Case study - Chronic Obstructive Pulmonary disease

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Case study

Mr Afridi is a 67-year-old war veteran who consults you for the first time.

He complains of being short of breath on exertion. From his history and examination you suspect chronic obstructive airway disease due to a long history of smoking (20+ per day for 50 years). While he is still well you send him off for some respiratory function tests. You also order blood gas measurements and the laboratory returns the following results:

Test	Result	Normal values
pH	7.39	(7.35 - 7.45)
pCO2	65 mmHg	(36 - 44)
HCO3-	39 mmol/L	(22 - 26)
pO2	55 mmol/L	(85 - 105)

Self test

Question 1

Which ONE of the following is the most likely acid-base condition of the patient?
Select ONE only

1. Acute metabolic acidosis.
2. Acute metabolic alkalosis.
3. Acute respiratory acidosis.
4. Acute respiratory alkalosis.
5. Chronic metabolic acidosis with evidence of respiratory compensation.
6. Chronic metabolic alkalosis with evidence of renal compensation.
7. Chronic respiratory acidosis with evidence of renal compensation.
8. Chronic respiratory alkalosis with evidence of respiratory compensation.
9. Mixed disturbance.

Answers and feedback are on page ??

Question 2
What drug treatment would you implement?

Answer and feedback is on page ??

Question 3
What general advice would you give the patient?

Answer and feedback is on page 40

Continuing history

Three weeks later Mr. Afridi develops bronchopneumonia and is admitted to the local emergency room. Mr Afridi is breathless with rapid shallow respiration and is coughing up yellow sputum. On auscultation a generalised wheeziness is found in both lung fields. Blood gases are ordered and have the following results:

Test	Result	Normal values
pH	7.20	(7.35 - 7.45)
pCO2	102 mmHg	(36 - 44)
HCO3-	41 mmol/L	(22 - 26)
pO2	40 mmol/L	(85 - 105)

Question 4
Which of the following is the most likely acid-base condition of the patient?

1. Acute metabolic acidosis.
2. Acute metabolic alkalosis.
3. Acute respiratory acidosis.
4. Acute respiratory alkalosis.
5. Chronic metabolic acidosis with evidence of respiratory compensation.
6. Chronic metabolic alkalosis with evidence of renal compensation.
7. Chronic respiratory acidosis with evidence of respiratory compensation.
8. Chronic respiratory alkalosis with evidence of renal compensation.
9. Acute and chronic respiratory acidosis with evidence of renal compensation.
10. Mixed disturbance.

Answer and feedback is on page 40

Question 5
What would you do now? Select one or moe form the following list.

1. Order blood and sputum cultures.
2. Commence O2 through loose facial mask.
3. Commence nebuliser using O2 and ventolin.
4. Set up an IV line and administer steroid and antibiotic.
5. Administer O2 using an airtight mask.

Answer and feedback is on page 40

Continuing history

Mr. Afridi continues to deteriorate and is intubated and moved to the intensive care unit. After one hour of ventilation blood gases are re-ordered and have the following results:

Test	Result	Normal values
pH	7.55	(7.35 - 7.45)
pCO2	38 mmHg	(36 - 44)
HCO3-	37 mmol/L	(22 - 26)
pO2	150 mmol/L	(85 - 105)

Question 6
Which of the following is the most likely acid-base condition of the patient?

1. Acute metabolic acidosis.
2. Acute metabolic alkalosis.
3. Acute respiratory acidosis.
4. Acute respiratory alkalosis.
5. Chronic metabolic acidosis with evidence of respiratory compensation.
6. Chronic metabolic alkalosis with evidence of renal compensation.
7. Chronic respiratory acidosis with evidence of respiratory compensation.
8. Chronic respiratory alkalosis with evidence of renal compensation.
9. Acute and chronic respiratory acidosis with evidence of renal compensation.
10. Respiratory alkalosis over chronic respiratory acidosis with renal compensation.
11. Mixed disturbance.

Answer and feedback is on page 40

Results and Continuing history

Mr. Afridi now suffers from an acute respiratory alkalosis induced by over-ventilation. This occurs “over” the pre-existing chronic respiratory with renal compensation.

The level of ventilation should be titrated against the blood pH. Tissues respond poorly to acidotic states and thus one should endeavour to maintain pH within the normal range by monitoring pH levels.

Upon commencement of artificial respiration you note an immediate drop in blood pressure.

Question 7
What is the cause of the drop in BP?

Answer and feedback is on page 41

Continuing history

Mr. Afridi’s ventilation rate is reduced until pH levels are stabilised. The infection settles over 5 days and he is then extubated. He is maintained under observation for a further week and then discharged home and back to your care with instructions to complete his course of antibiotics and to continue with his inhalers.

At Mr. Afridi’s first visit after discharge you discuss with him an asthma ‘action plan’.

The following is a copy of an Action Plan for Chronic Obstructive Airways Disease.

ACTION PLAN FOR COPD

1. Reliever .....
2. Preventer .....
3. Prednisolone .....
4. Other .....

Worsening symptoms
- More wheezy or breathless
- Reduced energy for daily activities
- Increasing tiredness and poor sleep
- Change in amount and/or colour of phlegm

Medication for worsening symptoms
1. Reliever
2. Antibiotic
3. Prednisolone
4. Contact your doctor if not getting better

Remember
Keep as active as possible
Have you had your flu vaccine (annually)
and pneumococcal vaccine (5 yearly)
Home oxygen prescription (if applicable)
.....litres/minute.....hrs/day
Lung function test result. .....
Date of test .....

For severe attack
You should act immediately
Call an ambulance
Say “Severe Emphysema”
Give your address or location

Continuing history

Mr Afridi says that he found the period of intubation very uncomfortable and distressing. He makes an impassioned plea that if the same situation were to arise again he categorically refuses to be intubated again.

Question 8
Having been told this, and assuming that a similar situation arises, what are your rights and responsibilities regarding the patient’s wishes?

Answer and feedback is on page 41

Answers and feedback

Question 1
Which ONE of the following is the most likely acid-base condition of the patient? Select ONE only.

1. Acute metabolic acidosis.
2. Acute metabolic alkalosis.
3. Acute respiratory acidosis.
4. Acute respiratory alkalosis.
5. Chronic metabolic acidosis with evidence of respiratory compensation.
6. Chronic metabolic alkalosis with evidence of renal compensation.
7. Chronic respiratory acidosis with evidence of renal compensation.
8. Chronic respiratory alkalosis with evidence of respiratory compensation.
9. Mixed disturbance.

The Authors' answer is 7.
Chronic respiratory acidosis with evidence of renal compensation.

Feedback
The presence of an elevated CO2 level indicates a respiratory acidosis. The concomitant elevation in plasma bicarbonate also indicates the production of bicarbonate by the kidney as a renal compensation for the respiratory acidosis. Thus the correct diagnosis is respiratory acidosis.

Question 2
What drug treatment would you implement?

Authors' answer
Commence a program of appropriate inhaled bronchodilator and inhaled steroids

Feedback:
The effectiveness of bronchodilators in treating chronic respiratory disease is dependent on the level of bronchospasm present. The potential effectiveness of bronchodilators in this condition can thus be predicted by the level of acute improvement seen in forced Expiratory Volume in 1 minute (FEV1) immediately following bronchodilator treatment. In cases of relative refractoriness to brochodilators, 4 weeks of steroid treatment can in some cases reverse the inflammation and improve airway caliber and responsiveness to bronchodilators.

Question 3
What general advice would you give the patient?
Provide two separate items of advice.

Authors' answer
• Stop Smoking.
• Notify doctor if changes suggesting respiratory infection occur.

Feedback:
Cessation of smoking occurs in less that 20% of people who are advised to do so. In the elderly who have smoked for the majority of their lifetime, the success rate would be significantly less. Nevertheless, individuals should be counselled about the importance of stopping smoking as this gives the lungs the opportunity to self repair. The use of nicotine patches may be beneficial in this regard.

Some elderly male patients may be resistant to seeking medical assistance. It should be impressed on Mr Afridi that he obtain a medical check on the earliest sign of a cold or 'flu' as this has the potential to be life threatening.

Question 4
Which of the following is the most likely acid-base condition of the patient?

Author's answer
This condition represents a state of combined acute and chronic respiratory acidosis with evidence of renal compensation.

Feedback:
The condition actually represents a 'decompensated' chronic respiratory acidosis sometimes referred to as a condition of 'acute over chronic'.

Question 5
What would you do now?

Authors' answer
Order blood and sputum cultures.
Commence O2 through loose facial mask.
Administer O2 using an airtight mask.

Question 6
Which of the following is the most likely acid-base condition of the patient?

Authors' answer
Respiratory alkalosis over chronic respiratory acidosis with renal compensation.

Feedback:
Mr. Afridi now suffers from an acute respiratory alkalosis induced by over-ventilation. This occurs "over" the pre-existing chronic respiratory with renal compensation.

The level of ventilation should be titrated against the blood pH. Tissues respond poorly to acidotic states and thus one should endeavour to maintain pH within the normal range by monitoring pH levels.

Upon commencement of artificial respiration you note an immediate drop in blood pressure.

Question 7
What is the cause of the drop in BP?

Authors' Answer
Reduced venous return to the heart

Question 8
Mr Afridi says that he found the period of intubation very uncomfortable and distressing. He makes an impassioned plea that if the same situation were to arise again he categorically refuses to be intubated again. Having been told this, and assuming that a similar situation arises, what are your rights and responsibilities regarding the patient's wishes?

Authors' Answer
In some countries under the Medical Treatment Act a patient is under no obligation to receive medical procedures that they have previously objected to and have explicitly requested not to receive. If a medical practitioner applies a medical procedure to a patient, and it can be documented that the patient has requested not to receive such a procedure, the doctor may be charged with assault. You will need to refer to your own National Guidelines

Final history
After Mr. Afridi's harrowing experience his compliance to medication and sticking to his action plan improved. He attended you every 2 months for regular monitoring and 12 months later was still well controlled.