A LECTURE

ON

DROPSY: ITS PATHOLOGY, PROGNOSIS, AND PRINCIPLES OF TREATMENT.

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DROPSY has been well defined by Sir Thomas Watson to be "a collection of serous liquid in one or more of the shut cavities of the body, or in the areolar tissue, or in both, independent of inflammation." The liquid which is thus collected is, as a rule, serum holding no fibrine in solution; and this absence of fibrine constitutes one of the main distinctions between dropsical and inflammatory effusions. It will help us to understand the nature and cause of dropsical accumulations, if we bear in mind that the meshes of the areolar tissue and the serous cavities in which these accumulations occur are moistened during life and health by a continual serous secretion. Dropsy consists in an excess of this fluid, which excess must be a result of either excessive secretion or defective absorption, or both combined. In fact, it is probable that, while dropsical effusion is going on, the absorption of liquid from the dropsical parts is nearly, if not quite, suspended. So far as we know, the *blood-vessels* are alone concerned in the exhalation and absorption of this fluid. The lymphatic absorbents have no share in causing the phenomena of dropsy. The cause of dropsy is to be found in the condition of the blood-vessels and their contents. In general terms, the proximate cause of dropsy may be said to be—1, a mechanical impediment to the circulation of the blood, and a consequent over-fulness of some part of the vascular system; 2, an alteration of the physical condition of the blood, either (a) an excess of the watery part, with a relative deficiency of the solids, or (b) an accumulation of excrementitious materials, especially of urinary constituents. We shall presently see that, in a very large proportion of cases, a retention of water in the blood is associated with an accumulation of urinary excreta. Let us now take some examples illustrative of each of these conditions as a cause of dropsy.

An Impeded Return of Blood through the Veins often causes dropsical swelling of parts on the distal side of the obstruction. Thus the pressure of enlarged cancerous glands or of an aneurism, on the femoral or popliteal vein, or the pressure of the gravid uterus on the iliac veins, will give rise to oedema of one or both lower extremities. Dropsy of one arm may result from the pressure of cancerous glands upon the subclavian vein. Structural disease of the liver, especially an advanced stage of cirrhosis, greatly impedes the return of blood through the portal system of veins; and the result is an effusion of serum into the cavity of the peritoneum, constituting the form of dropsy which is called ascites. And, again, this dropsical accumulation in the cavity of the peritoneum may so compress the large venous trunks within the abdomen as to impede the return of blood from the lower extremities, and thus render them anasarctous.

Sir Thomas Watson relates the case of a man who had dropsy of the head and neck and upper extremities, while the rest of the body was free from dropsical swelling, and therefore appeared disproportionately small. The cause of the dropsy was found to be obliteration of the superior cava vein by the pressure of an aneurism of the aorta. Not long since I had a similar case under my own care. The larger the vein which is thus obstructed, the greater, of course, will be the extent of the dropsy; and when the impediment to the circulation exists at one of the orifices of the heart, the dropsy may be general over the whole body.

Now, the immediate cause of the dropsical effusion in all these cases is over-distension of the veins and capillaries, and increased pressure upon their walls, consequent upon the impeded return of blood. The fluid then escapes through the walls of the distended capillaries. Experiment has proved that the transmission of fluids through membranes is in direct proportion to the pressure employed; and Magendie and other experimenters have shown that, while depletion of the blood-vessels by venesection quickens absorption, on the other hand, artificial distension of the vessels by the injection of water checks absorption, and favours exhalation or escape of liquid through the walls of the vessels.

Again, it is certain that absorption is checked by a retarded movement of blood through the vessels; while, on the contrary, it is favoured by a quickened circulation. "Fluid may be raised against gravity by directing a stream along a membranous canal which lies immersed in the stagnant fluid. The outer fluid enters the canal by endosmosis, and is carried away with a speed proportioned to the velocity of the current." (Todd and Bowman's *Physiology*, vol. ii, p. 287.)

It appears, therefore, that an obstacle to the return of blood through the veins checks absorption and favours dropsical effusion, by causing a retarded circulation, increased fulness of the veins and capillaries, and increased pressure on their walls. It is thus chiefly that valvular disease of the heart, and some forms of pulmonary disease, such as emphysema with bronchitis, cause dropsy. I shall presently show you that congestion of the kidneys, and a consequent scanty secretion of urine, with an excess, therefore, of water in the blood, are amongst the results of the cardiac and pulmonary diseases which concur in causing dropsical effusion.

Watery Blood.—We have next to speak of dropsy having its origin mainly in an alteration of the physical condition of the blood. Dropsy may result from an excess of water and a deficiency of the solid constituents of the blood. In cases of extreme anæmia, whether a result of hæmorrhage or of that condition of system to which the term chlorosis is applied, we frequently find more or less dropsical swelling, especially of the lower extremities. In these cases, the escape of serum from the blood-vessels is accounted for partly by the thin and watery state of the blood, partly by an enfeebled condition of the heart. Palpitation and dyspnoea on exertion are common symptoms. With these symptoms, there is probably overfulness of the right side of the heart, of the systemic veins, and consequently of the systemic capillaries; and hence the tendency to dropsical exudation.

Retained Excreta.—I have said that dropsy may result from an accumulation of excrementitious materials, and especially of urine in the blood. A case of acute febrile dropsy is a type of this class of dropsies. A patient with the eruption of scarlatina fully out, or with the skin desquamating after the disappearance of the rash, is exposed to cold; the cutaneous process of elimination is abruptly checked; morbid materials are thrown in upon the circulation, and reach the kidneys; these glands become irritated, congested, and inflamed; the urine is scanty, high-coloured, albuminous, and often bloody; and, in the course of a few hours, there is general dropsy. These symptoms may come on during the progress of scarlatina, while the patient is still confined to bed, and when there has been no exposure to cold. Cold, however, is a powerful exciting cause; and precisely the same phenomena often occur unconnected with scarlatina, when the body, having been fatigued and heated by exercise, is afterwards exposed to cold and wet, whereby the cutaneous secretion is suddenly checked, and general dropsy quickly follows. What is the immediate cause of the dropsy in this class of cases? 1. There is an excess of water in the blood, consequent upon the diminished action of the skin and kidneys. 2. Urea and other urinary constituents, as well as the materials of the cutaneous secretion, being retained in the blood, excite an active exudation of serum from the capillaries into the areolar tissue and the serous cavities; this dropsical effusion being the result of an irritant action only just short of that which would give rise to inflammatory exudation. This active effusion of fluid into the internal cavities is analogous to the active secretion from the mucous membrane of the alimentary canal when the blood has been poisoned by the inhalation of foul gases, or by the imbibition of impure water, or, as sometimes happens, by the sudden suppression of the cutaneous secretion. In this class of dropsical cases, the circulation of impure blood, resulting from the defective action of the skin and kidneys, is commonly attended with a considerable degree of febrile excitement. This form of dropsy, therefore, is often called acute, active, febrile, or inflammatory. Frequently, too, it is called acute renal dropsy; and, in the vast majority of cases, this name would be strictly applicable. For that the kidneys are usually implicated, and contribute largely to the production of the dropsy, is proved by the fact that the urine is not only scanty, but impregnated with blood-constituents. This, however, is not invariably the case. I have notes of three cases that have come under my own observation, and I have heard and read of others—cases in which, with acute general dropsy, the urine has been neither scanty nor albuminous. In these cases, I believe that a suppressed action of the skin was the sole cause of the dropsy. That the suppressed function of the skin is a very powerful concurring cause of the dropsy even in those cases which are commonly spoken of as examples of renal dropsy, is, I think, proved by the fact that, whereas in cases of scarlatina the occurrence of albuminuria is usually associated with more or less of dropsical effusion, in cases of diphtheria a scanty secretion of highly albuminous urine is of very common occurrence; yet dropsy rarely, if ever, occurs. The probable explanation of this remarkable difference is

that, in scarlatina, the normal functions of the skin are checked by the cutaneous rash, while in cases of diphtheria the skin is unaffected. I believe that most cases of acute general dropsy which are spoken of as *renal* might with more accuracy be designated *cutaneo-renal*. I shall presently prove to you that, in cases of chronic renal dropsy, the functions of the skin are always impeded; and that this suppressed cutaneous action forms an important element in the pathology of this class of dropsies.

I have given you illustrations of each of the three proximate causes of dropsy of which I just now spoke; namely: 1, a mechanical impediment to the circulation of the blood; 2, an alteration of the physical condition of the blood, either (a) an excess of water, or (b) an accumulation of excrementitious materials. I now proceed to show you that, in a large proportion of cases of chronic dropsy, all these conditions coexist and cooperate. There is an impeded circulation of blood; and the blood is physically altered, both by containing a relative excess of water, and by being contaminated with retained excreta. In the great majority of cases, chronic general dropsy is either cardiac or renal in its origin. If we carefully analyse the phenomena of these two classes of cases, we shall find that, much as they differ from each other in their primary pathological conditions, the proximate cause of the dropsy is the same in both.

In cases of cardiac dropsy, the starting point of the malady is a damaged valve, either the mitral or the aortic, or both. Sooner or later, this valvular defect seriously impedes the circulation, the whole systemic venous system becomes distended, and, as the circulation through the kidneys becomes obstructed, there is a scanty secretion of urine, which is sometimes also albuminous. It is obvious that, *ceteris paribus*, the amount of urine secreted depends upon the quantity of blood which circulates through the kidneys. Ligature of both renal veins—an experiment which has often been performed on the lower animals—causes a speedy and complete suppression of urine; and so, when cardiac disease obstructs the general circulation, the secretion of urine will be scanty in proportion to the degree in which the blood is impeded in its passage through the kidneys. Thus, a scanty secretion of urine, and a consequent accumulation of water and of urinary excreta in the blood, are the immediate precursors and the proximate cause of that which is rightly called cardiac dropsy.

Now let us examine the phenomena of *chronic renal dropsy*. In these cases, the blood is physically much changed. It contains an excess of water; it is deficient in its own normal constituents, especially albumen and colouring matter; and, lastly, it is more or less contaminated by retained urinary excreta. We find, as a rule, that patients with chronic renal disease are liable to become dropsical, in proportion to the abundance of albumen in the urine and the scantiness of the watery secretion by the kidneys. In cases of what we call the chronic desquamative disease—the small red granular kidney—a form of renal degeneration in which the urine is copious and contains but little albumen, there is commonly no dropsy, or very little. On the other hand, dropsy is a very frequent and prominent symptom in those cases of Bright's disease where the kidneys are large, pale, and waxy or fat, and which are associated with a scanty secretion of highly albuminous urine.

In addition to the altered physical condition of the blood in cases of chronic Bright's disease, there is yet another concurring cause of dropsical effusion, which assimilates these cases still more closely to those of cardiac dropsy. I mean an impeded circulation of blood. Many years ago, Dr. Bright published the fact that, in a large proportion of cases of chronic renal degeneration, the left ventricle of the heart is hypertrophied, and that, too, when there is no apparent cause for this change, the cardiac valves and the large arteries being quite healthy. Dr. Bright suggested, in explanation of this remarkable fact, "either that the altered quality of the blood affords irregular and unwonted stimulus to the organ immediately; or that it so affects the minute and capillary circulation as to render greater action necessary to force the blood through the distant subdivisions of the vascular system." (*Guy's Hospital Reports*, vol. i.)

I have lately discovered the cause of this hypertrophy of the left ventricle in the fact that the muscular walls of the small arteries in many of the tissues throughout the body in these cases of chronic Bright's disease are much hypertrophied. Now, since excessive growth of muscular tissue implies long continued over-action, and since the tonic contraction of the small arteries is known to oppose the passage of blood, it seems probable that the hypertrophy of the left ventricle is a consequence of the undue resistance offered to the circulation by the excessive contraction of the minute arteries; the arteries being excited to this excessive contraction by the irritant action of deteriorated blood. There is reason to believe that, notwithstanding the hypertrophy of the left ventricle, the effect of the arterial resistance is to impede the passage of blood onwards through the capillaries, and in the same degree to distend

the systemic veins. The arterial resistance being in excess of the cardiac propelling power, the obstruction has a retrograde action precisely as if the impediment were created by a diseased valve; so that, while the impediment offered by the minute arteries lessens the pressure on the arterial side of the systemic capillaries, the distension of the systemic veins increases the pressure on the venous side, and this distension and pressure would co-operate with the before-mentioned physical changes in the blood itself to favour the occurrence of dropsical effusion. You see, then, that, although the starting point in cases of chronic renal dropsy is different from that in cases of cardiac dropsy, yet that the concurring conditions and the proximate cause of the dropsical effusion are almost identical in the two classes of cases. In both cardiac and renal dropsy, there is a scanty secretion of urine, and a consequent alteration of the physical characters of the blood; and in both classes of cases there is an impeded exit of blood from the systemic capillaries, and a consequent transudation of serum through the walls of the capillaries. In cases of cardiac dropsy, the scanty secretion of urine is a consequence of impeded circulation through the kidney caused by a primary obstruction at the heart; while, in the renal cases, the scanty secretion of urine is primary, and the impeded circulation a secondary result of the blood contamination. In cases of cardiac dropsy, the obstructed circulation is the main cause of the dropsy; the physical changes in the blood are of secondary importance, while the reverse is true in the cases of chronic renal dropsy.

Our recent discovery of the increased growth of the muscular coat of the small arteries in cases of chronic Bright's disease, enables us to explain, for the first time, one of the most remarkable phenomena of the disease—I mean the inactive state of the skin, and the extreme difficulty of exciting perspiration, even by a prolonged application of the hot-air bath. We now find that the subcutaneous arteries have their muscular elements, and of course their contractile power, much increased; and we infer that the vessels, being stimulated to contract by their morbid contents, resist the relaxing effect of the hot-air bath.

I have lately been consulted by a sufferer from chronic Bright's disease, who, being an intelligent medical man, had observed that the progressive inaction of his skin had shown itself first in the feet and legs, and in process of time had gradually extended upwards to the trunk and upper extremities; thus taking the same course as chronic anasarca commonly pursues. In this case, there is scarcely any oedema, for there is a copious secretion of water; but it would appear that the defective action of the skin occurred first in the feet and legs, because in those parts, in addition to the arterial resistance, the cutaneous circulation is yet further impeded by the force of gravity acting upon the column of blood in the veins.

It can scarcely be doubted that this inactive state of the skin must have an injurious influence upon the renal disease. The functions of the skin and of the kidney are so closely correlated, that a disturbance of one almost of necessity has an influence upon the other. It is notorious how frequently renal disease is excited and aggravated by the suppressed action of the skin which follows the application of cold to the surface; and now we have reason to believe that the anæmia and the consequent inactivity of the skin which result from the undue contraction of the cutaneous vessels under the influence of the uræmic stimulus may have an injurious reaction upon the renal disease analogous to that which is known to follow the external application of cold. I believe that this inactive state of the skin constitutes one of the greatest hindrances to the cure of chronic Bright's disease. And I am sure that measures for restoring the normal cutaneous functions are amongst the most important means of treatment.

Another phenomenon which is explained by the backward pressure of blood through the veins, is that of minute tortuous varicose veins upon an otherwise pallid cheek. This appearance is often very striking in cases of chronic Bright's disease; it also occurs when the circulation is obstructed by disease of the heart or by emphysema of the lungs; but in these cases there is usually less of pallor and more of lividity than in the cases of chronic renal disease.

If now we review the various kinds of dropsy to which our attention has been directed, we find that all may be arranged in two classes: 1, the acute, active, or febrile; and 2, the chronic, or passive. I have sufficiently explained the characters and the proximate cause of each; but let me remind you of the different modes in which the anasarca shows itself in the two classes of cases. Acute febrile dropsy not only comes on rapidly, but it also manifests itself simultaneously in the subcutaneous tissue over the whole body—face, trunk, and limbs. The blood in these cases is suddenly contaminated with retained excreta; there is consequently an universal capillary engorgement and an active transudation everywhere through the walls of the vessels. On the other hand, chronic, passive dropsy, whether cardiac or renal, not only comes on slowly, but it usually begins in the feet and thence gradually extends up-

wards. The reason is, that the venous obstruction and the capillary engorgement are greatest in the most dependent parts, from which, in the erect posture, the blood has to ascend against the force of gravity. The liquid, too, after it has been effused into the areolar tissue, tends to gravitate downwards, so that the position of the dropsical effusion is greatly influenced by the posture of the patient, as well as by external pressure.

It is almost too obvious to require mention that the acute and the chronic forms of dropsy merge into each other by imperceptible gradations. An acute dropsy may gradually assume the chronic form; and, on the other hand, as a result of exposure to cold, a chronic dropsy may suddenly take on the characters of an aggravated acute attack.

The *Prognosis* in cases of dropsy differs extremely according to the nature of the disease, of which the dropsy is a symptom. Amongst the uninitiated, the belief is very general that dropsy is rarely curable; and when a patient asks concerning his malady, "Is it the dropsy?" an affirmative answer, without explanation, will almost invariably convey the idea of an incurable disease. The notion that dropsy is essentially incurable is happily an erroneous one. Some forms of dropsy are curable with ease and certainty. The slight oedema which frequently accompanies chlorosis usually yields at once to appropriate treatment. Cases of acute renal dropsy, if they come early under treatment, generally end in complete recovery. We shall have in future lectures to consider the means by which acute disease of the kidney may be distinguished from chronic degeneration of the gland. The cases in which the prognosis is most unfavourable are those in which the dropsy is dependent on advanced chronic disease of the kidney or organic disease of the heart. The prospect is especially unfavourable when both the kidneys and the heart are implicated. This complication is by no means an unusual one; for, on the one hand, the tendency of valvular disease of the heart is to cause congestion of the kidneys, albuminuria, and, at length, structural change in the gland: and, on the other hand, renal disease, through the blood-contamination to which it gives rise, not only tends, as we have seen, to cause hypertrophy of the muscular walls of the heart, but also to develop structural changes in the valves. Bear in mind, however, that even in cases of incurable organic disease of the heart, or kidney, or liver, a temporary removal of the dropsy may not uncommonly be effected.

The distress and the immediate danger attending a dropsical accumulation are greatly influenced, not only by the amount, but more especially by the seat of the effusion. The difference in this respect is immense between the tunica vaginalis and the pericardium—between the peritoneum and the pleura (the amount of liquid being equal); and so, again, between the areolar tissue under the skin and that beneath the mucous membrane of the larynx.

And now let us briefly consider the principles which should guide us in the treatment of dropsy.

There are two objects to be aimed at in the treatment of dropsy: these are, 1st, to remove, if possible, the original and exciting cause of the dropsy; and, 2nd, to remove the dropsical accumulation. If we can accomplish the first of these objects, the second is generally attained with it. The dropsy will soon disappear with the removal of its exciting cause. For instance, the slight anasarca which occurs in chlorotic young women is a result mainly of the poor and watery condition of the blood; and the dropsy quickly passes away when the quality of the blood is improved by nutritious diet, fresh air, and exercise, with the use of iron as a tonic, and perhaps an occasional aperient.

In the treatment of acute renal dropsy, it is important to bear in mind the relation in which the dropsy stands to the renal disease; and it is especially interesting to observe the phenomena which occur during the progress of recovery. In particular, there is one phenomenon which deserves notice in connexion with the general pathology as well as the treatment of dropsy. I mean the copious flow of urine which occurs spontaneously during convalescence.

In cases of acute renal dropsy the urine is at first scanty and of morbid quality, being often high-coloured from admixture with blood, always albuminous, and usually containing numerous casts of the kidney-tubes. The scanty secretion of urine is the cause of the dropsy, and the secretion of urine is scanty because the flow of blood through the kidney is obstructed and the structure of the gland changed, the tubes being filled with desquamated epithelium and with blood and fibrin which have escaped from the gorged Malpighian vessels. Now observe what happens during the progress of cure in a case of this kind. The patient we will suppose to be placed in circumstances favourable for recovery: he is confined to bed; has a scanty diet; the loins are dry-cupped, or mustard and linsed poultices are applied there; and means are taken to excite the secretory action of the skin and bowels, and thus to lessen the work of the kidneys. Soon the secretion of urine begins to increase, until, in the course of four or five days, perhaps, the quantity of urine,

which at first had been less than half the natural amount, becomes three times as great as the standard quantity, no diuretic medicine of any kind having been given.

The explanation of this spontaneous diuresis appears to be this. During the acute stage of the renal disease, the constituents of the urine, both solids and liquids, have accumulated in the blood, and have thence been effused into the areolar tissue and into the serous cavities. Now, urea itself is a most powerful diuretic; and no sooner is the inflammatory congestion of the kidney removed, and the freedom of the renal circulation restored, than the urea exerts its natural diuretic action on the kidney. The copious diuresis thus induced speedily removes the accumulated urinary solids and liquids from the blood, the areolar tissue, and the serous cavities into which they had been effused, and so the dropsy is cured.

This abundant flow of urine occurs without aid from diuretics or drugs of any kind. I have seen it happen while bread-pills alone were given as a *placebo*. Stimulating diuretics, such as squills, or cantharides, or turpentine, are injurious, by increasing congestion of the kidney. The best diuretics in such cases are means which tend to lessen the congestion of the kidneys; counter-irritation over the loins, especially by dry-cupping; hot air baths and diaphoretics, purgatives, and a scanty diet.

In some cases of chronic renal dropsy, diuretics may be given without risk, but too often without much benefit in the way of removing or lessening the dropsy. A pleasant and efficacious diuretic is the imperial drink made with lemon, cream of tartar and sugar, with the addition of gin, in the proportion of a wine-glass to a pint. Hot air baths often distress the sufferers from chronic Bright's disease; for the reasons which I have before given, the skin does not readily perspire, and the body consequently becomes painfully heated. Of late, therefore, I have been in the habit of prescribing for these patients a daily packing for two or three hours in a wet sheet and blankets. In this way I succeed in obtaining a more prolonged and copious diaphoresis, and that too, with less distress, if not with actual comfort to the patient.

In the treatment of cardiac dropsy, while we endeavour to remove the fluid by diuretics and by purgatives which excite copious watery discharges from the bowels, it is desirable to do what we can to sustain the power of the heart by nutritious food, stimulants, and tonics. Little or nothing can be done to repair a damaged valve, but much may be done to strengthen the muscular walls of the heart, and thus enable it to overcome the impediment to the flow of blood and the consequent tendency to dropsy which a diseased valve occasions. A combination of tincture of the perchloride of iron with tincture of digitalis is particularly useful in some cases of cardiac dropsy.

When other means fail to remove a dropsical accumulation, we may often afford great temporary relief, and prolong life sometimes for a considerable period by mechanical means—by tapping the abdomen, for instance, in a case of ascites; by acupuncture or incisions through the skin of the legs for the removal of anasarca.

It is very interesting to note the phenomena which follow upon puncturing or incising the legs in cases of anasarca. There is first a copious drain of liquid from the punctures. Secondly, there is a further exudation of liquid from the over-distended blood-vessels; this liquid also escapes from the punctures or incisions, and its escape is often associated with temporary symptoms of exhaustion, such as a rapid and feeble pulse and pallor of countenance. Thirdly, there occurs often a copious secretion of urine, in consequence of a more free circulation of blood through the kidneys.

Dropsical accumulation tends to cause a secondary impediment to the circulation by the pressure of the effused liquid from without upon the blood-vessels. And, again, the capillary circulation becomes more and more impeded in proportion to the increasing distension of the veins, which results from cardiac or renal disease. The drain of liquid from the areolar tissue, allowing of a further exudation from the capillaries, thus removes or lessens the obstruction which results from overfulness of the veins. The general circulation therefore becomes more free, and the greater freedom of the circulation through the kidney, is attended, as we have before seen, by a more copious secretion of urine. The greater freedom of the circulation through the kidneys is shown not only by the more copious secretion of urine, but also by the diminished amount of albumen, and not unfrequently when albuminuria has been caused by passive congestion, the result of cardiac disease, the albumen quite disappears for a time after a copious drain of dropsical fluid through the skin.

The free action of a hydragogue—elaterium for instance—is often followed by a copious secretion of urine. The gorged vessels are partly unloaded by the drain of liquid from the bowels; the circulation through the kidneys, as through other organs, consequently becomes more free; and hence a copious secretion of urine, and a rapid diminution or even a complete removal of the dropsy.