The Blue Clue: Perioral Cyanosis Revealing Methemoglobinemia

[1]Geoffrey Kern, DO, [2]Mankarn Hara, MD, [3]Ashley Gault, DO, and [4]Sarah Chmielewski, DO

[1]Jefferson Health Northeast EMIM, [2]Jefferson Health Northeast FM, [3]Jefferson Health Northeast IM, [4]Jefferson Health Northeast IM

Clinical Case

- A 87-year-old female with a past medical history of cutaneous vasculitis recently started on Dapsone, atrial fibrillation and moderate mitral regurgitation presented to the emergency department from home for shortness of breath
- The patient was found to have bilateral pneumonia with no evidence of pulmonary embolism on a CTA of the chest and was started on broad-spectrum antibiotics
- The patient was admitted for further management of acute hypoxic respiratory failure secondary to pneumonia
- She was noticed to have persistent hypoxia with a pulse oximetry reading of 85% despite high flow nasal cannula (HFNC) oxygen administration
- The patient was noted to have perioral cyanosis on exam
- An ABG was performed showing moderate methemoglobinemia
- 1mg/kg of methylene blue was administered with improvement of the patient's hypoxia and perioral cyanosis
- Dapsone was discontinued as it was thought to be the inciting agent
- The patient was weaned from HFNC to nasal cannula and eventually to room air
- She completed a seven-day course of antibiotics and was discharged to a skilled nursing facility on hospital day eight

Physical exam:

T 98.4°F, HR 96, BP 128/58, RR 18, 85% 40L/min HFNC 100% FiO2

General: Chronically ill appearing, in no acute distress

HEENT: Moist mucous membranes, PERRLA, perioral cyanosis

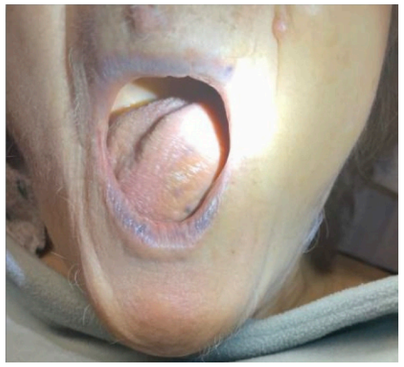
CARDIOVASCULAR: Regular rate and rhythm, normal pulses

LUNGS: Rhonchi to bilateral lung bases, no accessory muscle use or tachypnea

ABDOMEN: Soft, nontender to palpation

MSK: Soft compartments

SKIN: Warm, dry, capillary refill < 2 second



Pertinent workup (Figure 1 and 2):

Initial ABG

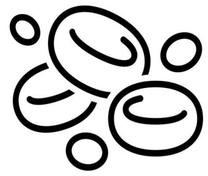
Figure 1	Latest Reference Range & Units	
pH	7.35 - 7.45 pH	7.51 (H)
pCO2	35 - 48 mm Hg	33 (L)
pO2	83 - 108 mm Hg	292 (H)
O2 Saturation (Meas)	95.0 - 100.0 %	96.4
Act Bicarb	21 - 28 mmol/L	27
Base Excess	-2.0 - 2.0 mmol/L	3.6 (H)
Fraction Oxygenated Hemoglobin	95 - 100 %	78.5 (LL)
Fraction Methemoglobin	<1.0 %	20.2 (HH)

ABG following Methylene blue administration

Figure 2	Latest Reference Range & Units	
pH	7.35 - 7.45 pH	7.45
pCO2	35 - 48 mm Hg	39
pO2	83 - 108 mm Hg	215 (H)
O2 Saturation (Meas)	95.0 - 100.0 %	98.1
Act Bicarb	21 - 28 mmol/L	27
Base Excess	-2.0 - 2.0 mmol/L	2.5 (H)
Fraction Oxygenated Hemoglobin	95 - 100 %	92.8 (L)
Fraction Carboxyhemoglobin	0.5 - 1.5 %	0.5
Fraction Methemoglobin	<1.0 %	4.9 (H)

Evidence and Literature Review

- Methemoglobin forms when the iron in hemoglobin is oxidized from ferrous (Fe^{2+}) to ferric (Fe^{3+})
- This inhibits hemoglobin's ability to bind oxygen
- Mechanism: Exposure to certain medications that act as oxidizing agents
- A key clinical clue is a pulse oximetry reading of 85% despite supplemental oxygen delivery
- Symptoms usually occur when methemoglobin levels exceed 10%
- Perioral cyanosis is an early indicator of methemoglobinemia
- Levels above 50% are life-threatening and should be treated with exchange transfusion
- The inciting agent should be discontinued
- **Methylene blue is the first-line therapy and is given at a dose of 1-2mg/kg over 5 minutes**
- Repeat doses can be given 1 hour later if symptoms persist with a max total dose of 7mg/kg
- Methylene blue is contraindicated in patients with G6PD deficiency; Ascorbic acid may be used instead



Unique Aspects of the Case

Our patient had an alternative diagnosis to explain the cause of her acute hypoxic respiratory failure, making the diagnosis more challenging to make

Most cases are caused by topical anesthetic agents. The cause in our case was Dapsone, a relatively uncommon medication

Conclusions

Medications that can cause methemoglobinemia include local anesthetics such as Benzocaine and Lidocaine, antibiotics such as Dapsone and Nitrofurantoin, Nitroglycerin and Nitroprusside and anticonvulsants such as Phenobarbital and Phenytoin

Methemoglobinemia should be considered when perioral cyanosis and a persistent pulse oximetry reading of 85% is noticed on exam

Treatment includes discontinuing the inciting agent, administering methylene blue (Ascorbic acid if history of G6PD) and exchange transfusion (severe cases)

References

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