

Intravenous Milk Infusion; Rare Medication Error

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Abstract

We report a rare medication error, and its management of a preterm female baby who accidentally received formula milk intravenously over two hours through central catheter. She developed leukocytosis, thrombocytopenia, transient metabolic acidosis, superficial thrombophlebitis and thrombosis of greater saphenous vein. She received supportive care with observation of her vital signs, including arterial blood pressure; broad-spectrum antibiotics were given for seven days after the event and low molecular weight heparin.

Staff nurse responsibility for initiating the error was addressed by the hospital administration. However; because of most errors are the results of faulty system not faulty people, health care organizations should establish safer environments by using methods to prevent similar errors, also more education for medical staff about medical errors and choosing the most qualified nurses for critical units will decrease the incidence of these errors.

Keywords: Intravenous; Milk infusion; Leukocytosis; Medication error

Introduction

Medication errors are common (4% of inpatients) [1]. It encompasses errors in prescription, preparation and administration. These errors may cause harmful effects including death [2]. Although these errors can be caused by system defects or human mistakes, the person is responsible for initiating the error [3]. Reporting medication errors during practice help caregivers to provide the proper management and to expect possible complications when similar errors happen. In this report we discuss one of the rare medication errors, its management, the system and human responsibility and suggestions for possible solutions to prevent this kind of errors.

Case report

Female neonate was born at 34 weeks gestational age with a birth weight of 2.6 kilogram. She was admitted to Neonatal Intensive Care Unit (NICU) at Jordan University Hospital due to prematurity and perinatal intestinal perforation. Baby had ileostomy in the next day.

She was intubated after surgery for ten days. A Peripheral Inserted Central Catheter (PICC) line was inserted for Total Parental Nutrition (TPN) administration. At the age of ten days, Medium-Chain triglyceride (MCT) formula was started gradually by continuous infusion through nasogastric feeding tube. After three hours from starting continuous feeding, the baby had self extubation of her endotracheal tube. Non Invasive Positive Pressure Ventilation (NIPPV) was initiated, and the feeding was restarted by orogastric tube. During this event, the responsible staff nurse connected the milk line with the PICC line thinking it is her intralipid infusion (Figure 1). Baby received an infusion of four milliliter of formula milk over two hours via PICC line.

Once this error was recognized, baby was assessed, her vital signs were stable, respiratory, cardiac and central nervous system exam were normal, there was swelling in her left leg at the site of PICC line, and PICC line was removed smoothly. After 30 minutes her left leg became mottled, red to purple in color, swollen, and there was cord like structure at medial aspect of her left thigh (Figure 2).

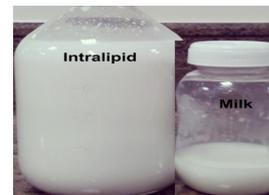


Figure 1: Similarity between intralipid and milk



Figure 2: The effect of IV milk on leg of baby

Management

Full work up was done: complete blood count, capillary blood gases, liver function test, kidney function test, blood culture, milk culture, chest X-ray, brain Magnetic Resonance Imaging (MRI) and Doppler study for the site of PICC line, as well as consultations of multiple disciplinary teams from pediatric surgery, vascular surgery, toxicology and infectious disease were done.

Close observation for vital signs and full physical exam including her left leg for progressive swelling, hotness and redness done for the next five days. Broad-spectrum antibiotics (Vancomycin and Imepenim) and low molecular heparin were started. She was kept NPO on IV fluids.

The family was informed of the incident and possible complications without delay.

Baby developed mild transient thrombocytopenia with lowest count $136 \times 10^9/L$ (normal reference between $150 \times 10^9/L$ - $450 \times 10^9/L$), metabolic acidosis (PH: 7.25, HCO₃:15, BE:-6.4), leukocytosis ($26.1 \times 10^9/L$), superficial thrombophlebitis and thrombosis of greater saphenous vein.

Chest x-ray was clear of infiltrate. Blood culture and milk culture results were negative. Serial brain MRI/MRV at age of 21 days and 48 days showed venous infarction which progressed to focal area of cystic leukomalacia at left suprainular frontal lobe (Figure 3).

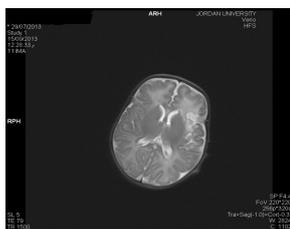


Figure 3: Cystic leukomalacia at left suprainular frontal lobe

Baby became off O₂ at the fifth day after the event. The baby was treated by antibiotics and low molecular weight heparin for seven days. Her leg improved dramatically.

Staff nurse responsibility for initiating the error was addressed by the hospital administration and investigation of this error was done according to the hospital quality assurance guidelines.

Nursing knowledge and skills was assessed and improved by:

- 1) Recruitment a qualified trained neonatal nurse to assess the nursing knowledge and skills and initiate continuous nursing health education.
- 2) The hospital administration has recruited the most qualified trained nurses to work in the critical care area of the neonatal units.
- 3) We reviewed and audit the guidelines for drug and food preparation and administration at the neonatal unit.
- 4) color-coded enteral administration sets and feeding tubes with Luer connections those are not compatible with intravenous cannulas were started to use.

Discussion

A focus primarily on prevention of medication and feeding errors rather than treatment is required [1]. In 2007 MEDMARX (the largest medication error internet reporting program in United State) published a study of NICU fat emulsion medication errors and nursing services including prescription, preparation and administration. They reviewed a total of 257 errors with 3.9% error resulting in harm, the mean age of affected neonates were seven days, and more errors occurred on Monday than any other days of the week, wrong dose errors occurred in 69% of the sample [3].

Accidental milk injection is still happening despite it was reporting 42 years ago [4].

Similar nine cases have been described by Ryan et al. [1] and Matthew Grissinger [5] with three reported mortalities.

The error in this case was accidental intravenous administration of MCT formula milk which happened due to similarity of the milk and intralipid, using the same infusion pump for continues feeding and intravenous medication administration and using same sets for feeding and IV medication which compatible with NG tubes as well as with IV catheters.

The reported complications of milk injection in neonates were: hyperosmolarity, micro embolism, hypersensitivity, apnea, respiratory distress, septicemia, neutrophilia, seizures, multiple organ failure and death [1-7].

The infant in this case developed leukocytosis, thrombocytopenia, metabolic acidosis, superficial thrombophlebitis and thrombosis of greater saphenous vein.

Evaluation and management should start immediately by removing the IV access, keeping the patient NPO, starting IV fluids and doing a full physical exam. Some laboratory and radiographic studies should be performed like: Complete Blood Count, Kidney Function Test, Liver Function Test, Prothrombin Time, Partial Thromboplastin Time, blood gases, blood culture, milk culture, chest X-ray, Doppler ultrasound for the site of IV access and brain imaging (MRI or Ultrasound).

Baby should be started on broad-spectrum antibiotics and anticoagulants if evidence of thrombosis was found.

Because of most medication errors are the result of faulty system not faulty people, health care organizations should establish safer environments by using methods which prevent similar errors.

Several studies suggested several ways to avoid intravenous administration of milk on the patient who was fed by continuous infusion:

- a) Tracing the tubing to the point of origin before any connection or reconnection is made [5].
- b) Rechecking connections and tracing all patients' tubes and catheters to their sources upon transfer to a new setting [5].
- c) Labeling tubes and administration sets [5].
- d) Using color-coded enteral administration sets and feeding tubes with Luer connections those are not compatible with intravenous cannulas [1].
- e) Adding methylene blue to the tube-feeding formula [1].
- f) Using color-coded distal connecting tubing [1].

g) Increasing monitoring intensity and decreasing nurse-to-patient ratio [1].

Also there is no evidence in favor of continuous gastric feeding so bolus enteral feeds may be preferable.

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