

Arterial Blood Gas Case Questions

In the space that follows you will find a series of cases that include arterial blood gases. For each case, you should describe the acid-base status of the patient (eg. acute, metabolic acidosis with respiratory compensation) and determine whether the patient has an alveolar-arterial oxygen difference. Finally, you should try to explain the observed abnormalities in light of the clinical scenario.

Case 1:

A 24 year-old woman is found down in Pioneer Square by some bystanders. The medics are called and, upon arrival, find her with an oxygen saturation of 88% on room air and pinpoint pupils on exam. She is brought into the Harborview ER where a room air arterial blood gas is performed and reveals: pH 7.25, PCO_2 60, PO_2 65, HCO_3^- 26, Base Excess 1. On his chemistry panel, her sodium is 137, chloride 100, bicarbonate 26.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 2:

A 60 year-old man with amyotrophic lateral sclerosis is brought into clinic by his family who are concerned that he is more somnolent than normal. On further history, they report that he has been having problems with morning headaches and does not feel very refreshed when he wakes up. An arterial blood gas is performed and reveals: pH 7.37, PCO_2 57, PO_2 70, HCO_3^- 32.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 3:

A 65 year-old man is brought into the VA hospital with complaints of severe nausea and weakness. He has had problems with peptic ulcer disease in the past and has been having similar pain for the past two weeks. Rather than see a physician about this, he opted to deal with the problem on his own and, over the past week, has been drinking significant quantities of milk and consuming large

quantities of TUMS (calcium carbonate). On his initial laboratory studies, he is found to have a calcium level of 11.5 mg/dL, a creatinine of 1.4 and bicarbonate of 35. The resident working in the ER decides to draw a room air blood gas that reveals: pH 7.45, PCO_2 49, PO_2 68, HCO_3^- 34. On his chemistry panel, the sodium is 139, chloride 95, HCO_3^- 34.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 4:

A 45 year-old woman with a history of inhalant abuse presents to the emergency room complaining of dyspnea. She has an S_pO_2 of 99% on room air and is obviously tachypneic on exam with what appears to be Kussmaul's respirations. A room air arterial blood gas is performed and reveals: pH 6.95, PCO_2 9, PO_2 128, HCO_3^- 2. A chemistry panel revealed sodium of 130, chloride 98, HCO_3^- 2.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 5:

A 68 year-old man with a history of very severe COPD ($FEV_1 \sim 1.0L$, < 25% predicted) and chronic carbon dioxide retention (Baseline PCO_2 58) presents to the emergency room complaining of worsening dyspnea and an increase in the frequency and purulence of his sputum production over the past 2 days. His oxygen saturation is 78% on room air. Before he is placed on supplemental oxygen, a room air arterial blood gas is drawn and reveals: pH 7.25, PCO_2 68, PO_2 48, HCO_3^- 31.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 6:

A climber is coming down from the summit of Mt. Everest. At an altitude of 8,400 m ($P_B \sim 272$ mmHg), he has a blood gas drawn while breathing ambient air as part of a research project. The blood gas reveals pH 7.55, PCO_2 12, PO_2 30 and HCO_3^- 10.5.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 7:

A 57 year-old woman presents with 2 days of fevers, dyspnea and a cough productive of rust-colored sputum. Her room air oxygen saturation in the emergency room is found to be 85% and the intern decides to obtain a room air arterial blood gas while they are waiting for the chest x-ray to be done. The blood gas reveals: pH 7.54, PCO_2 25, PO_2 65, HCO_3^- 22, Base excess -1.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

Case 8:

A 47 year-old man with a history of heavy alcohol use presents with a two-day history of severe abdominal pain, nausea and vomiting. On exam, his blood pressure is 90/50 and he is markedly tender in his epigastrium. His initial laboratory studies reveal a sodium of 132, chloride 92, HCO_3^- 16, creatinine 1.5, amylase 400 and lipase 250. A room air arterial blood gas is drawn and reveals pH 7.28, PCO_2 34, PO_2 88, HCO_3^- 16.

Acid-base status:

Alveolar-arterial oxygen difference:

Explanation for the clinical picture:

