Fill in the Gaps: An Unresponsive 55-Year-Old Man

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CASE DESCRIPTION

A 55-year-old man with a history of chronic obstructive pulmonary disease that did not require home oxygen, as well as hypertension, was brought to our emergency department after being found unresponsive at home. The patient's family said he was in his usual state of health until today, when they noticed increased dyspnea consistent with his chronic obstructive pulmonary disease. They believed it was caused by recent overexertion cleaning tools with various chemicals. His breathing became worse as the day progressed, and he was found overnight to be diaphoretic and unresponsive, prompting a 9-1-1 call. The family denied sick contacts, recent travel, and toxin ingestion.

Examination in the emergency department showed a chronically ill man in severe distress, with rapid shallow respirations, prompting immediate intubation. He exhibited no purposeful movements and no response to noxious stimuli, but his pupils were responsive to light. Vital signs included a heart rate of 86 beats/min; respirations, 26 breaths/min; blood pressure, 196/112 mmHg; and oxygen saturation, 95% by pulse oximetry. Point-of-care glucose was 176 mg/dL (reference interval, 70–199 mg/dL). An electrocardiogram showed sinus rhythm without ST segment changes. Initial laboratory testing included a basic metabolic panel, lactic acid, and arterial blood gases (Table 1). A white blood cell count was 20.8 K/mm^3 (3.9 –9.9 K/mm^3).

Using the calculated total CO_2 from the arterial blood gas, the anion gap was 27 mmol/L (2–15 mmol/L). Serum osmolality was 329 mOsm/kg (275–300 mOsm/kg), with a calculated osmolal gap of 52 mOsm/kg. Other initial blood testing included a hepatic function panel, lipase, troponin I, B-type natriuretic peptide, and acetaminophen; all were unremarkable. Urinalysis was notable for 1+ketones and 2+ protein. Computed tomography of the head and abdomen showed no acute abnormalities. A chest radiograph showed a normal cardiac silhouette and no evidence of pneumonia, effusion, or pneumothorax.

QUESTIONS TO CONSIDER
• How is the anion gap calculated, and what is its significance?
• How is an osmolal gap calculated, and what is its significance?
• What is the differential diagnosis for a high anion gap metabolic acidosis?

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Table 1. Initial patient results.

Test	Result	Reference interval	Units
Sodium	136	135–145	mmol/L
Potassium[a]	NA	3.3–4.9	mmol/L
Chloride	102	97–110	mmol/L
Carbon dioxide	<6	22–32	mmol/L
Urea nitrogen	14	8–25	mg/dL
	5.0	2.9–8.9	mmol/L
Glucose	201	70–199	mg/dL
	11.2	1.1–11.1	mmol/L
Creatinine	0.94	0.8–1.30	mg/dL
	83	71–115	μmol/L
Calcium	9.1	8.5–10.3	mg/dL
	2.27	2.12–2.57	mmol/L
Anion gap[b]	NA	2–15	mmol/L
Lactic acid	6.8	0.7–2.2	mmol/L
pH	6.7	7.35–7.45	
pCO_2	40	35–45	mmHg
Carbon dioxide, calculated	7	21–30	mmol/L

[a] Result not reported because of specimen hemolysis.
[b] Anion gap not calculated owing to CO_2 below limit of detection.
NA, not available.

Final Publication and Comments

The final published version with discussion and comments from the experts will appear in the July 2018 issue of *Clinical Chemistry*. To view the case and comments online, go to http://www.clinchem.org/content/vol64/issue7 and follow the link to the Clinical Case Study and Commentaries.

Educational Centers

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