E. F., male aged 31, on December 5th, 1932, ran a narrow chisel into the left knee-joint just above the patella. He thought it was merely a flesh wound, and applied pink lint and a bandage. The knee became very painful and swollen during the night, and on the following day the local condition was worse and he had several rigors. On admission to the Royal Infirmary on December 7th, the joint was distended with the skin inflamed around the small punctured wound, with streaks of lymphangitis up the thigh. Pus was aspirated from the joint (*Streptococcus haemolyticus*), and ether, introduced through the needle, bubbled out through the punctured wound, which had penetrated the subcrureus pouch. The subcrureus pouch, which was distended with pus, was emptied and drained through lateral incisions, the outer of which was carried upwards down to the femur. The drains were removed on the third day, and the discharge from the incisions and the joint reaction gradually subsided. Immobilization with weight extension was continued for three weeks, and he left hospital at the end of six weeks. He attended the massage department for four months, and when discharged had regained 45 degrees of flexion movement at the joint.

G. H., female aged 55, admitted to the Royal Infirmary, March 6th, 1933, diabetic, developed acute infective arthritis of the left knee-joint following extensive cellulitis of the leg. Haemolytic streptococci and *B. coli* were grown on culture of

the pus aspirated from the joint. The joint infection slowly subsided after transverse drainage of the subcrureus pouch and of the cellular space under the quadriceps through upward extension of the lateral incision. The limb was slung with weight extension, but the ultimate result was complete ankylosis of the joint with a fairly useful limb.

In the treatment of punctured wounds about the knee, when there is doubt as to whether or not the joint cavity has been penetrated, 2 or 3 c.cm. of ether should immediately be injected into the joint. Where the wound has involved the joint, the ether blows out from the external orifice, and immediate excision of the whole wound tract is indicated. The reaction set up by the ether in the synovial membrane appears to stimulate its resistance to infection.

Immobilization with suspension of the limb and weight extension and, if need be, repeated aspirations of the joint exudate are carried out. Where, however, acute infective arthritis of the joint develops or is already established when the patient comes under observation, the further steps described in the above article, on the lines of the Kanavel treatment of infections spreading up the forearm from pyogenic infection of the common flexor sheath, are recommended.

RENAL GLYCOSURIA MISTAKEN FOR DIABETES MELLITUS

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It is over thirty years since Klemperer first drew attention to a harmless form of glycosuria, now generally known as renal glycosuria, but our clinical experience shows that it is still a frequent cause of diagnostic error. In this condition glucose appears in the urine at normal blood sugar concentrations because the renal threshold is low (under 0.17 per cent.), and not because hyperglycaemia exceeds a normal threshold, as in diabetes. The latter is particularly liable to be confused with cases of renal glycosuria in which the leak point is very low (under 0.100 per cent.) and the sugar excretion consequently heavy. Other reasons, too, contribute to mistakes in diagnosis, and unpleasant impositions of unnecessary treatment, as the following cases show.

CASE I

Mr. B., aged 47, underwent a complete examination before going abroad on an aeroplane expedition, for which perfect fitness was essential. Sugar was found in the urine, and a blood sugar curve was carried out, with the following result:

Time	Blood Sugar	Urine Sugar
	Per cent.	Per cent.
Fasting: 50 grams glucose	0.087	nil
½ hour after	0.063	0.4
1½ hours after	0.077	nil
2½ hours after	0.071	0.5

The subject was so anxious to go abroad, and the response to glucose was so unusual, that the man was suspected of having taken a dose of insulin before the test was made. When we repeated the curve (see table below) its general features were confirmed, showing a combination of an extremely high carbohydrate tolerance with a very low renal threshold.

Time	Blood Sugar	Urine	
		Sugar	Ketones
	Per cent.	Per cent.	
Fasting: 50 grams glucose	0.095	0.2	0
25 minutes after	0.125	0.8	0
40 minutes after	0.063	1.1	0
1½ hours after	0.111	0.4	0
2 hours after	0.108	0.5	0

CASE II

Mr. O., aged 30. Sugar was found in the urine during a routine examination when the patient had pityriasis rosea. He was at once put on a strict diet of 9 Lines—that was, 45 grams carbohydrate, 67 grams protein, and 135 grams fat—and, since the urine still contained sugar after six weeks, a blood sugar curve was performed, with the following results:

Time	Blood Sugar	Urine Sugar
	Per cent.	
Fasting: 50 grams glucose	0.116	
32 minutes after	0.176	+
64 minutes after	0.188	+
120 minutes after	0.148	

No record of acetone in the urine was made, but the curve was held to be definitely diabetic, as hyperglycaemia persisted after two hours, and diet was again prescribed. When first seen by one of us, after four months of rigid diet, the blood sugar was normal at 0.099 per cent. two hours after breakfast, and slight glycosuria was present, which suggested a low threshold. Full diet was then prescribed, and one month later the following absolutely normal, though irregular, curve was obtained.

Time	Blood Sugar	Urine	
		Sugar	Acetone (Rothera)
	Per cent.	Per cent.	
Fasting: 50 grams glucose	0.116	slight trace	very slight trace
½ hour after	0.087	trace	slight trace
1 hour after	0.137	1.5	0
1½ hours after	0.077	slight trace	0

It is probable that the first slightly abnormal curve was the result of the previous carbohydrate starvation, which produces *per se* a diabetic type of curve in a normal individual.

CASE III

Mrs. P. This woman had complained to her doctor of thirst and polyuria, and on examination large quantities of sugar were found, and a diet of about 100 grams carbohydrate a day was prescribed. After some weeks the thirst and polyuria improved, but the glycosuria persisted and a blood sugar curve was carried out.

Time	Blood Sugar	Urine	
		Sugar	Ketones
Fasting: 50 grams glucose	Per cent. 0.131	+	0
½ hour after	0.67	+	0
1 hour after	0.155	+	0
1½ hours after	0.036	+	0
2 hours after	0.037	+	0

This curve was taken to be abnormal on the strength of the fasting level. No reference was made to the renal glycosuria, but shortly afterwards the patient was referred to the diabetic clinic at King's College Hospital for treatment. When first seen her blood sugar was 0.1 per cent., and her urine contained about 2 per cent. of sugar. Full diet was prescribed, and a few days later a blood sugar curve was obtained (see below), which showed a response to glucose approaching the "lag storage" type, with an unusually low threshold. The patient was discharged on full diet, and has since been untroubled by symptoms.

Time	Blood Sugar	Urine	
		Sugar	Ketones
Fasting: 50 grams glucose	Per cent. 0.097	3	0
½ hour after	0.200	3	0
1 hour after	0.162	3	0
1½ hours after	0.089	3	0
2 hours after	0.086	2	0
2½ hours after	0.089	3	0

CASE IV

Miss C., aged 24, a nurse in a provincial hospital, was discovered, during a routine examination, to have sugar in her urine. The test was repeated and diet prescribed. Later a blood sugar curve was done:

Time	Blood Sugar	Urine Sugar
Fasting: 50 grams glucose	Per cent. 0.160	Per cent. 1.8
1 hour after	0.200	4.0
2 hours after	0.180	5.0

Here again the renal element was neglected, and the curve was taken to be abnormal because the effect of a period of previous carbohydrate restriction was neglected (see Case II). Treatment for diabetes was recommended, and a month later insulin was felt to be necessary, as the glycosuria persisted. Small doses were given at first, but later—as the urine was never free from sugar—larger doses were thought to be necessary, and the girl was finally discharged on 20 units b.d. After a year of treatment, with continuous glycosuria and frequent overdoses of insulin, she was admitted to King's College Hospital for investigation. Her diet, which had been 65 grams carbohydrate a day, was raised to 100 grams, and 34 units of insulin in the morning and 24 units in the evening were prescribed. It was appreciated next day that a low renal threshold must be present, as a heavy glycosuria was found with low normal blood sugars. Insulin was discon-

tinued, and as a normal blood sugar level continued for three days a full diet was prescribed. (It is of interest that a strongly positive Rothera's test for ketone bodies was obtained on this patient for two or three days after insulin was omitted, but never at any other time.) After a week of full diet a blood sugar curve gave the following result.

Time	Blood Sugar	Urine	
		Sugar	Ketones
Fasting: 50 grams glucose	Per cent. 0.098	Per cent. 5.2	0
½ hour after	0.123	5.2	0
1 hour after	0.151	5.6	0
1½ hours after	0.142	6.4	0
2 hours after	0.142	7.9	0
2½ hours after	0.115	—	0

The patient was discharged on full diet and has remained perfectly well. Six months later the blood sugar curve never rose above 0.12 per cent.

CASE V

Male, aged 31. This patient is a perfect example of how renal glycosuria may be confused with diabetes. Towards the end of a very hot summer he complained of lassitude, slight loss of weight, thirst, and irritation of the penis. His country practitioner found over 5 per cent. of sugar in the urine. Treatment for diabetes was commenced without a blood sugar estimation. Starvation did not remove the glycosuria, and the patient was referred to one of us as a severe diabetic for insulin treatment. The urine was found to contain 3 per cent. of glucose and a high excretion of ketone bodies (strongly positive FeCl test), but the first blood sugar estimation gave a low normal figure of 0.082 per cent., and at this figure 2.5 per cent. of glucose was excreted. After two days' very full diet the following blood and urinary figures were obtained after 50 grams of glucose.

Time	Blood Sugar	Urine	
		Sugar	Ketones
Fasting: 50 grams glucose	Per cent. 0.085	Per cent. 2.5	} No ketonuria
½ hour after	0.161	} 9.8	
1 hour after	0.166		
1½ hours after	0.150	} 7.1	
2 hours after	0.098		

The slight delay in the return to the fasting level, caused presumably by recent ketosis from dieting, was neglected in view of the otherwise normal curve. Full diet was prescribed, and perfect health has been maintained for five years, in spite of heavy and permanent glycosuria. The previous slight irritation of the penis has been prevented by frequent cleansing.

Discussion

Little discussion is necessary. All five cases illustrate very well the difficulties that may arise if the possibility of a low leak point is not considered in every case of glycosuria without typical symptoms of diabetes. Cases II and IV show the advisability of prescribing full diet for some days before a diagnostic blood sugar curve is done, and Cases III and V the dangers of treating diabetics without adequate blood sugar control. Even without blood sugars, suspicion should have been aroused in these cases, for glycosuria without symptoms and without acetonuria in a young adult is always suggestive of renal glycosuria, and is seldom found in diabetes mellitus.

Summary

Five cases of renal glycosuria are described which, for various reasons, had been diagnosed as diabetes mellitus.