THE MORTON LECTURE ON CANCER AND CANCEROUS DISEASES.

Delivered before the Royal College of Surgeons.

By JOHN MARSHALL, F.R.S., F.R.C.S.,

President of the General Medical Council; Emeritus Professor of Surgery,
University College.

MR. PRESIDENT AND GENTLEMEN,—I am of course reminded in this institution that I am within a very short distance of a splendid museum, from which I could have drawn a superabundance of material to illustrate the subject of this lecture; but my own impression is that it is far better for a lecturer on a special occasion like this to provide himself with his own material, and by the aid of his own materials or those given to him by his friends, rather than to enter, as it were, into the domain of this vast collection, and perhaps overburden himself with its abundant material. I have therefore selected a certain number of objects which have been supplied to me by my friend Mr. Robert Boyce, assistant in the Pathological Department of University College, and through his ability and earnest work I hope to have an opportunity of allowing you to see certain specimens under the microscope and certain pictorial representations on the screen which will illustrate the portions of the subject which I have to bring to your attention. By the rather illogical term "cancer and cancerous diseases" I presume it is intended that one should consider, not only so-called true cancers, but sarcomatous tumours and those that contain the elements of both, mixed tumours, and not to travel beyond that line. On the present occasion, however, I must limit myself almost exclusively to the true cancers, for the subject is so vast that it is quite impossible to overtake that department in one lecture, and if I were to attempt more I should most significantly fail.

The term true cancer should be, I think, associated with those growths that depend primarily upon an over-development of a spurious form of epithelial, or mesothelial, or hypothelial tissue. I use the word *mesothelial* because it seems convenient to have a term to include those distinct forms of epithelioma which originate in the middle layer, from those which commence in the upper layer of the embryo, or the under layer of the embryo. I shall therefore speak occasionally perhaps of the epitheliomata, the hypotheliomata, and the mesotheliomata. We are apt also here to speak of these growths as being more or less embryonic, and the term is an exceedingly happy one—very good indeed—because it implies the incompleteness, at any rate, of the tissues of which these tumours are composed. At the same time, if used in too sharp a sense, it is untrue, because I contend there is nothing in the embryo like what you find in cancer, nor is there any cancerous element in the embryo itself. There is, in fact, a strange divergence from the embryonic type in these epitheliomatous and hypotheliomatous tissues, a strange divergence which I would rather criticise by the word *anarchy*. They are anarchical evolutions from the embryo or from the embryonic tissues; and this is a very important matter, because we are apt to suppose that an inference may be built upon that word embryo, or embryonic, namely, that the elements of these tissues may originate by a power of reversion to a true embryonic form. Now, if they were distinctly and absolutely like embryonic tissues, I should admit that theory, but until I find in a cancerous growth a distinct reproduction of the pure embryonic element, I say that it is a dangerous expression, very likely indeed to shut up inquiry, to limit our investigations, and to pass glibly on satisfied with the explanation that these are embryonic tissues. They are not embryonic tissues, they are like embryonic tissues, they originate from them even as the whole body does; they are part of the body, but they are not distinctly embryonic tissues; they are, as it were, irregular, uncontrolled tissues, and I would speak of them rather as *anarchical*. I would speak of them as anarchimorphic, anarchibolic, and anarchisynthetic, as building up a tissue.

Clearing our way, then, we may pass on to consider what is the character and what are the surroundings of these tumours. And here I, of course, throw myself upon your own experience, for it must be just as great as mine in regard to the painful history of these perilous growths as a general rule. You know how they begin, how they progress, and you know their termination as well as I do. Nor do I dwell upon the particular conditions, significations, or qualifications of this or that stage of their development; and if I do not trouble you with the influence of age, or of sex, or of hereditary influence, or of occupation, or of diet, it is because I assume that you know all about these points as much as I do.

I pass, therefore, directly, as far as I can, to ask what is the cause of cancer, and no doubt everyone here will say, "We know not the cause;" and in that I entirely agree. But does that prevent us from endeavouring to ascertain the cause? Are we not compelled as members of a scientific profession to dive into this mystery? Is it likely that Providence has, as it were, struck such a fatal and fearful blow at the human construction that there is no remedy for our ignorance, that there is no knowledge but that which we now possess? We most surely stand in a position between the past and the future; and we are responsible for carrying on this investigation and inquiring into this disease until we know something more about it; therefore, there needs no apology for attempting the solution of what seems to be an insoluble problem. But let us see how it has been approached in past times, and let us be encouraged if we can by ascertaining the mode in which and through which knowledge has been advanced in regard to these important diseases. And here I claim that the most advance has been made through the study of structure. We, of course, know the importance of studying the pathological relationships the history, the development, and the surroundings which are worked up, as it were, in this intricate problem—those also of nation, of race, of family, of hereditary influence, and so on; but we cannot conceal from our minds, I think, that as a structural condition affecting the living economy, it must be through the structural element that we must first try to reach the truth. Such has been the case, for if you study the older descriptions of this disease, you will see that they are especially remarkable for the keen appreciation of the conditions of growth, their whereabouts, the progress they make, the general career, as it were, of these tumours; but the writers are specially ill-informed as regards their structure. If we take a most admirable Thesis by one George Tabor, published upwards of a hundred years ago in Haller's splendid *Disputationes Chirurgicae*, we shall find that he gives a most characteristic account of a cancer of the breast. He speaks of the epidermoid element, of the soft tissue, of its extreme vascularity, of the union of the ducts with the acini of the glands; and then he adds that there are two sets of lymphatics—which, of course, we now know to be an error—one conveying material to the breast and the other bringing it back. Then he proceeds to speak of the life-history of the disease, and he characterises the whole in a few remarkably good touches, expressed in a Latin which we seem to have forgotten, embodying, in a few sentences, or sometimes in a few words, what we now spread out into a paragraph.

Now, how have we advanced since that time? Plainly by anatomical investigations in the first instance; and if I venture to put upon the screen an illustration of what has been done in the past, and then come to what we can do in the present, you will see that our advance since Tabor's time has been most remarkable. The diagram before me represents the plate in Dr. Walshe's *Cancer*, which was executed on steel from drawings by myself in the year 1846. You will find in this illustration that we knew then something more than our friend Tabor. In the centre you will see the section of a cancer of the breast. It is hard, scirrhous, with fatty lobules round about, and at the margin, the marginal glandular acini still unaffected. You will see that we were able at that time to illustrate the peculiarities of structure here, and to refer them by comparison to natural elements in the body; the red blood corpuscles, the white blood corpuscles, and then healthy epithelia, then unhealthy epithelioma, still more marked on this side, and still more wild-fashioned epithelial elements, and still more wild-looking growths in the heart of the cancer. Here you also see the remarkable stroma to which I shall have to direct your attention by-and-by—the peculiar stroma that surrounds the acini which contain the so-called cancer cells. I bring forward this plate merely to show that in the 130 years that have passed between Tabor and Dr. Walshe, the advance in knowledge was not in the history

of the disease, not in its development, not in the peculiarities relating to sex, and so forth, but was in the extent of knowledge in reference to structure. I maintain that in dealing with this point I afford the key to the most material advances which have yet been made in regard to the nature of this disease. So that I think anatomy must still be the first path of inquiry.

I will now show some specimens to illustrate by example the mode in which anatomical research has already given us even more knowledge than we possessed in 1846. First of all, in regard to the cells, I am afraid it is too frequently the case that in using the words epithelial and epithelioid cells we have neglected or ignored the particular deviations which these cancer cells certainly manifest when you compare them with healthy epi-, meso-, or hypothelial elements present in the embryo. In the embryo all is methodical; all the cells of these tissues are undergoing a straightforward and well defined career, not pressing each other out, not squeezing for victory, not forcing against any other tissue, but each co-ordinated to its destined end, and marked in the most peculiar way by characters leading to that end. Now, if you examine the epithelioid element in cancer you find distinct divarication and divergence from all that. What does it amount to? You are familiar enough with the forms of these cells, so that I need not sketch them: but you will allow me to remind you that the important part of the cell, according to modern physiological notions, is the so-called nucleus. Now the nucleus governs, as far as we can understand it, the development, the evolution of the cell, as well as its multiplication. What are the peculiarities of the nucleus in a cancerous cell? They are described in a very perfunctory manner. But have we not new methods of analysis; have we not methods of investigation which penetrate a little deeper than that? I fail to see, until recently in a paper by Dr. Heneage Gibbes, that there have been any effective researches into the *modus operandi*, as it were, of the nucleus of a cancer cell. He has undertaken this inquiry, and Dr. Lauder Brunton is working on the same lines when using various tests of colouring agents. He is not only able to discriminate between different layers or strata of healthy cells, but he has led the way, which has been followed to a certain extent by Dr. Gibbes, in his discrimination of the different changes which he sees in the cancer cell. These reagents will unlock the mystery which is lodged in the nucleus. We know that the nucleus has important properties, originating from the combination of seminal and germinal influence, developing the whole body, developing even the cancer which grows within the body. Now, this germinal and seminal influence has been shown to be associated with remarkable movements and changes of form in the core of this little bit of nucleus, a most wonderfully tufted columnar arrangement, feathering themselves out this way and that; and it is through the agency no doubt of this internal economy, through these remarkable changes, that the healthy embryonic cell, the germ and sperm cell, reaches the condition of the true embryonic cells which carry on their development still further. We must endeavour to search out this mystery, to look into the minute anatomy of the nucleus of the cancer cell. That is a hopeful, and it does not seem to me at all an impossible thing. We shall find it no doubt *anarchic*, but shall we not be able to trace the steps of the anarchy; shall we not hope as it were to unfold the mystery of mysteries which lies in the nucleus of a cancer cell?

But if we proceed further with regard to these cells, we find it is not only their structure which we must study, but we must study their composition. And here, again, it is by the agency of different tests acting upon them that we are able to discriminate between certain important portions of a healthy cell. Why should not this mode of analysis be applied at once to an unhealthy cell? Are there not swarms of agents in Nature, colouring matters, chemical substances, and other things, which should be forthwith tried to see whether we can develop by this sort of polarisation—not of light but of chemical agency—abundant characters in these unhealthy cells which will lead us to see how they become anarchic and unhealthy? Then we must apply, of course, to the chemist, because these cells are not only anarchic in their form and evolution, but in the products which they yield. The healthy epithelial cells stand out amongst the secreting agents of the body. Their function is not merely to cover up and protect, but they have functions beyond that—metabolic functions of separating from the blood secretions of an infinitely varied kind, and that must be done through mechanism and chemical affinity. It is no use believing that the process is blank. It is no use supposing that a salivary is the same thing as a mammary gland cell. That cannot be.

There must be some hidden secrets in the very substance, as in the very mechanism of these cells, which give origin to their metabolic action. There must be not only a peculiarity of structure as between the different glands in these little cells, but that must be associated with peculiarities of substance. And here we want the chemist to come in; we want chemical investigation of the highest character, and we are approaching the time when we may hope that chemists will take up this subject. We have them already engaged in investigating the poisonous substances which occur in the body from decomposition, and the other poisonous products which occur in the body in the shape of leucomaines, automaines, and toxines, things that may develop sometimes by foreign agency, as we know, and sometimes in a spontaneous manner; and we call upon chemists and demand their assistance, and we urge this on the younger members of our own profession who are showing zeal in various ways abroad and at home. We must take care of our honours, for foreigners are close upon our heels and are even surpassing us. We must urge on our young chemists to take up these matters; and opportunities will be afforded them by the conjoined Colleges to undertake inquiries of this kind. It would, I say, be a pity—I dare hardly call it a shame—if some did not come forward and push on investigation in regard to these serious and calamitous forms of disease.

Now we see that metabolism, as well as the mere mechanical thrusting in of these morbid elements into the body must be seriously at work, and we ask that that metabolism should be investigated. The epithelial cells are essentially secreting or excreting structures; although deformed, although disordered in their arrangement in cancers, that part of their duty is going on, but not going on right; it is going on wrong. What do they produce? Very many years ago I took a cancer immediately after it had been removed by Liston in the theatre of University College, and within a minute I tested the juice of the cancer, and found it acid. By degrees I found that this observation was not unique, and, in fact, it had been repeated and asserted over and over again, so that I thought little of it at the time; but it leads one's mind back at this moment to the thin edge of an inquiry, What is the acid? I tried to find it out, but with the imperfect means at my disposal, and my imperfect knowledge, I could not say anything more than that it yielded a viscid sort of acid and viscous liquid when it was evaporated, and I thought it was lactic acid. But I do not believe that lactic acid by itself is a sufficient answer to this inquiry. Here, therefore, looking at the secreting power of these cells, I say we ought to investigate, and we ought to have investigated what it is that they secrete or excrete.

Such chemical researches will be most material for the subsequent examination of what takes place with regard to these cells. I have described their behaviour as anarchical. Now what is the great governor of the body? The nervous system. It is very well to say that tumours can be developed in vegetables as well as in animals. Are we sure that this analogy is true? The world is full of analogies. A man to a certain extent is like a carrot, but he is very different; and so these cellular overgrowths in plants, caused by irritation or puncture, lead us to study in a most interesting way the possible alliance or analogies between them. But that must not mislead us; we must not suppose necessarily that an anarchical growth in a plant is quite the same thing as an anarchical growth in an animal. The anarchical growth in a plant may, however, be due to a distinct detachment of that little protoplasmic fibre which has been shown to run through many vegetable cells from cell to cell. With the growing plant there is a fine delicate protoplasmic fibre which has been long overlooked and only quite recently detected, which seems to govern the evolution of the outgrowing cells of the plant. Now, is there no such thing as that in the animal cell? Is there no connection between the governing fibre which really lays down, as it were, the form and structure, and the complication of the structure, of the human body or the animal body? It is said that this is merely an adaptation of the form of the nervous system to the form of the animal. I disbelieve that altogether. I believe strongly and firmly that the nervous system is the centre which lays down and commands the growth of the body in this, that, or the other direction. If not, what does it do? I can understand that in the heart of the embryo cell there should be a molecular movement which will give onset, as it were, and impulse to the growth of the cell. I can suppose that, but when once that cell has multiplied itself into hundreds and thousands can I believe that that cell, or its actual contents *per se*, still govern the body? No; the contents of that cell, the product

of this nucleus, must be growing all the time in the other cells; and it must shoot out into them and command them to go thus far and no farther, and to develop in this way and not in another. I believe this may be; you may regard it as hypothetical; but let us see what happens with regard to cancer. Has anyone ever shown, as distinctly as has been shown with regard to the secreting cells, that the epidermoid or epithelioid cells of cancer are under the influence of the nervous system?

Not many years ago we were very much struck with the fact, then expounded to us, that distinct nervous filaments had been traced into the corpuscles of the salivary gland. I saw the drawing of it, and I would hardly believe it. I thought it too wonderful to be believed, but I gradually became accustomed to it, and now we know that nerve filaments do penetrate into all normal epithelial tissues. I may mention a case that occurred to myself only this last year—that of an extremely sensitive tumour which I removed from the lip, and which, on investigation, my friend, Mr. Boyce plainly showed me was teeming, although it was a thick piece of epithelium, with many layers where there ought to be only a few, accumulated layers of epithelial cells growing from the rounded to the oval, and from the oval to the flattened form—with these little nerve filaments, exquisitely minute, running up between the rounded cells to reach the oval cells, and others, and finally becoming lost, because the epithelium had done its work and was about to be cast off. We know it has been demonstrated that a nerve, a commanding thread, an electric cord, as it were, passes into each individual cell, and what can be assigned as a function to it except that it is the governing cord, the co-ordinating fibre, the cell of its life? The blood nourishes, the lymph carries away its wasted or unused material, a duct conveys away its secretion; but what does this nerve fibre do? It gives sensitiveness no doubt in its own cell way, of the presence of external stimuli, not necessarily a consciousness of sensation. With a cut nerve there is no longer any sensation, but the cell is not destroyed. In the salivary gland the part from which the nerve is divided may still go on secreting; so may any other gland for a time, so long as the cells are in function and in health; they dwindle by degrees, but for a time may go on secreting. But the final control of the health and of the life of a cell must, I contend, be in the nerve filament, for I do not see in what other way it can be materially governed. In science we may not assume non-material agencies. We may try to conceive whatever there may be behind—that is the great unknown—but we are bound in this world to follow out material agencies, and not to be satisfied until we have traced every function through structure. After that function, and behind that, comes life, the original endowment which we can never understand and hardly approach; but once life has been imparted, it goes on in structure, and we can find out in structure everything which results from its evolution and disturbance.

Has anyone examined from this point of view the epithelioid cells of cancer? I have myself, and I cannot believe that when they are aggregated into these irregular masses and groups, when they penetrate along the lymphatic spaces as they do through the body, when they reach the lymphatic glands far away from any primitive nerve fibre which could possibly have once reached them, when they advance into distant tissues, when they recur in a cicatrix—I cannot admit without actual demonstration that the nerve fibres go on with them, so as to regulate their disordered and anarchic government. We want to know this, and here is work for the microscopist, to study carefully in a recurrent growth, in an early yet well-developed growth in a lymphatic or a lymphatic gland, the connections of possible nerve fibres with the epithelioid cells. We want an answer to that. I feel strongly upon this point. I suspect what the answer will be, from my own rude investigations. I can hardly suppose that in the pell-mell agglomeration which we see in a cancer, each cell has its own proper guiding nerve fibre. How and why may we suppose that these nerve fibres are severed? It may be simply from the extreme rapidity of the cell growth; and this may afford one indication of the mode in which cancer originates from a comparatively healthy tissue. In the healthy formation of epithelial tissue the nerve tissue would still remain in it, but in the overgrowth excited by some long-continued injury at last the cells break away from the nerves, they retain the power of multiplication within themselves, because each cell, like the cell of a minute infusorial creature, contains the quantity and kind of material which is necessary to build it up, but it does not retain the governing tissue with its power of control; that must be retained by a centralised nervous system, and as soon as you pass from the

unicellular animal to animals composed of many cells, you find the governing power, the control, in the presence of a nervous system. Now, why not try and solve this problem? It seems to me to lie at the root of a great deal of the explanation of cancerous growth. Even if it be shown that the primitive stimulus, the primitive irritant, is not a common irritant but a specific one; even if it be a bacillus or a bacterium, or any of those minute bodies which are supposed by some to be responsible for cancerous growths; even then the severance of the cell from its nervous connections may lie at the root of the explanation of this anarchical form of growth. Of course I put it as a theory, as my own impression; I do not think it is established; I should be sorry for anyone to say that I believe it in that sense; but I do think there is a great deal in it, and I think that unless we can ascertain whether the nervous filaments do enter the cells or not, we are ignorant of a fact which we ought to know. Not only the growth of the nuclei, the characters of the nuclei, the mode in which they develop the cell itself, but the mode in which the cells are connected so as not to be anarchical should be made a matter of immediate and profound investigation, to say nothing of influencing changes occurring in the great nervous centres themselves.

We come next to the further question, what are the products of these cells? I mentioned that they were acid, but that is a very poor result; we must know more about them, in what tendency they run, what are their secondary products, and what will be the action of those products upon surrounding tissues. They may be the very agents which destroy the nervous connections; they may, at all events, be the very products which alter the stroma around about, and help to dissolve the materials and carry them into the lymphatic spaces and channels, so as to cause a dissemination of the disease. It is not necessary that a very large particulate cell should pass into a lymphatic channel in order to spread this disease; a very minute nuclear particle might suffice; or such particle might not be a particle of the cell itself but a foreign product, though my own view is that it would be a particle of the cell itself.

Now let us go on to the question of the *stroma*. The stroma of cancer is acknowledged to be one great peculiarity of it, as distinguished from the basis of an ordinary sarcomatous tumour, distinguishing it from sarcoma as much as the sarcoma cell itself is distinguished from the epithelioid cells. This stroma of cancer is a very remarkable substance. Long ago, in my own lectures, I defined it as a spinous-looking structure. When you washed away the cells, and disclosed the little loculi of the cancer, you found a crisp, fibrous, sharp, clear, bright-looking tissue, absolutely different from the areolar tissue of an ordinary tumour or from healthy fibro-areolar tissue, yet no doubt developed from it. Its bands are hard, glistening, vitreous-looking, and break off short; it does not run in the beautiful undulating lines of areolar tissue, but encompasses the cell masses with curved bands of a most peculiar kind. It is always developed *pari passu* with the quantity of cells, provided the tissue in which these cells are developed is a firm tissue—the tissue of a firm organ. It is harder in the mammary gland than in the salivary gland; it is harder in the salivary gland than in the liver; it is softer still in the lymphatic glands. Of course, the lymphatic gland has a stroma which is capable of this remarkable transformation. I think this stroma has not been sufficiently studied; I do not think we know enough about it. Its curious, hard, shining, glassy character is further associated with that peculiar crispness when cut, that creaking sensation, which in certain advanced stages becomes almost bony to the scalpel edge; it resembles in a remarkable way not a highly organised and regular tissue, but in certain characteristics the periosteal fibres of a growing bone which is developed from membrane, not from the cartilaginous basis of the bone. In Quain's *Anatomy* you will see something which will remind you of the spinous character of this tissue, of which I hope to be able to show you some representation on the screen. In Quain's illustrations there will be found numerous fibres. I do not say that they are like the stroma of cancer, but the stroma of cancer shows a sort of likeness in that direction.

And this leads me to say that chemistry will herein aid us, because long ago it was pointed out that cretification is one of the conditions apt to follow upon the growth of cancer, especially in the breast; and the cretification or hardness of the stroma is accompanied by a deposit of lime salts in the little alveoli themselves. So that here we find hardness and crispness and a likening to periosteal growth, associated with the presence of lime. Many years ago I had a special analysis made for me of this

peculiar tissue, and the result was that its ash contained three or four times the quantity of phosphates that the ash of an ordinary piece of mammary gland did. There was nothing remarkable in that, because the fact had been demonstrated by the microscope, and shown by Dr. Hughes Bennett many years ago, in beautiful illustrations of this transformation of tissue into calcified kind of substance. Now this is extremely interesting, because it raises the question, What is the function of stroma, and what is its origin? Is the stroma a part of the cancer, is it part of that extraordinarily powerful agent which invades the body and which produces these diseases in the healthy tissue, or is it not? Now it seems to me there are very widely different opinions here, or rather one which is more commonly expressed than the other. It has been held by most writers that the stroma is a mere web that holds the cancer cells, that it is produced by the irritation of those cells, and that by degrees it may consolidate itself into such a hard firm form as to crush the very cells under the influence and agency of which it has been developed. This, of course, leads the mind at once to a possible mode of killing these forms of disease. We cannot say that it will lead to that, but of course that is an inference easily and naturally drawn from it. But what I want to do is to have this stroma investigated; I want the anatomist to pay a little more attention to it to show in what it consists. It is utterly unlike the wavy forms of the filamentous tissue; it seems to be more like bands crushed up together, moulded, as it were, together, pressed into an indifferent form, if I may use the word, and then impregnated with earthy salts in some peculiar way. Now the acid secretion of the cells, finding its equivalent in earthy matter, may penetrate this peculiar tissue, may give it its character; and so we may learn something more of it if we know its chemical constitution and its relation to the surrounding areolar tissue. I shall be able to show you, I hope, some progressive changes which take place in areolar tissues towards the formation of this peculiar stroma. Here is a compressed mass of cancer cells with stroma passing through it. You see the peculiar stroma with its compressed nuclei branching through it. You will see how extraordinarily different it is from the ordinary areolar tissue. I think myself that the history of this stroma has been neglected. I think that we may learn a great deal by a more patient and thorough investigation of the structure, the mode of formation, and the chemical composition of the stroma. Through these channels, through a more minute study of the cell growth itself and its relations, and a more deep and profound study of the stroma, I think there are still problems that require to be answered; that they will be answered in time I feel certain, and I trust that those answers will contribute to lighten our task in combating this painful disease.

Reserving till after the lecture the demonstration of the remaining figures, I omit what I hoped to say about the blood and lymph, and add a word or two about the mode in which this cancer invades the surrounding tissues. If the cancer cells secrete a substance in superabundance—and that they have secreting powers is certain, for that is their primitive formation—if they secrete something which induces the formation of the stroma, it may also serve to dis sever the elements of the cells themselves, and help to carry them on into the lymphatic spaces, as they are called, and so into the lymphatics, and onward to distant parts. But its fibres may also break down the limits between the cancerous formation and the surrounding tissue; they may be the channels through which the disease spreads, and, therefore, I say the more we know of their nature the more we may hope to arrive at a time when possibly, by remedies, we may stop the growth of the cell, stop the growth and production of these unwholesome products, and stop the invasion into the surrounding tissues; and, perhaps, if it can be shown that that is a right procedure, to harden the stroma and try to crush the cells in their nests. The invasion of cancer must come about, I assume, in this way. The elements must pass into the intervals between the surrounding tissue, they must get into the lymphatics, they must reach the lymphatic glands. The proof of this is that the lymphatic glands in the neighbourhood are always the first to be infected, and there it is again we ought to study the remarkable constituents of cancer growth.

As to the recurrence of cancer—I do not mean the spread of cancer through the system or by the agency of lymphatic glands, and so into the blood—but I speak of local recurrence after the removal of the cancer; this also affords us the most advantageous mode for investigating the isolated properties of the cell and the stroma.

In recurrent growths the cells abound; in recurrent growths the stroma is scanty; in recurrent growths, therefore, we should find the anatomy and physiology, so to speak, or the pathology of the cells much more easily followed than in the early growths. There cannot be a doubt that this recurrence very frequently takes place; and this is one important practical point which I wish to impress upon you if I can, that the true recurrence which takes place locally and on the margin of the site of old disease begins in atoms of diseased tissue which have been left behind. It is possible for an operator to say, "I know I completely removed this tumour, and it is utterly impossible anything can remain behind." But when you consider the number of lymphatic spaces, the smallness of the diseased units, and the facility with which these will creep through the healthy tissues, and the impossibility of detecting with the naked eye how far they have gone, you will see that it seems much more probable that the recurrence should be due to a local extension of the primitive disease rather than that it should be a new growth altogether. If it comes in a lymphatic gland, if it comes along the path of lymphatics, that is obvious; but we speak of recurrences near the growth, and those recurrences I have lately been studying, and I quite agree with Heidenhain that they are on the margin of the old incision. In this early recurrence, a very small one, you will find that the growth is not in the cicatrix; the cicatrix is composed of dense fibroid tissue, like an ordinary cicatrix; but exactly in the margin between that and the healthy tissue there is found a growth springing up. It may invade the cicatrix, but it goes a long way into the surrounding tissue first, and I have never found one in which I have seen it actually come in the cicatrix, but always at the margin; or, what is sometimes very deceptive, directly beneath the scar, which it may then invade. But suppose it did come in the cicatrix, What is the cicatrix? The cicatrix is a product of the body; it is a modified form of areolar tissue produced after accident, and intended not to kill, but to heal, to repair; and therefore it is a part of the frame, and is likely to contain its little channels and paths through which a morbid growth may extend. It is possible, therefore, that from the margin of the pre-existing tissue the cicatrix may itself become at once involved; and it does happen that the small recurrent nodule is not in the cicatrix, but in a thickened part of the surrounding tissue, loaded with stroma. Now here, again, the lesson that we learn is a perfectly obvious one, one which I myself have learnt a long time ago; and that is to disregard the neatness of an operation, the closeness to the tumour, but to sweep far away beyond what you really estimate may be the seat of the disease. Do not be timorous and hesitating, do not care about a scar, but sweep away to a great distance, follow the tissues up specially towards the axilla, especially when the tumour is on the axillary side of the mammary gland. Remember, also, that there are deep-seated tumours in the mammary glands, and that these usually have their lymphatics, not going to the axilla, but through the intercostal spaces and directly into the thorax or through the pectoral muscle, along under that, and reaching cervical or thoracic glands beyond. The position, therefore, of the growth in the mammary gland is of extreme importance. If it be central you do not know where it may extend and affect the lymphatics; if it be to the outer side, which is more commonly the case than in any other position, it is nearly sure to affect the axillary glands; if it be deep-seated it may pass into the intercostal spaces through the pectoral muscle, even long before there is any lymphatic mischief in a lymphatic gland, within the thorax or in the neck. The spaces between the muscular fibres and the spaces under the muscular fibres may be involved; this I have seen over and over again in a most characteristic way. Mr. Boyce has come here to my assistance, and gives demonstration of the fact that the cancer cells do really impregnate, as it were, the deep-seated muscular tissue and the under space between the muscular fibres, and unless these are removed, a return is almost sure to occur. The old form of sweeping operation, therefore, should be always held in respect. I believe that its good results, which were perfectly astonishing, depended on that. It does not matter about deformity, it is the preservation of the patient's life; and a very sweeping use of the knife is better, I would say, than any cautery, any electricity, any form of temporising with caustics, with pressure, with cold, or with any such means. They may answer, and in future that great force of electricity, now again on its trial by in a special form by Dr. Inglis Parsons, may come to be specially useful. We admit its value, and wish it all success; but at the same

time remember that it will only destroy what it reaches, and although it is extremely remarkable to find that the cancer tissues seem to dwindle under its influence, whilst the healthy tissues resist it, still, remembering the acid juices of cancer, remembering the mode in which it penetrates into the vacuities of the living tissues, what a tendency it has towards them, and remembering that in spite of electrical destruction this may go on, and then considering again the requisite repeated application of electricity, which come to be like the repeated application of a cautery of a simple character—remembering all this, I say we may find that it will ultimately be regarded as inferior to the knife.

The knife, which sounds so cruel, but which is not indeed cruel under the influence of anæsthetics and the use of antiseptic treatment—the knife is the most feasible method of removing these things. After the knife, however, I certainly, in my own practice where I have the slightest doubt, apply some kind of acid caustic. I do that, and I have found it extremely valuable. I have not cumbered this lecture with personal records, but when I look back to my own experience, I find cases in which accidental hæmorrhage came on, and in which I had to undo a wound and apply powerful caustics—perchloride of iron, and perhaps chloride of zinc. There are special cases, in which I could point to persons living and now perfectly well, eight, nine, ten, eleven, twelve years since operations of that kind. Comparing these cases with the hesitating use of the knife, which formerly I myself practised, keeping as near to the growth, as I was told to do by my teachers, as near to the tumour as possible, without, of course, leaving any ostensible mass behind, still keeping close to it—when I compare these later cases with those I had under observation twenty or thirty years ago, I say their success is very remarkable.

It is truly gratifying to find that success follows in proportion as you remove tissues, in proportion as you work up to the axilla and remove the axillary glands, and even cauterise the base of the wound if there is the slightest sort of suspicion about it. The gratification which one feels at the success of these operations convinces me that that is a most important practical point and a lesson never to be lost sight of.

Now, Mr. President and Gentlemen, the hour is at hand; of course you will all understand that a lecture of this kind is but playing on the surface of a great subject. If it is ever published, I may venture to append or introduce here and there illustrations that will carry perhaps conviction to some of your minds, who may not quite have followed me in all I have said. But in the meantime I thank you for listening to me for this hour, and I invite your attention to the diagrams and to the preparations which are upon the table.

NORTHAMPTON (Population, 61,352).—Beneficial Results of Sanitary Efforts: Want of an Infectious Diseases Hospital.—The health of this urban district for 1888 must be regarded as exceptionally favourable, for the death-rate (15.6 per 1,000) is the lowest recorded for a period of thirteen years (1876 to 1888). The history of the seven principal zymotic diseases is equally satisfactory, there being a most manifest diminution in the mortality from these diseases compared with the previous year, while there was much less prevalence. Mr. Lee F. Cogan states that no case of small-pox came under notice in the borough, but there were two cases at Kingsley, in the rural district, which had been imported from Sheffield. Only four deaths were registered as due to measles and eight to whooping-cough. Scarlet fever prevailed during the whole year, but did not assume any serious proportions. Eight cases of typhoid fever were brought under notice, seven of which were fatal. A most searching and complete examination was made of the sanitary arrangements and surroundings of the houses in which the patients lived, but in only two was any faulty condition discovered which could in any way be associated with the origin of the fever. The statistics of the past thirteen years (Mr. Cogan's tenure of office) exemplify very distinctly the beneficial influences on the health of the community exercised by the administration of the Sanitary Acts. There is evidence of progressive and substantial improvement in the diminution in the death-rates from both general and zymotic diseases. A serious deficiency in the sanitary organisation of the town is the lack of a hospital for isolation purposes; and for the speedy remedy of this deficiency Mr. Cogan pleads in very forcible language, which, it is to be hoped, may have the effect desired.

ABSCESS OF THE LIVER: TREATMENT.

Read in the Section of Medicine at the Annual Meeting of the British Medical Association, held in Leeds, August, 1889.

By VAUGHAN HARLEY, M.B.

HAVING enjoyed the advantage of seeing abscesses of the liver treated both in the tropical East and the temperate West, it may not be unacceptable to the profession if I describe what, I think, may with some degree of truth be designated, "A rapid mode of curing hepatic suppurations."

All having had much experience in the treatment of liver abscesses are aware how exceedingly troublesome it is to get them to close up after they have been evacuated; and that, not only does the emptied suppurating cavity occasionally refill more than once, but after a free counter-opening has been made, pus will continue to ooze away for weeks, aye, even months, equally to the discomfort of the patient and discontent of the doctor.

Several methods of treating liver abscess are at present before the profession, each professing to possess special advantages; but not one of these appears to me to be either so simple, or so successful, as that which I am now about to detail, as well as to illustrate the advantages of, by narrating the results which attended its adoption in two most unfavourable cases for treatment.

Before relating them, however, in order that the subject may be perfectly plain to those who have not paid special attention to it, I will tabulate some of the general principles in connection with liver abscesses, which teaching, reading, and experience have taught me to regard in the light of pathological aphorisms.

1. That the hepatic abscesses of the tropics differ in no essential feature whatever from the same forms of suppurations occurring in temperate zones, except in one single particular, that of relative frequency.

2. Men are far more liable than women to liver suppurations.

3. Although an abscess of the liver may occur at any period of life, it is much more common between the ages of 20 and 50 than at any other.

4. Suppurations of the hepatic tissues are most frequently met with in strumous subjects; and the most unsatisfactory cases of all to treat are those in which a syphilitic taint is superadded to a constitutional struma.

5. The most noted predisposing causes to liver abscess are struma and alcohol—even when alcohol is indulged in within what is usually regarded as the limits of moderation.

6. The commonest of all the exciting causes is a sudden chill, as pointed out by Sir William Moore.¹

7. All abscesses of the liver tend to evacuate themselves by burrowing their way to the surface of the organ, and seeking an outlet for their contents either directly through the abdominal walls, or indirectly (in general) through the pulmonary or digestive systems.

8. It is futile to evacuate a liver abscess either by knife or trocar so long as a free opening is not left to give escape to the subsequently formed pus.

9. When an accumulation of pus has taken place in the liver it not only tends to do serious mischief by causing disintegration of the hepatic tissues, but, from its becoming putrid, to kill the patient by blood-poisoning. This likewise occasionally happens when hydatids of the liver suppurate, which they frequently do when they contain daughter cysts.

10. Cancerous and tubercular deposits in the liver, by disintegration, sometimes lead to the formation of purulent formations.

11. As a natural corollary to these facts, I think all will admit that so soon as the existence of purulent matter is detected it should be evacuated, and the speedier this is done the better will be the patient's chances of recovery.

With these general remarks I shall now describe what seems to me to be the most satisfactory mode of operative procedure in cases of hepatic abscess.

So soon as the presence of pus is suspected its exact situation should be prospected in the following manner: A 6 inch long fine exploring trocar is to be passed up to its hilt obliquely from right to left into the liver, or from left to right, according to which lobe the abscess is supposed to occupy. The pus is then searched for by slowly and gradually withdrawing the instrument

¹ *Lancet*, October 31st, 1885, p. 798.