

Normal Neurologic and Developmental Outcome After an Accidental Intravenous Infusion of Expressed Breast Milk in a Neonate

C. Anthony Ryan, MB, FRCPI, FRCPCH, FAAP, Izlan Mohammad, MB, FAAP and Brendan Murphy, MB, FRCPI, MRCPCH

Department of Paediatrics and Child Health, Cork University Hospital, University College, Cork, Ireland

▲TOP
▪ ABSTRACT
▼CASE REPORT
▼NICU-NET INQUIRY
▼DISCUSSION
▼REFERENCES

ABSTRACT

Here we describe a premature male infant who was accidentally given 10 mL of expressed breast milk intravenously over a 3.5-hour period. Having survived this event with supportive care, this boy was attending regular school with no obvious neurologic or learning difficulties at 6 years of age. In 1998, after a query on an e-mail discussion group for health care providers in neonatology (NICU-net), we were informed of 8 similar events that proved fatal in 3 infants. A root-cause analysis revealed that accidental intravenous administration of breast milk or formula can be avoided by the use of color-coded enteral-administration sets with Luer connections that are not compatible with intravenous cannulas. The addition of methylene blue to feeds, or bolus enteral feeds (instead of continuous gastric feedings), may also help prevent such errors. These cases show the value of gathering information about rare but important events through a neonatal network. In addition, they confirm that prevention of medical error should focus on faulty systems rather than faulty people.

Key Words: breast milk • infant nutrition • injection therapy • neonatal morbidity • neurologic examination

Abbreviations: EBM, expressed breast milk

Iatrogenic disease continues to be an unfortunate complication of all aspects of medicine.¹ No setting is free from medical hazard, no specialty is immune, and patients are at risk no matter what their age, gender, or health status.² For patients on general medical wards, medication errors occur in as many as 4% of inpatients. Although greater monitoring intensity and much lower nurse-patient ratios in the ICU may reduce the incidence of medication errors, the sheer number of interventions dramatically increases the risk of error. Thus, among pediatric patients admitted to a British university hospital, drug errors were 7 times more likely to occur in the ICU than anywhere else.³ The NICU is no exception when it comes to medical error.

Here we report the case of a premature neonate who survived intact after having inadvertently been given 10 mL of expressed breast milk (EBM) intravenously in the newborn period. At 6 years of age this boy was attending regular school with no obvious neurologic or learning difficulties. In 1998, after a query on an e-mail discussion list for health care providers in neonatology (NICU-net), we were informed of similar events worldwide, some of which proved fatal.

- ▲TOP
- ▲ABSTRACT
- CASE REPORT
- ▼NICU-NET INQUIRY
- ▼DISCUSSION
- ▼REFERENCES

▶ CASE REPORT

This male infant was born at 29 weeks' gestation with a birth weight of 1.35 kg. He was ventilated for 2 days for hyaline membrane disease. By day 5, the infant was receiving a combination of continuous nasogastric feed of EBM and intravenous parenteral nutrition (containing lipid). After a period of Kangaroo care by his mother, he was placed in the incubator and his nasogastric and intravenous lines were reconnected. Some time later, it was observed that the lines were interchanged. It was estimated that the infant had received an infusion of 10 mL of EBM over a 3.5-hour period via a peripheral venous cannula while parenteral nutrition was given via the nasogastric tube.

Clinically, the infant's color was very pale but his vital signs, including arterial blood pressure, were normal. Because of the potentially devastating effects of this adverse incident, the infant was electively reventilated, a new intravenous catheter was sited, and broad-spectrum antibiotics were started. He developed a mild leukocytosis (white blood cell count: $15.8 \times 10^9/L$), transient thrombocytopenia (lowest platelet count: $86 \times 10^9/L$), and a metabolic acidosis (base excess: -8 mmol/L). A chest radiograph was clear with no evidence of infiltrates. Blood cultures from the infant subsequently grew group G *Streptococcus* and *Staphylococcus epidermidis*. A similar strain of group G *Streptococcus*

and a few unidentified anaerobes were isolated from the EBM culture. The cerebrospinal fluid was sterile. The infant's parents were informed of the incident and potential complications without delay.

The infant was extubated after 36 hours of ventilatory support and received a total of 10 days of intravenous antibiotics. A cranial ultrasound on day 14 revealed a right subependymal hemorrhage. He remained clinically well, with a normal neurologic examination, at a routine clinical examination at 6 years of age. Although no formal intelligence testing was performed, he was successfully attending a local elementary school and had no obvious learning difficulties.

[▲TOP](#)
[▲ABSTRACT](#)
[▲CASE REPORT](#)
[▪ NICU-NET INQUIRY](#)
[▼DISCUSSION](#)
[▼REFERENCES](#)

► **NICU-NET INQUIRY**

After our inquiry on NICU-net, we received 8 responses from around the world of adverse events similar to ours. Of the 8 infants reported, 3 died after the accidental administration of intravenous milk and 5 infants survived. Five of the infants received EBM, whereas the remainder received infant formula. Clinical effects reported in these infants included apnea, septicemia, neutrophilia, and multiple organ failure with subsequent cardiac arrest. Management included supportive treatment, steroids, and broad-spectrum antibiotics, and exchange transfusion in 1 case.

▲TOP
▲ABSTRACT
▲CASE REPORT
▲NICU-NET INQUIRY
• DISCUSSION
▼REFERENCES

DISCUSSION

There have been a number of previously published reports in the literature of inadvertent intravenous administration of infant formula⁴⁻⁷ that describe complications such as hyperosmolarity, microembolism, hypersensitivity, septicemia, and death. Oral medications also have been inadvertently administered intravenously to neonates.⁸ The infant in this case developed septicemia consistent with the bacterial contamination of the EBM and fortunately responded to antibiotic therapy and support. Although the incidence of such errors is unknown, they have occurred in a wide variety of settings including adult ICUs.⁹⁻¹³ The message from the current report is that some infants and children can survive these iatrogenic catastrophes with early recognition and appropriate support.

Nevertheless, the emphasis in such cases must be on prevention, not cure. The intravenous administration of EBM or formula can be avoided by the use of color-coded enteral-administration sets and feeding tubes with Luer connections that are not compatible with intravenous cannulas. The addition of methylene blue to the tube-feeding formula or use of color-coded distal connecting tubing may prevent accidental intravenous administration of tube-feeding formulas. In the absence of evidence in favor of either method, bolus enteral feeds may be preferable to continuous gastric feeding in stable premature infants, with less risk of interchanging the continuous intravenous infusion with an intermittent bolus gastric feed. After a root-cause analysis of the event, we adopted the latter practice in our unit to reduce the risk of recurrence of this mishap.

This report shows the value of gathering information about rare but important events through a neonatal network. Finally, because most errors are the result of faulty systems rather than faulty people, health care organizations must create and foster an environment in which safety, not blame, becomes the top priority. Indeed, one of the major aspirations of the 2006 National Patient Safety Goals, promulgated by the Joint Commission on Accreditation of Healthcare Organizations (www.jcaho.org) is the prevention of wrong-route errors.



FOOTNOTES

Accepted Jun 24, 2005.

Address correspondence to C. Anthony Ryan, MB, FRCPI, FRCPCH, FAAP,
Department of Paediatrics and Child Health, Cork University Hospital, Wilton, Cork,
Ireland. E-mail: ryant01@eircom.net

▲TOP
▲ABSTRACT
▲CASE REPORT
▲NICU-NET INQUIRY
▲DISCUSSION
▪ REFERENCES



REFERENCES

1. Richardson WC, Berwick DM, Bisgard JC, et al. The Institute of Medicine Report on medical errors: misunderstanding can do harm. Quality of Health Care in America Committee. *MedGenMed*. 2000;19 :E13
2. Weingart SN, Wilson RM, Gibberd RW, Harrison B. Epidemiology of medical error. *BMJ*. 2000;320 :774 –777[Free Full Text]
3. Wilson DG, McCartney RG, Newcombe RG, et al. Medication errors in paediatric practice: insights from a continuous quality improvement approach. *Eur J Pediatr*. 1998;157 :769 –774[CrossRef][ISI][Medline]
4. Wallace JR, Payne RW, Mack AJ. Inadvertent intravenous infusion of milk. *Lancet*. 1972;1 (7763):1264–1266
5. Lopez Garcia MJ, Sorribes Monrabal I, Fernandez-Delgado Cerda R. Accidental intravenous administration of semi-elemental formula in an infant. *Clin Pediatr (Phila)*. 1992;31 :757 –758[ISI][Medline]
6. Huddleston K, Creekmore P, Wood B. Administration of infant formula through the intravenous route: consequences and prevention. *MCN Am J Matern Child Nurs*. 1994;19 :40 –42[Medline]

7. Stellato TA, Danziger LH, Nearman HS, Creger RJ. Inadvertent intravenous administration of enteral diet. *JPEN J Parenter Enteral Nutr.* 1984;8 :453 – 455[Abstract]
8. Suresh GK, Horbar JD, Plsek P, et al. Voluntary anonymous reporting of medical errors for neonatal intensive care. *Pediatrics.* 2004;113 :1609 – 1618[Abstract/Free Full Text]
9. Malone M, Aftahi S, Howard L. Inadvertent intravenous administration of an elemental enteral nutrition formula. *Ann Pharmacother.* 1993;27 :1187 – 1189[Abstract]
10. Stapleton GN, Symmonds KL, Immelman EJ. Septicaemia resulting from inadvertent intravenous administration of enteral nutrient solution: a case report. *S Afr Med J.* 1988;73 :542 –543[ISI][Medline]
11. Ulicny KS Jr, Korelitz JL. Multiorgan failure from the inadvertent intravenous administration of enteral feeding. *JPEN J Parenter Enteral Nutr.* 1989;13 :658 – 660[Abstract]
12. Ong BC, Soo KC. Plasmapheresis in the treatment of inadvertent intravenous infusion of an enteral feeding solution. *J Clin Apher.* 1997;12 :200 – 201[CrossRef][ISI][Medline]
13. Casewell MW, Philpott-Howard J. Septicaemia from inadvertent intravenous administration of enteral feeds. *J Hosp Infect.* 1983;4 :403 – 405[CrossRef][ISI][Medline]