Lesson of the Week

Diabetic ketoacidosis and ruptured ectopic pregnancy: a fatal combination

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Abdominal pain severe enough to mimic acute abdominal disease is a common symptom of diabetic ketoacidosis and is reported in 13% to 20% of cases.^{1,2} During undergraduate training the high mortality associated with laparotomy in these severely ill patients is emphasised, but insufficient emphasis is placed on a diagnostic error that may be equally dangerous—namely, the failure to recognise the occasional precipitation of ketoacidosis by genuine abdominal disease.

Case report

A 17 year old white girl presented as an emergency after collapsing at home. She gave a 12 hour history of lassitude, vomiting, and poorly localised central and lower abdominal pain. On specific questioning she admitted to intense thirst for the previous two days but no polyuria or symptoms of infections. Her medical history was otherwise uneventful, and neither she nor her family had a history of diabetes mellitus. She claimed to have had a normal menstrual period two weeks before admission and was taking a contraceptive pill, containing 150 µg levonorgestrel and 30 µg ethinyloestradiol (Ovranette).

On examination she was pale, severely dehydrated, and barely rousable. There was Kussmaul respiration, and her breath smelt of ketones. She had no fever, her blood pressure was 70/40 mm Hg, and her pulse rate was 110/min. Her abdomen was a little distended, with vague generalised tenderness, but there was no rebound tenderness or signs of free fluid in the peritoneal cavity. The abdomen, however, was silent to auscultation. Examination of the respiratory, cardiovascular, and neurological systems showed no other abnormality.

Blood tests confirmed diabetic ketoacidosis, with a blood sugar concentration of 28.8 mmol/l (518 mg/100 ml); arterial pH 7.15; and plasma concentrations of bicarbonate of 13 mmol(mEq)/l, urea 9 mmol/l (54 mg/100 ml), sodium 133 mmol(mEq)/l, and potassium 3.9 mmol(mEq)/l. The total leucocyte count was $30 \times 10^9/l$, with 90% neutrophils. Unexpectedly the haemoglobin concentration was 7.3 g/dl. Plain abdominal x ray films showed gastric distension only. The clinical and laboratory findings suggested some acute intra-abdominal disease coincident with, and probably precipitating, ketoacidosis in a previously unknown diabetic. Emergency cross match of six units of blood was arranged while the patient's ketoacidosis was treated; 1.5 litres of intravenous normal saline and polygeline per hour, added potassium, and an insulin infusion of six units per hour were given. After two hours the blood pressure was 100/60 mm Hg and the blood sugar concentration was 25.4 mmol/l (457 mg/100 ml).

At this stage the patient's conscious level improved slightly, but she continued to complain of abdominal pain. The surgeon reviewing her abdominal condition was able to elicit a gynaecological history suggestive of a ruptured ectopic pregnancy. This diagnosis was supported by the finding of blood in three out of four sites of fine needle para-

Abdominal pain associated with diabetic ketoacidosis is occasionally due to acute abdominal disease

centesis. While preparations were being made for immediate laparotomy, the systolic blood pressure suddenly dropped to 60 mm Hg, her conscious level deteriorated, and she suffered a cardiac arrest. Though resuscitation restored a stable regular rhythm, the carotid pulse remained impalpable. This sequence of events was attributed to continuing severe haemorrhage, and laparotomy was performed on the ward while the cardiac output was maintained by external cardiac massage. The diagnosis was confirmed at operation, and ligation of the right fallopian tube allowed restoration of the circulating volume, raising the systolic blood pressure to 100 mm Hg and restoring the patient's spontaneous respiration. Two hours after the cardiac arrest the blood pressure remained stable, the blood sugar concentration was 14.5 mmol/l (261 mg/100 ml), and the potassium concentration was 4 mmol (mEq)/l. The arterial pH, however, was 6.63, indicating the severity of the metabolic disturbance caused by the combination of continuing severe ketoacidosis and the prolonged circulatory arrest. The patient maintained her condition for a further two hours, but then suffered a fatal asystolic cardiac arrest.

Necropsy showed pulmonary oedema only and confirmed an ectopic pregnancy in the excised fallopian tube.

Comment

The association of abdominal pain and diabetic ketoacidosis presents two distinct problems of diagnosis: the first is to identify those patients in whom presenting abdominal pain is symptomatic only of ketoacidosis, and the second is to recognise genuine abdominal disease as the cause of abdominal pain in a patient known to be suffering from ketoacidosis.

The first problem is reviewed in detail by Valerio.³ He emphasises the importance of a history of polydipsia, polyuria, and anorexia preceding the abdominal pain and the findings on examination of Kussmaul respiration, ketotic breath, and dehydration of a severity greater than that expected from the abdominal findings alone. The abdominal tenderness is usually generalised and bowel sounds are rarely absent if the pain is purely due to the ketoacidosis.

The second problem arose in our case: diabetic ketoacidosis was recognised immediately but the underlying intra-abdominal disease, though suspected early, was confirmed by paracentesis only after some delay. Campbell *et al* reported a series of 211 patients with severe diabetic ketoacidosis: of 46 patients with abdominal pain and tenderness, 17 had genuine intra-abdominal disease.² From their series they concluded that abdominal pain was unlikely to be due to the metabolic decompensation of diabetes alone if the plasma bicarbonate concentration was in excess of 10 mmol(mEq)/l, and that

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genuine intra-abdominal disease in the presence of diabetic ketoacidosis was more likely in patients over 40 years of age. There was no correlation between the presence of intra-abdominal disease and the concentration of blood sugar or the degree of dehydration. Furthermore, they concluded that pain caused by metabolic decompensation should resolve after a few hours of rehydration and treatment with insulin.

A search of the recent papers published in English showed only one brief mention of the combination of diabetic ketoacidosis and ectopic pregnancy.⁴ Analysis of the incidence of ectopic pregnancy and of new presentations of insulin dependent diabetes mellitus indicates that the expected number of cases of these two conditions presenting together is about 1.6 cases a year in the nine million women of reproductive age in the United Kingdom.^{5,6}

We present this rare case to show some of the practical difficulties of achieving an early diagnosis of underlying abdominal disease coinciding with diabetic ketoacidosis. The poor history available in a semicomatose patient is likely to make accurate diagnosis more difficult. The single most suspicious abdominal finding on admission in this case was the totally silent abdomen on auscultation, and though generalised tenderness tends to favour metabolic decompensation as the only cause of abdominal pain, a late presentation of genuine disease may well have progressed beyond the stage of localised tenderness. Few laboratory tests are helpful in achieving the correct diagnosis, but a low haemoglobin concentration in a severely

dehydrated patient is a sinister finding and the importance of the degree of acidosis as measured by plasma bicarbonate concentration has been mentioned above. Finally, emphasis must be placed on the need for a high index of suspicion initially and for continuing reassessment of the history and abdominal findings during the early period when fluid and insulin treatment improve the patient's level of consciousness.

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Medicine in Eastern Europe

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After the second world war the political and economic structures of the countries of eastern and south eastern Europe were built on the model of the Soviet Union, the slogan "Soviet Union is our example" being applied also to medicine. Over 50 years ago the Russian Semaško¹ proclaimed the principles on which the state medical services were to be based: state ownership of all the hospitals, medical institutions, spas, pharmacies, medical staff, pharmaceutical factories; integration of medical institutions and services into the economic plan; freedom from charges; and general availability and accessibility of all the health services.

These principles, together with the centralisation of the Soviet economy, led to the Orwellian idea of having the whole population not only medically registered but also regularly examined. The aim was to study the connections between environment, occupation, and the health of an individual—the so called dispensarisation.

Soviet Union

The health problems of this vast country, with her irregular density of population, extremes of climate, and ethnic, cultural and religious differences, are tremendous. Historically there has been a huge gap in the standard of medical care between the cities and the countryside, with its poor hygiene, poor sanitation, epidemics, prejudices, and high infant mortality.

Although the numbers of doctors qualifying have increased greatly since the war and now total 950 000 (a quarter of the doctors in the world),² the medical problems of the countryside could not be mastered without *fel'tchars*. The name comes from the German feldscher, who in the Prussian army of the eighteenth century was the aid to the military doctor. In Germany this function has disappeared, but it persists in the developing countries and in the Soviet Union. The *fel'tchars'* education lasts two and a half to three years and consists of medicine, surgery, obstetrics, paediatrics, and also philosophy and scientific atheism, history, literature, socialism, and sports. They are expected to take an active part in politico-social activity and to spend their free time in building roads, working on farms, and so on. Those who pass the final state exam with honours may be admitted immediately to a medical school; the others have to spend three years in practice. Although the *fel'tchar* is supposed to work under medical supervision, this is often not feasible. They are responsible for hygiene, sanitation,

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