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CLINICAL LECTURE ON DIABETES,

Delivered at Kings College Hospital,

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(Reported by S. J. A. SALTER, Esq., M.R.C.S.)

Gentlemen,—Most of you, I doubt not, are aware that at the present time there are no less than three cases of diabetes in the hospital, and considering that diabetes is not a very common disease, the occurrence of so many examples, all under our observation at once, offers us an unusually favourable opportunity of studying this malady, and I would here, in passing, express my belief that there is no way in which clinical study can be prosecuted with so much advantage as when we have several cases of the same kind before us at once, for we are then not only able to contrast the disease in its different stages, but also to observe what of the symptoms are common to all cases, and what are peculiar to individual instances alone.

The first of the cases, gentlemen, to which I shall direct your attention, is the man William Hardy, in Sutherland ward, who has been in the hospital since the 6th of July last. I will read you a brief outline of his case. He is 42 years of age, is a bricklayer by trade; he is a native of Essex, where he resided till within about twelve months before his admission into the hospital; his habits have been temperate, and it appears that his health has been for the most part good; he has, however, of late years, had occasional attacks of rheumatism, which was of a chronic muscular character. About two months previous to my seeing him, he had an attack of ague, from which he recovered, but this was shortly afterwards succeeded by catarrh, and since then he has never been in health. The first symptoms of the disease from which he is now suffering that he noticed, were great thirst and hunger, so that, to use his own expression, he "ate and drank all that came in his way;" added to this he remarked that he was rapidly losing flesh. He tells us that his thirst was most urgent, and that with what fluid he satisfied it, was quite a secondary object to him. This reminds me of a case which you may find in a recent volume of the *London Medical Gazette*, of a patient of Dr. Percy. This poor man suffered so intensely from thirst, that he would actually get up in the night and steal the medicine from the bottles of the other patients in the ward, and would drink whatever they contained, even though it were black draught.

About a fortnight after the thirst became urgent, Hardy noticed great increase in the quantity of urine, and also that he constantly had a disagreeable sweet taste in his mouth. When he entered the hospital he had other symptoms,—pain in the loins, slight dyspnoea, which was increased on the slightest exertion. During the first twenty-four hours he was here he passed twelve pints of straw-coloured urine, of the specific gravity of 1035. I also noticed a peculiar whitish chylous-looking exudation from the gums, which was more conspicuous upon pressing them with the point of the finger. The constipation was at first extremely obstinate, so much so indeed, that I thought at one time he was going to die from some internal obstruction, which we should be unable to overcome; this, however, has since very much given way.

Before I proceed any farther, I will advert to the point, which above all others, is the most interesting and important in the whole pathology of diabetes, and that is, the saccharine condition of the urine. I here show you a specimen of it, which was passed by the patient whose case we are considering; it is of a light lemon colour, with a peculiar cheesy odour. The best method for proving the presence of sugar consists in adding to a portion of the urine, in a test tube, an equal amount of Liquor Potassæ, and boil the mixture. I here exhibit to you this test, and observe, that as the fluid begins to boil, its colour, which was at first rendered lighter by the admixture of the colourless alkali, gradually passes to a fine deep reddish brown, a change which chemists tell us is produced by the sugar being converted into brown melassic acid; and if there is any superabundance of phosphates, as there usually is in these specimens of urine, they will be thrown down in the form of a white cloud, when the Liquor Potassæ is added. This test was first proposed by Mr. Moore, of Birmingham; it has the advantage of being very simple, and almost entirely free from fallacy. Not long since, however, Dr. Rees stated in the *Medical Gazette*, that in certain specimens of albuminous urine, quite free from sugar, he had known Liquor Potassæ and heat produce the brown red colour which indicates sugar. After this I examined albuminous urine with Liquor Potassæ and heat frequently, but in every instance the urine was made paler than before. Dr. Rees now states, that it is only impure Liquor Potassæ which produces the brown colour, when acting upon albuminous urine; so that you may

avoid all fallacy by using pure alkali, and keeping it pure, which may readily be done by preserving it in a dark green glass bottle, with a secure stopper. If, however, you should require further tests, there are several at your command. One of these is founded upon the action which yeast has upon sugar, converting it into alcohol and carbonic acid; so that by a proper arrangement you may witness the disengagement of the bubbles of carbonic acid gas. Then, again, you may obtain the sugar itself by simply evaporating the urine, and have it in a state of tolerable purity by treating the residue with boiling alcohol, from which monstium the sugar will deposit in a crystalline form as it cools. Another test consists in leaving a portion of the urine exposed in a warm place for a day or two, and then examining it under the microscope, when you will find that the *Torula* or yeast plant has been developed.

There is yet another—Trommer's test, which depends upon the power which diabetic sugar has of deoxidizing oxide of copper, and converting it into the yellow binocide. But all these tests, with the exception of Moore's and Trommer's, take time and trouble, and for all practical purposes, the effect produced by Liquor Potassæ and heat are perfectly satisfactory.

But, to return to our patient; there is another symptom which we must not overlook, and one which is constantly met with in diabetic subjects; it is *acidity of saliva*. You will find upon introducing a slip of litmus paper into his mouth, that it is reddened very decidedly. Another very remarkable fact which is frequently observed in cases of diabetes is, that the quantity of urine which is voided exceeds the amount of fluid drunk. In this case we have a good opportunity of observing this circumstance, for through the diligence of my clinical clerk, I have been furnished with an accurate and almost daily account, drawn up in a tabular form. The following are the results of some of his measurements:—

Date.	Quantity drunk.	Quantity voided.
July 9	80 ounces.	134 ounces.
" 10	80 "	184 "
" 11	80 "	128 "

Then passing over some days, we find that on July 21st, the quantity drunk was five pints, and that voided seven pints. On the 26th a more remarkable difference was observed, the amount of fluid taken on that day being 150 ounces, and the urine amounted to 268 ounces.

Tenderness of the loins was another symptom exhibited by this man, when a smart blow was struck with the point of the fingers in that region. When first he came into the hospital he was in a state of extreme prostration, so that for some time I feared his disease would have been speedily fatal; he rallied however, from this state, and is now much stronger.

Our next diabetic patient, gentlemen, is Isaac Bowles, also in the Sutherland ward; he is 20 years of age, 22 years younger than the patient to whom I have just now been referring. He is a native of Kent, and a carter by occupation. There does not appear to be any hereditary tendency to disease in his family; his

general health was always good up to the commencement of this present illness, which he dates back nine weeks from the time of his admission into the hospital, (October 9th, 1847.) The earliest symptoms that he noticed were extreme thirst, and frequent desire to pass his water, which was unaturally abundant; and this required him to get out of bed two or three times every night; his appetite was craving.

When I first saw him these were his symptoms:—Urgent thirst and hunger; frequent micturition, which, as was the case with Hardy, is worse at night; a sense of sinking and weight at the epigastrium; unpleasant but not sweet taste in the mouth; bowels greatly confined and evacuations scybalous; pain in the loins; mouth clammy; and I observed here, too, the white chylous exudation from the gums. The quantity of urine voided in twenty-four hours averages from five to six pints; the physical characters of this urine are very much as in that of our other patient, but it is somewhat denser, its specific gravity ranging from 1035 to 1040, this difference, doubtless, arising from the circumstance that less urine is voided. No accurate comparative table of the quantity of liquid taken and evacuated by this patient has been made; but I find in the report of the 12th of October, in the case-book, that the fluids drunk by the patient on that day measured in all five pints, and the urine voided by him five pints eight ounces, showing, that in this respect, this patient exhibits the same symptom as Hardy.

Stephen Dungay, who is the subject of the third case, is 22 years of age, and was admitted into Fisk ward, on the 10th of October; is an apprentice to a currier. Is not aware of any hereditary predisposition to phthisis or gout; his general health was good till he was eighteen years of age. At this time he had what he was told was a "slow fever," which prevented him from working, but did not confine him to bed. He states that the principal symptoms were headache, weakness and lassitude, with loss of appetite. He had no cough; there was great diaphoresis, but it was not preceded by rigors. He continued in this state for ten weeks, after which time he found he had acquired a craving appetite, and insatiable thirst, and that the quantity of urine he voided was much increased. These symptoms have now lasted four years, and have continued unabated up to the present time; and from the period when they first became marked, until now, he has been in the habit of getting out of bed two or three times every night to make water. The quantity of urine that he passes ranges from five to ten pints daily, and its average specific gravity is 1042.

The following is a tabular view of the quantity of fluids drunk and voided by this patient:—

Date.	Quantity drunk.	Quantity voided.
Oct. 15	120 ounces	124 ounces.
" 16	120 "	136 "
" 18	140 "	160 "
" 19	170 "	208 "
" 20	120 "	136 "
" 21	120 "	120 "
" 22	120 "	140 "
" 23	140 "	124 "

This man has had other symptoms, as pain in the loins, and the white exudation from the gums, like the other patients, but unlike them he has had diarrhœa. With this last exception, all these cases have had a remarkable analogy, as to their mode of access, progress, and duration, and I fear that they must all necessarily, sooner or later, come to the same termination.

I will, now, gentlemen, re-consider these four points, and make some general observations on them, in the order in which they are enumerated.

And first, then, as to the *access* of diabetes. We see that in all our cases the primary symptoms were referable to the stomach; they indicated stomach disorder,—the hunger, the thirst, the clammy state of the tongue and mouth generally, the sweet taste, the exudation about the gums all pointed to the same organ; and what is so remarkable is, that, unlike other stomach disorders generally, the digesting power of that viscus, as regards certain kinds of food, is enormously great, far exceeding anything that we ever witness in health. Our three patients take large quantities of food, but they do not suffer in any great degree from flatulence, epigastric tenderness, or weight. I think, gentlemen, any of you whom I see around me, and who have all the appearance of health, would feel extremely uncomfortable if you were to take in the course of the day or at a single meal, even half of what any of our diabetic patients take, and which is scarcely sufficient to satisfy them.

The *progress* of the complaint is not rapid; one patient, Dungay, has had it for four years in a very confirmed form, and many people have it for a longer period. The establishment of the disease, however, is rapid; that is to say, a person may be quite healthy, without a vestige of sugar in his urine, and in a very short time he will be suffering from the most marked symptoms of the disease.

As to its *duration*, it is evidently in the majority of cases, a chronic and not an acute malady. I take it that acute diabetes occurring to a person in previous good health and running rapidly to a fatal termination, is a thing of extremely rare occurrence. One of our patients has been suffering for four years, and has during the whole of that time, been indulging his appetite to the full; and this gives us an opportunity of observing the natural history of the disease, unmodified by medical interference, and shows us that under those circumstances the disease is a chronic one. The other patients have been ill less time,—Hardy about four months, and Bowles from two to three months. These, however, give us no measure of its duration. I have now in my private practice three cases of diabetes, all of which are of long standing. One of these I have had under my care for three or four years, and he had been ill nearly as long before he came to me. Another only a few months, but he had previously been under the care of another physician for more than twelve months. There is an important point in the natural history of diabetes, which has not been illustrated by either of my hospital patients; it is this, sometimes all at once, and completely, the diabetic symptoms

cease, and are absent altogether for an indefinite period, at the expiration of which they return and destroy the patient; or they may allow him several intervals of rest, but they are sure to return ultimately, and make the patient their victim. I have lately been consulted by a patient on account of pulmonary disease, who some years ago was under the care of Dr. Prout, who pronounced him to be suffering from diabetes; and Dr. Prout is the highest authority upon this subject in this country. But now, though the urine has been examined with great care, not a trace of sugar can be found. I know of another case, that of a lady, who had confirmed diabetes; her physician, Dr. Babington, who mentioned the case to me, sent her to Clifton, to drink the Clifton waters, and in a short time she was well. She had a complete intermission of her disease, and this lasted for a considerable period, when it returned. She again went to Clifton and got well, but upon leaving, the disease returned. I do not know what became of her afterwards. You will at once perceive that the interest of this feature in the natural history of diabetes consists in the bearing it has upon inferences respecting the influence of remedies. It is true that, in the latter case, the Clifton air and waters may have had much to do with the suspension of the disease; and were this the only instance of such suspension of the diabetic state, perhaps the inference would be unavoidable, but such is not the fact.

As regards the *termination* of diabetes, I fear we shall too soon witness that which is its constant termination, in the case of Dungay, in the Fisk ward; he is now much depressed, and is greatly emaciated, and does not rally under the stimulating and nutritive treatment and diet we have given him. I strongly suspect he has tubercles in the lungs, though as yet I have not satisfied myself of the fact, but I see in the case book that my clinical clerk has reported a dulness on the lower part of the right side; this, however, may arise from some enlargement of the liver.

Tuberculous disease of the lungs, gentlemen, is certainly the most frequent consequence of diabetes, and very commonly not only interferes with the influence of the treatment, but puts a termination to the disease by killing the patient. The cachectic state induced by the discharge of the large amount of solids by the urine, and by the imperfection of the assimilating powers, leads to the development of phthisis. I think it is a point for investigation whether the reverse of this does not sometimes happen, and not unfrequently,—whether, in fact, patients who are suffering from phthisis, do not become diabetic without their having been so previously. Of this I am convinced, that if you were to examine carefully the urine of all the phthical patients who come into the hospital, you would find traces of sugar more frequently than is generally supposed. I recollect one case in point which occurred at a time when I was endeavouring to ascertain the just value of Moore's test, and it made the more impression on my mind, as I was led at first to question the evidence which that test gives of the presence of sugar, and which previously I had so much trusted in.

I had already tested the urine of several patients, when I came to a specimen passed by a patient labouring under phthisis, and then I found that the addition of *Liquor Potassæ* and heat caused the brown colour characteristic of the presence of sugar; I had then some misgivings as to the truth of Moore's test, but I afterwards proved by other tests that this urine did really contain sugar.

The great exhaustion which is so constantly present near the termination of diabetic cases, is doubtless owing to the large amount of waste that occurs in the system, from the constant excretion of such enormous quantities of solid matter by the urine. One frequent termination of diabetes is the supervention of some fatal acute disease,—inflammation, for instance, of one of the serous membranes; pleurisy, or peritonitis, but especially pleurisy,—and this occurs generally in cold weather, or after some unusual exposure; and from this we learn an important hint as regards our treatment, that our patients should be carefully clothed, and kept in a temperature as equable as possible.

It is remarkable that this same tendency to acute inflammations exists in those diseases of the kidney, such as Bright's disease, chronic nephritis, which so far resemble diabetes, that a material foreign to the blood is suffered to accumulate in that fluid, and solid material which is foreign to the healthy secretion, excites irritation in certain organs and tissues.

We are now come to the most interesting and the most difficult point in our inquiry respecting diabetes, and that is, as to what the disease essentially is, and in what its true nature consists. We know the fact that there is an enormous development of sugar, and also in some cases an increase in the amount of urea, though this was at one time denied; for it was then thought that the urea was diminished, or even lost altogether, and replaced by the sugar; in short, that those two substances were vicarious of each other. This, however, is not the case; but it is remarkable, that though the occurrence of sugar does not cause a decrease in the amount of urea in the urine, still sometimes the sugar will disappear for a few days, the urine nevertheless retaining its high specific gravity, on account of the presence of a large quantity of urea. Sometimes lithic acid is present in the urine in excess.

As regards the development of sugar in diabetes, there are three important questions which suggest themselves to us,—namely, where is the sugar generated?—what is its source?—and, what causes the generation of this sugar?

These questions have as yet never been answered in a satisfactory manner; had they indeed been answered, the essential nature of the disease would no longer be enigmatical.

Let us now briefly consider what we know of these several points, and, first, as to the locality where sugar is generated. There is no doubt that this change takes place somewhere in the upper part of the alimentary canal—most probably in the stomach; for if you give a diabetic patient an emetic two or three hours after he has taken a meal, you may find sugar in large quantity in the matters vomited. This experiment has

often been made, and always with the same results, so that there can be little doubt that the development of sugar occurs first in the stomach itself.

The question raised as to what is the source of this sugar, is not so easily answered. The first point to settle is, whether it is produced by the mucous membrane, by any process allied to secretion, or whether the food, on being taken into the stomach, is immediately changed into sugar; and assuming the latter to be correct, a further question would arise as to whether the whole of the food, or only a certain portion of it, underwent this transformation. Though we have no very positive evidence of the fact, still there is reason, judging from analogy, to believe, that the latter is to a great extent the true explanation,—that the sugar is generated in the stomach from the food, and that certain portions only of the food undergo this change.

There are several substances in the vegetable kingdom which we employ as food, which in their ultimate composition are closely allied to sugar, such as gum, starch, &c.; and these, by chemical processes, can, out of the body, be converted into sugar. To take an example; if you mix starch and some saliva, and then keep them for some time at a temperature of 100° Fahrenheit, the nature of the starch is destroyed,—it becomes sugar, has a sweet taste, and will ferment; in fact it has all the saccharine properties; and what is still more remarkable is, that the sugar thus produced has some peculiarities which are met with only in grape and diabetic sugar, which are identical in nature and properties. This fact at once suggests the idea that the starchy materials of the food are the source of the sugar, and that they consequently ought to be removed from the patient's diet. This practice has been long pursued, and with a certain amount of success.

But, may not the nitrogenous aliments be converted into sugar? This point has frequently been endeavoured to be settled; but it is very difficult to come to any definite conclusion, for, however you may deny your patients the use of saccharine and vegetable food, such is their craving for this kind of aliment that they are sure by some means to obtain it in spite of the utmost precautions. I propose, however, to try an experiment on this point with one or two of our patients. I shall propose to them to be separated from all the other patients, and be shut up as prisoners in a small ward, keep them locked in, and allow them no communication except with the nurse, or other trust-worthy persons. When each patient is first introduced to his prison I shall order him an emetic and a purgative, and after that I shall give him, as his diet, beef, mutton, and eggs, and allow him simple water to drink; and in three or four days, make a careful examination of the contents of his stomach after the operation of an emetic, and shall have his urine examined as to the amount of sugar it contains. In a future lecture I shall communicate to you the results of this experiment.

Besides being found in the urine and fæces, and imparting a sweet taste to the saliva in the mouth, the sugar may be detected in the blood; this has but seldom been accomplished on account of the minuteness of the quantity which it contains, for the sugar has such

a diuretic action on the kidneys, that it passes off in the urine almost immediately after it has entered the circulation.

I told you just now, that when you submit a portion of starch to the action of saliva and heat, it is converted into sugar, there being some substance in saliva which has the power of producing this change. This is exactly what takes place in the natural transformation which occurs to the starch of seeds, converting that into sugar, and in this instance, the body which produces it has been isolated, and to it the name "*diastase*" has been applied.

A question here suggests itself, is there in this disease, any animal diastase generated either in the saliva, gastric juice, or pancreatic secretion? Or, according to the view lately proposed by Mialhe, is the substance (the diastase,) already existing in healthy saliva, and which we have seen can convert starch into sugar, increased to an abnormal degree? Whichever of these is the explanation, there can certainly be no doubt but that the saliva is in an unhealthy condition, for in each of the three cases which we have investigated to day you will remember the saliva was strongly acid, and this is the case almost uniformly in diabetes. Now, this constantly acid state of the saliva, is an unnatural condition of that fluid, for it generally causes an alkaline reaction or is neutral during health.

The locality at which the change of starch into sugar is effected, is undoubtedly, in great part at least, the stomach, but I do not believe that the secretion of that organ has any effect in producing the change. Tiedemann and Gmelin, also Dr. Prout, have thought that the gastric juice has this property, but it has since been proved by experiment that no such effect can be caused, for by digesting starch with gastric juice, at a temperature of 100° Fahrenheit, no sugar is generated. Gastric fluid has the power of digesting the albuminous portion of food, but its effect on the amylaceous is simply maceration. Indeed it seems most probable that amylaceous matters are only digested by the saliva and the secretion of the pancreas, which is, in fact, only a large salivary gland.

It has been shown by Bouchardat and Sandras, and I have repeated their experiments, that the fluid secreted by the pancreas has the property, like saliva, of converting starch into sugar; and Bouchardat holds that in diabetes not only have the pancreatic fluid and saliva this animal diastase, as in health, but that the gastric juice likewise contains it, and that the sugar is produced directly from the food by its action upon the amylaceous portion; and he believes that if the patients be prevented from taking amylaceous food, the formation of sugar will be suspended. Upon this view of the subject Bouchardat founds his mode of treatment by regulating the patient's diet, and denying them all vegetable food; and so successful has this plan been in his hands, that he tells us that of forty-one cases, the following were the results:—

16 cured.

14 relieved.

11 died from phthisis.

This, however, is, I apprehend, far greater encourage-

ment than we meet with in this country, even from a similar mode of treatment.

In another lecture I shall examine these points a little further, and discuss the various modes of treatment of this disease.

PUERPERAL FEVER;

IN WHAT WAY IT MAY ORIGINATE FROM ERYSIPELAS,
AND HOW COMMUNICABLE.

By R. U. WEST, Surgeon, Hogsthorpe, Lincolnshire.

The following cases, which are corroborative of the opinion that puerperal fever may originate from attendance on erysipelatous patients, and that a malady so originating is communicable from one puerperal woman to another, are also suggestive of other conclusions on this painful subject, which are, I think, of some practical importance.

On the 6th of January, 1842, I was called in to attend an elderly gentleman in this village, who had erysipelas of the face. As yet his symptoms were not at all urgent; it appeared to be quite a slight and common case. I sent some saline medicine, and a lotion. The same evening I attended a case of midwifery, two miles from my residence. The next morning, before visiting my erysipelatous patient, I attended a second case of midwifery, four miles from my residence. On my return home, I found my patient considerably worse; I applied nitrate of silver freely all over the affected part. At one or two o'clock in the morning of the next day, January 8th, I was called up to him. He was much worse; face and head frightfully swollen down to the shoulders on both sides. After visiting him again the some morning at nine o'clock, I called upon both my lying-in patients. They were doing well, and in fact recovered without a single bad symptom. In the evening I found the old gentleman in a very bad way; there was some delirium, and the head and face were still more swollen. I made a few punctures in both cheeks, and while busy with him was sent for in all haste to attend a case of midwifery,—Mrs. T. T., of L—, a distance of three miles. I believe I went without washing my hands. I was not detained more than a couple of hours, and as I was riding homewards, I was met by my groom, who had been sent to me with the announcement that an alarming change had taken place with my erysipelatous patient. I hastened on, and found him comatose, with a dusky livid appearance of the face. He died in the course of the night, a frightful spectacle.

And now commenced my troubles. In the night of the 9th of January, or rather early in the morning of the 10th, I was again summoned to Mrs. T. T. I found her in the following state:—Very severe pain, aggravated in paroxysms, like after-pains; some abdominal tenderness; had had a shivering fit; some headache; no anxiety of countenance; pulse 120, soft and full; skin hot; diaphoresis; lochia abundant; no signs of milk, but as it was barely thirty hours after delivery, it was quite early enough for that. I ordered