Severe Cyanosis: A Life-Threatening Complication with Methemoglobinemia in a Child in a Cosmetic Clinic

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Abstract

Topical anesthetic drugs are widely used clinically during hospital and outpatient procedures and are easily available to the public in a variety of over-the-counter preparations. These anesthetic are especially popular and commonly used in many local dermatological clinics. Yet, topical anesthesia poses certain risks with pediatric patients, especially when a large area is covered. Furthermore, methemoglobinemia is known to occur in elderly patients with preexisting comorbidities who undergo medical procedures with local-anesthetic application, such as nasopharyngeal or oropharyngeal intubation, panendoscopy, or transesophageal echocardiography. This study documents an adolescent female patient who experienced methemoglobinemia with evident cyanosis after topical lidocaine and prilocaine cream were used for laser hair removal surgery. (J Pediatr Resp Dis 2013;9:27-30)

Key words: methemoglobinemia, cyanosis, topical anesthetic agents

INTRODUCTION

Methemoglobinemia is a rare cause of cyanosis in pediatric patients. It occurs when an imbalance caused by either increased or decreased methemoglobin production occurs. Methemoglobin is a derivative of hemoglobin in which the iron component has been oxidized from the ferrous to the ferric state. It is generally characterized by a brownish color of blood and the inability to transport oxygen due to the ferric hemes of methemoglobin being unable to bind to oxygen. In addition, the oxygen affinity of any accompanying ferrous hemes in the hemoglobin tetramer is increased, and therefore the oxygen dissociation curve is “left-shifted” and oxygen delivery to the tissues is decreased. Thus, the patient has a functional anemia to the extent that the circulating methemoglobin-containing molecules are unable to both carry oxygen and deliver it to the tissues.

Acquired methemoglobinemia is the most prevalent form of the condition and has been related to different conditions, such as infectious diarrhea and acidosis, consumption of high-nitrate water or high-nitrate food, and exposure to certain drugs, including topical anesthetic agents (benzocaine, eutetic mixture of local anesthetics, prilocaine, lidocaine). In this study, we describe a patient who developed methemoglobinemia after administration of topical lidiprine cream (a proprietary mixture of lidocaine and prilocaine) used for skin anesthesia before laser hair removal surgery.
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CASE REPORT

The subject was an 8-year-old, 25 kg, girl with a history of patent ductus arteriosus post-coil embolization experienced at age 1.5 months. She had idiopathic hirsutism and started receiving laser epilating management every three weeks for cosmetic considerations. She was sent to the emergency department in the afternoon by her mother since she seemed lethargic and generally weak. Tracing her history, there were some symptoms of upper respiratory tract infection from several weeks prior, including a mild dry cough and rhinorrhea without fever. Before her current discomfort, she received scheduled laser epilation therapy at a local dermatological clinic in the morning. Lidiprine cream was applied (a mixture of 25 mg lidocaine and 25 mg prilocaine) over her entire body, which has been used in three previous therapy sessions but not over such a large area. Then, after the fourth therapy session, she complained of severe general weakness, sleepiness and lethargy. At the same time, she became pale and appeared cyanotic. One episode of post-prandial vomiting was also noted. On admission to the emergency department, her oxygen saturation, measured by pulse oximetry, was 80\% in normal air. A non-rebreather face mask was given with 100\% oxygen, but her oxygen saturation could only reach 87 to 88\%. Her pulse was around 100.

She had good air exchange and increased inspiratory effort due to hyperventilation. Her circulation was good, her extremities were warm, and she had normal blood pressure. Chest X-ray showed a suitable position of the patent ductus arteriosus coil without increased infiltration over the bilateral lung fields or pneumonia patches. Arterial blood gas showed pH, 7.56; PO\textsubscript{2}, 287.8 mmHg; PCO\textsubscript{2}, 24.4 mmHg; and HCO\textsubscript{3}, 21.8 mmol/L. A markedly elevated methemoglobin level (17.2\%) was found. Since the methemoglobin level did not account for more than 50\%, intravenous methylene blue therapy was not necessary. After close observation and adequate hydration, the symptoms of general weakness and lethargy improved, and the methemoglobin level dropped to 0.5\% the next day. Thereafter, there were no recurrent episodes noted, and the subject was discharged without further incident.

DISCUSSION

Cyanosis with general weakness and lethargy is a rare but severe complication resulting from topical anesthetic cream usage in children. Local anesthetics have been implicated as a cause of methemoglobinemia since 1955.\textsuperscript{12} Approximately 242 episodes have been reported in children and adults, and have even been associated with hypoxic encephalopathy, myocardial infarction, and death.\textsuperscript{13} Most reported patients were adults who received nasopharyngeal or oropharyngeal intubation, upper GI-endoscopy, or prior to transesophageal echocardiography (TEE).\textsuperscript{13} A recent case reported a 16-month-old boy with methemoglobinemia and loss of consciousness after topical application of benzocaine, resorcin and 8-hydroxyquinoline cream on the lesions of multiple mollusca contagiosum.\textsuperscript{14-15} Although most the patients that have been reported are safe after treatment, methemoglobinemia with severe hypoxia is still a life-threatening condition. In 2006, Dr. Michael and his colleagues reported two adult patients who received TEE examination with severe hypoxia and even ventilation failure.\textsuperscript{16} Another case report discussed one woman who presented chest pain and severe cyanosis after receiving endoscopic examination in 2001. The following disease course progressed to acute respiratory distress syndrome, and she was transferred to the intensive care unit for 12 days.\textsuperscript{17}
Clinical symptoms and signs depend on the level of MetHb. Levels greater than 15% are associated with cyanosis, which is compatible with the level of elevated methemoglobin (17.2%) in our case. Headache, lethargy, tachycardia, weakness, and dizziness generally manifest at levels of 20% to 45%, while dyspnea, acidosis, cardiac dysrhythmias, heart failure, seizures, and coma may occur at levels exceeding 45%. MetHb levels above 70% are associated with a high mortality rate. The clinical effects may appear earlier and be more severe in patients with underlying anemia or cardiopulmonary disorders. This condition may be life-threatening when methemoglobin comprises more than 50% of total hemoglobin. Blood transfusion or exchange transfusion may be helpful in patients who are in shock. In lesser degrees of methemoglobinemia, no therapy other than discontinuation of the offending agents may be required. However, if the patient is symptomatic, which is often the case in deliberate or accidental overdoses or toxin ingestion, specific therapy is indicated.

The initial oxygen saturation, measured by pulse oximetry, was 80% in our patient and was subsequently around 87 to 88% under 100% oxygen non-rebreather mask usage. However, arterial blood analysis revealed the PaO$_2$ was 287.8mmHg, and an obvious saturation gap was noted. The presence of methemoglobin should be suspected if oxygen saturation, as measured by pulse oximetry, is significantly less than the oxygen saturation calculated from arterial blood gas analysis. Pulse oximetry inaccurately monitors oxygen saturation in the presence of methemoglobinemia and cannot be used to diagnose this disorder.

**CONCLUSION**

Topical anesthesia is widely used in cosmetic clinics. For susceptible patients, especially children, this may result in methemoglobinemia with potentially life-threatening complications. The appearance of unexplained cyanosis after use of these compounds should be interpreted as a sign of potential complication.

**REFERENCES**


