caused by the influenza we had to defer for the present, as his business requires his personal attendance.

Now (February 6th), after the lapse of two months, he can see the second pointer of a watch, reads 20 Snellen at 3 feet distance and 20 Jaeger. He has been attending to his business five hours a-day, where he can see his clients and draft his letters, and does his work satisfactorily.

ON HÆMOPTYSIS.¹

By ARTHUR FOXWELL, M.A., M.D.CANTAB., F.R.C.P.,
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[DR. FOXWELL first dealt in some detail with the vascular supply to the lungs, and discussed the general pathology of hæmoptysis, and various minor causes of its occurrence. He then continued:]

Thrombosis producing an infarct is not an uncommon cause of hæmoptysis. The amount of blood lost is not usually large and a fatal issue directly from the bleeding is extremely rare. This condition arises from various states of cardiac weakness but, once established, the pathology is identical. The pulmonary arterioles being non-anastomosing terminal vessels, the portion of lung beyond the block is deprived of all blood from the pulmonary artery, and also, which is the more important event from the hæmoptoic point of view, of the pressure which is derived from the pulmonary artery. The blocked area is now only supplied with blood from the bronchial, œsophageal, and other small vessels; these are sufficient to keep the area full, but have not enough pressure to maintain a proper flow against the reflux pressure from the veins, which pressure is maintained by the other—unblocked—branches of the pulmonary artery. Stagnation results; the affected tissues, including the walls of the involved vessels, necrose, and hæmoptysis often results; or the proximal portion of the artery containing the original thrombus may give way, and then a serious hæmorrhage, having behind it all the force of the pulmonary artery, may ensue.

It is evident, therefore, that the hæmoptysis does not occur at the moment of the occlusion, but only after an interval, during which vascular degeneration has taken place, allowing extravasation of blood. Clinically, too, we find this to be so, for if immediately after a spitting of blood in, say, a case of mitral stenosis, we examine the chest, it is very rarely indeed that we shall be unable to discover localised signs of pleurisy and of inflammation of the lung parenchyma—that is, signs of degeneration in the area of the infarct.

Excessive strain of an otherwise healthy but weak heart may, though rarely, bring about a similar condition of things. Exhaustion of the right ventricle reduces the pressure in the pulmonary artery, and at the same time exhaustion of the left ventricle impedes the flow from the lungs into the left auricle; slowing and stagnation of the blood in the lungs ensue perhaps over a wide area, or, by inducing thrombosis, over two or three smaller ones, and, in a day or two, hæmoptysis arises. It is noteworthy that in all the records of fatal hæmoptysis from severe strain which I have read, the spitting of blood never occurred immediately after the exertion. Such was the nature of a case sent me by Dr. Newey, of Dudley, a few weeks ago.

A young man, of somewhat feeble physique, ran more than two miles to fetch a doctor to his recently married wife, who had accidentally poisoned herself. He hurried home again, all the time and for some time thereafter, being in a state of much mental depression and anxiety. A fortnight later he had a large hæmoptysis, extending over four days, in all a quart. The blood was almost black, and came up in clots. After a rest of three weeks (more for the sake of precaution than because of serious ill-health) he returned to his occupation, that of a commercial traveller, and continued at it for ten weeks, when, after an unusually heavy journey in Scotland, he had a return of similar hæmoptysis to a less extent. On its cessation Dr. Newey sent him to me. I found the right side of the heart much dilated, reaching 2 inches to the right of the sternum. The radial pulse was 120 and small, but of high tension. On examining the lungs, dulness was found throughout on the right, but this was most marked at the base; the breath sounds were diminished very much at the base and bronchial in quality, while in the upper half they were less bronchial and fuller. My diagnosis was base full of effused blood and infarcted matter, with upper part of lung somewhat collapsed, owing to distension of the lower half. I directed my atten-

tion to strengthening the heart with absolute rest, good food, digitalin, and nuxvomica, adding some bromidia to soothe the nervous system. I have heard since that he has much improved, though, as this was only some fortnight back, it is manifestly too soon to decide as to whether my diagnosis or that of tuberculous hæmoptysis be the correct one.

[January, 1894. This patient has again consulted me, and the condition of the right lung has greatly improved.]

Injury without puncture may so contuse a portion of lung that inflammation and suppuration result, when, if a vessel be involved, hæmoptysis may occur. I have now in the Queen's Hospital a little girl who was knocked down by the shaft of a cart hitting her just below and outside the right nipple. On the following day rather profuse hæmoptysis occurred and continued for ten days; then, according to the history of Dr. Haynes, of Evesham, who sent me the case—which history, by-the-by, was the model of what such histories ought to be—she had an attack of pneumonia of the right lung, from which after three weeks she appeared to be convalescent. But a fortnight later, with a sudden fit of coughing, a large quantity of pus was expectorated, with the usual signs of abscess of the lung. Later, signs of pleural effusion with blood-stained serum in small amount arose, at which time she came under my care. She is now fast recovering; seems perfectly well in herself, and the chest exhibits the usual signs of contracting cavity with much thickened pleura.

The explanation is evident. The blow contused the lung parenchyma, and so damaged the walls of one or more vessels that they gave way, hæmoptysis resulting. During the hæmoptysis pneumonia arising from the contusion crept on, and, by the time the hæmoptysis had ceased, had fully declared itself. This pneumonia was of such severe type that a portion of the inflamed lung necrosed, became isolated, and broke down gradually into pus, which latter found its exit by a bronchus. Meanwhile, however, some inflammatory material was conveyed by the lymphatics or by direct extension to the pleura and set up pleurisy with effusion.

But it is in association with the tubercle bacillus that the great mass of hæmoptysis occurs. I say "in association" designedly, for that there is no indissoluble bond between the spitting of blood and the bacillus is evident in the fact that more than half the cases of tuberculous phthisis run their course without any hæmoptysis; in the fact that in acute pneumonic phthisis and in acute miliary tuberculosis of the lungs, two diseases where the bacilli lead the most virulent life and bring hasty death, hæmoptysis is most rare; in the fact again that in other primary lung affections, such as emphysema and fibroid disease, where bacilli play no rôle, yet hæmoptysis is at least as common as in those two previously mentioned, where they play their greatest rôle of all; and finally, in the fact that hæmoptysis unites with the bond of a common symptom these primary diseases with those which are purely secondary to cardiac mischief, a mischief which is supposed by many to be positively inimical to bacillary life.

Yet hæmoptysis and tubercle are too closely related to be looked on as mere concomitants, however much stress we may lay on the very great frequency of tuberculous phthisis as compared with all other diseases of the lungs.

Indeed, they both depend upon a common cause: the "dispositio catarrhalis" of the old writers, which I may best define as a tendency to a sluggish catarrh occurring in places where the circulation is feeble. The circulation is not sufficiently feeble to bring about degenerative inflammation and its resulting hæmoptysis in previously well-disposed tissue, as we have seen may result from that far greater enfeeblement of circulation which follows cardiac failure; nor is the catarrhal tendency sufficiently active to start into being where the circulation is energetic, as occurs with the insective catarrh of pneumonia. But where the catarrhal tendency and the feeble circulation both exist, there we have a constant focus of depressed activity, gifted with a dogged persistence which the strongest tissue must in time give way to, a veritable quicksand where it wallows helplessly, and in which at last, after passing through the stage of fatty degeneration, it dies suffocated. Such a slough of despond is the birthplace of hæmoptysis and the rich foster mother of the bacillus.

All hæmoptysis in tuberculous phthisis arises from a perforating ulceration of a vessel's wall, or from the solution of

its continuity after fatty degeneration and necrosis, or, by far the commonest of all, from the rupture of an aneurysmal dilatation of it.

Granted my position as to the pathology of hæmoptysis, the *rationale* of its treatment is simple, and the best means to carry out this *rationale* easy of acquirement. It will be best to consider these means under two heads: (1) when the hæmoptysis arises from lung mischief secondary to cardiac failure, and (2) when it is due to primary lung disease.

The hæmorrhage occurring in cardiac disease is due to a degeneration of the endothelium with consequent thrombus in a branch of the pulmonary artery owing to feeble circulation, thus causing an infarct; the hæmorrhage itself arising from necrosis of a vessel or vessels in the infarcted area from inflammation in the tissues surrounding it. But the tension of blood is very low, the effused blood quickly clots and lies against the opening, the blood within the vessel looks on this clot as a foreign body and forms a thrombus upon it which soon occludes the bleeding point.² The indication in cardiac hæmoptysis is therefore to prevent a repetition, and to effect this we have to strengthen the heart by horizontal rest and such tonics as strychnine and digitalis; personally, I find subcutaneous injections, or rather intramuscular ones—for it is high time we did away with the term subcutaneous—of liq. strychninæ in the doses we are accustomed to give it by the stomach, 3 to 5 minims thrice daily to be the most efficacious of all means for stimulating the weakened musculature of the heart.

Should the initial cardiac hæmoptysis be very severe we must at first have recourse to the treatment I am about to suggest for hæmoptysis due to primary lung disease; but even then we must be very chary in adopting measures which depress the heart.

In primary lung disease we should look upon the bleeding point much as a surgeon would look upon a bleeding vessel in a sloughing ulcer of the leg, which he had to treat without the aid of any surgical skill. I take it he would be very ill-advised to employ ergot or any other vasomotor contractor, for the vessel in the neighbourhood of the bleeding point is diseased, its muscle fibres are degenerated, and therefore the drug will act less upon them than upon the fibres of all the other arterioles of the body; the injured arteriole it will not contract, but it will raise the pressure of the blood within it by its effect on all the healthy arterioles; the result will therefore be an increase rather than a lessening of the bleeding, unless, indeed, you should so press your ergot that the general contraction resulting produced heart failure and in this way lessened the flow of blood at the bleeding point, though not to so great an extent as would occur elsewhere. I do not think this procedure will for a moment commend itself to us; it is a far more dangerous and a far less efficacious method of producing heart failure (that is, faintness) than Nature's own. She does it by bringing the tension of the blood to a minimum, and the blood ceases to gush from the extreme weakness of the propelling force; there is the rest of sheer exhaustion; and during it mechanical and chemical (not physiological) forces create a plug for the hole in the relaxed and flaccid vessel. All the arterial system is in a state of half-empty flaccidity, so that the feeble flickerings of the heart have every encouragement to continue, for Nature has provided that it shall have the least possible work to do. And so life is kept going with the smallest possible amount of blood pressure, thus allowing the plug the best possible chance of establishing itself. But in ergot faintness the blood, so long as it moves at all, must move under considerable pressure, and hence plugging will be much less likely to take place. Moreover, the strong contraction of the arterioles gives the worn-out heart far less rest, and it has to re-establish the circulation in the least, instead of the most, advantageous circumstances.

As to ergot itself, I think I have given it a fair trial. My routine treatment when resident medical officer at the General Hospital was 30 grains of Bonjean's ergotine injected deeply into the muscles of the buttock. I never saw any injurious effect, local or general, result from such treatment; nor can I say that I was ever able to definitely associate any cessation in the hæmoptysis with its use. But even were it good to contract the arterioles of the lungs, how do we know

that ergot will do this? As I stated before, the calibre of the pulmonary vessels is under very different governance from that of the systemic ones, and I am aware of no evidence tending to show that ergot can contract them.

Venesection is, I think, sometimes of value at the outset; if the pulse be strong, the individual full-blooded, or if venous congestion exist, then it is easy to see how a timely venesection may diminish the loss of blood. For half a pint of blood withdrawn quickly will lower tension, etc., as much as a pint removed slowly; that is, the quick withdrawal of blood by venesection may do at once what Nature is striving to accomplish more slowly, namely, produce a faintness of the circulation.

Again, anything which keeps the blood in the systemic circulation and so produces anæmia of the lungs, is beneficial. We know that the splanchnic area can contain all the blood of the body; any therapeusis, therefore, tending to fill this area must be good; large doses of nitrites, which relax the systemic arterioles, should thus prove of service, as well as the constant supply of small portions of food so as to keep up a constant demand for blood in the alimentary tract.

To fulfil the same end ligatures may be applied to the thighs and upper arms to prevent the blood reaching the right heart, a procedure well spoken of by Walshe. Leeches to the anus or a hot foot bath have proved similarly useful. Till faintness come on the sitting posture is preferable; in this way the head is less supplied with blood, and so less able to stimulate the heart's action than if the horizontal position were maintained.

Any means which may increase the coagulability of the blood is evidently of value. It is for this reason that the swallowing of gallic acid is recommended, though the method of its action is unknown to me. Nor do I think the evidence in its favour is considerable. That it does reach the blood in these cases is shown by the fact pointed out by Wood, that the blood spat up after its exhibition often has a greenish hue.

In July, 1893, Professor A. E. Wright, of Netley, made a communication to the BRITISH MEDICAL JOURNAL on the Value of Calcium Chloride as an Increaser of the Coagulability of the Blood. He showed, also, that in too large doses it delayed greatly the period of coagulation. In cases of chronic bleeding—for example, hæmophilia—doses of 5 grains taken thrice daily were most beneficial, but to produce a sudden and complete effect such as would be our desideratum in severe hæmoptysis, a large single dose of half a drachm would obtain the maximum effect which, in the professor's own case, reduced the coagulation time of his blood from 4 to 1½ minutes.

Of all measures for the relief of hæmoptysis perhaps the induction of vomiting has the strongest clinical value of any, but the *rationale* of its action is certainly obscure, and, though I have thought much about it, I am in no position to offer any elucidation of the problem. It matters little what drug be employed for the purpose; whether it be a local irritant, such as salt and water, or one acting on the centre, such as antimony. Personally I prefer antimony, as it produces relaxation of the systemic arterioles as well.

Hydragogue purgatives are of extreme value, as they deplete the abdominal organs, and so enable them in turn to drain other parts of the body. Amongst them, calomel possesses a double virtue, as mercury is one of the best, if not the best, drugs we possess for lowering arterial tension. Its great antiphlogistic power adds still more to the efficacy of mercury.

The great thirst which often accompanies prolonged bleeding is best assuaged by the sucking of small pieces of lemon, as the exhibition of fluid drinks, except as nutriment, is to be deprecated, our aim being to keep the quantity of the blood as low as possible and its quality as concentrated.

A cool atmosphere is supposed to be advantageous. There is no doubt it is so in the case of epistaxis, and the nose is one portion of the respiratory tract. So it is hoped that it will be so to the vessels of the lung parenchyma, though we must remember, first, that, whatever the temperature of the outside air may be, that in the air sacs is constant; and, secondly, cold air is a stimulant to cardiac action—an action we wish to depress. Hence I believe a warm room to be preferable.

² On this question of thrombosis I have chiefly followed Cohnheim.

I must not forget one important aid with which Nature has provided us; she has given us a most capable ligature in the elasticity of the lungs. As blood is effused and more blood from the right heart takes its place within the vessel the effused blood distends those alveoli into which it flows, and the elastic walls of these in turn increase the pressure which they had previously exerted, and so press the effused blood with increasing force against the ruptured wall of the vessel. This natural ligature it is evidently our duty to aid by all the means at our disposal, and for this reason I would shun any method of therapeutics which would accentuate the act of inspiration, such as the inhalation of astringent sprays.

The application of an icebag to the præcordium, inasmuch as it is a powerful cardiac depressant, is valuable, but, in so far as it chills the surface of the body, it is undesirable. As ice in some form or other is usually importuned for by the patient, it is, perhaps, well at once to resort to this method of its exhibition, and the bag will be most wisely placed upon the præcordium. As to its local application over the bleeding point, even if we could accurately localise this, I doubt the advisability, owing to our want of knowledge of the effect of cold on the pulmonary vasomotor nerves and of the depth to which the cold of an icebag can penetrate. Experimentally, but not yet my to mind clinically, it seems to have been shown that the cutaneous application of ice to the chest has produced local anæmia of the subjacent lung.

I would conclude this paper with the exhortation, "Above all things let the thought of morphine be kept ever in mind." As a chain's strength is that of its weakest link, so is the hæmoptoic force of a circulation that of its strongest pulse. One strong beat may thrust away the plug which many feeble predecessors have allowed to form. A vascular serenity is, therefore, an absolute essential in the treatment of hæmoptysis.

REMARKS ON THE ETIOLOGY OF CANCER.¹

By C. H. CATTLE, M.D.LOND., M.R.C.P.

I PROPOSE to speak, almost exclusively, of the etiology of cancer in the strict sense of the word—that is, of malignant tumours of the epithelial type. This subject has attained to great prominence during the last few years on account of the alleged discovery of parasitic protozoa in cancerous tumours. No one will be able to adopt a narrow view of the etiology of cancer who has read in Mr. Hutchinson's *Archives of Surgery* the series of admirable clinical records, in which is shown the connection of cancer with other morbid processes, especially chronic inflammatory lesions. While bearing in mind as much as possible of what has been imparted to us by eminent observers, I have no wish to dissemble my personal bias towards a belief in a specific parasitic agent as one factor, and that probably a necessary one, in the causation of cancer. Leaving this for the present, I will glance very briefly at some contributory influences, which have received more or less general acceptance.

Heredity.—Under this head we have to distinguish carefully between diseases in which the disease itself is unmistakably inherited, and those in which a want of resistance or vulnerability of certain tissues is inherited, which may lead to the development of the disease if certain other conditions are favourable. To the first class belong syphilis and hæmophilia; to the second, in the great majority of cases, tuberculosis and cancer. It must also be remembered that in dealing with such a common disease as cancer the influence of heredity may be apparent rather than real; for although the same disease may affect the offspring as affected the parent or grandparent, yet the explanation may be that the individual was in both cases exposed to similar extraneous influences. Among private patients Sir James Paget estimated that a history of hereditary influence could be obtained in one case of cancer in every three. This estimate, high as it may seem, would still leave 66 cases in every 100 to be otherwise accounted for. Well authenticated cases have been recorded of cancer affecting many members of the same family, and extending over several generations.

Age and Sex.—Statistical tables and daily experience inform us that cancer is most commonly met with in persons between the ages of 40 and 60, and not infrequently between 60 and the end of life. The sudden rise between 40 and 50 is due mainly to the liability of the breast and uterus at this period of life to become cancerous. Females are about twice as liable to cancer as males; but if the reproductive organs are left out of account, cancer is much more common in males. Cancer of the lip is a hundred times as common in men as in women, and cancer of the œsophagus four times.² In Continental statistics the stomach is invariably at the head of the list as regards liability to cancer, the position of the uterus, and still more of the breast, being comparatively insignificant. While allowing due weight to the obvious fact that cancer is, in the majority of cases, a disease of the decline of life, it would be a mistake to allow ourselves to be so dominated by this fact as to ignore the occasional occurrence of cancer before the usual age. I think some light may possibly be thrown on etiology by a more careful study of cancer occurring comparatively early in life. I may quote four instances of early cancer which I have come across quite lately without being at any trouble to search for records. The first case, which came under my own notice, was one of cancer of the breast in an unmarried woman of 33. Careful inquiry failed to elicit any evidence of hereditary transmission. The second case, also of cancer of the breast, was related to me by a medical friend. The patient's age was 34, and no evidence of hereditary influence could be discovered. The third and fourth cases have been recently reported. One was a case of cancer of the rectum in a woman of 30,³ and the other of cancer of the cæcum in a girl of 22.⁴ In neither case is anything stated for or against the influence of heredity.

Chronic Irritation.—It has been said that parts which have long been in a state of chronic inflammation or irritation are liable, under the influence of heredity or senility, to become cancerous. The well-known records of "lupus cancer" are a case in point. The cancerous process is something so specific, so different from ordinary chronic inflammation, that I cannot bring myself to believe in the evolution of the one condition from the other, without the superaddition of a specific cause. To my mind such influences as heredity, senility, local damage to parts, and the involutional changes in organs whose functional days are overpast, are so many predisposing causes to a specific disease, which prepare the way for the entrance of a specific poison to the tissues. While saying this I must, however, admit that Mr. Hutchinson's records of warts and moles in the aged becoming malignant appear to afford strong ground for a belief in the evolution of cancer from simple and innocent modifications of structure. Some rare cases are on record in which cancer has followed the long-continued administration of arsenic.

The Seat of Cancer, etc.—It is a well-established observation that those parts which are frequently the seat of primary cancer are little liable to secondary deposits and *vice versa*. While these propositions will be generally admitted, it would be no easy matter to give reasons for all the observed facts on which they rest. For instance, in the case of mammary cancer, why is the liver so often affected by secondary growths while the lungs may escape? If cancerous emboli can get lodged and grow in the capillaries of the liver, why does the same result occur but seldom in the case of the stomach, spleen, intestine, and kidney, which are nourished by the same cancer-laden blood? Auto-inoculation has been observed occasionally where a healthy surface has lain in contact with a cancerous one. Cases are also known in which inoculation of the stomach or intestines has been effected by means of fragments detached from growths higher up the alimentary canal. I may just mention, without comment, the liability to cancer of orifices, the narrowings and flexures of hollow organs—in short, parts exposed to friction and other local damage.

Geographical Distribution.—Cancer is said to be more common in Europe than in any other continent. By some authors it has been thought to be more common in low-lying districts, especially near river banks, than in elevated re-

² BRITISH MEDICAL JOURNAL, February 3rd, 1894, p. 271.

³ BRITISH MEDICAL JOURNAL, February 10th, 1894, p. 299.

⁴ *Ibid.*, EPITOME, January 27th, 1894, p. 14.

¹ A contribution to a debate at a meeting of the Sheffield Medico Chirurgical Society, March 1st.