cases, and probably this was to be accounted for by the fact that the mechanical treatment was alone treated, and the true course of the disease left undealt with.

OBSERVATIONS

ON

DR. BERGEON'S TREATMENT OF CHRONIC DISEASE OF THE LUNGS AND AIR PASSAGES BY MEDICATED GASEOUS ENEMATA.

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DURING a residence last summer at Evian les Bains, on the south or cool shore of the lake of Geneva, Dr. Bergeon, of Lyons, came to see me, in order to bring under my notice his new treatment of phthisis and other pulmonary diseases. Dr. Bergeon is a well-known and experienced Lyons physician, and *agrégé*, or assistant-professor, at the school of medicine of that city.

When Dr. Bergeon first told me that he had discovered a new mode of treatment by which pulmonary phthisis, and other pulmonary diseases—asthma, chronic bronchitis, etc.—could often be cured, and nearly always alleviated, and retarded in their evolution, I smiled internally. I have so often heard of and tried new remedies, only to fall back on the old, that I was incredulous. His explanation of his treatment, however, at once dispelled this frame of mind, leaving me with the impression that he had hit upon something absolutely new, and of serious import. Indeed, I felt bound to admit that he had opened out a new field in pulmonary therapeutics, and that his views deserve, and must imperatively obtain, serious consideration and trial. The following is a condensed statement of his theories and practice.

Dr. Bergeon commenced his inquiries and experiments some years ago. Imbued with the parasitical, microbic, bacillary views of the day, he wished to discover a mode of destroying these morbid germs. Like many other experimentalists, he tried to do so by medicinal means, by inhalations, by hypodermic injections, but all in vain. He then remembered the experiments made by Claude Bernard thirty years ago on the absorption of gases by the large intestine. That eminent physiologist discovered that carbonic acid gas, when injected, was absorbed by the intestines in large quantities, without any toxic effect whatever. The same result was obtained with sulphuretted hydrogen, although it is poisonous if inhaled. Dr. Bergeon repeated these experiments on animals, principally on rabbits, with the same result. He then tried the injection of large quantities of the carbonic acid gas in human beings—to the extent of two, three, or four litres (quarts) two or three times in the twenty-four hours, with absolute immunity from any toxic effect. The gas is expelled by the mouth in the course of a few minutes after injection, without oppression, dyspnoea, or intestinal disturbance. The carbonic acid gas appears to be innocuous, but without any decided medicinal effect. It is the sulphuretted hydrogen, a powerful microbicide, which appears to exercise the therapeutic influence.

Dr. Bergeon, having got so far, having obtained an innocuous medium in the carbonic acid, began a series of experiments with various medicinal agents, which it would be too long to enumerate, stopping at last at sulphuretted hydrogen, as evolved from natural mineral waters. He found the most efficacious to be that of the Eaux Bonnes in the Pyrenees. By passing the carbonic acid through a bottle charged with this water, it becomes impregnated with the sulphuretted hydrogen gas which it contains, and this is well borne by the intestines. It is absorbed by the intestinal venous system, and rapidly exhaled by the mouth through the lungs. In two or three minutes, on applying the nose to the patient's mouth, the air emitted is found to be tainted by the sulphurous gas. Twenty minutes is the time prescribed for the slow, gradual injection of four litres. The abdomen becomes distended; but without pain, unless atmospheric air is, from imperfect manipulation, injected with the medicated gas. If this is the case, there are intestinal colics, or tormina, atmospheric air being apparently an irritant. It is singular

to feel with the hand placed on the abdomen the gradual distension of the latter, even in a very emaciated subject, often without pain or even discomfort. Within half an hour after ceasing the injection, all the gas is absorbed and expelled through the lungs and mouth, the abdomen regaining its usual shape and softness. This I have repeatedly witnessed.

Dr. Bergeon claims marvellous therapeutic effects for this medication. He says that he has been applying it for the last two years to all the cases of chronic pulmonary and throat disease that have come under his observation; indeed, in more than two hundred cases, although the experiments were made at Lyons, where the climate is bad, the results have been successful to a degree that has surprised and astonished him. He says that, in early phthisis, even in acute general phthisis, a form of the disease nearly always rapidly fatal, in two or three weeks there is generally an arrest, and in a few months a cure. Even in advanced, incurable phthisis great amelioration is obtained. The pulse is lowered, the temperature falls, the night sweats cease, the appetite returns, the expectoration rapidly diminishes, losing its purulent character, and the cough becomes less harassing and frequent. The amelioration, he says, is also rapidly obtained in advanced laryngeal phthisis, when all local or constitutional treatment has failed to give ease, or to arrest the ulcerative process. Asthmatic attacks are relieved with more certainty than by any other means, including the hypodermic injection of morphine.

These are very marvellous statements; but, coming from a scientific man of mature age, occupying a prominent orthodox position in a great medical centre (Lyons), and brought forward as the result of several years of trial and observation, they must command attention and counter-trial. Certainly, to pass from eight to ten or twelve litres of medicated gases through the intimate structure of the lungs several times in the twenty-four hours is a tangible reality, and a new departure in thoracic therapeutics. The entire structure of the lung is certainly reached; both the healthy and the morbid tissues are thoroughly searched out and permeated.

I am one of the least disposed to admit the local origin and nature of phthisis. I have always thought and taught that it was a constitutional disease, depending on hereditary and general conditions manifesting themselves locally, and have never believed in panaceas. I have only succeeded, according to my own lights and convictions, in arresting and curing the disease (which I have very often accomplished during the last twenty-six years) by hygienic treatment, coupled with such medicinal agencies as the complications of the disease treated required. Thus, *a priori*, I am not prepared enthusiastically to accept and endorse any new local mode of treatment; but facts are stubborn things, and Dr. Bergeon adduces facts, or apparent facts, in support of his views. At present he courts publicity and the most searching inquiry. After waiting two years, he says, until his experience became confirmed by successive series of cases, he has brought his views before the scientific world without the slightest reserve or reticence. He has communicated them to the Paris Academy of Sciences (*Comptes Rendus*, July 12th, 1886, p. 176), to the French Congress for the Advancement of Science, 17th August, 1886, to the Paris Academy of Medicine, through M. Cornil (*Bulletin de l'Académie de Médecine*, 2^{me} série, s. xvi). Moreover, his pupil, Dr. Morel, has recently published an exhaustive pamphlet, entitled "Nouveau Traitement des affections des Voies respiratoires d'après la Méthode du Dr. Bergeon." (G. Masson, Paris, 120, Boulevard Saint Germain.) In the *Bulletin de Thérapeutique* of November 30th, Dr. Dujardin-Beaumetz has also published an interesting article.

In September I was in Geneva, and saw several physicians there who were trying this treatment, as they stated, with apparent benefit. On my arrival at Mentone in October, I found a young Russian patient of former days, aged 21, dying of advanced phthisis, under the charge of her travelling physician, Dr. Cacace, of Naples. We tried the injections merely to see if we could give her ease. This was certainly done, and at first the treatment was attended with such an unhopedorally, that the family wished to see Dr. Bergeon himself, so I summoned him from Paris, where he then was. The rally, however, was only temporary, and she has since died. I had previously attended her here successfully at the age of 9, for scrofulous swellings in the neck; and at 16 for amenorrhoea and chlorosis, and this was her end. She thus went through the various phases of hereditary phthisis. The last therapeutic effort could only be expected to ease her sufferings in some measure.

Dr. Bergeon, who has remained a while with us to rest, has given a lecture to the twenty-two doctors who practise here, has seen several other patients in consultation, and has answered all our questions. He says that non-success is generally the inevitable result of inefficient application of the treatment or of the bad quality of the sulphur

water. At first the medical attendant must himself give, or see given, the enemata twice a day, slowly and cautiously, twenty minutes at least being devoted to each injection. He must begin at first with one litre, gradually increasing the amount, an hour before meals or three hours after, with careful study of what each individual is able to bear. All this, he states, cannot be left to unskilled hands at first. When, however, tolerance has been established, and the patient has become familiarised with the treatment, it can be entrusted to a skilled nurse or to a clever member of the family, or even to the patient. The carbonic acid must be generated on each occasion, and the bag or balloon must be first scrupulously emptied. If any gas remains in the balloon, atmospheric air enters through its walls by endosmosis and acts as an intestinal irritant. This is the all but invariable cause of the pains when they exist. On each occasion a half bottle of Eaux Bonnes water has to be used, which costs a franc in France—probably more in England. The water must be opened and smelt, and if not loaded with sulphuretted hydrogen, as is often the case, it must be thrown away. Dr. Bergeon has tried chemically-made gas, but all such preparations cause pain and do not succeed. The penalty for the neglect of any of these precautions is failure.

Dr. Bergeon has tried on animals, as stated previously, many chemical agents—chlorine, turpentine, ether, ammonio-bromine—but they all produce irritation of the intestinal mucous membrane, and even gangrene, and he has had to abandon them. The only agent beyond the natural sulphuretted hydrogen of mineral waters that he has found quite innocuous and efficient is the fluid sulphuret of carbon, the preparation that has been found so successful in destroying the phylloxera on vines. A teaspoonful is put into a glass tube, stopped at both ends with cotton, and the carbonic acid gas is passed through the tube, having previously been washed by passing it through a bottle of pure water.

Thus, there are many points to be scrupulously attended to in applying this treatment, and it has some drawback. It is most painful to the feelings of the patient, and not less so to those of the medical attendant. Both these considerations will have more weight with an English than with a foreign population, owing to national habits and peculiarities. It imposes a very arduous and unpleasant task on the medical attendant, especially on those advancing in life and very busy. In the case of senior consultants like myself, its adoption all but necessarily entails handing over the management of the case to juniors, to younger or less occupied men. And yet if the microbes and bacilli can be destroyed—or, in other words, if the morbid local conditions can be improved or cured thereby, and if they are really important factors in the disease—it will have to be adopted. I may remark that although the bacilli diminish in number, they do not disappear from the sputa, even in the cases most completely cured. This, says Dr. Bergeon, seems to imply that their presence is not the *fons et origo mali* in phthisis. He says that he does not propose his plan as a microbicidal treatment, but merely as one that succeeds. In any case this treatment will have to be put to the test of experiment. In Paris several leading physicians are now trying it in the hospitals, and report very unexpected good results. My Neapolitan friend, Dr. Cacace, who is assistant to the Professor of Clinical Medicine at Naples, will bring it before the profession there very shortly, on his return. He has already had the promise from the professors at the university of that city that it will be thoroughly tested. I hope this short account will lead to its being tried in our special hospitals in England as well as in private practice.

Formerly we could have thoroughly tested any therapeutic novelty at Mentone in our own sanatorium in one winter. The field of observation, however, is now much narrower on the Riviera, as we see comparatively few cases of phthisis. They are nearly all sent to the Swiss mountains, to the high altitudes. I think the prevalent professional feeling on this point a mistake, but I am afraid my opinion has not the weight it formerly had. Yet we have here all winter the "non-microbic" atmosphere which is sought for in the high altitudes—a land wind blows from 4 P.M. to 8 A.M. (during sixteen hours) from mountains 4,000 feet high behind us, and "non-microbic" sea air blows from the sea during the remaining eight hours. And that with a mild, but cool, temperature, which allows us to sleep all winter with the window discreetly open.

A Russian physician at Nice, Dr. Jacoby, tells me that he spent last summer examining the Swiss mountain winter stations, that he found the outside air pure, but that inside the hotels he found in midsummer any amount of microbes and bacilli responding vigorously to culture. For my own part, although by no means prepared to endorse the modern bacillary theory of contagion in phthisis, I should decidedly prefer not to spend the winter—nay, even a tithe of it—in a hotel full of consumptives in all stages of advanced disease, exhaling

microbes and bacilli in profusion with every breath. This objection to the breathing of a poisoned atmosphere indoors would hold good, whether I adhered to old or adopted modern ideas on the subject.

I must do Dr. Bergeon the justice to say that he does not pin his faith on anti-bacillary, microbicidal theories. He does not say that patients get better under this treatment because it destroys the germs of the disease. It may be so, but he does not affirm that such is the case, the more so as bacilli are still found in the sputa in cases in which the expectoration is reduced to mere mucus, and in which all, or nearly all, the constitutional symptoms of phthisis have disappeared. He feels certain, however, that the treatment by injection of sulphuretted hydrogen is decidedly antiseptic, and curative of local lesions. This is all that he feels warranted in asserting in the present stage of the therapeutic question.

We are accustomed to connect the respiration of atmospheric air containing an abnormal amount of carbonic acid, as in badly ventilated dwellings, churches, assembly-rooms, with decidedly toxic results. There is certainly, in many instances, immediate suffering; and if the influence is continuous, there is gradual deterioration of the health, and often development of scrofula, or phthisis, or other diseases of lowered vitality (see Dr. MacCormack's writings and my works on Phthisis).

The introduction of many litres of gas daily through the venous system by intestinal injection, although it is speedily got rid of by the lungs, would, one would think, be equally if not more pernicious. One would expect this immense amount of carbonic acid thrown into the venous blood to interfere with retrograde nutrition, with the transformation and elimination of used-up nutritive material. Singular to say, such does not appear to be the case. All the functions of life, of retrograde nutrition and elimination, are said to take place normally, as I have myself seen in several cases in which the treatment has been continued daily for weeks. Probably what, according to Claude Bernard, occurs with sulphuretted hydrogen may also occur with carbonic acid and other gases. They are poisonous when they pass into the arterial system through pulmonary inhalation, but innocuous when merely present in the venous system by intestinal absorption. Recent researches also have shown, I believe, that the air expired by animals contains animal products—*ptomaines* they are called in French—of a very poisonous nature. Dr. Bergeon appears so impressed with the innocuous character of carbonic acid introduced into the animal economy in any form, that he does not, in my opinion, attach enough importance to ventilation in the daily life of his patients—a common error abroad. Dr. Bergeon asserts, with great emphasis, that so far from nutrition being impeded or deteriorated, the very reverse is the case; the appetite returns very soon, and the power of digestion with it, and most patients begin to increase in weight, often very rapidly.

Since the above was written, I have seen a young Englishman, aged 27, whom I placed under Dr. Bergeon's care four days ago. He had been suffering from severe idiopathic asthma for six weeks, had never had a good night during that time, and had passed the last five nights out of bed on a chair. He had been sent from London to try change, but had found no relief at Cannes or at Monte Carlo. The very day he arrived at Mentone, and consulted me, he was placed under Dr. Bergeon, who gave him an injection. He remained in bed all night, and this he has continued to do ever since. The last, or fourth, night has been the best he has had for more than six weeks. He now feels free from oppression, and quite well. The case is a very remarkable one.

Several instruments have been proposed for the administration of the gas. That which Dr. Bergeon uses is one constructed by his pupil, Dr. Morel. It can be procured at La Pharmacie Centrale, 7, Rue de Jouy, Paris; cost, 70 francs, or £2 16s.

DESCRIPTION OF DR. MOREL'S GAS-INJECTION APPARATUS USED BY DR. BERGEON.

Fig. 1.—About three tablespoonfuls of bicarbonate of soda are placed in the bottle, which is then closed carefully with the india-rubber stopper, inserting the glass balloon, with a stem descending into the bottle. Dilute sulphuric acid (one part to four of water) is then poured into the balloon, and allowed to drop into the bottle on the bicarbonate of soda. The carbonic acid gas thus generated passes through a gutta percha tube supplied with stop-cocks into the gutta percha sac or balloon, previously carefully emptied of atmospheric air by folding. When the sac is filled, the stop-cock is shut, and the gas escapes externally, until the acid is turned off and the glass balloon removed.

Fig. 2.—The balloon filled with gas is then connected to a gutta

percha tube provided with a pressure sac, and then to one end of the cross branch of an instrument called *barboteur*, which is introduced into the bottle containing the mineral water, or other medicated agent. The vertical part of this instrument reaches the bottom of the bottle, from whence the gas which escapes, loaded with the medicated agent, passes into another tube for anal injection. If sulphuret of carbon is used, a teaspoonful is poured on cotton previously placed in the glass tube, the tube stopped with a little more cotton, and then placed on the one that connects the *barboteur* with the anal tube.

Fig. 1.

The carbonic acid gas, the medium in this case, is passed through plain water instead of through mineral water. When the mineral water is used, about six ounces of hot water should be put into a large bottle, and the half bottle of Eaux Bonnes water added, so as not quite to fill the bottle. This is to warm the gas. Dr. Bergeon has tried

Fig. 2.

many sulphur waters, but has found none equal to the Eaux Bonnes. He is still looking for a better one, more loaded with gas, and hopes that of Ponlippe at Naples may prove better.

Mentone.

ON FOUR CASES OF CORNEA-GRAFTING.

By W. JOHNSON, L.R.C.S., L.R.C.P.Ed.

THE following four cases of cornea-grafting were done in Jabalpur during the present year. They were all, I am sorry to say, though carefully done and attended to, unsuccessful; but it may be of interest to record my experience of an operation that has as yet been so seldom attempted. The only successful case I can find mention of is given in Juler's book (*Ophthalmic Science and Practice*, 1884), in which an account is given of the transplantation of a strip of cornea with conjunctival flaps from an enucleated human eye into the eye of a man whose cornea had been rendered opaque by an explosion. Good union took place, and a fair amount of vision was gained by the time the patient left the hospital. Subsequently, owing to exposure and privation, the transplanted cornea became opaque. Doubtless this resulted from the lowered vitality of the transplanted portion; and this lowered vitality of the graft and its inability to withstand the encroachment of the more vitalised tissues around it is the great difficulty I have found to exist.

Meeting with a large number of eye-cases among the Gonds, many of whom were totally devoid of any useful sight from the presence of thick cicatrices or sclerosed patches in both corneæ, or perhaps in one only, the other eye being entirely destroyed, the desire was forced upon me to try to restore a portion of sight to these otherwise hopeless cases. I had read of attempts at cornea-grafting in various books and papers; and on looking up my latest book (Juler's), I found the

description of Professor Wolfe's operation in the case mentioned above. After carefully considering the subject, I concluded to try the operation mentioned in De Wecker's work (page 145), and sent home for a trephine for the purpose. The trephine I ordered had four teeth, like the teeth of a saw set in a circle, each with one cutting edge turned in the same direction, so that when the instrument was rotated to the right it cut a circular groove. I soon found, however, by trial on sheep's eyes, that the tooth arrangement was a faulty one, as the teeth had a tendency to tear the corneal tissues instead of cutting them clean, and they also had a tendency to cause the instrument to deviate from the circular path first taken. I overcame this difficulty by getting the teeth ground down so that only a circular even edge remained. This was sharpened by grinding it from the outside all round. The next difficulty was to fix the instrument in one groove when in action, and not to allow it to travel over a large part of the cornea, as it tends to do owing to the mobility of the eye and the slippery tissues on which the trephine rests. This difficulty I met by getting an instrument made of bone, which consisted of a handle and a head, both flat and about an eighth of an inch thick. In the head of this instrument was a circular hole just large enough to admit the cutting end of the trephine and to allow it to rotate freely. When this was applied to the centre of the cornea, and pressed down, it served as a guide to the trephine and kept it to one spot when being used. That it might the better lie on the cornea, the under side was grooved to the curvature of the latter. When the trephine has well entered the cornea, or just before it has perforated, the bone instrument is removed, and the excision of the circular piece of cornea completed. The trephine cuts out a circular piece of cornea of about a quarter of an inch in diameter. This piece of cornea I usually found greatly thickened, sometimes almost an eighth of an inch instead of about one-twentieth of an inch, which is the thickness of the normal cornea.

I will first give my method of operating, and then refer briefly to the four cases operated on and their results. The first point to settle is whether the case is a suitable one or not. Only cases where the sight of both eyes was practically lost were selected. Then I endeavoured to satisfy myself of the healthy condition of the fundus by finding out if there was any perception of light and of shade, especially of sunlight, or the light of a lamp, etc. Having settled this point, I took the tension of the eye; got the history of the case, and so on. Eyes with staphylomatous cicatrices were rejected, as also were those with nystagmus. If the tension was about normal, the perception of light decided, and the history of the case in other respects favourable, I considered it a suitable one for operation. The younger the patient, and the shorter the time that has elapsed since the loss of sight, the more hopeful, *ceteris paribus*, will be the result of the operation. As to the cornea to be transplanted, I may say that I was practically restricted to animals' corneæ, as the enucleation of an eye of a native with the cornea intact is a very rare thing out here. Another reason for taking only animals' corneæ is that, if the operation is to succeed, and to be adopted in complete corneal opacity, we should from the number of cases be practically compelled to depend mainly on a supply of animal corneæ. I selected rabbits, both because they have several times been the subject of experiments on corneal grafting, and because they are not difficult to get, and also because, being small, they are easily managed—a point of no small importance where one has only the assistance of an imperfectly trained native. The rabbit's cornea has also nearly the same thickness, and nearly the same curvature as the human cornea.

Having anaesthetised the front of the patient's eye with cucaine, I trephined a circular piece from about the centre of the opaque cornea, by applying first the bone guide, and then the trephine through the hole of the former. If the bone guide be firmly pressed on the eye, no other instrument of fixation is needed, except, of course, the eyelid-speculum. When the trephine is nearly through, it is found to yield, and, perhaps, some vitreous escapes. It is now taken away, and the excised portion seized with small forceps, and entirely cut away with the point of a von Graefe's cataract-knife. This is usually necessary from the iritic adhesions at the back of the cornea. The edge of the wound is now well cleaned with the small knife and forceps, and any bleeding stopped with cold water. Sometimes the hardened remains of the lens or its capsule are found behind the cornea. These should be removed, and the vitreous allowed to present. All being ready, the selected full-grown rabbit is now killed by an assistant. I found it cheaper to do this than to waste anæsthetic and time in rendering it unconscious. Immediately the rabbit is killed, a portion of the centre of one of its corneæ is excised by the trephine in the same way as the piece from the patient's eye. For this purpose, a cutting edge of slightly larger diameter is fixed to the trephine. The graft is taken