Reminder of important clinical lesson

Methaemoglobinaemia due to mephedrone ('snow')

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Summary

Acquired methaemoglobinaemia is a serious complication caused by many oxidising drugs. It presents as cyanosis unresponsive to oxygen therapy. The case of 33-year-old male patient who presented in our department after noticing blue lips and fingers is presented. He had sniffed 1 g of 'snow' after buying it from a head shop. His oxygen saturation by pulse oximeter on room air at presentation was 90%, which did not improve with supplemental oxygen. Arterial blood gas analyses showed partial pressure of oxygen 37 kPa while on supplemental oxygen and a methaemoglobin concentration greater than 25%. The patient denied using any other recreational drugs and was not on regular treatment. Therefore, a diagnosis of methaemoglobinaemia due to mephedrone, which is the active ingredient of 'snow', was made. Treatment is with intravenous methylene blue. Our patient started to improve so methylene blue was not used and he was discharged after 8 h.

BACKGROUND

Traditionally cyanosis is due to de-oxyhaemoglobin but methaemoglobin can also cause blue discolouration of the skin. Emergency physicians should be aware of the differential diagnosis of cyanosis because methaemoglobin is treated with methylene blue. Methaemoglobinaemia can be fatal.

CASE PRESENTATION

A 33-year-old Caucasian male was brought in by ambulance with 'bluish lips and fingers', which he had noticed after using a new product called 'snow'. The patient also complained of abdominal pain and headaches. He had no significant past medical history and was not on any regular medication. He admitted to sniffing 1 g of 'snow', which he had bought from the local head shop. He denied taking any other recreational drugs.

On clinical examination, he had central and peripheral cyanosis. His temperature was 36.4 °C, blood pressure was 133/90 mm Hg and respiratory rate was 18 breaths/min. His pulse was 102 beats/min and oxygen saturation on pulse oximeter was 90% on room air. The rest of the systemic examination was normal.

He was started on 10 litres of supplemental oxygen. However, the patient's oxygen saturation remained at 90%.

INVESTIGATIONS

ECG showed a heart rate of 106 beats/min with normal sinus rhythm, and chest x-ray showed left lung base subsegmental atelectasis. Arterial blood gas was taken; it was noted to be chocolate-brown in colour and did not turn red on exposure to room air. Analysis of arterial blood gas showed oxygen partial pressure (PO₂) of 10.4 kPa and no carbon-monoxide-haemoglobin was present in the sample. Analysis of arterial blood gas during administration of supplemental oxygen showed PO₂ 37.8 kPa. Methaemoglobin concentration was greater than 25% (reference range 0.0–0.5%).

DIFFERENTIAL DIAGNOSIS

The patient denied the use of any other recreational drugs, so we diagnosed methaemoglobinaemia due to mephedrone, which is the active ingredient of the recreational drug 'snow'.

TREATMENT

The patient was treated with supplemental oxygen and symptoms to improve after a couple of hours. His methaemoglobin concentration dropped to 9.9% after 2 h.

OUTCOME AND FOLLOW-UP

The patient was discharged from the hospital after 8 h when his oxygen saturation on pulse oximeter was 99% on room air. His headache and abdominal discomfort improved.

DISCUSSION

Rare forms of congenital methaemoglobinaemia exist, but most cases of methaemoglobinaemia in adults are secondary to drugs or toxic agents. When haemoglobin is oxidised by certain drugs, it forms methaemoglobin, which imparts an intense bluish tinge to the skin, presenting clinically as cyanosis.¹ This is unresponsive to oxygen therapy.² Symptoms depend upon the concentration³ of methaemoglobin in the blood. Skin discolouration can occur in patients who are not anaemic when as little as 1.5 g/dl or approximately 10%⁴ of haemoglobin is in the methaemoglobin form. At a fraction of 15–20%, the patient may be relatively asymptomatic but cyanosed. At 25–50% headache, confusion and chest pain begin. Treatment is by removing the offending agent, providing supplemental oxygen and administering methylene blue intravenously.⁵ Methylene blue is indicated in the asymptomatic patient with a methaemoglobin blood concentration greater than 25–30%.

The drug 'snow' is a white powder that has recently become available in some head shops, where it is sold legally as a bath salt. Advertised as a 'legal high', the salt's active ingredient is mephedrone. According to TOXBASE,

mephedrone (4-methylmethcathinone) can be synthesised from pseudoephedrine, or is a derivative of methcathinone, which in turn may be derived from cathinone, one of the active ingredients in khat (*Cathula edulis* Forsk). Mephedrone is a psychoactive drug with effects similar to those of 'ecstasy' (MDMA, 3,4-methylenedioxymethamphetamine), however its stimulant properties predominate and are much more potent.⁶ The chemical also has a marked similarity with 4-methylamphetamine, a potent releaser of dopamine, norepinephrine and serotonin,⁷ thus making it neurotoxic.⁸

Since the patient denied using any other recreational drugs, it is believed that in this case mephedrone in the product 'snow' was responsible for the patient's methaemoglobinaemia. We did not use methylene blue in our case because the patient's oxygen saturation on pulse oximeter started to improve.

Learning points

- ▶ Cyanosis due to de-oxygenated haemoglobin is a common presentation in the emergency department.
- ▶ Unexplained cyanosis, particularly in association with normal arterial oxygen tension suggests abnormal haemoglobin, such as methaemoglobin.
- ▶ Cyanosis due to methaemoglobin is treated with methylene blue.
- ▶ Acquired methaemoglobin is a lethal complication of many oxidising drugs in adults.

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