ANTISEPTIC INHALATION IN PULMONARY AFFECTIONS.*

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I HAVE thought the occasion of the Southern Branch of the British Medical Association meeting at Bournemouth an appropriate one for bringing forward a subject bearing upon the treatment of certain forms of pulmonary disease. I do this the more readily, as I know it is one which has already been cordially taken up, and practised with success, by many of my professional friends here. This subject is the inhalation of antiseptic materials in the treatment of such stages of phthisical, pneumonic, and bronchial affections, as are accompanied by purulent or fetid expectoration.

In adopting local antiseptic medication in the treatment of pulmonary disease, medicine is but adding another to the many acknowledgments of the splendid success of Professor Lister's antiseptic methods in the sister domain of surgery. Lister's invaluable researches in physiological therapeutics seem, indeed, capable of indefinite extension. To us, as physicians, his doctrines are especially valuable, as shedding new light on the importance, locally and constitutionally, of the lesion of the lung in phthisis, as well as unmistakably indicating a most appropriate means of treatment. Already, antiseptic inhalation can no longer be regarded as a novelty in pulmonary therapeutics. It would be almost invidious to name in this connection the many distinguished physicians who have recognised the important bearing of the antiseptic views of Lister on the pathological relations of suppurative processes in the lungs, and their treatment. Dr. W. Roberts, of Manchester, very early took up the subject; and he has been followed, in rapid succession, among others, by Drs. James E. Pollock, Douglas Powell, Thorowgood, Dobell, Clifford Allbutt, Sansom, Burney Yeo, and many others.

Antiseptic inhalation, indeed, is evidently and deservedly coming into notice, as a valuable aid in the treatment of a large and important class of diseases; and I believe that it is capable of much greater development and extension, and that it will ultimately play a distinguished rôle in the pulmonary therapeutics of the future. It must, however, be admitted that it has not been adopted as rapidly or as generally as the undoubted indications for its employment would seem to justify. It is somewhat difficult to account for this tardy recognition of means that have been found so valuable in the hands of those physicians who have put it to the test of long and extensive trial.

The propriety of attacking disease in the local seats of its activity, in addition to treating the constitutional conditions which accompany—not necessarily in the relation of cause and effect—the local lesion, is one which, in the present state of pathological knowledge, hardly admits of question. If this be accepted as a leading principle in the therapeutics of disease in general, how much more readily should its application be recognised in the treatment of affections like those included in the common term of phthisis, where the relation of the tissue-lesion to the constitutional morbid state is not accidental or variable, as it is in many other maladies, but essential and continuous; and where, consequently, their reactions on each other are of primary importance. In the advanced progressive forms of tubercular phthisis, the fever which accompanies the breaking down of the infiltrated and disintegrated pulmonary tissue has long been recognised as an infectious pyrexia, directly resulting from the absorption of the septic materials from the seat of this retrograde metamorphosis. In pneumonic or secondary phthisis, also, we have a suppurative process set up as a retrograde sequel to the original inflammation of the lung-tissue, ending in an excavation, which is in all essential conditions analogous to a surgical abscess. The natural progress of the two local states—the excavation in the lung and the external abscess, as well as their influence on the general condition, are identical. In both, we have a localised suppurative process, continually invading and breaking down the adjacent sound tissues; exhausting the patient in proportion to the amount of pus thus secreted, forming active centres of disseminating infection, and lowering the powers of the patient by the resulting febrile movement, thus still further diminishing his chances of recovery. But this morbid process is capable of arrest—nay, as the great Laënnec first pointed out, and as all our *post mortem* experience amply corroborates—

nature herself is equal to the task; but it is none the less the duty of the physician to come to her aid with all the means in his power. In such circumstances, the objects of treatment are, as Dr. Douglas Powell states, in his admirable Lectures on Excavation of the Lung in Phthisis (*Lancet*, August 1877): 1. To lessen secretion; 2. to promote evacuation of what secretion is formed; 3. to disinfect the air which may pass into surrounding or deeper healthy portions of the lungs. Again, he says: “besides acting as disinfectants, antiseptic inhalations promote expectoration by increased energy of expiratory acts”. Dr. Burney Yeo also recommends antiseptic inhalations, “if they have only the effect of temporarily cleansing, as it were, the pulmonary surface. It is a process analogous to that of washing away the decomposing discharges of a foul superficial ulcer”. Dr. Clifford Allbutt has broadly stated, and as truthfully, that “most phthisical patients die of septicaemia; and the arrest of this daily re-poisoning is a primary object of treatment”. Antiseptic inhalation again assumes a still more important position, if the latest pathological theory of the contagiousness of phthisis through the respired air be well founded.

Why, then, should we, as physicians, not recognise that, in all suppurative processes in the lungs, as evidenced by purulent expectoration, we have local conditions presented, calling as loudly for direct antiseptic medication as the wounds, abscesses, and ulcerations which belong to the province of our surgical brethren? But, while the external or surgical employment of antiseptics is an easy and simple process, and its results more immediately apparent, it is very different when we have to introduce our remedies into the interior of the body through an intricate and jealously guarded portal, as we have in the case of the lungs. That the comparative accessibility, however, of the lungs, through the glottis, should have, even in the earliest times, suggested direct medication, is not surprising; but it is, indeed, strange that inhalation, or taking advantage of the respiratory act for this purpose, which dates from the days of the Father of Medicine himself, should only have received, until comparatively recent times, but occasional and rare employment. That its importance was from time to time recognised, there is abundant evidence in the works of the older physicians; and that this importance was even occasionally exaggerated by them, is shown by the statement of the celebrated Italian physician, Mascagni, who says: “If ever a specific should be devised against consumption, it would be such as to be introduced into the organism through the windpipe”. A succession of celebrated names in more modern times, too numerous to mention, is associated with the subject of pulmonary medication by inhaling; and a great variety of apparatus, more or less elaborate, have been introduced from time to time for the purpose. There are, however, great objections, apart from the almost impossibility of their penetrating deeply enough into the tissue of the lungs, to the inhalation of dry powders, however finely divided, on account of their mechanically irritating effect on the often already morbidly sensitive laryngeal and bronchial surfaces. Non-volatile fluids, again, can only be very partial in their distribution; and, if inhaled at high temperature, must further render the upper reaches of the respiratory tract sodden, and increasingly sensitive to changes of temperature. Careful observation of the action and effects of this steaming process in affections of the lungs has convinced me, that it is not only inefficient, but, in every respect, positively injurious. It relaxes the tissues with which the vapour comes into contact; it encourages suppuration where the ulcerative process has begun, and it tends, therefore, to increase expectoration and cough, and consequently the distress and exhaustion of the patient. The inhalation of hot moist vapour, indeed, is so repugnant to the respiratory tract, that but a small quantity of the medicated material can penetrate sufficiently into the pulmonary tissue to be of use. The immediately subsequent effects are also not unattended with risk; from the exposure of the air-passages to air of a lower temperature after hot inhalation. However beneficial, then, in laryngeal affections (and we are all familiar enough with its value in such), the inhalation of dry powders, or of pulverised fluids in the form of spray, either cold or hot, may be, they cannot be regarded seriously in connection with the treatment of suppurative processes within the lung itself.

It is now more than five years since I became strongly impressed with the important bearings of Lister's teaching on the local treatment of phthisis; and, in working out the idea of antiseptic inhalation, the considerations above referred to, suggested the plan of adopting the principle of the old-fashioned, and now happily almost obsolete, respirator for the purpose—selecting a volatile medium for the antiseptic materials, and employing the breath in the alternate acts of inspiration and expiration, as their vehicle. These so-called antiseptic inhalers or respirators were first made to my order by a local tradesman, in common tin, of the exact shape and size of the ordinary metal respirator. These were, however, somewhat primitive in style; and they have since been exten-

* Read before the Southern Branch.

sively made by Messrs. Maw, Son, and Thompson, in a more elaborate and convenient fashion.

The apparatus is extremely simple. It consists of a space for a pledget of tow or cotton-wool, enclosed between the perforated surface of the respirator and an inner perforated plate, which can be raised so as to permit the tow to be saturated with the antiseptic solution. Elastic loops are attached to pass over the ears, and retain it in position. The inhaler may be procured either plain, or of a slightly smaller size, and covered with black cloth, for wearing out of doors. The pledget of tow, which may be changed once a week or so, should be sprinkled with from ten to twenty drops of the antiseptic solution, from a drop-stoppered phial, twice-a-day at least, according to the extent to which the inhaling may be carried on. Of this the patient is the best judge, and the length of time and quantity of solution should be regulated by tolerance and effect. The most important times for inhaling are for an hour or so before going to sleep at night, and after the morning expectoration, which leaves the suppurating surface or cavity dry to be acted upon—disinfected, so to speak—by the antiseptic vapour. 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. I attach the utmost importance to the mode in which the respiration is conducted while inhaling. The patient should be carefully instructed to inspire through the mouth alone, and expire through the nose. In this way, the breath is drawn through the saturated tow in the perforated chamber of the inhaler, and passes directly into the lungs laden with the antiseptic materials. Expiring through the nose only, necessarily involves a complete circulation of the medicated air. The breathing should be short at the beginning of the inhalation, but gradually deepened, so as to displace and affect the residual air in the more distant portions of the lungs. This form of respiration itself is not only of great use in favouring the circulation of the blood in the lungs, and thus aiding both local and general nutrition through that fluid, but it helps very much the expulsion of the sputa by means of the increased energy and thoroughness of the expiratory acts. Indeed, the great objection to the ordinary respirator lies in the shallowness and rapidity of breathing which it involves, in consequence of which the lungs, being imperfectly expanded and contracted during each act of respiration, become themselves literally fatigued, and the breath is drawn in and forced out so feebly, and at the same time so quickly, that there is not time for it to be dispersed into the fresh air, but it returns each time into the lungs only partially changed. The extremely fetid odour which the apparatus rapidly acquires is sufficient proof of this. One of the patients

in the Royal National Hospital here, when I was working out this subject, made a pasteboard respirator for antiseptic inhalation of such a shape as to include the nose; but it was found to have all the objectionable points of the ordinary respirator, and certainly did not permit sufficiently free access of the medicated air to the lungs, a large amount of the antiseptic material being lost by absorption on the convoluted walls of the tortuous nasal channels.

After many trials of the now formidable list of antiseptics, I find that carbolic acid, creasote, and iodine, in combination with sulphuric ether and rectified spirits of wine, are the most efficacious and satisfactory. The want of volatility in boracic, salicylic, and benzoic acids, and their salts, proves a bar to their employment by this method. Dr. Horace Dobell, who has had a very favourable experience of this treatment, writes to me that he has found thymol, in the form of Shirley's thymoline, very grateful and efficient, in many cases, where the smell of carbolic acid and creasote was intolerable either to patients or to their friends. Of the three antiseptic agents I chiefly use, I find iodine most useful in the second stage of phthisis, when the expectoration is passing from the glairy into purulent character. I use a tincture, for inhaling purposes, made with sulphuric ether instead of spirits of wine; and this ethereal solution has a singularly soothing effect on the cough and pulmonary irritation. In combination also with carbolic acid as carbolised iodine, or iodide phenol, it is extremely useful in the purulent expectoration accompanying the resolution of pneumonia, both catarrhal and croupous. In the stage of excavation, whether tubercular or pneumonic, the combination of iodine with carbolic acid and creasote is most potent. The acid seems to have the greater influence in checking the amount and purulent nature of the sputa; while creasote acts more as a sedative in the cough, apparently by reducing the irritability of the pulmonary tissues. The addition, also, of varying proportions of sulphuric ether and chloroform greatly assists in soothing and allaying irritation. These combinations also act frequently like a charm in the profuse expectoration of purulent bronchitis, as also in bronchial asthma. Dr. Thorowgood, in the Lettsomian Lectures for 1879, describes my antiseptic respirator, and adds his valuable testimony to its efficacy in bronchial affections. I have also noticed that patients, while using this form of inhalation, frequently experience great relief from the aches and flying muscular pains which often occasion much distress in the advanced stages of phthisis.

In connection with these observations, the following formula may be taken as an adaptable basis for the antiseptic solution for inhaling. *R* Tincturæ iodi etherealis, acidi carbolic, aa ʒii; creasoti vel thymoli, ʒi; spiritus vini rect., ad ʒi. *M.* Where cough is urgent, or breathing embarrassed, chloroform or sulphuric ether may be added at discretion. In the formula which I published in 1877, a small quantity of glycerine was introduced, with a view to aid solution and fix the materials; but I found it unnecessary, and also that it clogged the respirator, and soiled everything with which it came in contact.

Whether these substances act by destroying the germs to which the formation of pus is attributed by the great teacher of the antiseptic method, or by their abortive effect from a physical cause, such as coagulation, on the cell-proliferation in the seat of morbid action, I do not profess to know; but the effect of this antiseptic inhalation in diminishing expectoration, and with it the cough, in the various forms of phthisis, during the resolution of pneumonia and in the purulent stage of bronchitis, acute or chronic, with dilated bronchi and fetid expectoration, is certainly most remarkable. The following are the first four of a list of cases of phthisis, selected by my friend, Dr. Grant, resident physician at the Ventnor Hospital, in which antiseptic inhalation was employed throughout as an adjunct to general treatment.

CASE I.—M. B., aged 32, a tailor. Third stage, right side, with moist crepitations all over the back, and second to third stage at the left apex. He was admitted on January 8th. The sputa were nummular and bloody, four ounces in amount. He was discharged on March 18th; sputa, two drachms, no tinge. He was under treatment ten weeks; he gained 10 lbs.; and was discharged with crepitation much diminished in all parts of the chest, and signs of dry vomicae at both apices. The other treatment consisted of hypophosphites and cod-liver oil, with iodine paint over the chest.

CASE II.—E. M., aged 20, a shopwoman, of strumous cachexia; had very moist excavation at both apices. Expectoration amounted to four ounces, and was muco-purulent. She was under treatment eighteen weeks. The expectoration was entirely stopped, and she was discharged with the moist sounds greatly diminished and the cavities contracting. There was great long-continued pyrexia in this case. The other treatment consisted of quinine and hydrobromic acid, atropia and oxide of zinc, cod-liver oil, and iodine to the chest.

CASE III.—J. B., aged 25, domestic servant, had phthisis in the third stage at both apices. At first there was considerable pyrexia.

The expectoration was three ounces, frothy and muco-purulent; in ten weeks it was reduced to half an ounce. He was discharged with the disease arrested; the physical signs in the right apex as before, and the left apex much drier. The other treatment consisted of quinine and hydrobromic acid, and afterwards quinine and phosphoric acid.

CASE IV.—J. G., aged 31, time-keeper, had the disease in the third stage, very moist, at the right apex; in the first stage, at the left apex. Expectoration amounted to one ounce, muco-purulent and nummular; hæmoptysis was intercurrent. After ten weeks' treatment, there was no expectoration; and he was discharged with the cavity completely dried and contracting rapidly, and physical signs absent from the other apex. This patient gained 9½ lbs. The other treatment was chiefly quinine and hydrobromic acid, and ergotine hypodermically for hæmoptysis.

These cases have been taken at random, and are by no means those in which we have seen the best results from antiseptic inhalation on the amount of sputa.

To be able, also, by this means to dispense, to a great extent, with cough-mixtures, *et hoc genus omne*, is in itself no small advantage in the treatment of a class of diseases in which it is so necessary to preserve, if possible, the appetite, with the digestive and assimilative processes undisturbed and intact. If there be sputa collected in the lungs, there must be cough; the *rationale* of treatment then is to prevent, if possible, the material from being secreted which demands cough for its expulsion. To attempt to stifle a cough under such conditions by sedatives is erroneous in theory, and most dangerous in practice, apart from the other mischievous effects of preparations to which I have already referred.

I may say here, that my later and wider experience of this form of antiseptic inhalation in phthisis laryngea, if such a disease exist *per se*, of which I have grave doubts, or, as I would prefer putting it, in phthisis complicated with affection of the larynx, has not been so favourable as my earlier cases led me to expect. It seems to have too drying or astringent an effect; and, in all such cases, a warm moist vehicle is preferable for the antiseptic material, if such be indicated.

I have now, for nearly five years, employed antiseptic inhalation, as a regular part of the treatment, in all lung-affections characterised by purulent expectoration, both in my private practice and in the Royal National Hospital for Consumption. I find that all patients take to it very readily, become very speedily impressed with the amount of relief it affords, and inclined to continue it on their own account, without the encouragement and suggestion which many other details of treatment often require. Any difficulty on the score of odour is easily met in the great variety of antiseptic materials from which to choose. I have received a great many communications from members of the profession, many of them in large practice among *poitrinaires*, expressing their high opinion of its value. I am sure the results of this auxiliary to general treatment, in appropriate cases, will be found most encouraging.

ON THE EMPLOYMENT OF THE MAGNET AND ELECTRO-MAGNET IN THE REMOVAL OF IRON AND STEEL FRAGMENTS FROM THE INTERIOR OF THE EYE.*

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THE employment of the magnet was advocated, according to Manché, as long ago as 1646 by Fabricius Hildanus, and he used it apparently at the suggestion of his wife, but confined its application to the removal of splinters of iron from the cornea. In the BRITISH MEDICAL JOURNAL of last year (vol. ii, p. 83), I recorded an extract from a work published in 1745 by a Dr. S. Milhes, giving a case where a "piece of iron or steel stuck in the iris", and, failing to remove it with a small spatula, he "applied a loadstone to it, and immediately it flew out".

It is, however, to Dr. McKeown of Belfast that we are indebted for drawing attention to the great value of this procedure in the removal of fragments of steel or iron from the interior of the eye. He recorded, in 1874 (BRITISH MEDICAL JOURNAL, 1874, vol. i, p. 800), a case in which, by its aid, a piece of metal was removed from the vitreous humour; and more recently has published two other cases (BRITISH MEDICAL JOURNAL, 1878, vol. i, p. 644). Hirschberg (*Berliner Klin. Wochenschrift*, 1879, No. 46, and BRITISH MEDICAL JOURNAL, 1880,

vol. i, p. 778) has since related a case in which, with the electro-magnet, he removed a fragment of iron from the vitreous body; and Knapp has also recorded a case in which he employed it successfully (Knapp's *Archives of Ophthalmology*, vol. ix, No. 2). Mr. McHardy, before the Clinical Society, in 1878, mentioned a case of interest, where a piece of metal, sticking in the lens capsule, was drawn into the anterior chamber by a powerful magnet held at some little distance from the eye, its removal being thereby facilitated.

It will thus be seen, that the number of cases recorded in which this plan has been adopted are few; but there can be little doubt that it is a procedure of the highest value, and destined to preserve vision to many eyes, whilst in others it may at least secure a presentable organ, and one free from fear of irritation.

There are two modes in which we may apply the magnetic force, either in some form of simple permanent magnet, or as the electro-magnet. Dr. McKeown used the first of these in his cases, and employed a bar-magnet tapered at each extremity; but the electro-magnet is a much more efficient instrument. The difficulty is to get a bar-magnet, exhibiting sufficient power at an extremity small enough for our purpose, to serve practically in the detection and removal of a piece of steel or iron. That, however, one of this character possesses sufficient power for many instances, is proved by McKeown's cases. My experiments also in this direction have shown me that considerable attractive force can be effected by different kinds of bar-magnets. One magnet I had made was a single steel bar, thirteen inches long, and tapered at one extremity to a point a line and a half wide, and three-quarters of a line thick. A few coils of soft iron-wire passed round the bar kept the magnetic current intact. This magnet possessed considerable power; and I almost immediately had an opportunity of testing its efficiency, or one somewhat smaller, though unsuccessfully, in the following case.

A miner, in one of the Derbyshire mines, was engaged in boring for the purpose of blasting, and a piece of the drilling instrument had flown off and struck his eye. The medical man who saw him advised his coming to the Sheffield General Infirmary. There was then a large wound in the cornea, the lens was opaque, and the foreign body appeared to have lodged in the vitreous humour. After the opaque and softened lens-matter was removed, the magnet above mentioned was passed into the vitreous body, but failed to detect the piece of steel, though the subsequent removal of the eyeball demonstrated the fragment lying at the fundus oculi. I have not the slightest doubt that, had I only had by me the electro-magnet described further on, the portion of steel would have been removed with the prospect of at least a presentable organ being preserved.

Of course, in the bar-magnet referred to, the size of the extremity is somewhat larger than convenient for ordinary use, and a further tapering would reduce its attractive force. Gruening of New York, after various experiments, devised a magnet, formed of a number of cylinders joined together and united with a cap at each end; and at one extremity he inserted a needle 52 millimètres long, 1 millimètre wide, and 0.3 thick. This instrument will support from the point a key weighing twenty-eight grammes (nearly one ounce). The attractive force of this magnet seems hardly greater than the simple bar-magnet I have described, and, as will be noticed further on, is very little compared to a well-made electro-magnet. Hirschberg and Knapp employed electro-magnets in their cases, and I have myself made use of them in two cases successfully. The first was the following.

James C., aged 33, whilst engaged, on September 10th, 1880, in striking an iron plate with a hammer, was hit in the right eye by a piece of metal. This happened in the course of the forenoon, and he lost no time in applying at the Sheffield General Infirmary, where I happened to be, so that I saw him immediately. On the inner side of the sclerotic, at some little distance from the cornea, and in the middle of the palpebral fissure, was a small horizontal wound. Examination with a fine probe at once disclosed the fact that the greater portion of the foreign body was lying in the vitreous humour, but that it clung to the inner sclerotic wall sufficiently to enable one to detect it with the probe. The situation of this piece of steel was such, that it appeared only too evident that any attempts to remove it, with forceps or otherwise, would most probably result in its being pushed further into the interior of the globe. The only electro-magnet at hand was one which was too large to introduce into the wound, and therefore it was decided to place it at the surface of the wound, which at the same time was carefully a little enlarged, in order to enable the fragment of metal to find a passage outwards more easily. After the electro-magnet had been applied a little time, the foreign body was found to be fairly in the wound, and it was readily removed with a fine pair of forceps. The patient remained in the infirmary for a few days, and the sclerotic wound healed immediately; and on a later date it was noted that vision

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