CASE TWO

Short case number: 3_7_2
Category: Respiratory System
Discipline: Medicine
Setting: Emergency Department
Topic: Severe asthma

Case

Adam Henshaw, aged 48 years, presents via ambulance from work. He is pale and unwell and short of breath. On examination his respiratory rate is 26/minute, his heart rate is 120/min. and he has difficulty speaking. The ambulance officers tell you he has a history of asthma and his PEF is 33% of predicted.

Questions

1. In a table, be able to list the features of acute severe asthma and explain which of Adam's symptoms suggest he is very unwell.
2. Describe you management of Adam in terms of history, examination, investigations and treatment and explain how your actions are modified by his emergency presentation.
3. List the four indications for assisted ventilation in acute severe asthma.
4. What is the evidence that long acting inhaled b2-adrenoreceptor agonists improve symptoms and lung function and prevent exacerbations of asthma in poorly controlled patients?
5. Explain how corticosteroids, b2-adrenoreceptor agonists and leukotriene receptor antagonists work in the management of asthma.

Suggested reading:

Innes JA, Reid PT. Respiratory disease. In: Boon NA et aal. Davidson's Principles and Practice of Medicine 20th Ed. Churchill Livingstone, London, 2006 PP647-737.

ANSWERS

1. **In a table, be able to list the features of acute severe asthma and explain which of Adam's symptoms suggest he is very unwell.**

Features of acute severe asthma: - PEF 33-50% predicted (< 200 l/min) - Respiratory rate ≥ 25/min - Heart rate ≥ 110/min - Inability to complete sentences in 1 breath
Features of life-threatening asthma: - PEF 33-50% predicted (< 100 l/min) - *Sp*O_2 < 92% or *Pa*O_2 < 8 kPa (60 mmHg) (especially if being treated with oxygen) - Normal *Pa*CO_2 - Silent chest - Cyanosis - Feeble respiratory effort - Bradycardia or arrhythmias - Hypotension - Exhaustion - Confusion - Coma
Features of near fatal asthma: - Raised *Pa*CO_2 - Requiring mechanical ventilation

2. **Describe you management of Adam in terms of history, examination, investigations and treatment and explain how your actions are modified by his emergency presentation.**

- Initial Assessment

An immediate assessment of patients must include their ability to speak, pulse rate, respiratory rate, BP and *Sa*O_2.
Measurement of PEF is mandatory unless the patient is too ill to cooperate and is most easily interpreted when expressed as a percentage of the predicted normal or of the previous best value obtained on optimal treatment.
Arterial blood gas analysis is essential to determine the *Pa*CO_2, a normal or elevated level being particularly dangerous.
A chest X-ray is not immediately necessary unless pneumothorax is suspected.

- Administration of Oxygen

High concentrations of humidified oxygen should be administered to maintain the oxygen saturation above 92% in adults.
The presence of a high $PaCO_2$ should not be taken as an indication to reduce oxygen concentration but is a warning sign of a severe or life-threatening attack.

- Administration of broncho-dilators

Short-acting β_2-agonists represent the agent of first choice.
In hospital they are most conveniently administered via a nebuliser driven by oxygen but delivery of multiple doses of salbutamol via a metered dose inhaler through a spacer device provides equivalent bronchodilation.
Ipratropium bromide provides additional bronchodilator therapy and should be added to salbutamol in patients with acute severe or life-threatening attacks.

- Corticosteroids

Systemic corticosteroids reduce the inflammatory response and hasten the resolution of exacerbations. They should be administered to all patients with an acute severe attack.
They can usually be administered orally (prednisolone 30-60 mg), but intravenous hydrocortisone 200 mg may be used in patients who are unable to swallow or vomiting.

- Intravenous fluids

Patients may be dry secondary to high insensible water loss and will probably benefit from hydration therapy.
Potassium supplements may be necessary because repeated doses of salbutamol can lower serum potassium.

3. List the four indications for assisted ventilation in acute severe asthma.

- Coma
- Respiratory arrest
- Deterioration of arterial blood gas tensions despite optimal therapy
  PaO_2 < 8 kPa (60 mmHg) and falling
  $PaCO_2$ > 6 kPa (45 mmHg) and rising
  pH low and falling (H^+ high and rising)
-Exhaustion, confusion, drowsiness

4. What is the evidence that long acting inhaled b2-adrenoreceptor agonists improve symptoms and lung function and prevent exacerbations of asthma in poorly controlled patients?

"In patients whose asthma is poorly controlled despite regular inhaled corticosteroids, addition of a long-acting β_2-adrenoreceptor agonist improves symptoms and lung function and prevents exacerbations."

- Greening AP, et al. Lancet 1994; 334:219-224.
- Pauwels RA, et al. N Engl J Med 1997; 387:1405-1411.

5. Explain how corticosteroids, b2-adrenoreceptor agonists and leukotriene receptor antagonists work in the management of asthma.

Corticosteroids are potent agents that are the primary for treatment of chronic asthma and prevention of acute asthma exacerbations. Numerous inhaled corticosteroids are used for asthma, with the aim of treatment being to alter the level of inflammation in airways by inhibiting multiple types of inflammatory cells and decreasing production of cytokines and other mediators involved in the asthmatic response.
B-2 receptor antagonists relax bronchial smooth muscle by action on beta2-receptors, with little effect on cardiac muscle contractility.
Leukotriene receptor antagonists are selective and competitive receptor antagonists of leukotriene D4 and E4, which are components of slow-reacting substance of anaphylaxis.