



Happy Easter from the PIC!

PIC QUESTION OF THE WEEK: 4/06/09

Q: Why should a person with a history of methemoglobinemia avoid using benzocaine?

A: Methemoglobin is a form of hemoglobin in which iron has been oxidized and exists in the ferric state (Fe^{3+}) rather than its usual ferrous form (Fe^{2+}). Ferric iron is unable to bind oxygen, thus reducing the oxygen carrying capacity of the blood. Methemoglobin releases oxygen poorly and results in tissue hypoxia. Normal methemoglobin values are $< 2\%$. Larger concentrations result in methemoglobinemia and, depending on the actual blood level, can produce a variety of complications including cyanosis, respiratory failure, arrhythmias, seizures, and death. When levels approach 15%, the blood may become chocolate in color. The combination of low pulse oximetry values, normal arterial PO_2 , cyanosis, and chocolate-brown arterial blood are indicative of methemoglobinemia. There are both acquired and congenital etiologies for methemoglobinemia. The congenital form is usually associated with a deficiency of the enzyme known as methemoglobin reductase. Possible acquired causes include a wide variety of chemicals, medications, and conditions such as sepsis or sickle cell crisis. Signs and symptoms usually develop within 20 – 60 minutes of exposure to the offending agent. Medications possessing direct oxidative properties have been implicated as causes of this disorder. They include antimalarials, dapson, flutamide, nitrates or nitrites, metoclopramide, phenazopyridine, phenytoin, sulfonamides, valproic acid, and many others. The most common cause of acquired methemoglobinemia is the administration of local anesthetics (primarily benzocaine and prilocaine). Most cases have been reported after the topical use of these compounds for oropharyngeal anesthesia prior to transesophageal echocardiography, insertion of endotracheal tubes, endoscopy, etc. Local anesthetics administered by local infiltration or peripheral nerve block can also result in methemoglobinemia. The topical combination of prilocaine and lidocaine (EMLA) has also been associated with methemoglobinemia. Methylene blue is considered the agent of choice for treating methemoglobinemia, while ascorbic acid is preferred in patients also deficient in glucose-6-phosphate dehydrogenase (G-6PD). Recommendations for the prevention and treatment of methemoglobinemia due to local anesthetics may be obtained from the *Anesthesia Analgesia* reference cited below. Benzocaine and prilocaine should be used cautiously, if at all, in patients with a history of methemoglobinemia.

References:

- Guay J. Methemoglobinemia related to local anesthetics: a summary of 242 episodes. *Anesth Analg* 2009;108:837-45.
- Kane GC, Hoehn SM, Behrenbeck TR, et al. Benzocaine-induced methemoglobinemia based on the Mayo Clinic experience from 28 478 transesophageal echocardiograms. *Arch Intern Med* 2007;167:1977-82.
- Sachdeva R, Pugged JG, Casale LR, et al. Benzocaine-induced methemoglobinemia. *Texas Heart Inst J* 2003;30:308-10.

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