Urinary tests before operation showed no abnormality as regards the presence of albumin or of sugar. Induction of anaesthesia was by chloroform-ether mixture, and then ether was employed to maintain the anaesthesia. Blood samples were taken from the finger before, and at intervals during and after, operation, and the blood sugar content estimated by MacLean's method. At the end of operation, which consisted of partial gastrectomy, gastro-enterostomy, and removal of the appendix, since shock was present, she received a rectal saline injection, containing 5 per cent. glucose. The first two urines passed by the patient after the anaesthetic were collected and tested for glucose by the fermentation test and by Fehling's test (Bertrand's modification). The result with each test was negative. Albumin, acetone, and diacetic acid were similarly found to be absent. The patient made an excellent recovery from the operation, and was discharged later from hospital in a reasonable state of health.

The time record for this case is as follows :

Time in minutes.	
0	First blood sample taken—0.150 per cent.
10	Induction of anaesthesia begun with CE mixture.
30	Change over to closed ether.
50	Second blood sample—0.181 per cent.
75	Third blood sample—0.260 "
85	Fourth blood sample—0.350 "
100	Anaesthetic stopped.
105	Fifth blood sample—0.386 per cent.
105	Rectal saline with 5 per cent. glucose.
280	Sixth blood sample—0.229 per cent.

Commentary.

This case, which forms one of a series in an investigation into the blood sugar changes in general anaesthesia, is interesting for the following reasons.

First, it is an example of the fact that general anaesthesia, whether by chloroform, ether, or CE mixture, is accompanied in practically every case by an increase in the concentration of the sugar in the blood, manifest within a very few minutes of induction, and continuing, within limits, throughout the period of anaesthesia.

A. Blood sugar curve of case as here described. Anaesthesia lasted for eighty-five minutes. Sugar absent from urine, both before and after anaesthesia. This curve, which is unusually high, may be compared with the two following curves, which are more typical of those found in the longer anaesthetics.

B. Blood sugar curve in a case of gastro-enterostomy, on a man aged 60, for malignant stenosis of the pylorus. Anaesthesia lasted for fifty-five minutes, and a rectal saline was given as in Case A. Urine did not ferment with yeast after operation.

C. Blood sugar curve in a case of hydatid disease of the liver in a man aged 35. Anaesthesia lasted for seventy minutes, and there was no glycosuria before or after operation.

For purposes of comparison there has been superimposed upon the above curves and on the same scale that of curve D, which shows the course of the blood sugar after a 50 grams glucose meal, as carried out by MacLean (1925).

Secondly, this case demonstrates that the extent of the increase may be far above that caused by the giving of a 50 grams glucose test meal, as carried out by MacLean. This is well seen by comparison with MacLean's curve (curve "D" on the accompanying figure) and the curves of two other cases (curves "B" and "C"), in which anaesthesia lasted for about an hour. These latter curves are quite typical of the usual anaesthetic hyperglycaemia, and differ only from the case here described in the degree of hyperglycaemia recorded.

Thirdly, in this case the unusual amount of hyperglycaemia to 0.386 per cent. would lead one to expect some subsequent degree of glycosuria, if the doctrine of a renal threshold for sugar of about 0.180 per cent. is to be accepted in its entirety. But such glycosuria was proved absent in this case by the two chief tests for sugar. Like-

wise, in the two other cases the curves of which are shown here, although the renal threshold was exceeded for some considerable time there was no subsequent glycosuria. As urinary secretion is not usually suppressed in anaesthesia, curves such as these lead one to doubt the validity of the renal threshold value, or to postulate for the anaesthetized state the existence of some other factor as yet unexplained.

Summary.

A case of anaesthetic hyperglycaemia of great extent, and unaccompanied by glycosuria, is described.

I wish to thank Mr. Deanesly, F.R.C.S., honorary surgeon to the Wolverhampton and Staffordshire General Hospital, for permission to record the details of this case.

REFERENCE.

MacLean (1925): *Diagnosis and Treatment of Glycosuria and Diabetes.*

RUPTURE OF UTERUS EARLY IN THE FIRST STAGE OF LABOUR.

BY

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THE following case is reported because it is of interest from several points of view. In the first place, rupture of the uterus apparently occurred early in the first stage of labour before rupture of the membranes, and without any of the usual causes, such as malpresentation or disproportion between the size of the child and the mother's pelvis. Secondly, the patient had had ten normal labours previously; all were of short duration and free from complications. Lastly, she survived the rupture, though hysterectomy was not performed until twenty-four hours had elapsed from the presumed time of its occurrence.

The patient, a European woman, aged 36, was admitted to hospital at 12.30 a.m. on October 6th, 1927, for labour at full term accompanied by severe abdominal pain. She stated that two days previously she had not been feeling well, so took castor oil, which resulted in four motions, and at 6 p.m. slight labour pains commenced. At midnight the pains were more definite, but were not severe enough to require medical aid of any sort. At 2 a.m. on October 5th, after two or three sharp pains, she suddenly felt an acute pain of a different sort; after this the child seemed to alter its position to the upper part of the abdomen, and within two or three hours its movements ceased. At the same time bleeding began from the vagina, and pain was felt on taking each breath. A doctor was called in the morning, and after an injection she slept; the bleeding became less, but on waking she felt no better. She vomited several times during the day, and from 3 p.m. the vomit was dark brown. The bowels did not act that day. As her condition was becoming so much worse she was brought to hospital at midnight.

The past history was that she had had ten children, the last one two and a half years previously. All the labours were quite normal and quick. She had never needed instruments. The last menstruation had occurred in February, 1927.

She was of medium height and nutrition, and was evidently in great pain on admission, especially in the upper part of the abdomen, which caused her to cry out all the time. The pulse rate was 110, and the tension was fairly good. The temperature was 100.4° F. and the respirations 30. The abdomen was markedly distended, especially above the umbilicus, where the outline of the dilated stomach was clearly seen; there was great tenderness all over it. The child was lying transversely across the middle of the abdomen, and was felt just under the abdominal wall; it could be moved about easily, but much pain was caused. No foetal heart sounds were heard. There was a small quantity of bright blood coming from the vagina.

The patient was so restless that a little chloroform was given for satisfactory vaginal examination. The cervix was found dilated, and the placenta lying above it was almost completely detached. The otherwise empty uterus lay on the right. On the left the membranes led out through a large tear in the lower part of the uterus and cervix, and the child could be felt lying in the unruptured bag of membranes among the intestines. Fresh bleeding was caused by the examination. A catheter was passed, and two ounces of slightly blood-stained urine were drawn off.

It was decided to open the abdomen, and the patient was prepared at once. By that time her pulse had risen to 132 and was decidedly weaker. She had vomited coffee-ground material once. Saline injections were commenced, and a 6-inch incision was made in the middle line, two-thirds being below and one-third above the umbilicus. The child, a full-term female of normal size, was

found lying free among the intestines in its bag of membranes, with the placenta still partly attached to the lower half of the uterus. There was a large rent extending from the middle of the vagina on the left side up through the cervix to about the junction of the middle and lower third of the body of the uterus; the left broad ligament had been split from far out on the lateral pelvic wall to close up against the bladder. There were only a few small clots in the abdominal cavity.

After removing the child with the placenta and membranes intact subtotal hysterectomy was performed, leaving the appendages, since they were healthy. The tear in the cervix and vagina was closed with a continuous catgut suture, and the stump of the cervix was sewn over in the same way. The abdominal wall was closed in four layers without drainage. The patient stood the operation fairly well. On her return to bed the stomach was washed out, as it had been found very distended. Within an hour after the completion of the operation, however, her condition became grave. She was restless, and her pulse had risen to 160, but by 8 a.m. she was improving, and by midday was decidedly better. By 2 p.m. the pulse rate had dropped to 130. The temperature was 98.6° F. and the respirations 30.

After this the patient made steady progress. There was a slight degree of fever for the first six days, up to 100°, and once to 100.5° F.; then the temperature became normal for three days, rose slightly on the two following days, and after that returned to normal. Her pulse was 100 to 120 for the first few days.

At the end of the first week slight thickening was felt in the upper part of the broad ligaments on either side, but there was very little tenderness. The patient took her food well from the first. The wound healed by first intention, and she was discharged well on October 24th.

The patient was seen a month later, and, except for moderate anaemia, was doing well. On vaginal examination the pelvic contents appeared quite normal, and there was no sign of cellulitis. The cervix was patulous on the left side on the site of the old tear.

The specimen was sent to the gynaecological museum of the Calcutta Medical College Hospital.

THE PROMOTION OF CALCIUM RETENTION.

BY

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THE success of calcium therapy is so dependent upon the degree of retention it achieves that satisfactory results can only be expected when the principles underlying calcium retention receive at least as much attention as its administration. Even in the discussions on the therapeutic uses of calcium salts at the Annual Meeting of the British Medical Association last July, this close connexion does not appear to have been sufficiently emphasized.

Unless the principles of calcium retention are given the consideration their importance deserves, failures and incorrect conclusions as to the value of calcium therapy are the inevitable results. In some cases there would be no retention of calcium, but, on the contrary, an increased loss, since it favours acidosis. When the dose of calcium chloride is as heavy as 10 grams a day—and as much has been given by one physician—it is not surprising that the results are so entirely disappointing as to bring calcium therapy into disrepute.

Acidosis is readily recognizable by the increased acidity of the urine, and the higher the degree of acidity the more lime the urine has withdrawn from the blood, as was shown by Schetelig in 1880 and confirmed more recently; the weaker also must have been the alkaline reaction of the blood from which the urine was excreted. It is therefore a logical inference that the losses of calcium are smaller (or the calcium retention is greater) when the degree of blood alkalinity is high. This degree corresponds under normal conditions with 0.3 per cent. of sodium carbonate (or bicarbonate in the venous blood). In other words, as the blood alkalinity decreases the calcium loss in the urine rises above the normal, which is 0.2 gram in twenty-four hours.

This leads to consideration of the question as to how the blood alkalinity is created and maintained in man and herbivorous animals. Carnivorous animals obtain their sodium carbonate from the interaction of ammonium

carbonate and sodium chloride; in man and omnivorous animals this occurs completely only under such conditions as prolonged hunger. The most common factor in alkalization in man and the herbivora is the oxidation of the alkaline salts of organic acids; potassium and sodium salts, especially of citric and malic acids, are contained in leaves, roots, tubers, and fleshy fruits. The potassium citrate and malate in such vegetables are converted into sodium salts by the sodium chloride contained in the meals. These salts, however, are lacking in meat and all kinds of seeds, which indicates the importance of a well-balanced diet. It is a very important and significant fact that milk contains sodium citrate; otherwise a baby would suffer from acidosis from the first day of its life.

Proteins, however, which form such an important part of present-day diet, favour a state of acidosis. Their sulphur contents appear in the urine as sulphuric acid and ester-sulphuric acid, and their phosphorus contents as acid phosphates. Therefore the physiological laws of a correct diet are observed by the usual practice of supplementing a dish of meat with potatoes, or cabbage and fleshy fruits. When, however, the meals consist of an excess of meat, beans, and bread, without any green vegetables or fruits, there would be no calcium retention, and ailments, such as gout, might gradually arise. It would definitely be a mistake to employ calcium chloride in such a case.

With animals, such as cattle and horses, which feed chiefly on hay, the use of calcium chloride produces excellent results by favouring growth, fecundity, and health. The normal dose of calcium chloride has been inferred from physiological laws, and fixed at 0.04 gram of the crystallized salt to 1 kilo of body weight, or 0.02 gram of the anhydrous salt. Hay contains alkaline salts of citric, malic, and other organic acids, which provide for calcium retention and counteract the acidosis produced by calcium chloride.¹ Therefore, when due consideration is given to the usual diet of man, calcium lactate is preferable to calcium chloride, since it does not favour acidosis, and far superior still to calcium lactate is the double salt of calcium and sodium lactate (Wulffing), since it favours calcium retention by being oxidized into carbonate. Many physicians have used it with most excellent results.

Is the calcium content of the blood a reliable index?

There is still considerable adherence to the view that a deficiency of lime in the system can be recognized by determining the amount of calcium in the blood. It has, however, been proved by various workers that this is decidedly unreliable, and Stewart² was right in calling that index unsatisfactory. Indeed, it has been commonly observed that, in various diseases which readily respond to calcium therapy, the blood calcium was normal, or higher than normal, and not lower, as one would expect. In other cases, again, the calcium index of the blood was below the normal. In short, the evaluation of the calcium content of the blood is not a sure guide for the application of calcium therapy. Such an examination of the blood calcium is, moreover, unnecessary, even if there is a developing disease which cannot be definitely diagnosed, since calcium can do no harm in any case, and frequently acts as a prophylactic.

The fact that a lack of lime in certain organs is sometimes coincident with a rise of blood calcium is accounted for when we remember that the calcium stored in the bones can be utilized to fill up deficiencies in other and more vital parts of the body. Since this transfer of calcium takes place through the blood, an increase of blood calcium may be observed in spite of a deficiency of calcium in certain other organs. Sometimes when there is not enough calcium in the food bone calcium will supply the material needed for calcification of tuberculous foci in the lungs, or it may serve to calcify weak arteries and thus increase their power of resistance against a rise of blood pressure. Even the teeth may be called upon to give up part of their calcium in certain cases; hence the suggestion by many women that the birth of each child costs the mother a tooth.

How unreliable an index is the evaluation of the blood calcium has recently been again demonstrated in cases of urticaria undergoing hospital treatment. Because the