Question 9 (16 marks)

You are the consultant in charge receiving morning handover from your registrar. There is a 30 year old woman in your resuscitation bay who was intubated overnight after presenting with an altered conscious state.

Her initial arterial blood gas is shown in PROPS BOOKLET page

Arterial Blood Gas:

pH 6.89 (7.35- 7.45)
pCO_2 72 mmHg (35- 45)
pO_2 60 mmHg (80- 110)
HCO_3 10 mmol/L (23- 32)
Base excess -20.5 (-2/ +2)
Sodium 136 mmol/L (135- 145)
Potassium 4.0 mmol/ L (3.5- 5.5)
Chloride 90 mmol/ L (90- 115)
Urea 16 mmol/ L (3.5- 8.0)
Creatinine 0.14 mmol/L (0.06- 0.12)

a. **Provide two (2) calculations to help you interpret these results. For each result list its significance. (4 marks).**

Feedback:

When reading this scenario and then looking at the ABG, this is obviously a mixed metabolic and respiratory acidosis. However, in the scenario, it would be that the metabolic disturbance is most likely the primary disturbance with the respiratory disturbance due to either hypoventilation from a reduced conscious level (if the ABG was taken prior to intubation) or poor ventilator settings (if the ABG was taken after intubation)

Calculations needed:

1) Anion Gap calculation- 136 (+4) -90-10 = 36 (40). Hence anion gap metabolic acidosis.
2) Winter's Formula to calculate expected pCO_2 which is ~23 mmHg. Hence there is respiratory acidosis as well with the pCO_2 being 72.

Some candidates also calculated the delta ratio. If this was done as part of the anion gap calculation, I accepted it. However, if it was done instead of calculating the expected

pCO_2, I did not accept it as it showed that as a candidate you did not appreciate that there was a mixed acidosis present.

If the delta ration was calculated:

(Anion gap -12) / (24- HCO_3)
= (36-12) / (24-10)
=24/14
= 1.7

Hence, pure anion gap metabolic acidosis

b) List four (4) most likely diagnoses for her presentation. (4 marks).

Feedback:

Key points – read the question!. What is most likely in this 30 year old lady.

I needed at least 3 of:

1) DKA
2) Sepsis
3) Toxicological (a likely one) aetiology that could cause a metabolic acidosis e.g. alcohol, ethylene glycol
4) Seizure – cause of seizure could be multiple

If a candidate wrote, for example, two infective causes and two toxicological causes, they could not get full marks.

Some candidates wrote an intracranial bleed. I did not accept this as the bleed itself is unlikely to cause a metabolic acidosis unless there was a complication of it which caused e.g. a seizure.

The patient is appropriately managed overnight and her condition improves. The registrar is hopeful she can be extubated after handover.

c) Complete the table below listing four (4) patient factors that are required to allow safe extubation of this patient and for each state how you would ensure adequacy of that factor. (8 marks)

Feedback:

Possible patient factors:

1) Adequate oxygenation
    - $SaO_2 \geq 95\%$ on FiO2 of ≤0.4
2) Adequate ventilation
    - RR<30, Tidal Volume ≥6 ml/kg, PEEP≤5
3) Normal haemodynamics
    - BP (systolic) ≥100, HR ≤100 / minute, off inotropes/ vasopressors
4) Normal mentation
    - Alert, obeying commands
5) Lack of difficult airway
    - Check intubation notes or old anaesthetic notes (if available) to see if intubation grade is mentioned, assess thyromental distance to assess if at least 6 cm (3 finger breadths).
6) Resolution of the issue requiring intubation
    - I accepted this though it isn't probably a patient factor as it is tied up in the first 4 factors above.

For demonstrating how you would ensure the adequacy of that factor, you had to give some endpoints with parameters that you would assess for the full mark. E.g. BP, HR, Tidal volume. Simply writing "able to take a deep breath" was not enough.

I also noted that many candidates wrote the same factor twice in different ways. E.g. conscious and alert as one factor and then adequate cough as another factor. These are the same. A patient will need to be alert to have an adequate cough.