

Methemoglobinemia caused by airway topicalization

Annika Grupp MD, Johnathan Kassira MD, Andrey Rakalin MD, Vandana Gupta MD

Department of Anesthesiology, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center, Boston, MA.



Introduction

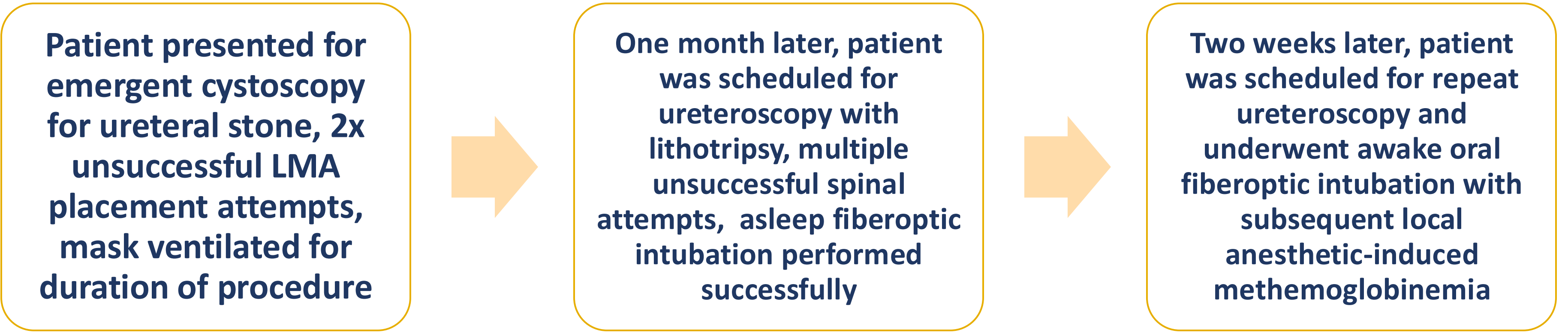
Benzocaine spray and lidocaine lubricant were used for topical analgesia for an awake fiberoptic intubation and despite successful intubation, the patient experienced persistent oxygen desaturation due to local anesthetic-induced methemoglobinemia.

Methods

This case report is without patient identifiable information, it is exempt from IRB review requirements. Informed consent was obtained from the patient for publication of this case report.

Case Report

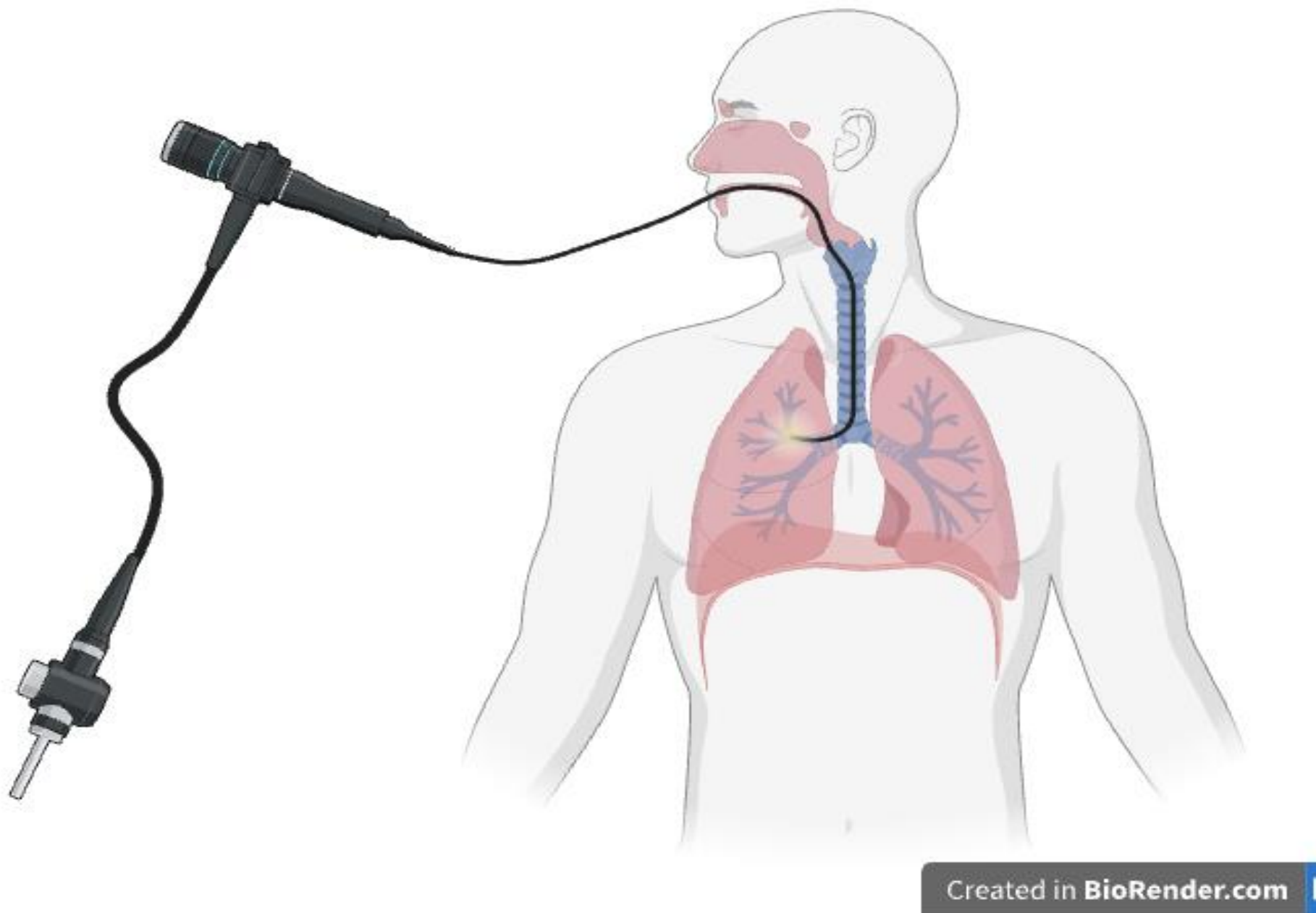
A 69-year-old man with **ankylosing spondylosis** and **prior difficult airway** presented for ureteroscopy. Awake oral fiberoptic intubation was planned. The airway was **topicalized with 4 sprays of 20% benzocaine spray in addition to 4% lidocaine lubricant** on an oral airway. 40 minutes after intubation, slow down trending of oxygen saturation to low 90s was noted. Recruitment maneuver was performed, FiO2 was increased to 100%, breath sounds noted to be clear and equal bilaterally, ETT suctioned, positioning of ETT confirmed with bronchoscope, and ABG was sent. The **oxygen saturations persisted to downtrend to low 80s. ABG revealed elevated methemoglobin, 17.2%. A 1mg/kg dose of intravenous methylene blue was administered with steady improvement in oxygenation.** He was kept intubated and transferred to ICU. Serial monitoring of ABGs showed continual down trending of methemoglobin. He was extubated the following morning and discharged that afternoon.



Created in BioRender.com

Benzocaine topical spray is the most common topical anesthetic associated with methemoglobinemia

	BIDMC East OR			BIDMC FN4 Intensive Care Unit				
	2025 12/1/25 15:53	12/1/25 16:04	12/1/25 16:41	12/1/25 17:27	12/1/25 17:28	12/2/25 00:18	12/2/25 04:18	12/2/25 04:19
ARTERIAL BG								
pH, Arterial	7.32 ▼		7.23 ▼	7.27 ▼		7.30 ▼		7.29 ▼
pCO2, Arterial	41		52 ▲	42		38		43
pO2, Arterial	369 ▲		461 ▲	192 ▲		131 ▲		151 ▲
Bicarb	20 ▼		21	19 ▼		18 ▼		20 ▼
Carboxyhemoglobin, ABG	1.1		0.4 ▼	0.7		1.0		0.3 ▼
% O2Hb Arterial	82 ▼		92 ▼	94 ▼		97		97
Base Excess ABG	-5.2		-6.6	-7.2		-7.2		-6.1
Lactic Acid, ABG	1.4		1.0					
MISC HEMOGLOBINS								
Carboxyhemoglobin, ABG	1.1		0.4 ▼	0.7		1.0		0.3 ▼
Hct on Blood Gas	38.1 ▼		37.6 ▼					
Hemoglobin, Blood Gas	12.4 ▼		12.2 ▼					
Methemoglobin, ABG	17.2 ▲		7.2 ▲	4.5 ▲		1.2 ▲		1.5 ▲



Created in BioRender.com

Discussion

Methemoglobin is formed when hemoglobin's iron is oxidized from ferrous (Fe2+) state to ferric (Fe3+) state, impairing oxygen binding which can lead to hypoxia¹. Acquired methemoglobinemia commonly results from topical benzocaine and lidocaine^{2,3}.

Symptoms include cyanosis, pulse oximetry desaturation, and chocolate-colored blood².

Intravenous methylene blue 1-2mg/kg is first-line treatment, however for patients with G6PD deficiency or taking serotonergic drugs it is contraindicated³. For these patients, intravenous ascorbic acid 1-2 grams may be used for treatment³.

References

1. Rehman HU. Methemoglobinemia. *Western Journal of Medicine*. 2001;175(3):193-196. doi:<https://doi.org/10.1136/ewjm.175.3.193>
2. 2. FDA. Risk of serious and potentially fatal blood disorder prompts FDA action on oral over-the-counter benzocaine products used for teething and mouth pain and prescription local anesthetics. Published online March 21, 2019. <https://www.fda.gov/drugs/drug-safety-and-availability/risk-serious-and-potentially-fatal-blood-disorder-prompts-fda-action-oral-over-counter-benzocaine>
3. 3. Tantisattamo E, Suwantararat N, Vierra JR, Evans SJ. Atypical Presentations of Methemoglobinemia from Benzocaine Spray. *Hawaii Medical Journal*. 2011;70(6):125. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3233396/>
4. 4. Icons created with <https://BioRender.com>