


IMAGES IN EMERGENCY MEDICINE

General Medicine

Diagnosis on sight: Chocolate blood

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1 | CASE PRESENTATION

An adolescent presented to the emergency department after an unintentional supratherapeutic use of an over-the-counter throat spray. The patient was cyanotic, and the oxygen saturation was 88% on room air (Table 1). Despite supplemental oxygen, the patient remained cyanotic. An arterial blood gas was obtained.

2 | DIAGNOSIS

Methemoglobinemia

Methemoglobinemia occurs when one or more of the hemoglobin's iron moieties becomes oxidized. The oxidized ferric (Fe³⁺) iron of methemoglobin causes a left shift in the oxygen-dissociation curve and renders it unable to carry oxygen.^{1,2} This shift will increase the affinity of the ferrous (Fe²⁺) iron for oxygen and impair oxygen release to the tissue.^{1,2} This leads to tissue hypoxia due to the decrease in oxygen delivery. Methemoglobinemia can be congenital or acquired through oxidizing xenobiotics such as local anesthetics.^{3,4,5} Patients presenting with clinically significant methemoglobinemia will often have dyspnea, cyanosis, and low pulse oximetry.² With supplemental oxygen, they may remain cyanotic, though measured arterial oxygen will likely be normal.² Arterial blood gas samples often demonstrate a chocolate-brown tone (Figure 1). Treatment may include methylene blue, though where it is contraindicated (such as those with G6PD deficiency), other interventions may include cimetidine, hyperbaric oxygen, exchange transfusions, N-acetylcysteine (NAC), and ascorbic acid.^{1,2,6-12}

TABLE 1 Summary of expected clinical findings of methemoglobinemia.

| Methemoglobin level | Presentation |
|---------------------|---|
| 0%–3% | Level is within normal limits |
| 3%–12% | Asymptomatic or mild cyanosis/pallor |
| 13%–20% | Mostly asymptomatic unless pre-existing condition, chocolate-brown arterial blood, cyanosis may become apparent |
| 20%–50% | Fatigue, shortness of breath, weakness, lightheadedness, syncope |
| 50%–70% | Lethargy, respiratory depression, altered mental status, coma, seizures, metabolic acidosis |
| >70% | Death |



FIGURE 1 An arterial blood gas sample.

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In summary, treatment for methemoglobinemia depends on the severity and underlying cause of the condition. Methylene blue remains the first-line treatment, but other options, such as cimetidine, hyperbaric oxygen therapy, transfusions, NAC, and ascorbic acid may be considered in certain situations. Clinicians should carefully evaluate the risks and benefits of each treatment option and tailor their approach to the individual patient.

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