

A 77-year old woman with hyperventilation

Rebecca Verheggen

Roel Klein Wolterink

Mark van Haaren

ER presentation

Chief complaints

- Dyspnea for 1 week during exercise
- Tingling sensation in the right arm
- No chest pain or discomfort

Past Medical History

- Diabetes mellitus type 2
- Hypertension
- Chronic kidney insufficiency

Medication

- Metoprolol, hydrochlorothiazide, metformin, pravastatin

ER presentation

Physical examination

RR 168/91, HR 89/min, Sat 95%, 16 breaths per minute

General: not acutely ill, no dyspnea

Heart: S1S2, no souffles

Resp: normal breathing, absence of rhonchi and crackles

Abd: soft, non tender, non distended, absence of pain

Ext: no edema

Additional investigations

Lab: no abnormalities in relation to previous laboratory results

ECG: sinus rhythm, 82/min, normal cardiac axis, normal conduction and morphology

X-chest: no abnormalities

Arterial blood gas: pH 7.45 [7.38-7.46], pCO₂ 29.4 [31.0-42.0], Bic 20.0 [20.4-26.0]

Consultation cardio/pulmonary resident

Conclusion:

No signs of cardiac or pulmonary pathology

Advice:

Expectant management

ER dismissal

Closer look at the ABG

Arterial blood gas: pH 7.45 [7.38-7.46], pCO₂ 29.4 [31.0-42.0], Bic 20.0 [20.4-26.0], pO₂ 69mmHg, O₂ sat 94.5%

Table 1. Five steps to interpreting arterial blood gas results

Step 1	Is there an acidaemia or an alkalaemia?
Step 2	Is the primary disturbance respiratory or metabolic?
Step 3	For a metabolic acidosis, is there a high anion gap?
Step 4	Is there compensation? If there is, is it appropriate?
Step 5	What is the alveolar–arterial gradient? Look at the arterial pO ₂ in the context of the inspired oxygen concentration and the arterial pCO ₂

A-a O₂ gradient

$$Aa \text{ Gradient} = \left(150 - \frac{5}{4}(P_{CO_2})\right) - P_aO_2$$

- Difference between the calculated alveolar pO₂ and the measured arterial pO₂
- Alveolar pO₂ is a function of gas exchange and fractional inspired concentration of O₂ in air (FiO₂)

A-a O₂ gradient = 44 mmHg (age-expected A-a gradient 23.3)

- Calculate the efficiency with which oxygen goes from the alveoli into the arterial circulation
- Assesses for degree of shunting and V/Q mismatch

Differential diagnosis

Dyspnoea with exercise + respiratory alkalosis + elevated A-a gradient

DD pulmonary embolism

DD atelectasis

DD pneumothorax

DD pneumonia

DD intrinsic lung disease

DD left sided heart failure

CT scan



Conclusion

Extensive bilateral pulmonary embolism

Take home message

A-a O₂ gradient:

Your help to assess the efficiency with which oxygen goes from the alveoli into the arterial circulation

