refills should be done with a needle of finer bore (Morland's needle is easily the best) without an anaesthetic. The needle must be introduced quickly and deliberately for the operation to be painless. It is, however, necessary to be certain that the needle will go through the intercostal space and not hit the rib—which is definitely painful and impairs one's reputation!

It is unwise to squirt the local anaesthetic into the pleural cavity unnecessarily and the needles should be dry sterilised and not used wet with spirit. The pleura appears to be a delicate and temperament membrane, especially in the early stages of an artificial pneumothorax, and I have
Treatment of Asthma

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