SOME PRACTICAL CONSIDERATIONS IN DIABETES MELLITUS

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Diabetes no longer presents the economic problem that it has in the past. Before the era of insulin, diabetic patients were a great liability. Usually patients with severe diabetes were a hopeless burden to their families or to their communities. Those of you who have treated diabetics for as long as 11 years, know well the problems that severe diabetes presented. Treatment by starvation, the only method available in those days, was anything but pleasant for the physician, as well as for the patient.

Today in this country there are nearly two million patients with diabetes in various degrees of severity. They are no longer a great liability, but, for the most part a definite asset to society. A diabetic patient no longer has to starve himself, he no longer has a dreary outlook on life's progress, he no longer has the fear of early death. Quite the contrary, he may have a liberal diet, his outlook on life is cheerful, he accomplishes as much, if not more, than the fellow who has no diabetes, and, as has been shown by statistics, his life span is longer than that of persons without diabetes. In the history of medical diseases the chapter of diabetes reads like a fairy tale. Such rapid progress seems almost unbelievable.

The routine treatment of diabetes is so well known and so well standardized, that I shall spend no time discussing it. The basic principles of the regimen are described in any standard work on medicine. A clear understanding of the details in the treatment of diabetes comes only from prolonged work and experience in the field. In the future I feel but little progress will be made in treatment. Certainly I look for no radical changes. Where tremendous progress will occur, however, is in prevention and in the treatment of juvenile diabetes. Today these present the most interesting problems and the most promising fields for clinical investigation. Our future milestones of progress will be marked by the children afflicted with diabetes. For that reason, the treatment and the study of diabetic children ought to be restricted to fewer men, so as to give them an opportunity to gain a wider experience and to exert a more concentrated effort in order that progress in this special field may be more rapid. There are relatively few diabetic children and if many different doctors are treating them, further progress is likely to be retarded.

Before discussing the prevention of diabetes, I want to stress the importance to the patient of the early recognition and early treatment of the disease.

The importance of early treatment. With all our studies and efforts at prevention diabetic patients will always be with us. By the methods of prevention we can hope only to reduce the total number of diabetics. Inasmuch as diabetes is and always will be a medical problem of considerable extent, an effort should be made to discover the disease in its incipiency. To discover and to treat tuberculosis in its incipiency is well recognized as *the* orthodox procedure, the only procedure which brings good results. With diabetes there is identically the same problem. Discover it in its incipiency and you will have done a valuable service to your patient, for you will have a splendid opportunity to prevent any further destruction or dysfunction of the islands and keep his diabetes in a mild stage. Those islands that are gone can not be replaced but those that are still present can perhaps be saved; that is the medical problem confronting the physician at any stage of diabetes.

Upon finding a trace of sugar in the urine, especially in a young or middle-aged patient, it is wrong to leave it at that, to wait until much sugar appears, or to tell the patient just to cut down a bit on sugars and starches. Such a patient needs further investigation and a definite solution of his problem. It may be the beginning of diabetes or when his problem has been worked out it may be found that he does not even have diabetes. Having no laboratory facilities is no excuse, for there are plenty of laboratories and plenty of well trained medical men who will gladly work out the problem and give their data and their advice. I am emphasizing this because I meet with this situation frequently. Patients today usually are keen and wide awake and with just a spark of suspicion they may look for help elsewhere. And how easily the physician can eliminate this very thing and protect himself. Repeatedly I have seen patients who have been treated for diabetes, from one month to two or three years, and finally when the case was studied thoroughly it was found that they did not have diabetes. Or again, I have seen patients whose diabetes definitely began a year or so before with no treatment in the interim, and by the time I saw them they had severe diabetes which necessitated strict diet and insulin. Perhaps a year before, when the diabetes was just starting, they might have been treated more economically and more efficiently with a milder regimen.

It is well not to wait for the development of the classical symptoms of diabetes. They are present in a comparatively small per-

centage of cases and if they are taken as criteria the majority of diabetics will have been missed. The early cases have practically no symptoms of any significance. These come only at a more advanced stage of diabetes. If the diabetes has been developing gradually the symptoms will not appear at all, for the body has had ample time to readjust itself to the new state of affairs. The symptoms do come if the onset is rapid, and the rise of blood sugar overwhelming, for in such a case the body has not had time for physiological readjustment and most or all the classical symptoms will be present. Or symptoms will appear in a case that has been evolving gradually when an acute infection of some sort, tonsillitis, carbuncle, influenza, superimposed on the slowly developing diabetes rapidly raises the blood sugar and produces acidosis. Such a patient may even go into coma within 24 hours.

At the Cleveland Clinic we do routine blood sugars in all new cases. The percentage of patients with unsuspected diabetes, discovered in this manner is considerable. You can imagine how chagrinned a physician feels when he has taken a careful history and has done a thorough physical examination and has sought the counsel of one or more specialists for whatever seemed indicated, and then a blood sugar report of 380 mg. per 100 c.c. comes from the laboratory. This settles the problem of diagnosis, yet when the history is re-examined, there is not an inkling of a symptom or a complaint which would even suggest diabetes.

Just as I wrote this such a case came to my attention at the Clinic. The patient was a man 64 years of age, who came in for an entirely different reason, and diabetes was not suspected until the laboratory report appeared. Two more such cases appeared the next day. One of the most striking cases that comes to my mind was that of a young girl, 16 years of age, whom I saw in coma three years ago. In going back over her history, there was not an inkling of a symptom which would make one think of diabetes. And yet she went into coma within 24 hours, following an acute gastro-intestinal infection.

Many of these patients with a very high level of blood sugar do not have glycosuria. It is not uncommon to see the blood sugar as high as 200 mg. to 300 mg. per 100 c.c. without accompanying glycosuria. The highest value for blood sugar without glycosuria that I have seen was 552, a figure which is, of course, exceptional.

Whether or not sugar will appear in the urine at any given time depends entirely upon the renal threshold for sugar of the particular person. This renal threshold is not fixed, but varies widely in dif-

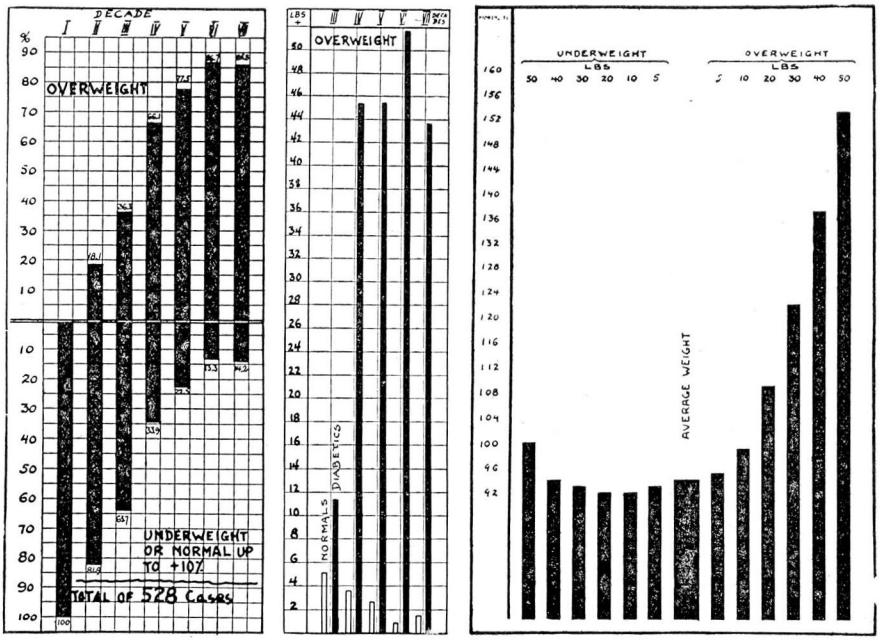
ferent individuals and perhaps slightly in the same individual. The renal threshold is high in the obese, and there is also a step-like rise of thresholds in various affections. I do not mean to imply that these are fixed figures, for these are but average values; in each group there is a wide range up and down. The diabetics have the highest threshold of all. This may be a protective mechanism of nature's to prevent more sugar from being excreted.

For that reason the clinical course of diabetic patients who have a high renal threshold can not be followed well by urinary examinations alone. In treatment an effort is made to approach as nearly as possible the physiological type of glycemia. Hyperglycemia is not physiological. Diabetic patients who have a low threshold can be guided even less by the urinary examinations, as they will show a more or less constant glycosuria. It is in the middle group of patients in which guidance and follow-up may be accomplished by urinary examinations alone. But in order to know to which of the three groups any given patient belongs, one has to work out the problem of the patient's renal threshold. For a quick and practical answer to a man in general practice this is of little help. This just shows the problems involved in the treatment of diabetes. I do not mean to be discouraging, for, after all, good work in the treatment of diabetes was done when no studies of blood sugar were available. And good work can still be done, though the availability of blood-sugar studies improves the situation. If one is dependent upon urine examinations alone, one should examine the 24-hour specimen of urine and compare the subsequent examinations in order to see whether the 24-hour output is diminishing or whether it is increasing, so that one can alter the treatment accordingly. Even a better way is to examine each specimen of urine during the 24 hours in order to see at what time during the day the patient is losing sugar, and when his urine is sugar-free. In this manner, if insulin is used, the dosage can be adjusted more closely. The examination of a single specimen of urine, taken at random, is of very little value.

Prevention. By the prevention of obesity and infections, much can be done to prevent the development of diabetes. As compared with this, the treatment of diabetes plays but a secondary role, and is but a mere palliative measure. Prevention presents a challenge to accomplish something constructive. The symptomatic treatment of malaria *did not* solve the problem of malaria. The elimination of the mosquito was not treatment; but it *did* solve the problem of malaria!

Obesity. In the studies of men devoting much of their time to diabetes much stress is laid on obesity. In the report of a series of

2,000 diabetics that I published in 1930,[1] 76 per cent were overweight either at the time I first saw them or previously. The number of patients with obesity increases with each decade and is most marked in the fourth, fifth and sixth decades; in the last two decades including nearly 90 per cent of those in this age group. The average number of those overweight among patients with diabetes which developed in the fourth decade or later was 79 per cent. The contrast in the percentage of obesity in diabetics and in normal persons is very striking, as can be seen in Chart I, where these two groups are projected side by side according to decades; the figures were obtained from life insurance statistics.



(*a*) (*b*) (*c*)

Chart I. (*a*) The relation of overweight according to decades in a series of 528 diabetics. (*b*) The relationship of obesity in diabetics (black column) arranged according to decades as compared with a large series of non-diabetics in these same decades taken from life insurance statistics. (*c*) The relation of weight to the mortality rate.

This is an illuminating picture and it has significance other than just in diabetes. Obesity leads to general diseases due to metabolic degeneration, such as arteriosclerosis, myocarditis, hypertension, chronic nephritis, et cetera. All of these tend to shorten the span of life. In Chart I also is the information on longevity and over-

weight as given by life insurance statistics. These facts are striking, for it is known that the life insurance companies are particular in the evaluation of their risks, and in the study and elimination of physical factors which might shorten the life span. Therefore, this information which they offer us is important since it deals primarily with only the one factor, overweight. Note on the chart how the mortality rate is unaffected by underweight which is shown to the left of the normal standard in the middle. However, when extreme undernutrition is reached, there is a slight increase in the rate of mortality. But look to the right and see the effect of increased weight and its progressive rise of mortality. This needs no comment; the data speak for themselves.

Obesity presupposes overeating. Newburgh in his recent study of obesity[2] makes the following drastic statement: "There is no specific metabolic abnormality in obesity. All obesity is "simple obesity." The increase in weight merely represents an inflow of energy greater than the outflow. Failure of the primitive instinct to adjust the inflow of energy to the bodily needs is always the immediate cause of both leanness and obesity."

What practical relationship, then, has obesity to diabetes? Already I have called attention to the great amount of obesity accompanying diabetes. If obesity is due primarily to overeating, these persons have been placing a great load on the insulogenic function of their bodies. Increased amount of food calls for an increased output of insulin. An increased output of insulin can be provided as long as the insulogenic apparatus is intact, functioning well and maintaining a great reserve. But suppose that an individual was born with an insulogenic apparatus which had not an unlimited reserve; or suppose that an individual was born with a perfectly functioning pancreas, with good reserve, which had been diminished through infections; or suppose that through sclerosis of the vessels, the blood supply to the pancreas had been diminished and a certain atrophy of the islets, either anatomical or functional has resulted, reducing thus the reserve of the insulogenic function. By overeating, and thus placing a big load on such a handicapped organ, it is easy to see how a reduced reserve could be lessened further with the ultimate development of diabetes. This point should be borne in mind in dealing with all types of obesity, for here is an excellent field in which to practice preventive medicine and to reduce the incidence of diabetes.

In a series of 1100 glucose tolerance curves that I published[3] in 1930, 65.6 per cent of cases of obesity in a series of 297 investigated showed a diabetic type of a curve. This fact is even more striking

when we compare the carbohydrate metabolism in obesity cases to that in a group of patients who are not overweight. There are two and a half times as many diabetics among the obese as there are among the lean. The renal threshold in obesity is relatively high, as has already been stated, so in order to investigate the status of an obese person in relation to diabetes, examination of the urine for sugar is not sufficient, but one must resort to blood sugar

TABLE I

The Results of Glucose Tolerance Tests on Obese Patients and Those Presenting Normal Weight

	Type of Curve		Number of Cases	Total	Per Cent	Total Number Cases
Obesity	I	Nondiabetic	16	59	34.3	172
	II		43			
	III	Diabetic	23	113	65.6	
	IV		90			
Normal Weight	I	Nondiabetic	92	213	74.2	287
	II		121			
	III	Diabetic	24	74	25.8	
	IV		50			

studies. Whether or not a rise in the renal threshold for sugar means chronic nephritis, is a problem which the pathologists will have to answer.

Hypertension develops more frequently in the obese. In a study of hypertension in various diseases it was found that there is an increase of blood pressure in 42 per cent of the obese; only in carcinomatosis and in hyperthyroidism is there a higher incidence of hypertension. The influence of obesity may be seen even in the group with hyperthyroidism, for when the obese hyperthyroid patients are separated from the lean ones, the incidence of hypertension is again higher among those who are overweight.

Infection. Infections probably play a greater role in the causation of diabetes than we think at present. Though clear-cut evidence of any factor in question is an excellent prerequisite for scientific work, tangible evidence is not always available. Not all medical problems can be solved in a test tube or in the laboratory. A certain amount of philosophy and deductive logic is necessary. Long experience makes such deductions more tenable. All of you, no doubt, have had a "hunch" at the bedside that the fate of the patient before you would be thus and thus; yet were you pinned down to actual facts, you could not explain it in scientific terms. Experience

has taught you, you will say, but more than that is in obscurity. It is on such authority that I say that infections play a considerable role in the development of diabetes. We all see patients whose diabetes followed some infectious disease, such as influenza, pneumonia, cholecystitis, or, in children, mumps, measles, or tonsilitis. In such cases, one can't help but feel that there is a definite connection between the diabetes and the infection.

Let me tell you of a concrete example: A little boy eight years of age, was much emaciated when he was first admitted to my care at the Cleveland Clinic. His blood sugar was 288 mg. per hundred cubic centimeters and he weighed 38 pounds. (Normal weight at his age would be 55 pounds). He gained practically 10 pounds in weight during his stay in the hospital. As much as 35 units of insulin per day had to be used and he was discharged from the hospital after a stay of 23 days with advice to use 25 units of insulin per day. A month later this was reduced to 10 units per day and in less than three months from the time I first saw him, all insulin was discontinued, and he was allowed to increase his diet to 2000 calories, as you will note from the chart. Three weeks later he developed measles. He lived in a small town and the family physician did not realize the havoc wrought by infections in children with even mild diabetes, and hence he did not appreciate the importance of administering insulin at that time. When I saw the boy two weeks later his blood sugar was 497 mg. per 100 c.c. The resumption of treatment with insulin and reduction of the diet was necessary. The dosage of insulin had to be increased up to 80 units per day (in four doses) and the entire course of treatment had to be repeated. The infection resulted in definite damage to the pancreas, for even today — two years later — the boy has to take 27 units of insulin per day. I believe all this might have been prevented by the timely administration of insulin when measles first developed.

A diabetic child should be watched closely when an infection begins, for then more insulin is required temporarily, to protect him from a downward course. If the child's diabetes ordinarily is controlled by diet alone, he requires some insulin, the amount depending on the severity of the infection. Only in this manner can a diabetic child go through an infection safely, without a decrease of his tolerance for carbohydrates. Even such a simple problem presents, then, a fertile field for preventive medicine and gives the physician an opportunity to do constructive work.

The deleterious effect of infection is evident not only in children, but also in adults. I present the case of an old man now 76 years

of age. I am presenting to you the influence of infection in the two extremes of life. This man had always been in good health. In 1919 prostatectomy had been performed and he had made an uneventful recovery. Several urine examinations in 1922 did not reveal the presence of sugar. In 1923 epidydimitis developed, and no sugar appeared in the urine subsequent to this, nor yet in 1924. In February, 1926, there was a slight rise of blood sugar to 149. When this was rechecked a month later it was 114 — normal.

It might be questioned whether this slight rise in the blood sugar was a warning or of no consequence in a man seventy years of age. Undoubtedly it was a warning, for ten months later heavy glycosuria developed with a blood sugar of 400, and the patient had frank diabetes. Could his diabetes have been prevented by mild restrictions in diet had not the original rise in the blood sugar been disregarded? I feel rather certain that it might have been, especially in the light of subsequent happenings.

The patient was hospitalized for two weeks; he was given insulin and a low carbohydrate diet, and his blood sugar returned to normal. When he was discharged he was not taking insulin and was taking a fairly liberal diet. For some years he was quite well and on each subsequent examination his urine was free from sugar and the blood sugar was normal. In January, 1930, when the patient was seventy-four years of age, cystitis developed. Again the diabetes came into the foreground, requiring the routine measures for control. Even yet, this man needs a small amount of insulin, five units twice daily. This case illustrates again, just as in the previous case, what infection does.

It is likely that a similar thing, i.e., loss of some insulogenic function, happens to all of us with any serious infection. This, however, is of small concern, if we have adequate insulogenic reserve, which can not easily be exhausted. It is only when such a reserve is small that diabetes can and does develop.

This premise can be evolved still further. Presupposing a good insulogenic reserve; one infection reduced it; a second infection reduces it more; a series of subsequent infections reduce it still further, until the dividing line may be reached where only one more infection may bring about diabetes. That next infection may or may not take place and consequently the person may or may not develop diabetes. In such a borderline case there are two further possibilities. Such an individual may be just a moderate eater and keep his weight normal, or he may live well and become obese. In the first instance he will stay a borderline case the rest of his life;

whereas in the second, he will break down that small reserve and become a patient with diabetes. It is the last straw always, which breaks the camel's back.

The same reasoning may be applied to the question of hyperthyroidism. Why is it that some hyperthyroid patients do develop hyperglycemia, glycosuria, diabetes? It is not the stress of hyperthyroidism alone which brings it about, for were it this factor, diabetes would be seen principally in the most severe cases of hyperthyroidism. This is not the case, however, for diabetes often is encountered in the mildest cases of hyperthyroidism. In these cases the added strain of hyperthyroidism again happens to be the last straw. Diabetes in hyperthyroidism is not an academic phantom, but a reality. In 9,000 cases of thyroid disease seen at the Cleveland Clinic, 620 cases of 6.88 per cent showed some degree of nonphysiological hyperglycemia. When followed for a period of one to ten years, it was found that most of them improved, but 200 of these 620 patients remained diabetic after thyroidectomy. Over one-third of this permanently diabetic group are still taking insulin in order to control their diabetes. Thus, although 6.88 per cent of patients with hyperthyroidism showed evidence of disturbed sugar metabolism the incidence of actual diabetes in thyroid disease was only 2.1 per cent.

Glycosuria in gallbladder disease occurred five times in 16 cases, that is, in 31 per cent. In this same series, nonphysiological hyperglycemia occurred in six instances at some time or other. In this same group of patients, nine, or 56 per cent, had a normal glucose tolerance curve and seven, or 44 per cent, had a diabetic type of curve.

This shows the relationship of chronic infection to diabetes. The incidence of diabetes in this group is quite heavy. In this group of patients with gallbladder disease it is interesting that the incidence of diabetes rises in succeeding decades. Thus we find in the fourth decade, 20 per cent, in the fifth decade 44 per cent and in the sixth decade 84 per cent with the diabetic type of curves. This suggests that the effects of a prolonged infection, together with physiological wear and tear, finally break down the reserve and results in diabetes. It points also to the need of removing all foci of infection in diabetic patients, whether these be in the tonsils, in the sinuses, in the teeth, in the prostate or in the gallbladder, in order to stop progressive damage within the pancreas.

Surgery in Diabetes. Operation in the presence of diabetes no longer presents the dreaded problem to the surgeon that it did in

TABLE 2

The Mortality of Operation in the Presence of Diabetes in the Preinsulin Era

	Year	Number of Operations	Mortality, Per Cent
Berkman	1915	26	7.6
Binney	1916-1923	32	19
Bruce	1914	...	50
Bruce	1927	4	0
Chovannez	1925	...	40
Cumston	1914	6	16.66
Fisher	1914	86	48.4
Fitz	1918	45	30
Foster	1925	...	45
Gardiner	1922	25 (Amputations)	80
Jones	1923	8	25
Joslin	to 1917	27	18
Joslin	1919	61	9
Karewski	1914	68	11.8
Lahey	1916	14	7.1 (Thyroid)
Mason	1916-1924	101	18
Mayer	1914	...	54.6
Menninger	1925	47	42.5
Morrison	1896-1913	775	23
Mugind	1921	5	80
Noble	1903	...	24
Phillips	1902	101	27
Phillips			
Pilcher	1910	...	50 (Amputations)
Strouse	1916	38	31
Tuffier	1914	...	40
Weeden	1897-1922	160	36.8
Young	1918-1922	99	16.1
		1,728 Total	31.3 Average

the preinsulin era. Today a diabetic patient can be operated on with reasonable safety, provided he is given proper care. Whether this care is rendered by the surgeon or the internist is immaterial. The surgeon, however, is not likely to deal with the medical problems of the diabetic frequently, and, for that reason, he is wise to lean upon the wider experience of the clinician who is well versed in this field.

In the preinsulin era the surgical mortality in diabetes as shown in Table 2, amounted to 31.3 per cent. The ranges in this table are from 0 to 80 per cent. In reality, I believe, the mortality was even higher for there must be much unpublished material. It is discourag-

TABLE 3

Surgery in Diabetes in the Insulin Era

	Year	Number of Operations	Mortality, Per Cent
Adams and Wilder	1924	327	1.2
Bauman	1925	56	26.7
Bazin	1930	73	2.7
Bruce	1927	97	2.1
Cohen	1923	8	14
Coler and March	1925	65	24.6
Eliason and Wright	1926	55	41.8
Foster	1925	103	11.6
John	1921-1925	35	8.5
John	1925-1928	276	4.3
John	to 12/5/30**	462	4.7
Joslin	1923	69	5.7
Joslin	1924	75	14.6
Joslin	1925	97	10.3
Joslin	1926	81	14.8
Joslin	1927	321	11.5
Judd	1926	667	3
Lemann	1926	43	2.3
Mason	1925	101	17.8
McKittrick and Root	1928	80	11.2
Menninger	1925	22	4.5
Petty	1924	31	12.6
Rabinovitch*	1930	130	5.3
Reed	1929	43	25.5
Roth	1926	20	10
Weeden	1924	12	1.2
		3,349 Total	11.3 Aver.

*Verbal report. **Unpublished.

ing, to say the least, to publish statistics showing a high mortality rate and no one likes to write about discouraging data.

Since the advent of insulin, data gathered from the world literature in Table 3, show that the average surgical mortality has dropped to 12 per cent. This means that on the average, where three patients died in the preinsulin era, only one dies now. A splendid record for just a decade, and as time goes on I venture to say that even this average of 12 per cent will be diminished considerably and approach quite nearly the surgical mortality in non-diabetic patients.

Such progress is encouraging, not only to the physician but to the patient as well, for it removes the dread of operation which in previous decades could not be avoided. As a result, more and more

diabetic patients are being operated on early and not as a last resort. This too has some bearing on the reduction of the mortality rate.

The treatment of the diabetic who has had an operation is exactly the same as that of the ordinary diabetic, that is, dietary control or dietary control plus insulin. Patients who are ill and can not tolerate food by mouth, are supplied their nourishment through the intravenous administration of glucose to which a sufficient amount of insulin is added to insure the utilization of this glucose. In this way, a patient may be kept comfortable for days, even weeks, at a time, without food by mouth.

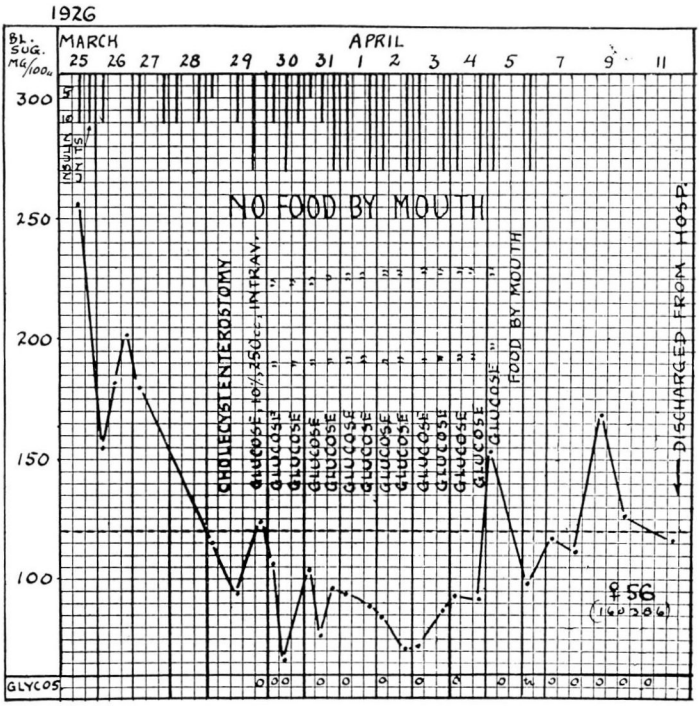


Chart II. The progress of a case of jaundice associated with diabetes mellitus before and after operation; no food was given by mouth for seven days.

Chart II shows the results of this postoperative procedure in a woman 56 years of age who had had a cholecystenterostomy. In order to eliminate peristalsis which might interfere with the healing, she was given 250 c.c. of 10 per cent glucose together with 20 units of insulin twice a day for seven days. During this time she was quite comfortable, there was no hunger, and she made an uneventful

recovery. The administration of glucose did not raise the level of the blood sugar at any time and the urine was sugar-free. When some time ago I went over the data relating to intravenous administration of glucose in diabetics, I found the following: Of a total of 54 cases, 81.5 per cent showed a fall of blood sugar two hours after its administration; 3.7 per cent showed no change in the level of blood sugar; 14.8 per cent showed a rise of blood sugar. The average fall of the level of the blood sugar was 29 mg. per hour; the average rise of blood sugar was 19 mg. per hour.

A diabetic patient should be prepared for the operation, that is, his diabetic condition should be under control and his sensitivity to insulin ascertained. However, in cases of emergency, operation may be done immediately provided the medical man cooperates with the surgeon. A small dose of insulin is given before the operation and the blood sugar, acetone, and carbon dioxide estimations are done (it takes but 25 minutes) while the patient is on the operating table. If the level of sugar is high, another small dose of insulin is given while the patient is undergoing operation. Immediately following the operation, treatment is instituted with insulin, hypodermoclysis, and also glucose intravenously if indicated. It is wise to obtain sufficient laboratory data during the first two or three days; this insures safer and more adequate treatment with better results.

Chloroform as a general anesthetic no longer is used in this country. It injures the liver, causes hyperglycemia and acidosis and for that reason is contraindicated in diabetes. Ether is not much better, especially because of the postoperative nausea which it causes. Nitrous oxide is a preferable general anesthetic. More and more, however, the surgeons are turning to local and lumbar anesthesia and the results are very promising. Just what ether narcosis does to the blood sugar has been shown by experiments on rabbits, which have a parallel in man. The higher curves of blood sugar indicate deeper narcosis. Not only does the blood sugar rise during ether narcosis, but there is a concomitant increase in the ketone bodies which, in a diabetic patient, is undesirable.

Another very helpful thing in the postoperative care of diabetic patients is the early use of the oxygen tent when this is indicated in cases of anoxemia. It should be used before the patient becomes definitely cyanotic. The early signs of anoxemia are excitability, stimulation, headache, rapid pulse and a dusky appearance of the nails.

Juvenile Diabetes. The treatment of children afflicted with diabetes offers today the most encouraging phase of the whole

problem. When we stop to think that before the insulin era they were doomed, that there was nothing to look forward to, that the physician had absolutely nothing to offer to the mother of such a child except a slow, gradual starvation of her child and finally, inevitable death; this was enough to shake even an old medical warrior. Joslin in his health talk on Diabetes (which by the way is a splendid little book for every physician to have in his waiting room because of the general information which it offers to the layman), makes this statement: "One of the most noted child specialists in the United States wished he might never have another diabetic child to treat, so sad was it to see a child starve to death." In those years, it was really a blessing if an intercurrent infection swept the child off of the list of the living, thus cutting short the prolonged agony of the child as well as of the parents.

We have had insulin only a decade, but what a difference do we see with these little diabetics. No longer do we deal with an undernourished, starving, fretful child, but with a vigorous youth growing up normally, full of mischief, full of ambition. Last summer while operating a summer camp for diabetic children it was really stimulating to me to see the trend of their conversation, which concerned going to college and speaking of professional occupations. And this was not just empty childish talk, for they actually are doing it. Just now four of my youthful diabetics whom I have had under my care for a number of years, are in college. And it is pleasing that their records show that they rank high scholastically.

Some time ago while addressing a group of Jewish women on the diabetic child, I said the following: "A diabetic child lives at a sacrifice, for only thus is his survival possible. He lives by self-imposed discipline. Don't think for a minute that when this child grows up, he will be an ordinary person. He will be the outstanding person in his group, for he has learned early in life what the other fellow learns late in life, if ever. Already some of these youthful diabetics, whose survival has been made possible, thanks to insulin, have shown their worth and are occupying places of responsibility and places of leadership in our social structure. Help these children now when they need your help most, watch their progress, for you will hear from them later."

And already we are hearing from them from all directions. They are growing up into serious-minded and responsible citizens. Each year there are more and more of them, so it behooves us to think of this rapidly growing group and to plan for them in our medical world. Summer camps for diabetic children are needed all over the country in order to give them an outdoor vacation during the

summer under proper conditions, such as have been provided for all other groups of children. When confronted about a camp by such a diabetic child, we can't say simply, "I never thought of it"—for he has, and he has a right to think of it. The psychologic influence of camp life on the diabetic child is most interesting. Many diabetic children come there with a sort of inferiority complex. This, however, is soon discarded after a few days at camp, and the child gains self-confidence and independence; it is a real joy to see such transformation taking place in these children. One can't help but feel that any sacrifice for them is worth while, and then, last, but not least, is to be considered the respite which a sojourn at camp offers to the mothers who are tied down by diabetic children 365 days of the year. It was really the thought of the mothers of these diabetic children which led me to the idea of such a camp years ago. I saw them bending under the great load, disheartened and exhausted. I felt then that the problem of such a diabetic child did not consist in the mere scientific management of that child, but in some consideration of the mother who carried the brunt of the load. It was the mother who had to be relieved, somehow, because her survival was essential for the survival of her child, and a summer camp for diabetic children is the answer both for the child and for the mother.

Pregnancy in Diabetes. Three of my diabetic girls already have grown up and have married and now have healthy babies of their own. That, too, was an impossibility in the past. In the first place, diabetic girls did not survive. Diabetic women in the preinsulin era had no menses and therefore were sterile. Pregnancies occurred but rarely and I believe that the few instances happened in mild cases of diabetes. Now, this whole picture has changed: a woman is again restored to her normal physiological plateau, even though she had not menstruated for 15 years before the insulin era. The mortality of diabetic mothers in the preinsulin era was high as one can see from Table 4. During the two years following parturi-

TABLE 4

Mortality of Diabetic Mothers in the Preinsulin Era

Author	Year	Per Cent Mortality
Hirschfeld	....	50
Williams	1926	27 — 23% more died in 2 years.
Hansen	1928	17
Colorni	....	46 — In the first two years.
Wiener	1923	30 — 21% more in 2½ years.

tion there was an added mortality of about 20 per cent. Therefore, it was a most serious procedure for a diabetic woman to attempt to go through pregnancy, for the risk was extreme. This state of affairs exists no longer for now these prospective mothers can be carried with safety through pregnancy and parturition.

It is a known fact that the babies of diabetic mothers are large, or, at any rate, many large babies are reported in the literature. Hence, an obstetrician never fails to investigate the possibility of the presence of diabetes in a mother who has given birth to a large baby. In the records which I gathered from the literature in a series of 54 babies born of diabetic mothers, the average weight was 10.1 pounds (the highest being 16 pounds) whereas the average weight of a child born of a normal mother, according to Williams is 7.25 pounds. This makes a ratio of 100:71. There are a few cases on record of babies born with diabetes, though this is of rare occurrence.

During the last few months of pregnancy the mother's diabetes improves and then it is necessary to lower the dosage of insulin. This very likely is due to the interdependent metabolism, with the fetus supplying insulin to the mother. This point has been questioned, but more and more evidence is being gathered for such an explanation. Another explanation is that the hyperglycemia of the mother stimulates the growth of the fetal insulogenic apparatus, which hypertrophies, or, at any rate, overfunctions and produces an excess of insulin. This in turn, reduces the amount of the mother's blood sugar and produces a large fetus. Perhaps both mechanism are at work. Theoretically it would seem dangerous for the fetus to develop a hyperfunctioning insulogenic apparatus; for then after birth cuts off the excessive intake of sugar due to the maternal hyperglycemia, such an overproduction of insulin would produce hypoglycemia in the child which might even be fatal. This will have to be worked out by obstetricians who have access to the data in a large number of cases; they might thus ascertain whether the death of such babies shortly after birth is due to hypoglycemic shock. This would seem probable.

Summary

The classical symptoms of diabetes usually are lacking. Hence it is important to determine the amount of sugar in the blood as part of the general physical examination. Early recognition and early treatment are of extreme importance to the patient with diabetes.

The prevention of obesity is of prime importance in the prevention of diabetes. The effect of infections, both acute and chronic,

is discussed, and the importance of removing all foci of infection in diabetics is urged. In this connection, the constantly decreasing surgical mortality in diabetes is emphasized.

The treatment of children with diabetes presents a great challenge and inspiration to the physician, and this is a field of diabetes in which further progress may be anticipated. The course of diabetic mothers during pregnancy is discussed briefly.

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