

Blood Gas #10

History: A 24-year-old man experiences cardiac arrest secondary to [Torsade de pointes](#). Below is his arterial blood gas post-return of spontaneous circulation:

pH 7.47	Na 129 mmol/L
pCO ₂ 50 mmHg	K 2.8 mmol/L
HCO ₃ 36 mmol/L	Cl 90 mmol/L
Lactate 1.3 mmol/L	Glucose 5.3 mmol/L

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What's the pH?



What's the primary process?



Is there any compensation?



Are there any other clues?



What's the differential diagnosis?

What's the pH?

7.47 = alkalaemia

What's the primary process?

HCO₃ 36 = primary metabolic alkalosis

Is there any compensation?

Expected pCO₂ = 0.7 × HCO₃ + 20

= 0.7 × 36 + 20

= 45.2 mmHg (+/-5)

Actual pCO₂ is 50, therefore there is maximal respiratory compensation.

Are there any other clues?

Lactate is borderline high at 1.3. Sodium, potassium and chloride are low. Glucose is within the normal range.

What's the differential diagnosis?

Description: This venous blood gas reveals a maximally compensated metabolic alkalosis associated with hypochloraemia, hyponatraemia and hypokalaemia.

Interpretation: In this clinical setting, hypokalaemia has most likely resulted in QT interval prolongation and the development of a polymorphic ventricular tachycardia or [Torsades de pointes](#). Serum magnesium and calcium levels should also be measured and replaced accordingly. Hypochloraemic metabolic alkalosis could be secondary to upper gastrointestinal losses secondary to vomiting, diuretic use/abuse, or intravascular volume contraction. Primary hyperaldosteronism could be considered, however this is usually associated with only a mild hypernatraemia, therefore a sodium of 129 mmol/L would suggest this possibility to be less likely. Further investigation of the hyponatraemia with serum osmolality, urinary sodium and urine osmolality should be performed. Management includes electrolyte replacement, intravenous rehydration and supportive care.

Additional information: Strong ion difference ($\text{Na} - \text{Cl}$) = 39 is consistent with high strong ion difference alkalosis.

Diagnosis: [Cannabinoid hyperemesis syndrome](#) leading to hypokalaemic metabolic alkalosis and resulting in Torsades de pointes with cardiac arrest. The patient made a full recovery following serum electrolyte replacement and supportive care.