disorder. But the implication of the nerve in the inflammatory disease of the vessel was most obvious, and the pain was a completely explained by the *post mortem* appearances as facial neuralgia is explained by finding an exposed branch of dental nerve. In both these cases, the nerve was involved in inflammatory decay of the artery. A similar case of inflammation, including the cardiac nerves and causing angina pectoris, is given by Lancereaux, and is figured in his *Atlas of Pathological Anatomy*.

From the foregoing observations, it would appear clear that there are two distinct kinds of angina pectoris: one which is a result of tenderness under overstrain of the great vessels. In this kind of pain, high tension in the arteries is a factor, although a morbidly sensitive state of the nerves must at the same time be present. Such pain corresponds to pain and tenderness in the teeth during mastication, and it is lessened by whatever will lessen the strain upon the tender parts—so that amyl nitrite, or (less certainly) nitro-glycerine, will bring welcome relief, even when it does not give entire comfort. But the relief thus afforded is apt to be temporary, and often only partial—so that, even in these cases, we have to bring in other means, and supplement the service which the amyl renders in relieving the strain upon the vessel by such further service as morphia can render by reducing general sensitiveness. A second form of angina pectoris is a kind of neuralgic heartache, arising from actual inclusion of a cardiac nerve in the inflammatory decay of an artery, and no signs of high tension in the vessels are present. This disease corresponds with such neuralgic toothache as arises when a branch of the dental nerve is involved in inflammatory decay of a tooth. It is more paroxysmal and violent than the first form, the intervals are more free, and there are usually no signs of disease of the heart or great vessels. The means of relief are those which are found useful in the similar neuralgia of the face; and lead us, firstly, to reduce morbid sensitiveness by such improvement of tone in the general health as may be possible; secondly, to employ such alternative drugs as, like arsenic and quinine, have proved themselves to possess some power of controlling the tendency to neuralgic pain; and, thirdly and chiefly, the use of sufficient quantities of morphia to afford relief in the attacks. Morphia, given in the form of subcutaneous injection, will produce the most satisfactory result in the way of temporary relief of this form of angina pectoris.

But angina pectoris does not always arise from organic changes in the heart or arteries: for, like facial neuralgia, it may occur secondarily, as a reflected pain, whose source is at a distance. The primary disturbance which gives rise to reflex angina pectoris is usually seated in the course of the pneumogastric nerves. A very remarkable example of this occurred in the person of one of the greatest surgeons of our own or of any past time. My late friend and colleague, Mr. Hilton, was attacked, three years before his death, with severe angina pectoris—so severe that the cramping thoracic pain would not allow him to walk many steps, and he was obliged to have a cab to go a distance of one hundred yards. This pain, after causing great suffering for several months, passed away; and then, very gradually, during the next two years, the symptoms of cancer of the stomach developed themselves. The heart and great vessels were found after death to be entirely free from all morbid changes.

But, not only may the gastric branches of the pneumogastric thus influence the cardiac nerves, and give rise to the special pains of neuralgic heartache; but, on the other hand, I have met with some remarkable cases, which time will not allow me to detail, in which aortic disease has been associated with abdominal pain in the hepatic region, of a neuralgic character; and, in its mode of onset, and conditions of relief, behaving just like angina pectoris. Nor is it only the sensory fibres that thus vicariously suffer. A lady, fifty years of age, has been for three years under my observation, with no other sign of organic disease than a weak heart and feeble pulse. This lady is reduced to a most sedentary mode of living by the fact, that, if she tries to walk but a few yards, she is suddenly attacked with vomiting. Heberden, in his description of angina pectoris, mentions that some of his patients, who persevered in walking in spite of their pain, were attacked with vomiting. In this lady the vomiting appears without the preceding pain; the onset of gastric disturbance, without previous nausea, is as sudden and surprising to her as is the pain which seizes the chest in angina.

The largeness of the subject I chose, when the College honoured me with an invitation to deliver these lectures, was not so broadly apparent to me as it is now that I have to take leave of it, with so deeply felt a sense of the imperfection of the treatment it has received at my hands. I can only hope that the few points I have brought before you may contribute a little towards maintaining, for the hour, that interest which continuously belongs to everything affecting the brain.

In my first lecture, that part of it which spoke of the cornu of the

fourth ventricle, I adduced Dr. Guy's observations as in support of the suggestion I made with respect to the function of the choroid plexus in the cornu. I inadvertently reversed the bearing of a part of his results, and they were thus made to appear more favourable to my suggestion than they really are. I did not say that the choroid plexuses of the fourth ventricle are overlooked in our anatomical works, but that the occupation of the cornu by the choroid plexus is not mentioned.

A LECTURE ON THE PATHOLOGY OF SCROFULOUS LYMPHATIC GLANDS.

Delivered at the Royal College of Surgeons of England.

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MR. PRESIDENT AND GENTLEMEN.—There are few matters in the domain of pathology that are at the present time more indefinite, and more in need of scientific limitation, than is the pathology of scrofula; and probably in the past there will be found no condition of disease that has been more susceptible to varied interpretation, or more burdened with repeated change and frequent amendments of opinion. That this should be so, it is not hard to understand; and I believe that the explanations of the difficulty depends mainly upon two factors. In the first place, the less marked forms of this disease constantly merge into the manifestation of what is known as mere ill-health, mere delicacy of constitution. These terms refer to conditions that are without any definite significance, without a pathology, and without the least scientific meaning. The very condition, indeed, known as poor or delicate health, represents a wide and blank area in all pathological surveys; it exists as an indication of want of knowledge and lack of precise and inclusive notions of disease; it is, from a pathological point of view, a species of common land unowned and uncultivated; many diseased conditions besides scrofula encroach upon it, and every year's increasing acquaintance with morbid change causes some portion of this area to be absorbed by one disease or by another, and rendered thereby definable and distinct. So long, however, as it will be possible to ascribe any morbid conditions to mere ill-health, to delicacy, to a feeble state of body, so long will pathological knowledge be incomplete; and as scrofula has been bordered widely by this chaotic district, it is a matter of no surprise that the term should still be somewhat vague, and the character of some of the included diseases a little indistinct. In the second place, the subject of scrofula has been considerably complicated by its connection with the subject of tuberculosis. In commencing any discussion upon the pathology of scrofulous affections, it has been customary, if not necessary, to open the argument with a definition of tubercle, and to then proceed to answer the question, is scrofula a tuberculous or a non-tuberculous process? This forced alliance of a vaguely defined disease, with a still less distinct morbid condition has, I believe, proved a serious bar to the proper appreciation of scrofulous processes. Notions as to the nature of tubercle have undergone, from time to time, most rapid and emphatic changes; attributes, once considered as essential, have been one by one eliminated; the very term has shifted from this morbid appearance to that; and the tubercle of one period of knowledge has not been the tubercle of another. The forced association of scrofula, therefore, with this unstable element, the very Proteus of pathology, has, I believe, contributed not a little to the present indistinctness in our knowledge of that affection. The great point has been, to range such facts as have been adduced on the one side or the other; to class them as tuberculous or non-tuberculous. Thus it happens that few additions to our knowledge of the histology of scrofula have been made, that have not been seriously encumbered by theoretical matter; new observations have been influenced, often to no slight degree, by an attempt to make appearance accord with theory; and many sound investigations have been lessened in value by the deductions and inferences with which they have been introduced.

The clinical difficulty, therefore, on the one hand, of clearly isolating scrofulous affections from the unknown factors of ill-health and frailty of constitution, and the pathological difficulty, on the other, of avoiding the indistinctness that appears to have been always the hereditary right and

possession of tubercle, seem to have been the two agencies most active in rendering the outlines of this affection ill-defined. It will be my humble endeavour, in placing before you some fresh facts in the pathology of scrofula, to have especial regard to these matters of difficulty.

As the limits of this lecture will not permit me to discuss the minute changes observed in even the more conspicuous scrofulous affections, I will confine my remarks on this occasion solely to one affection—to the scrofulous process in lymphatic glands. Many reasons can be adduced for selecting this one affection, and for regarding it even as a type of the general process involved in scrofula. These gland-affections form the most frequent, the most characteristic, and certainly the most easily recognised of all those outcomes of disease designated scrofulous; in all discussions upon the subject of scrofula, they have occupied a conspicuous position; their clinical characters have been fully investigated, are well known, and have been for ages appealed to, as the one great evidence of a so-called strumous taint. The lymphatic gland moreover presents great facilities for examination; its structure is comparatively simple, and the morbid processes to which it is subject are, from anatomical reasons, well isolated and circumscribed.

The first change noticed in these glands is an increase in the number of their lymph-corpuscles, an increase observed both in the sinuses of the organ, and in the proper gland-tissue itself. The more active the process the better marked is the change, the sinuses in such cases appearing so blocked and crowded with lymphoid bodies, that Berlin blue injected by a Pravaz's syringe only imperfectly follows the course of the lymph-paths.

It is significant to observe, that an increase in the number of their contained corpuscles is the very first indication of the inflammatory process as it affects lymphatic vessels, a condition constantly observed by Dr. Klein in the pleural lymphatics of animals, the subjects of chronic pleurisy. And in connection with this point, it is necessary to remember that the mode of development of lymphatic gland-masses shows that they are merely modified lymphatic vessels. Whence these corpuscles come it is perhaps at present impossible to say, but it has been suggested, with reference to this condition both in the glands and in the vessels, that they may have been derived from some initial seat of inflammation, or that they are leucocytes escaped from the neighbouring blood-vessels, or finally, that they owe their origin to the proliferation of the existing cells of the part. And it may here be convenient to allude to a singular and incorrect statement that appears to have been handed down from one pathological handbook to another; and that is, to the effect that the changes in the glands are first observed at their extreme periphery, *i.e.* in the cortical sinuses and follicles, a statement explained by the theory that the periphery is that part of the gland that would be first exposed to any irritant brought from a primary seat of inflammation—for it is generally allowed that in nearly all cases of scrofulous enlargement of glands some primary inflammation can be detected with which the lymphatic lesion is more or less directly in connection. With reference to this statement, I must assert that in no single instance, in all the specimens examined, have I ever found the morbid changes commencing at the periphery of the organ, including in that term the cortical sinuses, and a fair amount of the cortical follicles. Indeed, the exact converse holds good, and the changes invariably commence in the medullary or deeper portions of the gland. It must have been obvious, over and over again, to all who have cut open a scrofulous gland, that the gross changes visible to the eye are always most advanced in the central parts of the organ. If there be only a few specks of caseous change visible, they will always be found to occupy, not of necessity the precise centre of the affected organ, but, at least, a part other than the extreme periphery. The same holds good for limited suppuration, and, within certain limits, for even extensive purulent or caseous collections.

This drawing was taken from a large gland of more than one inch in diameter that was absolutely caseous throughout, with the sole exception of the extreme periphery, where, as is shown in the figure, unaltered lymph-corpuscles can still be seen in great numbers. If, however, the previous statement were true, and the changes commenced in the periphery, one would expect to find them most advanced in that situation. So much for the fact. With regard to the theory, notice has not apparently been taken of this fact, that the afferent vessels of the gland first enter the plexus between the strata of the capsule, and then pass on to the cortical sinuses. The capsular plexus, therefore, is the part of the gland first brought into contact with infecting material, and yet that capsule is acknowledged by these very observers to be only secondarily affected; and, as a matter of fact, this plexus is almost the last part of the true gland-tissue to be involved.

The next change noticed in these glands assumes the form of certain spots of varying size and shape, and which owe their conspicuousness to the fact that, in specimens prepared with hæmatoxylin, they appear more tightly stained than does the rest of the gland. They are observed first

in the medulla, then in the cortex, are always limited to the gland-tissue proper; and the more active the process, the more distinctly do these changes assume the character of isolated spots. Closer examination shows that these districts are occupied by a large number of cellular forms of very diverse character; they range from ordinary lymph-corpuscles on the one hand, to certain very large and conspicuous cell-elements on the other. These latter are nucleus-like roundish bodies, that stain lightly, are pellucid, and present a very distinct intranuclear plexus; between them and the unaltered lymph-corpuscles every gradation can be observed, and there can be no doubt that from these latter they are derived. All these elements, both large and small, show evidence of active division. The endothelial cells of the part appear unaltered. The blood-capillaries in these districts are very numerous and distinct, and are often provided with a well-marked adenoid sheath that, while described by His as of normal occurrence, is certainly best seen in slightly inflamed glands. That these conspicuous changes indicate so many spots or foci of inflammation may, I presume, be granted, especially on the ground of their precise resemblance to changes elsewhere of undoubted inflammatory origin.

The large cells with glistening protoplasm form a great feature in all scrofulous inflammations. They were first noticed by Rindfleisch, who regarded them as characteristic; he described their segmentation, and conceived their origin to be from the leucocytes of the part, an origin almost undoubted in the present instance. All subsequent pathologists have observed them and their almost uniform appearance in scrofulous inflammation, as an important factor in that process. With regard to the future of the cell-products in these exudations, it can only be said that, as a whole, they are short lived, or become involved in subsequent changes. The large elements, especially, soon undergo degeneration and disappear from the scene; in no instance do they experience any further development, and they have no share whatsoever in the formation of giant-cells, which, it may be remarked, are never observed at this stage of the process. The changes just indicated become more or less general, and very soon fresh manifestations of a somewhat different character become apparent.

Before detailing these further changes, I might draw attention to what I believe to be a new feature in the anatomy of lymphatic glands. The system of lymph-sinuses in the glands is well known, and the current of the lymph in them, I believe, well established. It is known that lymph brought to the glands by the afferent vessels enters first the capsular plexus, passes then to the cortical sinuses and through them to the medullary sinuses, whence it issues by the efferent lymphatics at the hilus. In addition, however, to these vessels and passages, I would draw attention to the existence of proper lymphatic vessels in the gland-tissue itself, that appear so far to have escaped notice. These vessels are ordinary lymphatics, their walls are composed of a single layer of endothelium, and they run in the proper gland-tissue, both of the medulla and of the cortex. They are rendered very distinct in the affection now under consideration, but that they have escaped notice in normal glands is no matter of surprise, inasmuch as, when filled with lymph-corpuscles, their distinction from the surrounding gland-tissue must be a matter of difficulty, if not impossible. Into their further anatomy, their mode of division and of termination, I will not now enter; suffice it to say that they have no connection with the system of sinuses, and appear to be concerned, indeed, solely in the simple process of nutrition. The fresh changes now to be described are intimately associated with these very lymphatic vessels, affecting at the same time, although in a less degree, the lymph-sinuses of the part.

It is important to note that they commence in, and for some time remain limited to, the sinuses and lymphatics of the medulla. These lymph-vessels are found to be distended, the endothelial cells lining their walls distinct, and showing evidence both of individual and of numerical increase. Across the lumen of the vessel a fine but irregular reticulum is being developed, composed in one place of fine fibres, in others of broader bands, or even membrane-like expansions. This reticulum is closely associated with the lining endothelial cells, and many acts point to the probability that it is actually developed from those cells. These changes, so far, are almost identical with those observed by Klein in the lymphatic vessels under the pleura and in the lungs, in cases of chronic pleuritis; and to this reticulum developed within the vessels, he has given the name of the "endolymphangeal network". Within the lymphatics, and occupying the meshes of this reticulum, are a varying number of lymph-corpuscles, with a certain but small proportion of those larger cell-elements observed in the earlier stages of the process. These morbid products are no doubt developed from the lymphoid corpuscles that would normally be found within the lymphatic vessels, there being no evidence that they are derived by absorption from a more remote or more advanced focus of disease. Lastly, these vessels always contain more or less of a homogeneous or faintly granular material; and that is

evidently but coagulated lymph, as shown by comparison with undoubted coagula. The changes noted in the sinuses are precisely similar to those first described, and need no special description.

Marked changes at the same time are going on in the gland-tissue adjacent to these affected vessels and sinuses. That tissue, already crowded with altered lymph-corpuscles and the typical large cell-elements, becomes conspicuous by the appearance of opacity, and the loss of the transparent condition of the intercellular spaces. This opacity is always first noticed in the immediate vicinity of the sinuses or vessels, and is due to deposit in the part of the homogeneous material that is obviously only coagulated lymph. The corpuscles appear embedded in this material, and the anatomical details of the affected district become indistinct. The fibres of the adenoid reticulum increase in density and width, become softened, and of so nearly the same refractive index as the structureless coagulum, that the general ground-substance of the spot assumes a more or less homogeneous appearance. These spots tend to extend by peripheral increase, and always assume, therefore, a rounded outline; for the same reason, a faintly concentric arrangement is often given to such relicts of fibrillation as persist. The lymph-vessels are lost to view. The trabeculae become altered, their whole tissue becomes infiltrated with lymphoid corpuscles, their fibrillation very indistinct, until at last they cannot be distinguished from the adjacent gland-tissue, especially as by this time every trace of the corresponding sinus will have been lost. In this manner, spots of opaque altered tissue appear simultaneously in many parts of the gland; they increase in size, still retaining their rounded outline, often fuse together, and so produce those conspicuous patches that have been so prominently regarded by all who have investigated this subject. The connection of these opaque patches with the lymphatic vessels is often very clearly seen. The cell-elements in these patches soon indicate a condition of decay. The largest cells are first to perish, and are soon lost in the general monotony of fatty degeneration; whereas the endothelial cells are the last to go, and, even when caseous changes are far advanced, will persist, shrivelled and deformed, as the sole survivors of a once vigorous crowd of corpuscles.

Early caseous degeneration, then, is the usual sequel in such glands as present the disease in some degree of intensity, although the process does not necessarily end there. If further change ensue, the little caseous spots appear to act as irritants, an indolent suppuration follows, purulent collections are formed that are at first small and isolated, and that ultimately, if left to themselves, occupy the greater part of the gland tissue. The clinical features of these glands are as follows. They enlarge quickly, and often with distinct inflammatory symptoms; soon become caseous or suppurate; seldom attain great size, but become matted together, if numerous, and contract adhesions to adjacent parts. They present little thickening of their capsules, are fleshy and opaque on section, and show, here and there, a cheesy spot that projects above the cut surface, or a cavity or two filled with thick pus, or larger areas of caseation or suppuration. For convenience of reference, glands with these characters may be distinguished as glands of the first variety.

When the process is more chronic or less intense, the appearances are somewhat different; and this difference depends, I would urge, mainly upon the fact that, the more active or intense the inflammatory process, the greater the tendency for the products of that inflammation to be cellular rather than fibrous.

So far, cell-elements have been most conspicuous in the process, but in the more chronic forms, now to be described, it will be observed that a development of fibrous material becomes always the most marked feature. The process is similar, differing only in degree; the reticulum within the lymph-vessels and sinuses is dense and more extensive, as is also the adenoid tissue of the proper gland-substance. The result is, that the opaque basis or ground-substance of the patches is now less homogeneous, and shows more distinct fibrillation; the change being slower, the cellular elements show more varieties of outline, and, on account of the prominence assumed by the fibrillar structure, appear to be much less numerous. Now it is in the midst of such opaque patches that giant-cells first appear. The aspect of these bodies is well known. It is necessary to insist that they never, as some have stated, commence the process; they indicate the attainment of a certain stage in the process of the inflammation, and never appear, under any circumstances, until that stage has been reached. Still more important it is to observe that with their appearance the process terminates and caseous degeneration follows—a fact first noticed I believe by Virchow in connection with the giant-cells in phthisical processes.

Glands showing these changes may be classed as glands of the second variety; they form by far the commonest form of scrofulous gland-tumour: they enlarge slowly, may attain great dimensions, remain for a long time freely movable, have an uniform fleshy semi-transparent aspect, as if they had been soaked in glycerine, and, if caseous, show that

change but slightly to the naked eye, and only in faint diffused districts rather than in isolated spots.

Before dealing with the subject of giant-cells, I will draw attention to the last and most chronic or least intense process noticed in scrofulous glands. This change occurs in glands that have undergone the most indolent enlargement, as a rule; that attain large size and yet produce few symptoms, that are apt to be numerous, to extend, to form no adhesions, and to shell out with great ease if treated by operation. They may be termed glands of the third variety.

As, in other forms, the scrofulous changes are apt to assume rounded outlines, so in this last variety the most conspicuous feature is a great fibrous development, with a tendency for that material to arrange itself in more or less rounded masses. In some cases, these rounded masses are so dense as to appear quite solid, the contained cell-elements being scanty and withered; they can be isolated by shaking, and, although they present no characters that would now distinguish them as tubercle, yet in less recent descriptions they have received that name. In other districts will be seen a rounded spot, occupied by more or less open but irregular fibrous structure, that often presents a concentric arrangement at its edge. Such an area contains different degenerate cell-elements, the periphery and adjacent tissue being at the same time probably occupied by lymph-corpuscles, but little altered. Throughout all parts of the affected spot, can be seen the homogeneous material that closely resembles coagulated lymph. In other instances, giant-cells are introduced into these spaces, and the appearance denominated tubercle is produced. Into the reputed structure of the true reticular, lymphoid, or sublimary tubercle, I will not enter. It is sufficient to refer to the fibrous material so arranged as to include a more or less circular space, with a giant-cell in or about its centre possessing branched processes that reach the periphery; and casually to mention the larger and smaller cell-masses that occupy the tissue between the giant-cell and the periphery, and that are considered to represent all gradations between that cell and the little lymph-corpuscles that may crowd the outskirts of the tubercle. Lymphatic glands are supposed to show the structure of this tubercle to perfection; but an examination of a large number of such glands leads to the conviction that the appearances described as indicative of tubercle are certainly not common, and that they are rather constructed from many different parts of the affected tissue, than represented in their entirety by one. Many of the affected districts contain no giant-cells; others only show the circular arrangement of the fibres, or show giant-cells with no definite fibrous arrangement; while another part contains few, if any, of the corpuscles that are considered typical of the appearance. Certain it is that, with the appearance of these giant-cells, or of this tubercle, the process ends, and degeneration of a gross character immediately ensues.

It will now be convenient to discuss very briefly the nature and relationship of these giant-cells and tubercles. I would urge that the so-called giant-cells are merely lymph-coagula involving in their coagulation a greater or less number of cellular elements; and it would be simpler to confine the remarks upon this head in the first instance to the giant-cells observed in the glands of the second variety. The reasons for this belief are the following: the material of which the mass of the so-called cell is constructed, is precisely similar to undoubted lymph-coagula. These bodies are found, under favourable circumstances, distinctly to occupy the lymphatic vessels or sinuses of the gland. Their position in these channels is not clearly indicated in the bulk of instances, owing to the rapidity with which the anatomical details of the part are lost. They precisely resemble in every respect the giant-cells sometimes found in chronically inflamed connective tissue, and that are located without doubt in the lumen of lymphatic vessels. Their appearance is associated with the appearance, throughout the greater part of the gland, of a material precisely similar to coagulated lymph, and that could hardly from its extent and distribution be regarded as protoplasm.

In opposition to the theory that they are protoplasmic masses, I would remark that the number of contained nuclei bears no relation whatsoever to the size of the cells. The arrangement of the nuclei in some of these bodies is so casual and incoherent, as to suggest no other explanation than that of a plug of cells in a coagulum. Then again, if the cell-elements in the neighbouring tissue are few, the nuclei of the giant-cell are few and *vice versa*. Giant cells are found in a tissue on the point of death and decay, and in parts that are absolutely, if not quite, non-vascular; and I cannot conceive that, surrounded by these conditions, it is possible for such active and vigorous changes to ensue, as must of necessity exist, if the protoplasmic theory be correct. It is urged by some, that they are developed in blood-vessels, but; as just stated, they do not appear until the tissue has become practically non-vascular. The orderly arrangement sometimes noticed in the nuclei clustered at the margin of a giant-cell is considered conclusive as to the origin from

the endothelium of a blood-vessel; but a similar orderly arrangement can be seen in giant-cells occupying lymphatic vessels, whose endothelium is not disturbed.

I would urge that these masses are formed in the meshes of the reticulum that occupies the lymphatics and sinuses, and that they indicate the absolute cessation of all lymphatic current, for, up to the time of their appearance, the possibility of a circulation of lymph still exists. It will be remembered that the first changes appear in the medulla; its sinuses are blocked, the afferent vessels appear quite empty, and yet the cortical sinuses are distinct, often dilated. This appears to support the belief that lymph is still entering the gland by the afferent tracks, and may be actually distending the organ, owing to the greatly obstructed outflow. I believe that their processes are merely portions of the reticulum in which they are deposited; and it is a most significant fact that the distinctness and density of the processes vary precisely with the state of the surrounding tissues. These processes are acknowledged to be continuous with the adjacent network; and so similar are the refractive indices of the reticulum and the cell-mass, that that part of the reticulum embedded in the mass is not obvious. The shape, moreover, sometimes assumed by these bodies is eminently suggestive of a formation within a vessel.

A similar explanation I would urge for the giant-cells found in the so-called tubercle. The circular outline often noted in these tubercles appears to be merely a circumstance in the inflammatory process, by no means peculiar or specific. The anatomical details of the sinuses and lymphatics are no longer obvious in gland-tissue presenting tubercle; but I would still urge that these giant-cells are lymph-coagula formed in the irregular meshes of the now quite disordered structure. Some districts show no giant-cells, but in their place the material that is in no way different from a coagulum. The masses, moreover, are as often seen at the periphery as in the centre of the supposed tubercles, and the smaller giant-cells would represent smaller coagula. The connection of the processes of one giant-cell with those of another, and the still further connection of those processes with the surrounding reticulum, is fully explained on the supposition that these giant-cells are coagula deposited haphazard in the meshes of the fibrous tissue of the gland, and that they conceal the reticulum to an extent equivalent to the size of the coagulum or so-called cell.

In proof of this, I would draw attention to the giant-cell figured here, which has been taken from the edge of a caseous patch. The giant-cell and surrounding tissues are degenerating; and when such degeneration takes place, the cellular elements and the lymph-coagulum are always the first to perish, the fibrous elements resisting for a longer period the caseous action, and acquiring thereby a temporary distinctness. Therefore, if the giant-cell is deposited in a reticulum and blots out by its very substance the details of that reticulum, it is obvious that, as the mass degenerates, the fibres of that mesh-work should again become apparent. Now, in this decaying giant-cell, a fibrous mesh-work can be seen stretching across the mass, exactly similar to that observed in the vicinity; and especially it is to be noticed that this reticulum is continuous with the so-called processes of the giant-mass, and, through them, with the adenoid tissue in the neighbourhood. The appearance of fibrous matter in moribund giant-cells has been observed. Klein, in speaking of the giant-cells in tubercle of the lung, states that, before undergoing final decay they are often converted into a fibrillar substance; on this point, however, I would urge that the development of fibrous material in a tissue partly decayed and quite destitute of blood-supply would seem scarcely probable. The changes in the blood-vessels, it may be briefly said, are very similar to those observed by Dr. Wilson Fox, in connection with the caseous processes attending artificial tuberculosis.

Such, in outline, are the changes that occur in scrofulous glands; and from the data furnished, in addition to extensive observations that have been made in other scrofulous affections and with the same general results, some conclusions may be attempted as to the nature of the process.

Scrofula indicates a tendency on the part of the individual to inflammations of a peculiar character. The peculiarities are numerous, and, taken *en masse*, distinctive. The inflammatory process always tends to be chronic and ill-conditioned, to be excited by slight, and, as I shall show, often peculiar irritation: the products are remarkably cellular in character, and present especially certain large cell-bodies of almost distinctive appearance. These products show a great disposition to resist absorption, and to linger in the tissues. The affected districts soon present signs of diminished vascularity; the inflammatory action tends to increase within certain limits, but to be restricted by no barrier of healthier action. The great feature, however, in these inflammations, is the early, marked, and constant implication of lymphatic vessels and tissue.

Caseous degeneration is a common mode of termination, and depends upon three main factors—upon the cellular character of the exudation, the deficient blood-supply, and, above all, the lymphatic implication—factors that all point to difficulties in any effort at absorption. In the course of this process, giant-cells may appear, and the condition known as miliary tubercle be observed: but, as I have previously shown, the scrofulous process may run its complete course before any giant-cells are met with; or, again, giant-cells have appeared, before any so-called tubercle has been found. These so-called giant-masses and tubercles merely indicate stages or degrees of the process; they mark grades of intenseness, and are more incidental than necessary.

Tubercle appears in the most chronic or least intense form of the process; and with regard to its relation to scrofula, I would urge that it is a product simply of a peculiar inflammation; that it indicates simply a stage or particular degree of that inflammation; and, above all, that it, like the giant-cell, requires for its development the anatomical element of lymphatic tissue.

Time will only permit me to deal with a few of the features of the scrofulous inflammation; and I will, therefore, draw attention to that most important and essential factor of the process—the implication of lymphatic tissue. In the first place, some well known clinical facts may be alluded to in support of this point. One of the commonest, perhaps the commonest, symptom of a strumous disposition, is an enlargement of those lymphoid bodies, the tonsils, or, if not actually of the tonsils, at least of the adenoid tissue at the back of the pharynx. Then, again, the scrofulous ulcer of the intestine commences in the lymphatic tissue of the part; the same tissue in the bronchi would appear to be most conspicuously involved in scrofulous bronchitis; the disease known as pharyngitis scrofulosa is merely a caseous inflammation of the lymphoid tissue of the pharynx; and other affections of the mucous membranes, such as scrofulous oozena or coryza, and the vaginitis of strumous children, probably commences in, or largely involves the same structure.

The best evidence under this head, however, is of course afforded by the glandular enlargements in the scrofulous. In answer to the question, what glands are the more usually involved in scrofula? we should be told the glands of the neck, the bronchial glands, and the mesenteric glands.

Now comes a point of the utmost interest in the present matter. Why should these particular sets of glands be so commonly affected? Speaking only of the surface of the body, it may well be asked why the cervical glands should be so constantly involved? There are large numbers of glands in the axillæ and the groins, the limbs are exposed to injuries that may well prove sources of peripheral irritation, the parts themselves are subjected to constant and often violent movement, and, as a matter of fact, the glands in the axillæ and groin are actually more often affected in the non-strumous than are those about the neck. The explanation that I would venture to urge of this remarkable fact is the following. The glands that are most usually affected in scrofula, are those whose radicles are connected at the periphery with adenoid tissue. The most extensive collections of such adenoid tissue are found about the mouth and pharynx, in the bronchial mucous membranes, and in the mucous lining of the intestines. The glands that receive the lymph from these areas are the cervical, the bronchial, and the mesenteric.

The irritation that may produce enlargement of glands in scrofula may be slight, but, to operate effectually, it should be located in the lymphoid tissue of a mucous membrane. Sores about the limbs, or on the face or neck, even when of long duration, very commonly induce no more gland-trouble in the scrofulous than they do in healthy individuals.

With regard to the enlarged cervical glands, it is well known that the main sources of peripheral irritation are to be sought for in the mouth and throat, and the particular vigour of irritations in this situation is well shown in a case of this kind, one of many that I have collected to illustrate this point. A little girl had a strumous ulcer on the cheek that had existed for nearly a month, and yet the submaxillary glands were not affected. She became, however, the subject of scrofulous pharyngitis, *i.e.*, the adenoid tissue became involved, and in a few days the glands on both sides of the neck were enlarged, and subsequently attained a great size.

To view the question under another aspect, caeous inflammation is an usual ending of scrofulous processes, and the connection between the extent of this change and the extent of the lymphatic implication is most marked. Certain animals, as the rabbit and guinea-pig, are extremely liable, under the most trifling irritation, to caseous inflammations; and the one great fact in the pathology of such inflammations is the prominent part taken by the lymphatic structures in the morbid change. Indeed, it would appear that the extent of the caseous change in such animals is to be measured by the extent of the lymphatic implication. Lastly, proof can be afforded of the fact that lymphatic vessels, as dis-

tinguished from lymphoid tissue, are of themselves capable of showing all the changes incident to scrofula. The capsular plexus in glands is well isolated between the two layers of the capsule; it represents a tissue composed solely of lymph-vessels well marked off from surrounding parts, yet this tissue can show all the changes incident to struma, the large cell-elements, the giant-cells, the tubercle so-called, and the caseous termination.

In conclusion, I will draw attention to certain practical points, illustrated by the pathology of these affections. It has been stated that, in the earlier stages of the process, the gland is crowded with lymphoid corpuscles; often many glands are affected in this manner, and under such circumstances one would expect that some, at least, of these cell elements would enter the general circulation by the efferent vessels, and produce a state of leucocythæmia. But opposed to such a supposition is the fact, that an anæmic appearance is not commonly observed in these affections, not even in the earlier stages, and a reference to the glands themselves explains the reason of this. The medulla is the part first affected: and the medullary sinuses, whence the efferent vessels are derived, are therefore soon blocked and rendered practically impervious. At the same time, sections made through the hilus show that the efferent vessels, instead of being crowded with lymph-corpuscles on their way to the general circulation, are absolutely deficient in those elements. They contain merely a little coagulum, a small cluster of corpuscles here and there, and nothing more. One must assume, therefore, that the early compression of the sinuses is instrumental in preventing an increase in the white elements of the blood. This condition is in strong contrast to that observed in the glands in lymphadenoma. In such organs, no attempt appears to be made to prevent the escape of the rapidly proliferating elements, and the vessels at the hilus are seen to be actually crowded with leucocytes on their way to enter the circulation of the blood.

The question as to the mode of extension of this disease of glands in scrofula touches very pointedly upon the value of operative interference in certain cases, and receives excellent answer in the pathology of the process.

There is no doubt that, from some one peripheral irritation in a mucous membrane, many glands may be simultaneously affected, or at least involved in rapid succession; but in addition to this mode of increase, I would draw attention to the fact, that glands already attacked have the power of conveying the disease to others in the vicinity, by a process of local infection. One constantly meets with cases where glands are involved, one after the other, in a very regular succession, and in a direction often actually the reverse to that of the lymph-current. From some definite peripheral irritation a gland may enlarge just above the clavicle, and be followed, in the absence of any fresh irritation, by a series of glands that will appear in order one after the other, and mount up the neck, the last gland affected being that nearest the jaw. In such a case, it may be urged that the circulation of lymph is so interfered with by the implication of the original gland, that a species of backward stasis is produced and the diseased lymph thrown thereby into collateral channels. In the same way, it is very common to see gland-mischief extend from the neck into the axilla, in a most precise order, and by direct continuity of parts.

The microscope, however, reveals another explanation; the diseased process may actually be followed from the gland-tissue back into the capsular plexus, and thence into the afferent vessels: these latter become blocked up by the corpuscular elements, develop within their lumen a reticulum, just as observed by Klein in inflamed lymphatics elsewhere, undergo all the scrofulous changes, and become in time caseous. I imagine that, by means of these vessels, connected glands may be affected, especially as one finds connecting lines of diseased tissue running from one gland to another. Moreover, this morbid change can extend along the vessels, independently of valves and in the reverse direction to the lymph current.

Then, again, it is well known that the larger glandular masses may present more separate gland-bodies than can be accounted for by the anatomists. Many of these are no doubt due to the enlargement of glands so small in health as to escape the eye of the dissector. And again, I have repeatedly found little glands wholly caseous, which are yet no larger than hemp-seeds. Now, I believe that many of these apparently supernumerary bodies are produced from the afferent lymphatics of the adjacent diseased glands by the following process. Klein has shown that irritated lymphatic vessels very readily develop into masses of adenoid tissue surrounded by a perfect sinus, which sinus is nothing indeed but the altered vessel itself. These little masses may assume the features of a gland, although they retain a much more rudimentary structure, are quite capable of increasing indefinitely, of showing the whole of the changes incident to scrofula; and I have no doubt that they form, in time, many of the bodies that are not to be distinguished

from the ordinary lymph-glands. These points would strongly support the early removal of glands in certain situations and in certain subjects, especially the more chronic forms which are the most inclined to extend on the one hand, and the most easy to remove on the other; but in any case the mischief should be recent, the nature of the affection undoubted, and the glands involved few and well isolated.

There is another mode of treatment—namely, that of scooping out the interior of the gland through a small incision—that is even more restricted in its application; and I think that the needful restrictions are clearly indicated by the pathology of the disease. Such a proceeding could only be applied to glands that are advanced in disease, and that are either very caseous or have partly suppurated. It is most applicable to those glands referred to as of the second variety; for in their latter stages these glands become very adherent to the adjacent parts, their contents become soft on the one hand, and their capsule very dense and thick on the other. These three conditions being present, a good prospect is afforded for the success of this method. But in some of the less intense forms, and again some of the most chronic forms, before suppuration has been induced, such a plan would be attended by much risk, for these glands are often very movable, have formed few adhesions and possess moreover a very thin capsule.

In conclusion, I should imagine that much can be done by operative measures to lessen the duration and to modify the subsequent ill effects of these gland-diseases; but there can scarcely be a disorder where such procedures require more care in their application, and more restrictions in the selecting of proper cases, than does the affection to which I have now had the honour of drawing your attention.

ON THE USE OF STEAM IN THE SICK-ROOM FOR INCREASING THE ATMOSPHERIC HUMIDITY.

By WILLIAM MARCET, M.D., F.R.S.,

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It is now fully admitted that the atmospheric conditions most beneficial in pulmonary congestion, bronchial irritation, and many other affections, are warmth and humidity. Unfortunately, the temperature required indoors cannot be attained without a considerable accession of atmospheric dryness; and this we endeavour to counteract by steaming the air.

On January 20th of the present year, with a temperature of 32° out of doors on my dining-room window-sill in Grosvenor Street, the wet bulb reading gave 65 per cent. of moisture, while in that room, with a temperature of 53°, the atmospheric humidity registered only 55 per cent. On the 22nd, the temperature out of doors was 27.5°, and relative humidity 90 per cent.; indoors temperature 49°, relative humidity only 57 per cent. On the 23rd, humidity out of doors 76 per cent.; indoors 60 per cent. It is, therefore, very obvious that, on cold days, the relative humidity in warm rooms falls to a very low figure; and, in cold and wet weather, the humidity indoors will be much below what it registers in the open air.

The usual way of imparting dampness to the air in a room is to keep water boiling with a spirit-lamp, or generate steam from the common bronchitis-kettle placed on the fire. Thus volumes of vapour are emitted, often giving an erroneous impression that the air is becoming dampened to a considerable extent. In a small room, holding only 1,454 cubic feet of air, with double doors shut, and no other ventilation than that going on through the chinks of an indifferently fitting window, I have obtained with the usual bronchitis-kettle an increase of relative humidity amounting in one case to from 57 to 67 per cent., or by 10 per cent. with an open-air temperature of 40° and 96 per cent. of humidity, which were favourable conditions towards the artificial addition of moisture. On another occasion, the increase was from 61 to 71 per cent.—again 10 per cent.—with 41° out of doors and 88 per cent. of relative humidity: again a favourable condition towards the dampening influence of steam. In a third instance, the increase was from 59 to 64.4 per cent., or by 5.4 per cent.; open-air temperature 43°, and 85 per cent. of relative humidity; the circumstances being in this case rather less favourable towards the influence of steam as increasing the atmospheric humidity.

In the first of these experiments, the steam was emitted for one hour, during which time two pints and eight ounces of water were evaporated out of three pints from a common bronchitis-kettle placed on the fire. In the second, two pints of water poured into the kettle were converted into steam in thirty-five minutes, or at the rate of a little over three pints and eight ounces per hour. In a drawing-room holding 4,184 cubic feet of