Original Articles.

THE GENERAL MANAGEMENT OF DIABETES.¹

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ALTHOUGH pathological knowledge affords the best basis of therapy it is not always the sole basis. We cured malaria long before we knew its cause. Syphilis was controlled long before bacteriology was born, and all that we know of the cause of syphilis to-day is that it must be dependent upon some form of living organism having the power of indefinite reproduction.

When we use the term diabetes mellitus let us clearly grasp the fact that we speak probably of a symptom rather than a disease; that the presence of sugar in the urine means a greater or less impairment, temporary or permanent, of the power of the organism to consume sugar; that while our knowledge of the starting point of such impairment is very imperfect, we have good reason for believing it may be as widely separated as Langerhans' islands in the pancreas, the liver, or several portions of the central nervous system; that during life, at least, we can rarely determine the point of origin in a given case.

Useful as the term glycosuria may be for clinical purposes as denoting the milder grades of the condition, in these brief remarks I shall, for simplicity's sake, include all grades of the failure to burn sugar under the term diabetes. Although we treat a condition and a patient, not a disease and a patient, treatment may be of much value, resulting in prolongation of life and promotion of comfort, sometimes in absolute cure. The means to the end are diet and mode of life, the rôle of drugs being, as I am sure my friend Dr. Thomson will agree, a subordinate one.

Prevention, being the highest form of medicine, comes justly first. What can we do to prevent diabetes? Very little. Human life in civilized regions unavoidably tends to become more complex, the struggle for existence fiercer, competition of all kinds, but especially among brain workers, more keen; and we must recognize nerve overstrain as one of the predisposing causes of diabetes. Even if it were practicable and wise to make periodical tests of the sugar-burning capacity of all our adult patients in active life, how many would heed the danger signal of sugar in the urine after the ingestion of a hundred grams of sugar fasting? Some even of the godly say, "Tush! there shall no harm happen unto me," showing an attitude of mind possibly more conducive to happiness and comfort in life than that of Martha, "careful in many things."

I have in mind a man approaching middle age whose great-grandmother, grandmother and mother all died of diabetes,¹ and whose own urine has been saccharine. With such an in-

heritance it is fairly in place to examine the sugar combustion power of such members of the family as we can, and to enjoin a careful life as to diet and strain. Until we know far more than at present, I do not see much more we can do in either special or general prophylaxis.

Time does not permit, even if the occasion demanded, much detail; and I propose, therefore, to deal mainly with the principles which, as it seems to me, should guide us in the management of our diabetic patients. A diabetic who consults us and has not been treated should, I think, be told to collect his twenty-four hour urine for, say, three successive days, without change in either diet or mode of life, the amount of urine and sugar being important factors in the estimation of the gravity of the case. If, on the other hand, the patient is under rational treatment which has reduced or done away with his sugar it is rarely desirable to let down the bars, as experience shows that sugar production is in many cases more easily controlled the first than on subsequent attempts. In general, with the exception of cases which are evidently very mild or severe in type it seems to me wiser to enforce an absolute or nearly absolute diet at once, — just as it is more humane to complete the shortening of a dog's tail at one rather than in successive operations. The very mild case probably does not require great restrictions. If acetone and diacetic acid are present a radical and rapid change in diet is dangerous. The striking improvement in strength, weight, and general symptoms which we so often see rewards the patient for his self-denial, and thus encourages him to persevere.

So wide is the variation between the different cases of diabetes, and so emphatically do we treat the patient, the more we individualize our patients, applying general principles to special cases, the better results shall we have. The diet list should be adapted to each case. I do not like the printed lists disinterestedly furnished us by some of the manufacturers of food products. They encourage laziness and routine — those two cardinal vices. Moreover, quantity is only next in importance to quality in the food of a diabetic. An approximate adjustment of the amount of food to the requirements of the special case must be aimed at. The body weight should be noted at stated intervals, weekly during the earlier part of treatment, at longer intervals later and in the more favorable cases. I doubt the wisdom or necessity in most cases of such accuracy as some of the modern German writers seem to enjoin; and yet, although it may not be essential for the patient to provide himself with scales and weigh out his portions, nor to dine in scales like Dr. Sanctorius of old, he should be given a rough idea of the size of a given weight of bread, meat, and fat. An increase in the amount of fatty food may be of importance nearly comparable to that of a diminution of starch.

The weight of the patient, his general symp-

¹ Read before the Medical Society of the State of New York at its Annual Meeting, Albany, Jan. 26, 1904. Symposium on Diabetes.

toms or their lack, and the condition of the urine, taken together, will generally prove safe guides as to the judiciousness of the diet. Under a strict diet the sugar and polyuria, one or both, are practically sure to diminish, and may disappear. In a favorable case I expect to see the sugar disappear in two or three weeks, the weight increasing. How long a strict diet is to be maintained must depend upon the type of the disease, which, again, largely depends upon the age and nutrition of the patient. In milder cases I believe it to be wiser to keep the patient on a strict diet for one to two months, and then to test the tolerance for starch, giving first 2 or 3 oz. of bread daily and increasing the amount weekly as toleration warrants. In more severe cases which are rendered sugar free with difficulty one must be more careful in allowing bread, and watch its effect even more closely. In the severest cases, in which the diet does not cause the sugar to disappear, it is ordinarily better to allow a fixed amount of bread. It is certainly so if under the strict diet weight and strength fall off. The sugar is then made from the nitrogenous food or the body tissues and the danger of acid intoxication is increased.

A diabetic who loses weight does so for one of three reasons: His diet is not strict enough; or it is too strict; or, finally, the case is a hopeless one. Every case is a law unto itself. Severe diabetes is not a disease for a lazy doctor to treat, or for a careless or willful patient to well endure.

As I have grown older I find that I have more and more discarded the use of diabetic breads. No diabetic bread which is palatable for any length of time is safe. We must always reckon with human greed for gold, and I much prefer to give ordinary or perhaps graham bread, the percentage of sugar-forming material in which is known, than to run the chance of deluding myself and my patients. I once visited incognito the agency of a well-known company which purveys for diabetics. "Have you bread for diabetics?" "Yes." "How much starch does it contain?" "None." "What! No starch?" "None!" My friend, Professor Wood, however, said the bread contained 60% of sugar-forming material. Gluten flour from another manufacturer had a low sugar-forming percentage one year and a high one the next.

If alcohol is considered desirable it is best given in the form of whiskey or brandy, a brut champagne, Moselle wine, or one of the California hocks, some of which contain practically no sugar.

I have never used the skimmed-milk cure as advocated by Donkin. To remove the fat and leave the sugar does not seem consistent with common sense. I concede that it has worked well in some cases, but wonder if the explanation does not lie in the fact that these patients had been eating far too much and would have done equally well under a diet judiciously restricted in quantity as well as quality.

A day of starvation once every two or three months is very useful in some cases. Austin Flint's plan of keeping a patient in bed from Saturday night until Monday morning, fasting, has seemed to me a good one. If hunger is felt a little beef tea may be a comfort without really invalidating the fast.

The bowels should always receive careful attention. All the more so if acetone and diacetic acid reactions are present in the urine. The skin also should not be neglected. Hot or vapor baths at home followed by active friction, a Turkish or Russian bath at a well-managed establishment, if the general state of the patient permits, are useful adjuvants, especially if the skin be harsh, dry, and inactive. Ralfe thinks he has succeeded in preventing impending coma by the hot bath. In milder cases, with the skin still relatively active, the tonic effect of a daily cool or cold bath, provided that reaction be prompt, thorough, and maintained, is of service. Diabetics are sensitive to cold, and wool or silk underclothing of light or moderate weight is usually desirable. I think we generally err in this country in the colder season by wearing too heavy underclothing. We keep our houses at summer temperature, and voluntarily load ourselves with clothing which we would think justified revolution if a czar compelled its adoption. A diabetic should have several overcoats of varying thickness and warmth, and can scarcely be too well wrapped up while driving in an open carriage, the only form of conveyance really fit to drive in except in stormy weather.

Worry and anxiety are to be avoided as far as possible. Such avoidance is—alas!—only too often easier to enjoin than to secure; but we must do our best. The man of large affairs and responsibility must be helped to systematize his work, to throw every possible detail on subordinates, and to shorten his working hours. How many of us inspect the down-town offices of our patients in active business in order to remedy defects of light, ventilation, and heating of the apartments where more time is passed than anywhere save in the bedroom? In many cases the sum of small advantages forms a large aggregate, and sunshine and open fires are better classed among the greater than the small advantages. In a word, we are dealing with a class of people whose resistance and vitality are more or less diminished; in many of whom, we have reason to believe, the nervous system is especially at fault. The desirability of moderating nerve strain is therefore obvious.

Muscular exercise is useful directly, in that it burns sugar; indirectly, in that it aids blood and lymph circulation. It is therefore peculiarly adapted to diabetics, provided that thought and intelligence govern its use. In excess it is potent for harm. Outdoor exercise is far better than in any confined space, if the condition and circumstances of the patient permit. As to the form—walking, golf, tennis, horseback—it must depend upon the purse

and taste. We are all so constituted that what we enjoy is, on the chances, better tolerated than what we dislike. Calisthenics and the various forms and degrees of massage, carefully adapted to the individual patient, are for the severer cases. Patients debilitated from any cause rightly ask direction as to the amount of exercise they can take. If the intelligent co-operation of the patient can be secured, better results will follow, even in sanitarium treatment; and most diabetics are not, and cannot be, under constant supervision. The best rule I have been able to formulate is the following: The patient is told, "You exercise; you feel tired; you rest an hour and fatigue passes. That fatigue was physiological, healthy, beneficial. If, on the other hand, after you rest you are still tired, you have done too much."

A change of climate during our Northern winter, with all that such change carries with it in freedom from care and in the ability to be in the open air, may be of great importance.

I am painfully conscious of the sketchiness of these remarks, but try to derive some consolation from the thought that, after all is said, is not he the best practitioner of medicine who, reasonable diagnostic acumen being assumed, at the expense of his own gray matter most skillfully adapts general principles to the particular needs and circumstances of the special case? In passing it occurs to me to add that, unless my experience has been exceptional, it is unusual to observe a case of diabetes from start to finish. The very rapid cases are not very common. Others co-operate heartily for a time; the restrictions then become irksome, and they sometimes shun the doctor, partly because they see that he does not attach much importance to drugs, the giving of which still represents too largely in the public mind the function of the physician, and partly because they do not want to exercise the self-denial which they feel will be demanded of them. In the milder cases past middle life perhaps no great harm results. It is the cases of medium severity which are most apt to suffer from this ostrich-like procedure. We can roughly classify our diabetic patients into those of (a) severe, (b) moderately severe, and (c) mild type.

The classification of any given case can usually be more accurately made after than before a suitable diet is enforced, as some cases prove more or less manageable than we expect when we first see them. And yet, classify as we will, there is every possible gradation between the extremes.

I trust that a few illustrative cases will not trespass too much upon your patience. A patient under twenty is sure to be of the severest type, and is, with very rare exceptions, beyond hope; and yet life may be prolonged even for ten years, as in a young man of exceptional resolution and force of character whom I saw several times. A rigid diet should be enforced as long as it can be tolerated and strength and weight are maintained.

I. Two years ago I saw a girl of ten. Polyuria and sugar had recently and inexplicably appeared. Under strict diet she became sugar free for a considerable time. She now, under the same diet, passes about 50 oz. of urine containing 8% of sugar, looks and feels well, and has held her weight.

II. A school girl of eighteen spent Christmas vacation at home and appeared to her mother as well as usual. She returned to boarding school and soon complained of extreme hunger and thirst, with increasing lassitude. Polyuria was also noted. She lost flesh rapidly, and was sent home Jan. 27. She passed four quarts of urine in the twenty-four hours following her return, and the amount of sugar was 4.6%. There were marked acetone and diacetic acid reactions. In spite of large doses of bicarbonate of soda, and without much change in diet, she went into coma, and died Jan. 30, three days after her return from school. The whole process, as nearly as could be ascertained, was of a little less than a month's duration.

III. A man now thirty-eight, active, florid, muscular, weighing 206, consulted me seven years ago for marked polyuria and 4% of sugar. The polyuria was recent, but the sugar was probably of older date, as he had had eczema of the penis the previous summer. Under strict diet in two weeks the urine became normal. There was a slight loss of weight. He now weighs 175 to 180. He is in good general condition, in spite of extreme and unavoidable business worries and hard work the past four or five years. He has relaxed, and again restricted his diet, sugar reappearing in the urine with less provocation than formerly. I doubt if he will attain old age, though I hope I may be mistaken.

IV. A woman of forty-one, weighing 185, entered the hospital in July, 1891, for sciatica. She had a moderate polyuria with about 1% of sugar, varying from day to day. Under treatment the sugar disappeared from the urine, and she was discharged much relieved after a month in the hospital. A brief record in 1897 states that she was looking well, sugar present. Two other records the same year show sugar in her urine in amounts varying from 1% to 1½%. She entered the hospital again in December, 1903, saying she had taken no special care of herself, except to avoid sweet stuffs. During her two weeks' stay in the hospital this time the urine varied between 42 and 72 oz., the largest amount of sugar being 6%, the lowest, under strict diet, $\frac{1}{10}$ of 1%. She was discharged at her own request, the urine still containing sugar; no acetone or diacetic acid reaction at any time. Weight 175. In twelve years she seems to have lost no ground, and her case is probably to be classed as a favorable one.

V. Seven years ago a man, then sixty-three, of large business responsibilities, first consulted me. Ten months before that a competent observer had found no sugar in his urine. I found a moderate polyuria, and a percentage of sugar.

Weight 184. He was easily rendered sugar free, and after a time could tolerate a moderate amount of starch. From time to time he broke loose, has gradually developed a marked arteriosclerosis, which last spring led, through rank imprudence, to a uremic attack. This has necessitated some change in his diet, and he has never fully regained the weight he lost last spring, now weighing 165, and passing about 2% of sugar without polyuria. He feels well and is in active work, having few mental resources outside of his business.

VI. Shortly after this his brother, one and a half years younger, came to me with great polyuria and much sugar, recent in onset. All symptoms disappeared rapidly under diet, and I have not seen him professionally for six years. About that time he was elected to Congress, and has been since active in political and campaign work, feeling very well with moderate dietary restriction. These brothers are fair examples of diabetes coming on after middle life, in well-nourished though not obese persons—the milder type of the disease. It is usually not necessary to enforce an absolute diet in such cases long; moderate restriction can then be allowed. Some of these cases can later return to practically an ordinary diet without reappearance of sugar. The experience of all of you can, doubtless, duplicate such cases as I have sketched.

In the young, treatment can at best only delay the fatal result. In those in the prime of life great service can generally be rendered, though actual cure occurs only in the minority of cases. In those past middle life the disease is usually well tolerated, and may be of comparatively little moment, provided that reasonable care be exercised; and yet, now and then we encounter cases the course of which proves other than first impressions would lead us to expect.

MEDICAL TREATMENT OF DIABETES.¹

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THE pathology of diabetes mellitus has been the most elusive subject of modern medicine. Repeatedly during the past forty years we have seemed to be on the verge of important discoveries relating to it, only to find that our uncertainties, instead of being dispelled, had simply taken new forms, which in turn have raised other problems to solve.

It is, of course, due to the great obscurity resting upon the physiological mechanism for the disposal of the carbohydrates of food in the system that the pathology of diabetes has remained so uncertain. Fifteen years ago in a symposium like this, held at a medical gathering in New York City, I suggested that we were yet without any knowledge of a seemingly important factor in the problem, and that was the relation of the muscular tissues to the utiliza-

tion of the saccharine elements of food. The facts which we did know then were that the muscular tissues were virtually the chief generators of animal heat, and that quite apart from their function of contraction and of relaxation was their function of oxidation, so that the blood collected from the veins of a large muscle like the gluteus, though the muscle were at perfect rest, yet contained less oxygen and more carbon dioxide than the blood of the right ventricle itself, as this latter was mixed with blood from the great glandular viscera, where oxidation is less active than in muscle. This shows how much burning up of blood contents occurs when the blood is coursing through muscular tissue, and as the chief material for such oxidation consists of carbohydrates, some failure in this muscular function might have much to do with the pathological failure of sugar oxidation in diabetes.

This suggestion was received with incredulity, and most of the speakers confined their attention to the supposed relations of the nervous system and of the glycogenic functions of the liver to this disease. Not long afterwards the pancreas in its relation to diabetes came to the front, and has maintained its place as one important factor in the problem ever since. Lately the news comes that O. Cohnheim finds that an enzyme is produced in muscle which if alone does not act upon sugar, but when mixed with the secretion of the pancreatic cells of Langerhans is a very energetic solvent, in the same way that trypsin becomes effective only when conjoined with the kinsic ferment in the intestine.

Until physiology becomes settled, pathology cannot be settled; and, therefore, therapeutics, while matters so stand, must remain mainly empirical. And so I confess that I regard the subject of medical treatment of diabetes, which has been assigned to me, as one to which I can contribute little beyond the results of my experience, based upon written notes of the histories of patients whom I have treated in the course of years.

To the question, When does glycosuria mean diabetes? my answer is that we do not know. That glycosuria, limiting that term to dextrosuria, is an epiphenomenon, appearing in the most diverse connections, we all know. Like albuminuria, it occurs too often and too variously as a temporary accompaniment of different disorders to be rated as frequently no more than a symptom. In the case, however, of albuminuria we usually can form some conception of its causation. But with glycosuria we do not know whence it cometh nor whether it goeth; and, therefore, we can never be sure what its significance is. Hence, I feel skeptical about the assurance with which some pronounce offhand a given case as one only of glycosuria and another as surely diabetes, because in my experience some patients come with both a moderate and an intermittent presence of sugar in the urine, and with no consti-

¹ Read before the Medical Society of the State of New York at its Annual Meeting, Albany, Jan. 26, 1904. Symposium on Diabetes.