CROONIAN LECTURES ON DISEASE AND ITS MEDICAL TREATMENT.

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LECTURE I.—*Concluded.*

No one who has not tried his hand at it can appreciate the difficulty of making a consistent classification of diseases. All who had anything to do with the preparation of the celebrated *Nomenclature* will especially have a wholesome dread of attempting it; and I shall not attempt it. At the same time, I propose to enumerate certain families or groups of diseases (into one or other of which most of the diseases with which we are acquainted seem to fall more or less naturally) with the object of basing upon them, and thus bringing into some kind of order, the remarks (with which I shall end this lecture) upon the processes by which disease affects the body, as well as those upon the remedial treatment of disease, which will occupy my subsequent lectures.

1. *Functional Diseases.*—I suppose there is no doubt that all so-called "functional" diseases are the results of intimate structural or chemical changes: but, as we do not the least know in what these changes consist, and recognise the diseases only by certain perversions of function, the term "functional" may still be fairly retained for them. The diseases to which the name is most applicable are for the most part connected with the nervous or muscular systems; and amongst them may be especially enumerated mania, epilepsy, chorea, asthma, palpitation, angina pectoris, and neuralgia. It must be added, however, that no diseases occur in which functional disturbance in some form or other is not present, and does not form a more or less important item.

2. *Diseases originating in Excess, Deficiency, or Improper Quality of Nourishment.*—These would comprise not only cases of general plethora due to over-eating, and of anæmia or emaciation due to insufficiency of food, and scurvy, and some other affections traceable to improper quality of food; but cases also in which, owing (say) to obstruction of lymphatics, the bones and other tissues of a limb become hypertrophied, and those in which (in consequence of excessive lactation or hæmorrhage or discharge of pus) the blood becomes poor generally, or in certain elements.

3. *Diseases arising from Retained Excretions* are such, therefore, as depend on the retention in the blood of carbonic acid, urea, or bile.

4. *Diseases due to the Action of Poisons.*—Under this head might be included morbid conditions owing to the reception into the system of various vegetable poisons, such as strychnia, opium, chloroform, and ergot; of various animal poisons, such as those of venomous animals, and those occasionally yielded by mussels, sausages, and the like; and of various chemical poisons—lead, mercury, and arsenic, to wit. And we might, perhaps, also add to the list of poisons chemical substances acting locally as irritants or caustics.

5. *Diseases originating in Mechanical Causes.*—These would comprise all those cases in which tubes are narrowed or closed by compression, stricture, or concretions—hernia, intussusception, gall-stones, stricture of the urinary passages, thrombosis, embolism, affections of the cardiac valves, dilatations and perforations of tubes and cavities, and mechanical impediments to the transmission of nervous influence along the nerves or cord.

6. *Parasitical Diseases.*—These are due solely and entirely to the fact that certain lowly but perfectly definite species of animals or vegetables have made the body their *habitat*. They include scabies, phtheiriæ, trichiniasis, and those diseases dependent on the presence of cysticerci and intestinal worms, ringworm, favus, and pityriasis.

7. *Inflammatory Affections, Tubercle, and other Proliferating Growths or Neoplasms,* are all very intimately correlated. In all, there is proliferation of the cell-elements of the tissues in which the morbid condition is in progress; in all, there is a tendency, under certain circumstances, for the primary disease to spread or multiply locally, or to become disseminated by the lymphatics or by the blood-vessels; and in most, if not in all, the disease is autopathic—in other words, its cause (whether it be chemical or vital) originates within the body.

8. *Diseases generated by Contagium.*—These, which include all the

exanthemata and most of the other diseases which the Registrar-General terms zymotic, form a large class. They are communicable by contagion, directly or indirectly. In all of them, the contagium is probably to use Dr. Sanderson's word) particulate and organised, and multiplies within the body; and in most of them the disease has a certain limited duration, and presents a characteristic sequence of stages. As types of subgroups of diseases belonging to this category, may be enumerated small-pox, whooping-cough, cholera, enteric fever, hydrophobia, and syphilis.

Now I repeat that my list is not intended to be a complete or thoroughly thought-out list of diseases. I know that it would be easy to name some which do not fall very obviously under any of the above classes; and I know also (as, indeed, I have explained) that many diseases are complex, and are made up of phenomena which would severally come under classes in the above list different from that to which the primary disease belongs. Nevertheless, the scheme is not altogether indefensible; and it will, at all events, answer the purpose which I had in view in framing it.

I shall not now stop to discuss my first two classes of diseases—namely, functional diseases and those which are connected with nutrition. But I shall proceed to the consideration of the diseases which I have termed mechanical, with especial reference to their immediate effects, and the methods by which these effects are counteracted by nature; for they are amongst the simplest forms of diseases, and those the phenomena of which are most easy to be analysed. I will take a few examples.

A patient has constriction of his aortic orifice, and serious impediment to the passage of blood through it. In order to exert an equal influence over the systemic circulation to that exerted previously in the healthy condition of the organ, the left ventricle acts more powerfully, and, as the physiological result of this over-exertion, becomes soon hypertrophied. But we know that invariably, along with hypertrophy of the walls, dilatation of the cavity takes place; the dilatation being evidently due to the fact that the ventricle, though acting powerfully, fails to empty itself at each contraction, and becomes consequently, during the contraction of the auricle, distended beyond its wont. Now the dilatation of the cavity is at least as great a source of weakness, as the hypertrophy of the walls is a source of strength. If hypertrophy alone occurred, it is conceivable that that might compensate accurately for the obstruction taking place at the aortic orifice; but the superintention of dilatation neutralises gradually the beneficial effects of hypertrophy; and, though the patient's life may no doubt have been prolonged by these conditions, there is equally no doubt that a time finally comes at which his mechanical arrangements are less efficient than they would have been, had the wall and cavity of the ventricle remained each in its primitive condition. The same thing precisely occurs in cases of stricture of the bowels. The tube above becomes dilated and hypertrophied—dilated, because of the accumulation of fecal matters in it; hypertrophied, in consequence of its powerful efforts to transmit these matters onwards. But here again, though these changes are easy of explanation, and natural, their effect is abortive, and ultimately simply injurious. No cases more clearly demonstrate the truth of these statements, than those in which such dilatation and hypertrophy occur in the rectum and colon secondarily to prolonged constipation. The hypertrophied and powerfully acting walls are incompetent to expel the fecal accumulation; and, even when the constipation is relieved by artificial means, the bowel remains as a flaccid, almost inert bag, notwithstanding the excessive thickening which its muscular walls present. Now, in the above, and in all similar cases, the muscular walls of the cavities become hypertrophied, not in consequence of any conservative instinct which belongs to them, but in obedience to the ordinary physiological law that all muscular tissue tends to become more powerful according (within certain limits) to the efforts which are required of it. No one regards the enlargement of the athlete's limbs as a conservative effort of nature; nor, I submit, can we regard the enlargement of the muscles of the heart or intestine as such an effort. It is to some extent conservative, no doubt, but conservative by accident only, and it is neutralised almost from the beginning by the weakness of dilatation which accompanies it.

Again, in obstruction of the ureter, or of the common bile-duct, by a calculus, what occurs? The cavities behind become dilated, and their walls hypertrophied; but neither the dilatation nor the hypertrophy has any direct reference to the calculus. The dilatation is due to the accumulating fluids behind the seat of obstruction; the hypertrophy, to the persistent efforts of the muscular tissue to contract in obedience to the stimulus which the increasing dilatation supplies. It is questionable, however, whether this dilatation and hypertrophy have any beneficial effect in promoting the onward transmission of the stone; for, whilst these processes are going on above, the immediate effect of

the presence of the stone is to irritate the muscular tissue around it into spasmodic action, and thus to cause itself to be retained. Here again, but even more markedly than in the former cases, the so-called efforts of nature are abortive; they become, indeed, less operative in proportion as they become more frantic; and the most successful remedial measures, so far as I know, are such as act in restraint.

I take one more example. We have an aneurism of the aorta, communicating by a comparatively small orifice with that vessel; and we find its cavity in great measure obliterated by an accumulation of layers of coagulated fibrine. We regard the presence of that fibrine as conservative, and so no doubt it is; and perhaps as an effort of nature to counteract an evil which she has already permitted, but that no doubt it is not. The explanation of the phenomenon is, partly, that the inner surface of the aneurism was rough, so that there was a tendency for fibrine to become adherent to it; partly, that the cavity had such relations to the artery that the blood in it was nearly stagnant, and hence in a condition peculiarly apt for the deposition of fibrine. Fusiform and sacculated aneurisms, which are quite as dangerous as the above, are rarely lined with fibrine. Why has nature neglected them? But, again, we frequently meet with fibrinous deposits in the cavities of the hearts of persons who have been dying slowly of chronic Bright's disease, and similar deposits obstructing the iliac veins of patients who are in the last stages of phthisis. The cause of the deposition here is doubtless, in the main, identical with that which operates in the case of aneurisms; but the deposition, if it be an effort of nature, is an effort to kill.

Now, in these and numberless other instances which might be adduced, it is obvious that there are, so to speak, no "intelligent" efforts of nature to counteract the ill effects of mechanical diseases, or to cure them; but that, under certain conditions, certain results follow; and that these are curative, or not curative, or even detrimental, almost by accident. Hypertrophy and dilatation of a bowel equally take place above an impediment, whether that impediment be a concretion that can be driven onwards, a stricture which cannot yield, or a length of paralysed and congested bowel ready to rupture into the peritoneal cavity. Deposition of fibrine occurs not only in aneurisms, where it is remedial, but in the cavities of the heart, and in the trunks of veins and arteries, where its occurrence is a source of extreme danger.

What are the consequences and results of parasitic diseases? Such of them as are due to vegetable parasites, for the most part attack the superficial portions of the trunk. The parasites imbed themselves in the substance of the epidermis and its appendages, grow there, and irritate the tissues into inflammation. The diseases, if left to themselves, gradually spread, and never, so far as I know, tend to disappear. We know, at all events, that favus remains for many years, and that pityriasis versicolor is equally perennial. The same thing holds good in respect of animal parasitic diseases affecting the skin and bowels. Neither itch nor lousiness has any tendency to subside; nor do intestinal worms tend, as a rule, to become eliminated. But those parasitic animals, such as trichinae and the different varieties of hydatids, which gain an entrance into the solid tissues of the body, remain quite permanently in the organs in which they have squatted; they undergo development there, perhaps even proliferate, and produce injurious results of more or less gravity.

Now, in all parasitic diseases, the parasites grow and multiply in the tissues of the body according to their nature, and maintain their health and vigour amongst all the morbid processes which are taking place around them, and which they have evoked. Nature seems to have made no provision for their destruction or discharge from the body in the interest of their host, but seems, on the other hand, to have taken as much care for the preservation of their lives and of their species as she has for the preservation of the lives and species of numberless other living things which, in our prejudiced view, pass a more innocent and beneficial existence. They are no doubt liable to accidents, as all other living things are; and thus they may die prematurely, or be discharged from the body, very much to the advantage of the individual on whom they have been subsisting. But in most cases they remain in the body until they have fulfilled the purposes of their existence in it, or until natural death overtakes them, damaging their host, plotting only too successfully for the damage of others, and finally perhaps making him their living cemetery.

However different the diseases may be in other respects, there is a resemblance between those due to retention of poisonous excreta, those due to poisonous matters received into the system from without, inflammations, tumours, and infectious or zymotic diseases: in this respect, namely, that in all of them the poisonous material circulates with the blood, and tends to be deposited from the blood. Urea comes from the effete albuminous materials of the food and of the tissues, and is either manufactured within the vessels or in the tissues

occupying the intervascular spaces. The manufacture of the essential elements of bile is believed to take place within the liver, and through the agency of the glandular tissue of that organ, whence, in cases of obstruction of the ducts, it becomes absorbed into the circulation; but whencesoever derived, and by whatever process these and other excretory matters are formed within the body, any impediment to their escape from the body by the emunctories, designed for their removal, leads to their accumulation within the blood. Poisons (using the word in its usual restricted sense) which come from without are all inorganic, or, at all events, unorganised, and for the most part easily diffusible; and they enter either by the mucous surface of the alimentary canal, or by the lungs, or by inoculation; and for the most part they probably enter at once into the veins, and so become rapidly diffused throughout the system. Some portions, however, in most cases doubtless enter the circulation indirectly by means of the lymphatic system; and, indeed, there is good reason to believe that all those which occur in solid and not readily soluble particles enter solely by the lymphatics, and therefore reach the veins only after a comparatively long period. Inflammation, tubercle, and proliferating growths, have especially much in common. They all of them originate in some obscure cause, generally at some particular spot, where nutritive changes take place attended with proliferation of the protoplasmic masses there, and where, in consequence, swelling or tumour occurs. In most cases, there is a proneness for these affections to spread locally, and to involve more and more of the surrounding tissues. And in many cases there is a tendency for what is now called generalisation to ensue; that is, either particles of the morbid protoplasm or poisonous fluids (more likely the first than the second), detached from the diseased mass, are carried along the lymphatic vessels to the nearest lymphatic glands, where they excite morbid changes identical with those which gave them origin, and whence again, after a while, similar particles or similar fluids are conveyed by the efferent lymphatics to the thoracic duct, thence into the veins, and thence to the lungs and other organs, there to evoke a tertiary series of identical morbid processes. It is thus, perhaps, that local inflammation becomes pyæmia: it is thus, certainly, that tubercle and carcinoma become diffused throughout the system. No disease probably illustrates this mode of spread better than syphilis. A patient has a chancre. In the course of a week or two, the inguinal glands become large and hard; and, as we know, the infectious material of syphilis has been carried from the chancre to the glands, and produces morbid changes in them identical with those formerly occurring in the chancre. As yet, the patient's general health is unimpaired; but, in about seven weeks from the first appearance of the primary sore, the symptoms of secondary syphilis manifest themselves; a roseolous rash appears upon the skin; the throat becomes affected in a similar manner; and the hair falls off. Subsequently, the so-called "tertiary" symptoms show themselves, breaking out from time to time in successive crops. Here we have obviously, 1, the primary disease; 2, involvement of the lymphatics; 3, the generalisation of the disease by means of the general circulation. From syphilis to the infectious fevers is a short step. In some of these, as the exanthemata, the contagium is inhaled with the breath; in some, as in enteric fever and cholera, it is generally, if not always, ingested with the food; in most, if not in all, it may be implanted by inoculation. In the first case, it seems probable, judging partly from Mr. Lister's observations (that the lung, even when its tubes communicate with the pleura, prevents all living particles from without from entering the pleura), partly from the fact that particles of soot and of earthy matter drawn into the lungs find their way, not into the air-cells or into the blood-vessels, but into the lymphatic glands, that the contagious particles which enter the lungs fail to reach the air-cells, and hence the pulmonary capillaries; but that they become attached to the mucous surface of the air-passages, penetrate this, and thence find their way into the bronchial lymphatic glands, whence their general diffusion takes place. In the case of cholera and enteric fever, the contagia received into the stomach pass into the bowels, and are doubtless there absorbed (as all particulate substances are) by the columnar epithelium, whence they pass (as also all particulate substances pass) not into the vessels, but into the lymphatics, through the agency of which their general diffusion takes place. If these views be sound, it would appear that (as regards inflammation, tubercle, tumours of a so-called "malignant" nature, and infectious diseases) the infecting elements are carried, from their point of primary development or of entrance, by means of the lymphatic vessels, to the nearest glands; that they are here delayed, and here multiply, and hence, after a time, are poured into the circulation. It is not pretended that there are no exceptions to this rule. We know as a fact that, in many cases, diseases given by inoculation become more rapidly generalised than the same diseases received with the breath or food. It is certainly so with small-pox and cattle-plague; and there are very powerful reasons for

suspecting that puerperal women, and patients who have undergone large operations, exposed to the contagium of scarlet fever, catch the disease, and, after a few hours only of incubation, come out in a rash, and present all its other characteristic symptoms. Now in all these cases it seems not improbable, and in the latter of them it seems certain, that the contagium at once enters the blood-vessels, and at once becomes generalised.

But, whatever the manner, whatever the route, by which the poisonous matters (in the classes of disease under consideration) gain access to the blood, there is no doubt of the fact that they do enter the blood; and that it is by circulating with it, and by being thus carried to different parts of the system, that the diseases which they cause become general diseases. A chancre is a local disease; a variolous pustule, the result of inoculation, is a local disease; and in both cases the local disease remains local, and takes its own course, altogether independently of any special constitutional changes. But the inoculation which excites local mischief at the same time supplies poison which at once becomes absorbed; and, whilst that remaining at the point of inoculation is producing immediate specific results, that generalised by the circulation gives generalised results of the same kind, which manifest themselves at a later period—at a period when the primary affection is subsiding or has disappeared. Yet, although the poisonous matters evidently enter the blood and circulate with it, it is only exceptionally that they can be detected in it. It is true that urea, the elements of bile, and carbonic acid (when the respective organs by which they should be discharged act inefficiently), are found there in excess. It is true, too, that in inflammation the blood is generally found to be overloaded with fibrinogen; but this is only the result of inflammation, and not its cause. And it is also true that, in many of the diseases which we are considering, the blood becomes deteriorated in quality in various ways. But poisonous matters introduced from without rarely remain sufficiently long in the blood, and in sufficient quantities, to be easily recognised in it; and the specific elements of specific diseases especially seem to defy detection. Undoubtedly the corpuscles which characterise inflammation, the specific germs of tubercle and carcinoma and syphilis, and the contagia or microzymes of infectious fevers, have never been seen in the circulating blood; and we know that the blood in these diseases is rarely, if ever, capable of successful inoculation.

The fact is, that the blood is an ever-changing fluid. It is constantly receiving into its bulk nutritious matters and leucocytes from the lymphatics, oxygen through the pulmonary vessels, and waste-elements of the body mainly, perhaps, through the systemic capillaries and veins; and it is constantly discharging from its bulk, on the one hand, nutritious matters which are needed for the growth and maintenance of the various tissues and for the secretions of glands, and, on the other hand, carbonic acid by the lungs, and various effete matters by the several other excretory organs. It of necessity equally tends to get rid of unusual and deleterious matters which have entered it, and must thus in all cases speedily purify itself of them, unless they should chance to multiply rapidly and persistently within it, or unless there should be some source of infection constantly in operation to renew those which have been removed. We could scarcely, however, expect to find that equally efficient means should exist for the separation from the blood of matters which are only accidentally introduced into it, as are provided for the separation from it of those effete matters which it is natural for the body to yield, and which it is essential for its health should be removed; and, in fact, we might expect them to be very much in the position in which urea and bile-pigment are when their appropriate emunctories fail to act. The circumstances which immediately determine their removal are, of course, of the same kind as those which determine the removal of normal matters from the blood, such as either great solubility and diffusibility, or the existence of special elective affinities between the poisonous matters and certain elements, tissues, or organs of the body. Thus we know that some gaseous substances and fluids which readily evaporate (chloroform, ether, and hydrocyanic acid), pass off readily by the lungs; that iodide of potassium and many salts speedily escape from the body with the urine and even with the milk; that madder becomes fixed in the bones, lead in the muscles of the arm and those of the intestine, mercury in the salivary glands and elsewhere, and silver in the walls of the blood-vessels and other parts throughout the greater part of the body. Bile-pigment, as we know, in cases of obstructed bile-ducts, is partly deposited generally throughout the body, and partly escapes with the urine; and urea in Bright's disease accumulates with dropsical effusion in the connective tissue, and to some extent escapes in the perspiration. And the same kind of thing takes place in autopathic diseases. When the germs of inflammatory mischief, or those of tubercle or of carcinoma, are carried by the circulation, they manifest, undoubtedly, an elective affinity for certain organs. In rheumatism, for example, the fibrous

tissues especially suffer; in tuberculous and carcinoma, most visceral organs—the muscular tissue, pancreas, and salivary glands, however, enjoying a special exemption. Precisely the same thing holds good in the various forms of infectious diseases. The contagium of small-pox affects the skin and mucous membranes; that of scarlet fever, the skin, tonsils, and kidneys; that of cattle-plague, the majority of the mucous surfaces; that of mumps, the salivary glands; those of cholera and enteric fever, the intestinal mucous membrane; those of whooping-cough, hydrophobia, and cerebro-spinal meningitis, probably some part of the nervous system.

But it is important to note that, although this escape of poisons from the blood is probably in all cases essential to recovery, it is equally an essential step in the progress towards death; and that the graver symptoms, which indicate their presence in the system, occur for the most part after, and in consequence of, that escape; and that, whether recovery or death is to be the final issue. Thus it is pretty certain that neither opium, nor strychnia, nor lead, nor arsenic, nor any such poisonous substance, works its special effects until it actually mingles with the tissues which it has the power of influencing. The elements of carcinoma and of tubercle only then lead to the development of secondary growths when they have escaped from the circulating fluid. The contagia of the exanthemata and allied diseases produce their most characteristic effects, the most dangerous symptoms, and proliferate most abundantly, when they are leaving or have left the vessels, and have taken root, as it were, in the tissues or organs between which and themselves a special attraction exists.

Now surely in none of these cases can it be fairly contended that there is any special eliminative effort of nature to get rid of the matters which are acting injuriously on the system. If it be argued, on the one hand, that iodine is cast off by the kidneys, and madder thrown into the bones, where no ill effects can be produced by them, it may reasonably be objected, on the other, that lead and other metallic substances are deposited in the muscles, in the nerves, and in other parts in which their presence is inimical to health and life. If it be contended, on the one hand, that scarlet fever, small-pox, measles, cholera, and the like, have a limited duration, and that, in their progress towards recovery, their contagia escape from the blood into the connective tissue, and thence from the body by the cutaneous and mucous surfaces, it may clearly be objected, on the other hand, that Nature is, at all events, in these cases, clumsy for good and prescient for evil; for, instead of eliminating or neutralising or destroying the poison on the threshold, she allows it to run riot in the system, and only permits of its escape after it has effected all the harm of which it is capable upon its host, and when, by its amazing increase, its power of imparting the disease to others has increased a millionfold. But in many of these cases there is no process which under any aspect can be regarded as eliminative. There is no elimination from the system in the case of carcinoma, or of tubercle, or of syphilis; and none, so far as we know, in hydrophobia, in glanders, or even in whooping-cough or mumps. And, indeed, as regards carcinoma, tubercle, and syphilis, so far is there from being any tendency towards elimination, that every fresh local development acts as a new centre of infection.

It may, I think, in conclusion, be fairly admitted that poisonous matters, of whatever kind, which are present in the blood, tend speedily to be discharged from it, much as do its own normal elements; that, when they chance to have special affinities (chemical or vital) for certain tissues, they are deposited mainly in those tissues blindly, and altogether irrespective of the amount of good or evil they are likely to effect there; and that the subsequent morbid processes depend partly on the position, structure, and functions of the organs in which this deposition has taken place, partly on the nature of the deposited poison, whether it is merely chemical or vital, and whether (as in the latter case) it acts as a ferment, living and multiplying only so long as certain conditions essential for its development are present, or takes root in the tissues, and produces therein persistent proliferation or a growing tumour.

CORRIGENDA.—The proofs could not be furnished last week in time for Dr. Bristowe's emendations; and the following corrections should be made in the part of the lecture published in the last number of the JOURNAL.

Page 331, col. 2, line 61, for "conditions", read "complications"; p. 332, col. 2, line 61, for "the most", read "no"; col. 2, line 76, for "exert a", read "exert no"; p. 333, col. 1, line 56, for "the", read "other"; col. 2, line 21, for "other induce", read "thus induces"; col. 2, line 22, for "on", read "one"; col. 2, line 42, for "lungs", read "legs"; col. 2, line 60, for "effervescence", read "efflorescence"; col. 2, line 65, for "innumerable", read "numerous"; col. 2, line 73, for "contribute", read "constitute."