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### Case report

## A rare cause of severe metabolic acidosis: Presurgical fasting<sup>☆</sup>



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#### ABSTRACT

**Objectives:** To discuss a clinical case and a non-systematic literature review on severe metabolic acidosis due to pre-surgical fasting, its incidence, etiology, and pathophysiology. **Materials and methods:** Discussion of a case of a patient with fasting-induced severe metabolic acidosis during a laparoscopic cholecystectomy, its management and outcomes. The Ethics Committee of our institution approved the case discussion. The literature search included Pub Med, Scielo and Bireme.

**Results:** Fasting-induced metabolic acidosis is underdiagnosed and is related to the search for an alternate energy source in the absence of glucose and glycogen. Free fatty acids are these alternate source and generate ketone bodies that accumulate and lead to the development of acidosis. This is the first case of a non-diabetic patient at our institution. We found no other reports at the national level. There are some cases in the world literature associated with fasting from vomiting during the third trimester of pregnancy, psychiatric disorders, strict dieting, gastric band dysfunction and alcohol abuse.

**Conclusions:** The anesthesiologist must be aware of this possibility in patients with fasting-induced metabolic acidosis with normal lactate values and hemodynamic impairment that are either too young or too old, non-diabetic and with no history of alcohol abuse. The anion gap calculation tool is a simple diagnostic approach. The incidence of the condition increases during pregnancy.

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## Una causa inusual de acidosis metabólica severa: ayuno prequirúrgico

### RESUMEN

#### Palabras clave:

Cetoacidosis  
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Anión gap

**Objetivos:** Presentación de un caso clínico y revisión no sistemática de la literatura sobre acidosis metabólica severa por ayuno prequirúrgico, su incidencia, etiología y fisiopatología. **Materiales y métodos:** Con autorización del Comité de Ética de nuestra institución, se presenta el caso de un paciente con acidosis metabólica severa inducida por ayuno durante una colecistectomía laparoscópica, su manejo y desenlace. La búsqueda bibliográfica se realizó en PubMed, Scielo y Bireme.

**Resultados:** La acidosis metabólica secundaria a ayuno es subdiagnosticada y está relacionada con la búsqueda de una fuente alterna de energía en ausencia de glucosa y glucógeno. Los ácidos grasos libres constituyen esta alternativa, generando cuerpos cetónicos que, al acumularse, desencadenan una cetoacidosis. Este es el primer caso en nuestra institución en un paciente no diabético. No encontramos reportes a nivel nacional. Existen en la literatura médica mundial casos asociados a ayuno secundarios a vómito durante el tercer trimestre de embarazo, trastornos psiquiátricos, dietas estrictas, disfunción de banda gástrica y abuso de alcohol.

**Conclusiones:** El anestesiólogo debe contemplar esta posibilidad en pacientes con acidosis metabólica inducida por ayuno con valores de lactato normal y clínica de deterioro hemodinámico, que estén en los extremos de la vida, no diabéticos ni con antecedentes de abuso de alcohol. El cálculo de anión gap es una herramienta sencilla de aproximación diagnóstica. Su incidencia aumenta durante el embarazo.

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## Introduction

The fasting-induced metabolic acidosis diagnostic of the pre-surgical patient is a challenge to the anesthesiologist. The causes of euglycemic ketosis are two-fold: the first one is a drop in the amount of circulating glucose due to vomiting, extreme dieting and pregnancy. The second one is due to excessive hydrogen ions resulting from salicylate poisoning, methanol and sepsis, inter alia.<sup>1,2</sup>

Lower glucose levels and glycogen stores from poor intake results in reduced insulin secretion and increased lipolysis. These fatty acids are oxidized in the liver and develop into ketone bodies: B-hydroxybutyrate, acetoacetate and acetone. Then the tissues are transformed via mitochondrial succinyl CoA into Acetyl CoA, enabling the onset of Krebs cycle and generating an alternate energy source.<sup>3</sup> One gram of beta hydroxybutyrate produces 4.69 calories as compared to glucose with 3.72 calories. The accumulation of the former causes metabolic acidosis.<sup>4-7</sup>

In clinical practice, fasting is seldom the suspect as the cause of metabolic acidosis, much less in asymptomatic, non-pregnant, non-diabetic, patients who are not alcohol users.<sup>8</sup> Moreover, pre-surgical fasting in children and blood glucose levels below 144 mg/dl are also associated with a decrease in gastric emptying.<sup>9</sup>

## Case report

With the authorization of the Ethics Committee, this is the first case in the institution. 71-Year old male patient, mestizo ethnicity, farmer with 48 h of colicky abdominal pain in

the midgut and right hypochondrium, associated with multiple vomiting and no fever. A cholecystitis-cholelithiasis is documented and the patient is scheduled for laparoscopic cholecystectomy and cholangiography. Patient Background: dyslipidemia treated with lovastatin. Oral antihypertensive therapy is initiated for uncontrolled high blood pressure. His EKG and paraclinical tests are normal. No new vomiting episodes recorded in the last 48 h. Rapid sequence intubation was performed free of complications with midazolam 2 mg, fentanyl 150 mcg, Propofol 70 mg, rocuronium 50 mg. The patient continued to develop hypotension refractory to crystalloid and vasopressors management. The perioperative and postoperative arterial and venous gasses evidence severe metabolic acidosis with no tissue hypoperfusion. The patient is transferred to the ICU with invasive ventilation support and vasopressor (Tables 1 and 2).

In the ICU, the cardiac enzymes curve was negative. The blood chemistry, coagulation and urinary output were all normal. The positive findings were: elevated anion gap value with low SID and normal lactate. The urine test showed positive ketones (three crosses). Fasting metabolic acidosis was suspected and managed with 10% dextrose for 12 h; the acid-base status was then normalized. 24 h later the ventilation support and vasopressors were removed (Tables 2 and 3).

## Literature review

The anion gap, the SIDa and the lactate measurement are simple tools for the diagnostic approximation of metabolic acidosis.<sup>10</sup>

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