

Child with intestinal volvulus misdiagnosed as diabetic ketoacidosis

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DESCRIPTION

A 5-year-old boy was brought to the Emergency Department (ED) because of abdominal pain, nausea and fever. On examination the patient was unwell, mildly tachycardic and tachypnoeic; his abdomen was diffusely tender. Venous blood gas showed metabolic lactic acidosis (pH: 7.07, HCO₃: 13 mmol/L, lactate: 10.3 mmol/L) with hyperglycaemia (21.5 mmol/L).

Based on these findings the boy was diagnosed with diabetic ketoacidosis (DKA) and transferred to our paediatric ED.

On arrival the boy was critically ill, his vitals showed an SpO₂ of 70% on room air, arterial blood pressure of 79/50 mm Hg and heart rate of 145 bpm. On examination the patient was dyspnoeic, the abdomen distended and diffusely tender with no audible bowel sounds.

Following intubation and stabilisation an abdominal CT was performed ([figure 1](#)); it showed small bowel obstruction and superior mesenteric ischaemia. Immediate surgery was performed, revealing midgut volvulus on intestinal malrotation with intestinal necrosis ([figure 2](#)), therefore the patient underwent a subtotal small bowel resection with jejunocolic anastomosis, resulting in ultrashort bowel syndrome (residual bowel length <10 cm or <10% of the expected length for age).¹

He was eventually discharged on parenteral nutrition.

Intestinal malrotation results from an abnormal rotation of the embryonic gut; later in life it can cause twisting of the small bowel around the superior mesenteric artery, leading to vascular compromise and eventually necrosis of large portions of the intestine. Clinical manifestations of intestinal malrotation usually occur within the first year of



Figure 2 Intraoperative picture of necrotic bowel.

life, but our patient was asymptomatic until 5 years of age.

The diagnosis of volvulus is usually made by abdominal ultrasound, radiograph and, potentially, CT²; treatment consists of immediate laparotomy³ and prognosis depends on the time of intervention.

The boy originally presented with mainly abdominal symptoms but, because of the hyperglycaemia, he was mistakenly diagnosed with DKA.

Biochemical diagnostic criteria for DKA are blood glucose >11 mmol/L, pH <7.3 or serum bicarbonate <15 mmol/L, ketonaemia ≥3 mmol/L or moderate-to-large ketonuria.^{4,5}

The patient was not initially tested for ketonaemia or ketonuria.

These simple tests would have allowed to rule out DKA and suspect stress hyperglycaemia, an endogenous response to stressful conditions such as injuries, severe infections or respiratory distress; stress hyperglycaemia results from the interaction between the sympathetic nervous system, proinflammatory

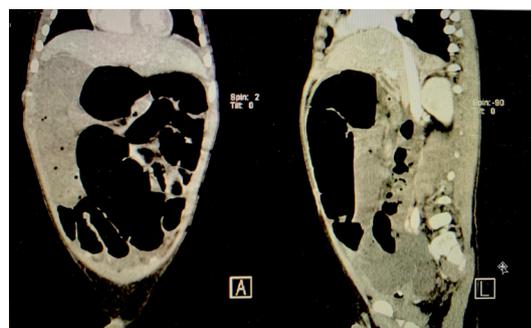


Figure 1 Abdominal CT shows severely dilated ileal loops with air-fluid levels, compatible with small bowel obstruction.

Learning points

- ▶ Volvulus on intestinal malrotation usually occurs within the first year of life, but it should be considered as a cause of acute abdomen in older children as well.
- ▶ When suspecting an intestinal volvulus it is pivotal to promptly obtain diagnostic images to expedite the surgical treatment and improve the outcome.
- ▶ Hyperglycaemia is not found exclusively in diabetes, but it can also occur as a systemic stress reaction.



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mediators and the hormones involved in glycogenolysis and gluconeogenesis.

Our patient had a bowel obstruction leading to shock, lactic acidosis and, eventually, metabolic acidosis with extreme stress hyperglycaemia (blood sugar >16.7 mmol/L). The latter is a sign of severe illness and correlates with high mortality.⁶

To conclude DKA should only be diagnosed when all its biochemical features are present; in this case overlooking an acute abdominal emergency because of stress hyperglycaemia led to a disastrous outcome.

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