Why Are You So *Blue*?

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【CC】Cyanosis, Low oxygen saturation

【HPI】

Patient is a 60-year-old female. The patient presents to endoscopy suite for scheduled upper endoscopy for a part of her regular health checkup. She **underwent transnasal upper endoscopy.** During the procedure, **her SpO_2 dropped down to 86%** and thus she was referred to ED for evaluation. Her SpO_2 prior to the procedure was 95% on ambient air. She had several episodes of gagging during the endoscopy but otherwise denies shortness of breath, chest pain or any other symptom. The patient denies any symptoms at the time of ED evaluation and states she feels fine. She states that she underwent upper endoscopy three times in the past and all of them went uncomplicated. Upon further questioning, she reported that **she was started on a new medication for pemphigoid about three weeks ago.**

【PE】

VS: Temp 36.8°C (98.2°F), HR 66bpm, BP 118/70mmHg, **SpO_2 91% (O_2 2L via nasal cannula)**
General appearance: Good. Not in acute distress.
HEENT: **Conjunctival pallor (+), Cyanosis noted in lips**
Lungs: CTAB
Heart: Normal S1, S2. No murmurs, gallops, rubs.

Questions:
1. **What is the differential diagnosis for this condition?**
2. **What is the most useful test in order to make a diagnosis?**

Arterial Blood Gas with Co-oximetry

pO_2	92.5 mmHg	ctHb	12.1 g/dL
pCO_2	38.3 mmHg	FCOHb	0.2%
FO_2Hb	89.2%	FHHb	4.5%
SaO_2	95.2%	FMetHb	6.1%
		Hct, c	37.3%

Answers:
1. **Differential diagnosis for cyanosis includes but not limited to low cardiac output states (shock, LV failure, hypovolemia, etc.), exposure to cold, arterial occlusion, hypoventilation, impaired oxygen diffusion, ventilation-perfusion mismatch, congenital heart disease with anatomic shunt, and dyshemoglobinemias.**
2. **Order arterial blood gas with co-oximetry.**

【Case Discussion】

Additional history taking revealed that **lidocaine jelly and naphazoline nitrate** were used for analgesia for transnasal endoscopy. Also, for last two weeks, the patient has been taking **diaminodiphenyl sulfone (Dapsone)** for newly diagnosed bullous pemphigoid. Considering this history, **methemoglobinemia** was suspected and **arterial blood gas with co-oximetry** was ordered. Co-oximetry showed **elevated methemoglobin level of 6.1%. Mild dissociation of SpO_2 and SaO_2 were also noted** on blood gas analysis. (SpO_2 91% and SaO_2 95.2% on O_2 2L via nasal cannula.)

The diagnosis of drug-induced methemoglobinemia due to diaminodiphenyl sulfone (possibly provoked by lidocaine use during the endoscopy procedure) was made.

The patient was instructed to stop taking diaminodiphenyl sulfone and outpatient follow up two days later showed improved methemoglobin level of 3.1%.

Clinical Pearls & Take Home Messages:
1. **Methemoglobinemia is diagnosed when circulating methemoglobin level exceeds more than 2%.**
2. **Majority of the cases of methemoglobinemia are acquired and the most of them are drug-induced.**
3. **If methemoglobinemia is suspected based on history or clinical findings, co-oximetry should be ordered to confirm the diagnosis.**
4. **Be reminded that the pulse oximeter readings are not accurate in patients with methemoglobinemia and dissociation between SpO_2 and SaO_2 is well-known phenomenon.**