Methemoglobinemia is a rare but potentially life-threatening medical condition that may occur after use of high doses of topical anaesthetics for endoscopic procedures. We present a case of profound, life-threatening methemoglobinemia following minimal dose of topical benzocaine spray for transesophageal echocardiography (TEE) in a patient with normal hemoglobin levels. Clinicians who use benzocaine during a TEE need to be aware that this potential complication can occur even with use of very minimal doses, be able to recognize early symptoms, and promptly initiate management.

Introduction / Background

Methemoglobinemia is a rare but potentially life-threatening medical condition that may occur after use of high doses of topical anaesthetics for endoscopic procedures. We present a case of profound, life-threatening methemoglobinemia following minimal dose of topical benzocaine spray for transesophageal echocardiography (TEE) in a patient with normal hemoglobin levels. Clinicians who use benzocaine during a TEE need to be aware that this potential complication can occur even with use of very minimal doses, be able to recognize early symptoms, and promptly initiate management.

Case Report

A 66-year-old male with a medical history of schizophrenia presented after a gun-shot injury to the chest. He developed respiratory failure due to massive hemopneumothorax requiring a chest tube and short-term mechanical ventilation. Following clinical improvement, he was extubated to a nasal cannula. However, his clinical course was complicated by encephalopathy, staphylococcal bacteremia and persistent fever requiring a TEE to exclude infective endocarditis. The patient received 0.5 second of benzocaine spray prior to procedure and was noted to be cyanotic shortly after the procedure. Oxygen saturation persisted remained around 70% despite escalation of respiratory support to a bilevel positive airway pressure. An immediate arterial blood gas revealed a methemoglobin level of 69.5%. The pH, partial pressure of oxygen, and carbon dioxide were 7.47, 194 mmHg and 34 mmHg respectively. The patient responded favorably to treatment with 2 doses of intravenous methylene blue and repeat blood gas sample.

Discussion

Methemoglobinemia is a rare disease. It is a hemoglobinopathy that can be either inherited or acquired [1-3]. The acquired methemoglobinemia is due to exposure to an oxidizing chemical or drug resulting in conversion of ferrous hemoglobin to ferric hemoglobin. Methemoglobinemia usually occurs when the oxidizing mechanisms surpasses the endogenous reducing mechanisms that primarily include the enzymatic activity of cytochrome b5 reductase and nicotinamide adenine dinucleotide (NADH) methemoglobin reductase [1-3]. The ferric hemoglobin binds tightly to oxygen and does not release oxygen to the tissues. Oxygen deprivation at tissue level may lead to cyanosis and even death [1-3].

Clinically, acquired methemoglobinemia is usually characterized by cyanosis, low oxygen saturation on pulse oximetric readings, chocolate-brown arterial blood, and a normal or high partial pressure of oxygen on an arterial blood gas sample. Symptoms can range from lethargy, stupor, deteriorating consciousness to dysrhythmias [4], and cardiopulmonary collapse [5]. The occurrence of neurologic abnormalities and death is proportional to the
degree of methemoglobinemia [5]. The diagnosis of methemoglobinemia is confirmed by direct measurement of methemoglobin levels on arterial blood sampling. Treatment is effective when initiated promptly and includes oxygen therapy, discontinuation of causative medications, and intravenous administration of the antidote methylene blue, a thiazine dye that acts as an electron donor activating the nicotinamide adenine dinucleotide phosphate methemoglobin reductase pathway [5].

In the hospital setting, patients who develop cyanosis which fail to respond to supplemental oxygen following exposure to topical anesthetics should be suspected to have methemoglobinemia. Various medications have been implicated as potential causes of methemoglobinemia. Some of these medications include antibiotics (trimethoprim, sulphonamides, dapsone), local anesthetics (lidocaine, benzocaine), nitrites and nitrate derivatives [6]. The local anesthetics are usually employed in various endoscopic procedures. Transesophageal echocardiography is a commonly performed cardiac procedure with a low incidence of complications in the United States [6]. Local anesthetic agents are used during TEE to anesthetize the oropharynx before esophageal intubation. A typical 1-second spray provides 150 to 200 mg of the medication. Investigations in healthy volunteers indicate that a 2-second spray marginally affects systemic methemoglobin levels (0.8%-0.9%) [7]. Several risk factors may predispose a patient to develop methemoglobinemia on exposure to benzocaine. These include excessive dose, elderly age, enzyme deficiencies, hypoxia, malnutrition, mucosal erosion/damage and sepsis [4]. Our patient received 0.5 second spray of benzocaine and developed life-threatening methemoglobinemia. He had poor pulmonary reserve and may have aspirated the benzocaine spray since he was unable to protect his airway due to encephalopathy. Rapid absorption of benzocaine spray through the respiratory epithelium may have contributed to development of profound methemoglobinemia.

Conclusion

Profound life-threatening methemoglobinemia may occur with minimal doses of benzocaine spray and may be more common in encephalopathic patients with poor pulmonary reserve. Early recognition and prompt treatment may be life-saving and obviate the need for intubation and mechanical ventilation.

References