

CASE REPORT

Type B lactic acidosis as initial presentation of acute myeloid leukaemia. A case report

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Abstract

Lactic acidosis type B is a rare complication in patients with haematological malignancies. This article reports a single patient case with lactic acidosis as a first presentation of acute myeloid leukaemia. Finally, we briefly speculate on the pathogenesis of this disorder.

Introduction

Developing type B lactic acidosis (LAB) in the setting of a haematological malignancy is a rare complication with poor outcome.¹ LAB in haematological malignancies has a multifunctional aetiology.^{2,3} We report a case of an 82-year-old woman who presented with LAB as the first presentation of acute myeloid leukaemia.

Case report

An 82-year-old woman was referred to the emergency department of the Amphia hospital Breda because of acute progressive shortness of breath and no response to antibiotic treatment and prednisone. Her medical history mentioned no respiratory or cardiac disease and no diabetes or use of drugs. On admission the patient was tachypnoeic with a decreased level of consciousness and normal blood pressure. Physical examination revealed no evident cause for respiratory insufficiency. Chest X-ray and electrocardiography were normal. Arterial blood gas analysis showed: pH 7.03, PCO 7.6 kPa, PO 12.4 kPa, bicarbonate 15.0 mmol/L and a base excess of -15.4 mmol/L. Plasma level of lactic acid was 12.4 mmol/L. Serum creatinine was 84 µmol/L. The full blood count showed anaemia (Hb 4.6 mmol/L), thrombopenia of $32 \times 10^9/L$ and leukocytosis of $280 \times 10^9/L$, with a differential count of mainly myeloblasts indicating acute myeloid leukaemia (AML). Despite respiratory support with intubation and mechanical ventilation after admission to the intensive care unit, our patient deteriorated and died the same day. No medication was given because of her poor prognosis.

Discussion

Lactic acidosis (blood lactate concentration $>5\text{mmol/L}$ and $\text{pH} <7.30$) is the most common cause of metabolic acidosis.³ Lactic acid is the normal endpoint of the anaerobic breakdown of glucose in the tissues and is transported to the liver when it exits the cells. In the liver, lactic acid is oxidized back to glucose. In the setting of decreased tissue oxygenation, lactic acid is produced as the anaerobic cycle is utilized for energy production. Lactate is cleared from the blood primarily by the liver and to a smaller degree by the kidneys and skeletal muscles.² Under normal circumstances the body produces 15-20 mmol/kg lactic acid per 24 hours.

In clinical practice two types of LA are commonly seen, type A and type B. Type A lactic acidosis occurs in association with clinical evidence of tissue hypoperfusion or acute and severe hypoxaemia. Type B lactic acidosis is lactic acidosis that occurs when there is no clinical evidence of poor tissue perfusion or oxygenation. Type B occurs in association with systemic disease, such as renal and hepatic failure, diabetes and malignancy, or due to hereditary metabolic diseases, several classes of drugs and toxins, including biguanides, alcohols, iron, isoniazid, zidovudine and salicylates.^{2,4}

Malignant cells can switch their metabolism towards the glycolytic pathway despite normal oxygen concentrations leading to excessive lactic acid production (Warburg effect) which is normally counterbalanced by the gluconeogenesis in the liver. This metabolic balance can be disrupted and end up as LAB. An increase in the glycolytic rate in tumour cells can be due to an aberrant insulin-like growth factor (IGF) signalling system that induces overexpression of hexokinase type II, a rate-limiting enzyme involved in glucose consumption by the cell.¹

Other mechanisms described that result in LAB, are an increase in lactate production by the action of tumour necrosis factor- α , and cytokine involved in systemic inflammation by reducing the activity of pyruvate dehydrogenase.¹ Also thiamine deficiency has been suggested because thiamine is

an important co-factor for converting pyruvate into acetyl coenzyme A in the Krebs Cycle and without this conversion, anaerobic metabolism will prevail.¹

Tumour microembolism can also cause lactic acidosis, or decreased hepatic clearance of lactic acid due to extensive liver involvement.² However, many case reports in the literature show no evidence of liver infiltration.^{2,6} In addition, no evidence has been found for extensive liver metastasis as a cause for LAB.²

LAB in (haematological) malignancy indicates a poor and often fatal outcome and can be considered as a marker of poor prognosis regardless of treatment. Even improvement of disease activity as a result of response to chemotherapy is generally temporary. Aggressive chemotherapy has been effective in a small group of patients and is still the first choice of treatment. Alkalinization seems to be a logical choice but seems ineffective.¹ Administered bicarbonate is immediately converted to CO₂ and if the patient is unable to eliminate the additional CO₂ by increased ventilation the pH will not change.^{1,2,3}

The cause of respiratory distress in our patient is probably due to the obstruction of the pulmonary vasculature caused by leukostasis or by extensive tumour emboli at the time of clinical manifestation of her leukaemia. She also presented with lactic acidosis which carries a very poor prognosis. At this age chemotherapy is not an option, since it would only give a temporary improvement as the literature states.

Conclusion

The metabolic imbalance between excessive production of lactic acid by malignant cells and hepatic lactic acid utilization causes lactic acidosis type B. However, the exact pathogenesis of this mechanism in malignancies is still poorly understood.¹⁻⁶

The literature states an unfavourable prognosis of LAB in haematological malignancies. Chemotherapy is generally only a temporary successful treatment.

As caregiver one should be aware of the poor prognosis of LAB and be cautious with overtreatment.

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