Abstract—To reduce the overall time spent in the ED, triage nurses are encouraged to treat patients with a topical anesthetic cream, eutectic mixture of local anesthetics (EMLA®). We present a case in which a 28-day-old neonate who was treated with EMLA® cream in triage developed severe methemoglobinemia 18 hours post admission to the pediatric ward. This case demonstrates that there may be some risks associated with this approach, and that protocols for the use of EMLA® at triage should include not only the indications for its use, but also need to ensure that there is a process to have the EMLA® removed before patient discharge or transfer. © 2008 Elsevier Inc.

Keywords—methemoglobinemia; triage, EMLA® cream

INTRODUCTION

Topically applied local anesthetics have been shown to reduce the pain associated with dermal instrumentation (1). The effect of EMLA® (eutectic mixture of local anesthetics; AstraZeneca LP, Wilmington, DE) cream requires sufficient time between placement on the skin and needle insertion. Previous studies have shown the feasibility of using EMLA® with pediatric patients in an emergency department (ED) setting. These studies have also shown that experienced triage nurses can effectively predict which patients may need an insertion of an i.v. line and will benefit from the application of a topical anesthetic (2,3).

Triage nurses in the ED of the Meyer Children’s Hospital (Haifa, Israel) are encouraged to apply EMLA® cream to any child likely to require an intravenous catheter, venipuncture, or lumbar puncture. We report a case of a 28-day-old neonate who was treated with EMLA® cream in triage, admitted to the pediatric ward, and developed severe methemoglobinemia.

CASE REPORT

A 28-day-old girl was referred to the ED due to fever that had started 2 days earlier (38.3°C, rectal). She was born prematurely (36 5/7 weeks, 2800 gr) but had a normal post-natal history and was discharged from the regular nursery at the age of 3 days. She was feeding well and had no suspected risk factors for sepsis. At triage, the baby appeared well and was sucking vigorously. The temperature was measured rectally at 37.7°C. The physical examination was notable only for clear nasal discharge. The triage nurse considered that a lumbar puncture would later be performed as part of a neonatal sepsis workup and applied EMLA® cream to the patient’s lower back covered by a gauze pad. Approximately 30 min later, the baby was examined by the emergency physician, who drew blood and urine cultures, a complete blood count, which was normal (white blood cell count of 6000/μL, 10% segmented cells, 44% lymphocytes, 6% bands, and 20% reactive lymphocytes) and collected a urinalysis, which was also normal. The baby was admitted to the pediatric ward for further observation and a lumbar puncture was not performed.
Eighteen hours after admission to the pediatric ward, a nurse noticed that the patient appeared cyanotic, with a bluish color clearly observed over her lips, nose, cheeks, and mucous membranes. She was described by the nurse as appearing “more blue than sick” because she had no signs of respiratory distress and looked relaxed. Pulse oximetry measurement was 88% and remained almost unchanged with oxygen supplementation. Thorough examination by the ward pediatrician revealed a normal cardiovascular examination with no signs of respiratory distress, dehydration, or sepsis. The pediatrician also noted that a gauze pad was covering the patient’s lower back and removed it. Further testing revealed a discrepancy in the arterial blood gas analysis; although her oxygen saturation measurement was 90%, blood PO2 was 100 mm Hg. At that point, when clinical cyanosis and low oxygen saturation were observed in the presence of normal arterial oxygen tension, the diagnosis of methemoglobinemia was considered. The pediatrician hypothesized that the gauze she removed from the patient’s back was soaked with EMLA® cream that had been left in place from the day before. Final diagnosis was confirmed using direct measurement of methemoglobin by a multiple wavelength co-oximeter showing a methemoglobin level of 32%.

Treatment with methylene blue, 0.3 mg per kg, was immediately initiated. Over the course of a few hours, the patient’s oxygen saturation measurements returned to normal, and the methemoglobin level decreased to 5% (Figure 1). The baby was carefully monitored for an additional 24 h and remained asymptomatic until discharge.

DISCUSSION

In the pediatric ED, venipunctures, insertion of intravenous lines, and lumbar punctures are common painful procedures. Advances in topical anesthetic techniques have led to a wide acceptance of their use in the pediatric ED (1–8). EMLA® cream is one of the frequently used topical anesthetics, and it has been shown to reduce the pain associated with these procedures (1).

To facilitate patient comfort and reduce the overall time spent in the ED, triage nurses are encouraged to treat patients with EMLA® cream when the patient is assessed in triage. A recent study has demonstrated that a large number of ED patients may benefit from this approach (2). We were unable to find any studies published demonstrating adverse events with this approach. To our knowledge, this report is the first to describe EMLA®-induced methemoglobinemia due to treatment in ED triage.

Methemoglobinemia is a well-known, serious side effect of the treatment with EMLA® cream (4–7). A retrospective report of 138 cases of acquired methemoglobinemia in two hospitals revealed one fatality and three near-fatalities that were directly attributable to methemoglobinemia (5).

A systematic review demonstrated that the risk of methemoglobinemia is low after single-dose application of EMLA®, but there is an increased risk in pre-term and infants younger than 3 months of age due to decreased Met-Hgb reductase, and increased percutaneous absorption due to an immature stratum corneum (6). Methemoglobinemia can be potentiated with the addition of other methemoglobinemia-inducing agents such as trimethoprim/sulfamethoxazole.

![Figure 1. Methemoglobin levels on diagnosis and 8 h after treatment with methylene blue (measured by multiple wavelength co-oximeter).](image-url)
sulfamethoxazole, or impaired renal function leading to reduced clearance of prilocaine (6,7). Two case reports of EMLA®-induced neonatal methemoglobinemia were reported to occur in the outpatient setting. In both cases, the EMLA® cream was applied to the outside of the prepuce before circumcision (9,10). Of note is that the measured level of 32% methemoglobin in our case was twice the level of 16% that was found in these previous outpatient cases (9,10). To the best of our knowledge, our report is the first to describe EMLA®-induced neonatal methemoglobinemia in the outpatient setting that is not related to circumcision.

In the presented case, the EMLA® cream was applied to the lumbar region of a young infant who was born prematurely. We believe that this case presents three potential risk factors for methemoglobinemia:

2. The gauze covering the EMLA® cream was placed on the lower back, and was not visible as it was under the baby’s clothing. Gauze placed on a limb has a greater likelihood to be visible to the nurse and to the parent (and a lower chance of being mistakenly left in place for a longer-than-intended period of time).
3. Limiting the dose of the drug and the area of application may play an important role in preventing toxicity in young patients. Our patient was born prematurely, and at the age of 28 days she had a relatively small body surface area compared to a full-term infant at her age. According to the manufacturer’s instructions for use, up to 1 gram of the EMLA® cream should be applied to patients aged 0–3 months or weighing < 5 kg, with a maximum application area of 10 cm². It is possible that our patient was treated with overdosage of EMLA® cream (when removed, the gauze pad was still soaked with EMLA®) (11).

Identifying children likely to benefit from the application of EMLA® cream at triage is important and should be regarded as part of the overall strategy to proactively reduce the painful experiences children go through in the ED (8). However, this case report demonstrates that there may be certain risks associated with this practice, and that protocols for the use of EMLA® at triage should not only include the indications for its use, but also need to ensure that there is a process to have the EMLA® removed before the patient is discharged or transferred from the ED. These protocols should also clarify which patients need to be excluded from EMLA® application.

**CONCLUSIONS**

A heightened awareness of methemoglobinemia will result in a safer approach. Our case report emphasizes the importance of using set protocols when applying EMLA® cream in the ED triage.

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**REFERENCES**