

SPONTANEOUS DISAPPEARANCE OF
DIABETES

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In certain patients with diabetes, I have often noted such a markedly increased carbohydrate tolerance that it seemed almost equivalent to a cure, but up to the present time, in no case have I had sufficient scientific evidence to prove that a case was definitely cured. Recently I have been able to collect sufficient data in two cases of diabetes associated with acromegaly to afford a basis, with the data on a few other cases that have recently appeared in the literature, for serious

diet, was in perfect health and did not show a trace of glycosuria.

Boyd and Robinson have recently reported the case of a boy, aged 9 years, who had had diabetes since he was 2 years old. Under treatment with insulin, he improved remarkably and his carbohydrate tolerance increased markedly, being trebled in a year, when the insulin was reduced from 90 to 30 units daily. The authors state that "from a chronic invalid in 1922 he became the leader of a 'gang' in 1923, and he was killed by fracturing his skull when sleigh-riding. He lived only about three hours after receipt of the injury and an immediate postmortem examination was made," at which the authors found actual regeneration of the cells of the islands of Langerhans. Such a case is very



Chart 1.—Observations in case of diabetes associated with acromegaly showing apparent cure of diabetes.

consideration of the possibility of effecting a cure in certain cases of diabetes.

Thus, Joslin reports a case of diabetes in a little boy who first showed sugar in the urine at the age of 7, although symptoms of diabetes had been present during the preceding year. His mother also had had diabetes. On a diet that was practically normal except for some restriction of sugar, he remained sugar free for fifteen years, although his weight was always somewhat subnormal.

Von Noorden reports the case of a boy, aged 7 years, with diabetes, who even when on a strict diet constantly excreted from 20 to 30 gm. of sugar and considerable quantities of acetone. On an oatmeal and vegetable diet, he became sugar free. At the age of 12, when again seen by von Noorden, he was eating an ordinary

instructive, suggesting the possibility of regeneration or formation of new islands in the pancreas on insulin therapy.

This case supplies an important corollary to the important work of Copp and Barclay at the Physiatrie Institute. These investigators have shown that in dogs in which a diabetic status was induced by the ablation of a large portion of the pancreas, and by overfeeding, if the damage to the islands of Langerhans had not progressed beyond the stage of hydropic degeneration of the beta cells, the process could be reversed by a proper dietetic treatment or with insulin, if necessary. That is, what seemed to be a restoration of the islands took place with resultant functional improvement. It would appear, therefore, that the destructive change in the islands of Langerhans to which diabetes is due,

up to a certain stage, may be considered as a reversible process.

To the foregoing reports from the literature, the following case histories are added:

REPORT OF CASES

CASE 1.—A man, aged 55, came to the clinic in March, 1925, complaining of general weakness, intense thirst and polyuria. The patient had had none of the diseases of childhood, but had had pneumonia and rheumatism in later life. At the age of 22, his head was injured and his leg broken in an accident. In 1924, he had some teeth extracted. Apart from the rheumatism, the patient had been fairly well until December, 1924, about three months before I saw him, when he had an attack of hiccup which lasted for five days, and glycosuria was discovered by the family physician, who had treated him for the past two months with insulin. At times, he had double vision and the eyelids drooped a little. On exertion, he had

albumin; a few hyaline casts. Blood examination revealed: red blood cells, 4,550,000; white blood cells, 5,900; hemoglobin, 85 per cent.

On the day after admission, a glucose tolerance test gave the findings presented in Table 1 (Chart 2).

In this case, it was not necessary to make a glucose tolerance test in order to confirm the diagnosis of diabetes, as the presence of a 5 per cent. glycosuria with a fasting blood sugar value of 440 mg. per hundred cubic centimeters is sufficient evidence of the condition; but in view of the statements by the patient's physician that insulin had not benefited him at all, nor had a month's treatment with pituitary extract helped

TABLE 1.—Glucose Tolerance Test in Case 1, March, 1925

	Before	½ Hr.	1 Hr.	2 Hrs.	½ Hrs.	4 Hrs.
Blood sugar before and after ingestion of 100 gm. glucose in mg./100 c.c.	440	543	626	680	600	506
Total water intake.....			6.27	17.5	12.0	11.5
Sugar in urine, in grams 3 plus						
Total urine output.....						860 c.c.
Total sugar intake.....						1,010 c.c.
Total sugar output.....						100 gm.
Total sugar output.....						47.27 gm.
Corpuscle volume at beginning of test.....						.36 per cent.
Plasma chlorids						530 mg./100 c.c.
Blood urea						51 mg./100 c.c.
Blood uric acid.....						2.7 mg./100 c.c.
Blood creatinin						1.6 mg./100 c.c.
Nonprotein nitrogen						55.6 mg./100 c.c.
Plasma acetone						Trace

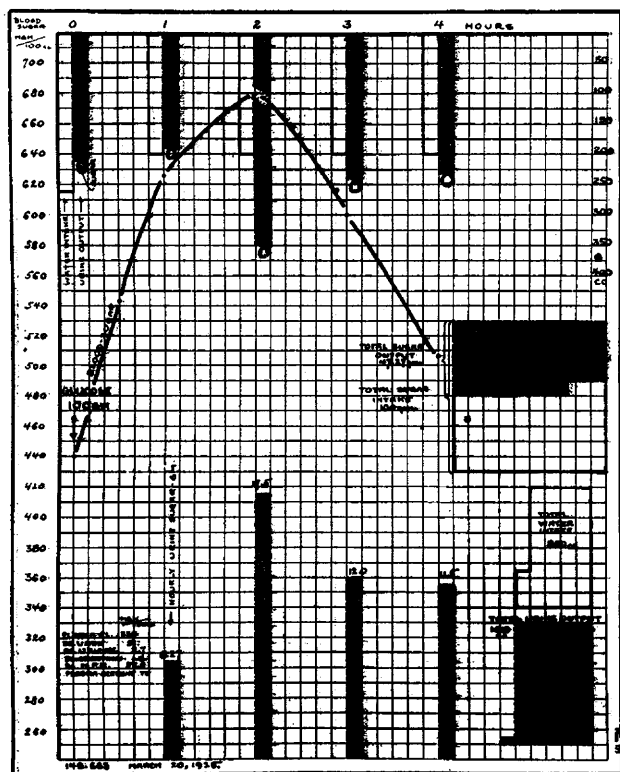


Chart 2.—Glucose tolerance curve of patient whose progress is illustrated in Chart 1, on admission.

some dyspnea and the rectum frequently prolapsed. During the preceding three months, he had lost 37 pounds (16.8 kg.).

The patient was tall, 6 feet 1 inch (185 cm.) in height, weighing 203 pounds (92 kg.), with coarse features and large joints and fingers of the acromegalic type. There was marked hypertrophic arthritis of the hands. The roentgen ray revealed Heberden's nodes on the fingers. The pulse rate was 104; the systolic blood pressure was 105; diastolic, 78. The scalp was very thick and wrinkled, with supra-orbital ridges; the cheeks and jaws were very prominent.

The growth of the skull, hands and feet during the preceding ten years is shown by the following comparative measurements:

	Hat	Glove	Shoe	Shirt
1915.....	7¾ inches	No. 10	No. 9	16½
1925.....	7¾ inches	No. 13	No. 12	17½

Roentgen-ray examination showed a large sella turcica.

Laboratory examination of the urine revealed: sugar, 5 per cent.; acetone, 4 plus; diacetic acid, plus; a trace of

him, the glucose tolerance test was made for final proof. It was evident that the prime need was to treat the diabetic condition. He was, therefore, placed in our diabetes hospital on a diet of 100 gm. of carbohydrate, 60 gm. of protein and 128 gm. of fat, a total of 1,800 calories, on which he gained 5 pounds (2.3 kg.) during the first twenty-four days, but later lost 10 pounds (4.5 kg.). He received an average of 100 units of insulin each day in four doses, 40, 20, 20 and 20 units, respectively, for ten days, at the end of which time the blood sugar had reached the normal level. He then received 20 units daily for about two weeks, and only three more doses after that time. April 17, the diet was increased to 120 gm. of carbohydrate, 80 gm. of protein and 133 gm. of fat, a total of 2,000 calories, and the insulin was discontinued. As Chart 1 indicates, the patient kept a normal blood sugar level until he was discharged, April 29. During his stay in the hospital, the twenty-four hour sugar output in the urine was as follows: March 25, 78.75 gm.; March 26, 27.00 gm.; March 27, 1.54 gm.; March 28-30, a trace; after March 31, none.

Double iridectomy was performed, April 17, as the patient had developed acute cataracts in both eyes, and one lens was removed a few days later. The cataracts developed very rapidly; on entrance the lenses were clear, but within a few days a lenticular change began, the progress of which could be seen from day to day, although the diabetic condition was getting better and was completely under control—a surprising circumstance, as one would expect that the control of the diabetic condition might prevent any further retrogressive eye changes. The visual fields could not be measured on account of the cataracts.

The report of Dr. Ruedemann of the ophthalmologic department was as follows:

March 20, the vision of the right eye on entrance was 6/15; the vision of the left eye on entrance was 6/20. The vision was improved with a plus 2 lens to 6/10; tension (Schiotz) was 25 in both eyes and the examination revealed early lenticular changes in both eyes with no changes in the disk of the retina.

April 3, there were heavy central opacities, with the vision reduced to 6/60 and not improved with glasses. There were no changes in the fundus.

April 17, a double iridectomy was performed which did not materially improve the vision, so the right lens was extracted.

This is a typical case of the association of diabetes with acromegaly. Because of the acromegaly, the diabetic status had not been recognized, the polyuria being

considered to be due to the pituitary deficiency, although pituitary extract did not improve the condition, which grew worse daily.

The possible relation of acromegaly to diabetes offers an interesting field for discussion, and will be consid-

TABLE 2.—Glucose Tolerance Test in Case 1, July 24, 1925

	Before	½ Hr. After	1 Hr. After	2 Hrs. After	3 Hrs. After	4 Hrs. After
Blood sugar before and after ingestion of 100 gm. of glucose in mg./100 c.c.	105	158	168	125	74	60
Urine sugar	Neg.		Neg.	Neg.	Neg.	Neg.
Total water intake						1,040 c.c.
Total urine output						465 c.c.
Plasma chlorids				585 mg./100 c.c.		
Blood urea				21 mg./100 c.c.		
Blood uric acid				1.9 mg./100 c.c.		
Blood creatinin				1.1 mg./100 c.c.		
Nonprotein nitrogen				25.7 mg./100 c.c.		
Plasma acetone				Negative		

ered in another paper, as it is not pertinent to this report, in which we are considering only the cure of the diabetic condition.

The patient was seen by me again nearly three months later. During the interim, he had been living on a liberal diet which he did not weigh, practically the only articles he had eliminated being sugar and pastry. At that time, his fasting blood sugar was 105 mg. per hundred cubic centimeters, and he had no glycosuria. I then made another glucose tolerance test (Table 2), and, to my astonishment, secured a normal curve (Chart 3), the first one that I have encountered in a diabetic patient in the years I have been observing them.

The clinical progress, together with the blood sugar estimations, suggested a very marked improvement, which was verified by the glucose tolerance test. The normal glucose tolerance curve showed that the functional capacity of the islands of Langerhans had been restored to normal. In other words, the diabetic condition had been "cured." Whether or not the insulogenic function will remain normal or whether it will again become impaired under some undue strain, of course, cannot be stated at this time; but as this case is followed, the permanence of the cure will be determined.

CASE 2.—A married woman, aged 37, sent in by her physician because of glycosuria, had no familial history of diabetes.

In childhood, she had had measles, mumps, chickenpox and scarlet fever; later in life an attack of influenza.

Six weeks before, she had consulted her physician because of thirst, polyuria and pruritus vulvae. A heavy glycosuria was found, and two hours after eating, the blood sugar was 280 mg. per hundred cubic centimeters. As the result of absolute fasting for two days, the thirst and frequency of

The history of glycosuria and hyperglycemia seemed quite typical of diabetes. On examining the urine, I found glycosuria present, and the blood sugar three and a half hours after a meal was 133 mg. per hundred cubic centimeters (Myers-Benedict method). It appeared to me, therefore, that this was either a borderline case or one of mild diabetes, and it seemed advisable to observe the patient closely for a time in order to safeguard her from any future catastrophe. I therefore placed her in the hospital, and gained the information presented in Table 3.

The data show clearly that when the patient was first seen by her family physician, she had a typical case of diabetes. The rigid routine cleared up the condition, which was kept in check by careful adherence to the prescribed diet. It is clear now that if a diet consisting of 200 gm. of carbohydrate, 70 gm. of protein and 157 gm. of fat, a total of 2,500 calories, does not increase the blood sugar content, the carbohydrate tolerance is restored, and is normal.

This appears to have been an early stage of diabetes of the functional type, in which, when the strain on the pancreas was lightened by the strictly controlled diet, the islands of Langerhans had a chance for

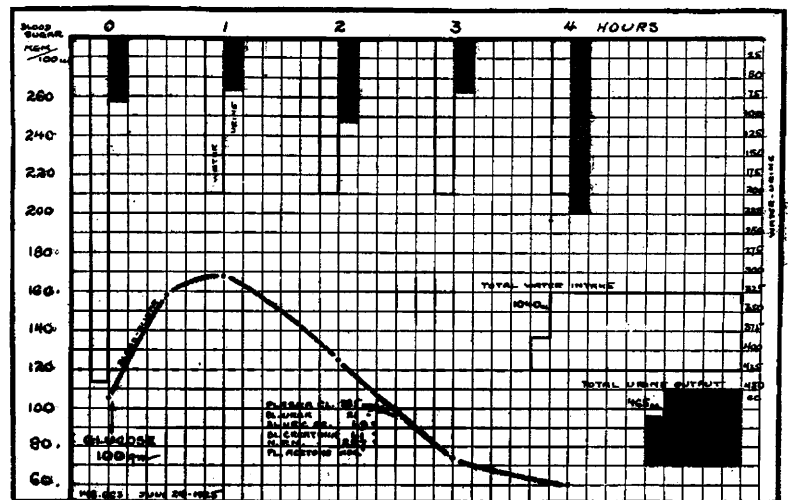


Chart 3.—Glucose tolerance curve of patient whose primary curve is shown in Chart 2, four months later.

restoration to their normal status. It should be borne in mind, however, that a "cure" of diabetes can occur only in the exceptional and very early cases, before much damage has been done to the islands. Nevertheless, it is encouraging to know that by rigid treatment instituted as soon as the disease is recognized, such cases as these may be restored to a normal status.

CONCLUSIONS

1. Theoretically, the cure of diabetes is possible, provided the destructive process in the islands of Langerhans has not progressed beyond the reversible stage.

2. In the two cases here reported, a cure appears to have been established, as is indicated by the normal glucose tolerance curve secured in the first case, and in the presence of normal blood sugar values on a very heavy diet in the second.

3. These cases add further evidence to the cases of apparent cure previously reported in the literature, and to the experimental work of Copp and Barclay in support of the belief that up to a certain stage the diabetic process is reversible.

TABLE 3.—Observations in Case 2

June	16	19	20	21	22	23	24	25
Diet:								
Carbohydrate ..		100	100	100	200	200	200	200
Protein		60	60	60	70	70	70	70
Fat		128	128	128	157	157	157	157
Calories		1,800	1,800	1,800	2,500	2,500	2,500	2,500
Fasting blood sugar, mg./100 c.c.	133	89	83		76	95	96	98
Urine sugar, 24 hours, gm.	Plus		Neg.			Trace	7.5	

urination cleared up, the pruritus disappeared in a few days, and the urine became sugar free. The diet was gradually increased, and the physician wrote that he found it necessary only to curb her intake of candy and sugar.