

REFRESHER COURSE FOR GENERAL PRACTITIONERS

THE MANAGEMENT OF DIABETES MELLITUS

BY

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The discovery of a reducing substance in the urine should always be regarded as abnormal no matter what may be the age of the patient. If the partial and atypical reductions produced by drugs such as aspirin, salicylates, and chloral are excluded—and this can easily be done by stopping all medicines for a few days—persistent glycosuria is almost always due to diabetes mellitus or to a lowered renal threshold for sugar (renal glycosuria). Symptoms such as thirst, polyuria, loss of weight, lassitude, or pruritus vulvae make the diagnosis of diabetes more than probable, but a definite diagnosis of this disease should not, if possible, be made without the confirmatory evidence of a raised blood sugar.

It is bad practice to prescribe a restricted carbohydrate diet for patients with undiagnosed symptomless glycosuria, as this may result in quite needless treatment of nothing more than renal glycosuria. The diagnosis of renal glycosuria should be suspected when the glycosuria is symptomless, occurs only after meals, and is unassociated with ketosis; a family history of this condition is not uncommon.

A blood-sugar curve or glucose-tolerance test is the most certain method of diagnosis of the cause of glycosuria, but is only necessary in a very small proportion of cases. It should be carried out after the patient has been on full diet for at least a week, as a low carbohydrate diet may produce misleading results. When glycosuria is associated with symptoms of diabetes a single blood-sugar estimation performed about two hours after a good carbohydrate meal will almost always confirm the diagnosis, figures of 180 or more indicating the presence of diabetes. In the absence of symptoms when the blood sugar lies between 130 and 180 it is more difficult to be certain, and a blood-sugar curve is advisable. The association of symptomless glycosuria with a blood sugar of 120 or less is strongly suggestive of renal glycosuria, especially if a normal figure is obtained on more than one occasion. It is important to remember that the single diagnostic blood sugar should be taken about two hours after a meal, not in the fasting state. A normal result may be obtained in fasting patients with mild diabetes.

Clinical Types

Clinically, diabetics may be subdivided into two main groups—moderately severe or severe, and mild obese.

Moderately Severe or Severe.—This group consists of all children and adults up to the age of about 45, and a number of old patients of 70 and upwards. They present the textbook picture of diabetes, with loss of weight as a marked feature of the disease. They are liable to develop ketosis and if untreated may die in diabetic coma.

Mild Obese.—This group consists chiefly of middle-aged and elderly women. Obesity is a striking feature, loss of weight being insignificant or absent. Ketosis and diabetic coma do not occur. Patients of this type rarely complain of the typical symptoms of diabetes, except pruritus vulvae.

Medical advice is often sought on account of this or some complication such as retinitis or vascular disease affecting the toes or feet.

The subdivision of diabetics into these two main types is not of course a hard-and-fast one. Typical severe diabetes is seen at all ages, and young cases may be mild, but the clinical picture and treatment of each group differ sufficiently to make this classification one of considerable practical importance.

Diabetes may be treated by diet or by diet and insulin. The use of insulin without diet is generally unsatisfactory and often dangerous.

Diet

It is customary to allow diabetics average amounts of protein and fat, to the extent of the Ministry of Food ration for diabetics, and to restrict only the intake of carbohydrate. Comparatively few diabetics are willing or able to weigh their food, and visual methods of estimation, though less accurate, give reasonably good results. This does not mean that scales have no place in the treatment of diabetes, as they are of great value in teaching and checking visual measurements.

A convenient form of diet card is that devised by Lawrence and used in the Diabetic Department at King's College Hospital. In this the protein foods such as meat, fish, bacon, eggs, and cheese are listed, and allowed in average helpings. The fats such as butter, margarine, cream, and olive oil are similarly treated. Green vegetables except peas, tomatoes, mushrooms, and onions are allowed without restriction; so are sour fruits such as lemons, stewing gooseberries, red currants, and rhubarb. The foods rich in carbohydrate are listed in amounts containing 10 g. of carbohydrate, and each is called a "portion" or "black line." The number of portions allowed for each meal is prescribed, and the patient can vary his diet by selecting the portions from the list provided. Greater variety can be obtained by the use of 5-g. portions, but the 10-g. method is easier and more convenient. In my opinion the technique of dieting by calorie values is more complicated than the above, is rarely understood by patients, and is open to serious theoretical objections.

In mild diabetics who are not overweight it is wise to start treatment with a diet containing about 120 g. of carbohydrate (12 portions) evenly distributed over three or four meals. If the urine becomes sugar-free the carbohydrate can be gradually increased to 150 or even 180 g. Persistent glycosuria or progressive loss of weight means that diet alone is insufficient to control the diabetes, and that the diet should be raised and the patient given insulin (see below).

When diabetes is associated with obesity it is important to reduce the patient's weight, as this is usually the best way of controlling the diabetes. In such cases the diet should contain 80 to 100 g. of carbohydrate (8 to 10 portions), and fatty foods of all kinds should be reduced to a minimum. If this fails to reduce weight and control the

diabetes the patient may with advantage eat nothing but fruit, or abstain from food altogether, for one day each week. This method of treatment should be used only in mild obese diabetics who show no tendency to develop ketosis.

Diet and Insulin

In the absence of significant ketosis it is usually wise to start treatment with a restricted carbohydrate diet without insulin. This has the double advantage of giving the patient the benefit of any doubt that may exist about the necessity for insulin injections, and of allowing time for him to become familiar with the principles of dieting before learning how to inject insulin. In a week or two it is clear in the majority of cases whether or not insulin is necessary. The persistence of heavy glycosuria, especially in the fasting morning specimen, indicates the need for insulin, and a decision must be made on the type of insulin most likely to be suitable for each case. Three insulin preparations are in common use in this country : soluble insulin

following is a suitable arrangement of carbohydrate for use with a mixed injection of S.I. and P.Z.I.

Breakfast	40 to 60 g.
Lunch	40 g.
Tea	30 g.
Evening meal	30 to 40 g.
Bedtime	15 to 20 g.

Treatment may be started with a single dose of P.Z.I. and S.I. added later, or a mixed injection may be given from the outset. It is well to remember that when these two insulins are mixed a certain amount of S.I. is converted into P.Z.I., and the dose of the former should therefore in most cases be equal to or larger than that of the latter. A convenient way of starting treatment is to give equal amounts of S.I. and P.Z.I., 12 to 16 units being a suitable order of dosage in cases of moderate severity. The dose of S.I. is then adjusted until the urine test (or, better, the blood sugar) is satisfactory at the time of maximum S.I.

SCHEME OF TREATMENT

	Diet Alone		Diet and Insulin			
	Trial Diet*	Reducing Diet†	Single Injection of P.Z.I.	Mixed Injection of S.I. and P.Z.I.	Morning and Evening S.I.	Morning S.I. Evening S.I. and P.Z.I.
Breakfast 40	20-30	→ 40	→ 40-60	→ 40-60	→ 60
11 a.m. —	—	—	—	20	20
Midday 40	30-40	30	40	40	40
Tea-time —	—	30	30	0-20	0-20
Evening 40	30	30	30-40	→ 40-60	→ 40-60
Bedtime —	—	20	10-20	10	20

All figures in grammes of carbohydrate. 10 g. carbohydrate = 1 "black line" (Lawrence). → = Time of insulin injection.

*Increase to 180 g. daily if urine remains sugar-free.
 †If weight still not reduced, order one fasting day a week.

(S.I.), protamine-zinc insulin (P.Z.I.), and globin insulin (G.I.). S.I. is prepared in strengths of 20, 40, and 80 units per ml., and P.Z.I. and G.I. in strengths of 40 and 80 units per ml.

Single Injection of P.Z.I.

For relatively mild cases whose diabetes cannot be satisfactorily controlled by diet alone a single morning dose of P.Z.I. often gives excellent results. The diet should be evenly distributed over four meals, and a bedtime feed of 15 to 20 g. of carbohydrate given to prevent nocturnal hypoglycaemia, the danger of which makes it wise not to exceed a maximum dose of 40 units. If this method is adopted, the urine should be tested for sugar before breakfast, the bladder having been emptied on rising; this specimen, called the second morning specimen, should be sugar-free. If the blood sugar before lunch is less than 200 mg. per 100 ml. the control may be regarded as satisfactory. There may be some glycosuria in the evening, but this is usually transitory and can be ignored. If, however, heavy glycosuria persists throughout the day, a single dose of P.Z.I. is bad treatment, and the insulin dosage should be changed to a mixed injection of S.I. and P.Z.I., or to morning and evening injections of S.I.

Mixed Injection of S.I. and P.Z.I.

The mixed-dose method of treatment is suitable for diabetics who lead reasonably regular lives with regular mealtimes. It is less suitable than two injections of S.I. for those whose occupation makes this type of life impossible. The diet should be so arranged that the greater part of the carbohydrate content is taken in the earlier part of the day, while the S.I. is active. The

action—that is, before lunch for doses up to about 30 units and before tea for larger doses. P.Z.I. should be adjusted from the second morning specimen in the manner described above. The persistence of heavy glycosuria before the evening meal, especially if it is associated with ketosis or a recurrence of diabetic symptoms, such as thirst or polyuria, may be treated by the addition of an injection of S.I. before tea or supper. In these circumstances, however, it is wise to consider whether it would not be better to give the patient morning and evening injections of S.I. or the modification of this form of treatment described below.

Morning and Evening Injections of S.I.

This is the oldest and one of the best methods of treating diabetes with insulin. It has the advantage of simplicity and elasticity, it allows a relatively large breakfast and evening meal, and the time of the latter can be varied within reasonable limits. The times at which hypoglycaemia reactions are apt to occur are easily predictable, and suitable precautions can therefore be taken to prevent this important and potentially dangerous complication. The disadvantages are the necessity for a second injection and the tendency in severe diabetics for a relapse to occur before breakfast, owing to the relatively short duration of action of S.I. It is important to remember that the duration of action of S.I. or any other insulin is proportional to the size of the dose injected. A relatively large dose of S.I. can be given before breakfast, and any tendency to hypoglycaemia corrected by means of a mid-morning feed of about 20 g. of carbohydrate. In the evening it is usually not safe to give such a large dose, so there is a greater tendency for relapse to occur about 8 to 10 hours after

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the injection. The following modification of this method of treatment is usually successful in preventing this form of relapse, and is particularly suitable for the control of very severe diabetics, pregnant diabetics, and some children.

Morning S.I. and Evening S.I. with P.Z.I.

The addition of a small dose of P.Z.I. to the evening injection of S.I. tends to prevent early morning ketosis and controls the fasting blood sugar. The smallest dose of P.Z.I. which prevents morning ketosis should be given in most cases, and the best results are obtained when the mixed evening injection is given not later than 6 p.m. When given early in this way the S.I. has passed its period of maximum action by the time the patient goes to bed, and a buffer feed on retiring reduces the risk of hypoglycaemia during the night. The P.Z.I. acts relatively weakly but continuously throughout the night, and in consequence morning ketosis is abolished and the fasting blood sugar prevented from rising to too high a level. If too much P.Z.I. is added to the evening dose of S.I. the fasting blood sugar may be made so low that it is impossible to give an adequate dose of S.I. before breakfast without producing severe hypoglycaemia during the late morning. For both of these arrangements of insulin the diet should be prescribed in some such manner as the following.

Breakfast	60 g.
11 a.m.	20 g.
Lunch	40 g.
Tea	0 g.
(or 20 g. if the morning S.I. exceeds 40 units)		
Evening meal	60 g.
Bedtime	20 g.

Urine tests should be made before lunch or tea, whichever is the better. The time will depend largely on the size of the morning dose of S.I., more resistant patients often giving the better test in the afternoon.

Globin insulin (G.I.) may be used alone instead of P.Z.I. as a single injection method of treatment, or may be mixed with S.I. and given once or twice a day. Given alone before breakfast G.I. will often control relatively mild diabetes satisfactorily, but small doses tend not to maintain their action throughout the 24 hours, while large doses of 40 units or more are liable to produce severe hypoglycaemia before lunch or tea. G.I. is useful in those cases in which P.Z.I. fails to control hyperglycaemia by day but causes hypoglycaemia during the early hours of the morning. It gives good results in some difficult very insulin-sensitive cases also, in which it may be given by morning and evening injections, either alone or with a small dose of S.I. The diet for a single dose of G.I. is the same as that for a single dose of P.Z.I. with the omission of the bedtime feed.

Urine Tests

It is important to realize that urine tests should be made at the time of maximum insulin action, not after meals. Most diabetics, however good their treatment, are likely to pass sugar after eating. Attempts to render the urine sugar-free after meals may result in severe hypoglycaemia before the next meal. Always, therefore, test the urine before meals and at the time when the type of insulin used is known to be exerting its maximum action. In the case of P.Z.I. this will be before breakfast, and with S.I. about four to eight hours or more after injection, according to the size of dose. The bladder should be emptied half to one hour before the urine for testing is passed, so that the result is not confused by the presence of sugar secreted after the previous meal.

Children

The treatment of children is similar in principle to that of adults, but insulin is required in almost every case. Children are usually very sensitive to insulin, with the result that there may be wide fluctuations in blood-sugar level, periods of heavy glycosuria giving place rapidly to hypoglycaemia. The aim of treatment should be to provide an adequate and reasonably attractive diet, to avoid ketosis, and to render the blood-sugar level normal, or nearly so, for some period of the 24 hours. Any attempt to keep the urine perpetually sugar-free is bound to result in hypoglycaemic reactions. If these aims can be achieved with a single injection daily, so much the better for the child and those caring for it. Very often, however, especially at or about puberty, it is necessary to change over to two injections. S.I. before breakfast and S.I. with P.Z.I. before tea is a particularly suitable method of treatment at this difficult period in the life of the child diabetic.

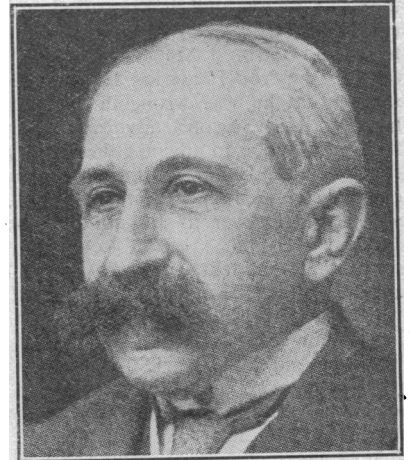
The diagnosis and treatment of ketosis, including diabetic coma, and hypoglycaemia will be considered in next week's article.

SIR FELIX SEMON* HIS CONTRIBUTION TO LARYNGOLOGY

BY

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Felix Semon was born in Danzig on December 8, 1849, the son of a substantial merchant. He was educated at Heidelberg and at Berlin, and took the Berlin M.D. in the summer of 1874. His training had been interrupted by the Franco-Prussian War of 1870-1, when Semon served as a "one-year volunteer" in the Prussian Uhlan Guards, seeing some active service. After graduation he went on to spend a postgraduate year at Vienna and London, studying particularly the various specialties. In London he visited the chief teaching hospitals, finally attaching himself to the medical wards of St. Thomas's, where an old friend of his mother's, Richard Liebreich, was in charge of the eye department. Semon also attended the Brompton Hospital, Moorfields, and the Throat Hospital, Golden Square; at the last he had a letter of introduction to its founder, Morell Mackenzie, from an old friend of Mackenzie's, Fürstenberg, of Berlin. Laryngology was then a brand-new specialty, with exciting new methods of diagnosis and treatment presenting themselves almost every month, and Semon determined to embrace the opportunity presented in London, attending Golden Square Hospital with redoubled zeal. In March, 1876, Semon approached Mackenzie to know what his views would be if he were to stay on in London, and Mackenzie kindly promised him that as soon as possible he would get him appointed a physician to Golden Square Hospital—this less than a year after he had come to England. He passed the M.R.C.P. examination in October, 1876, was elected to the old Royal Medical and Chirurgical Society, and began private practice at 6, Chandos Street.



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*A shortened version of a paper read at a meeting of the Osler Club on December 1.