

# Lethal Pediatric Iron Ingestion Refractory to Extracorporeal Support

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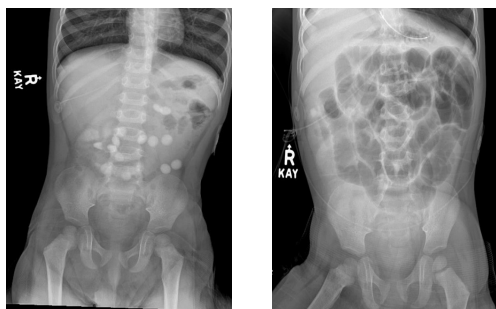


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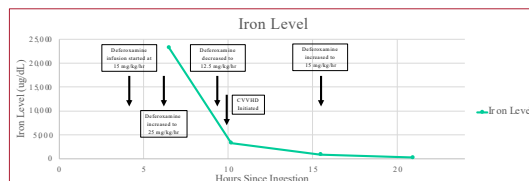


## CASE DESCRIPTION

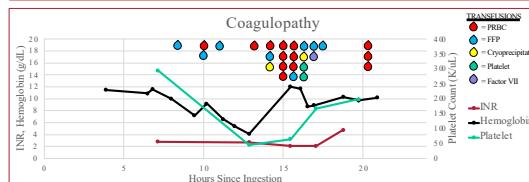
- 23-month-old boy presented to ED with vomiting & altered mentation, following ingestion of an unknown amount of 325 mg ferrous sulfate tablets.
- Initial bloodwork
  - Serum iron 23,300 =  $\mu\text{g/dL}$  ~ 6.5 hours post-ingestion
  - Anemia, thrombocytopenia, & coagulopathy
  - High anion gap metabolic acidosis
- Clinical deterioration  $\rightarrow$  lethargy, tachycardia, & poorly perfusion
  - Tracheal intubation for airway protection
  - Initiation of vasoactive infusions for worsening hemodynamics
  - Blood transfusions for coagulopathy & active hemorrhage
- Iron toxicity management
  - Deferoxamine infusion titrated as tolerated by blood pressure
  - CVVHD initiated to expedite iron removal
- Cardiopulmonary support
  - During cannulation, clinical bleeding acutely worsened
  - Bivalirudin, a direct thrombin inhibitor, was chosen in place of institutional standard of Heparin for ECMO circuit anticoagulation given the patient's active bleeding
  - Factor VII was given to slow the patient's bleeding
  - Despite massive transfusion administration, he was unable to be stabilized & maintained on ECMO support
- Within 24 hours of ingestion, he progressed to multi-organ system failure including acute hepatic failure with severe coagulopathy & refractory cardiogenic shock.
- The patient's family and care team transitioned to comfort care measures, and he died after discontinuation of ECMO support.



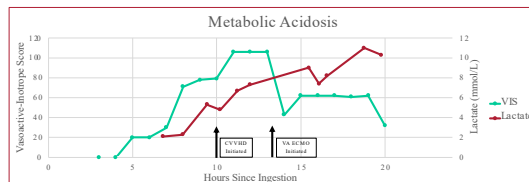
**Figure 1.** Approximately twelve radiopaque tablets were visualized on x-ray obtained 3 hours post-ingestion. Repeat x-ray 7 hours post-ingestion revealed absence of all tablets, which demonstrated rapid absorption of tablets and limited utility of performing bowel irrigation.



**Figure 2.** Serum iron levels over time, with interventions for iron chelation and filtration.



**Figure 3.** Severe coagulopathy resulting in thrombocytopenia & anemia, requiring massive transfusion protocol



**Figure 4.** Patient had worsening metabolic acidosis & hypotension, despite escalating vasoactive & inotropic infusions, requiring venoarterial ECMO support. (VIS=vasoactive inotropic score)

## PREVENTION AND ADVOCACY

- 1990s: Iron toxicity leading cause of poisoning-related death among young children.
- 1997: The FDA mandates display warnings, blister packaging, & restrictions on container quantity
- 2003: FDA mandate legally overturned.
- Prenatal vitamins in the home have been recognized as a significant risk factor
- Pediatricians must advocate for patient/family education regarding poisonings associated with prenatal vitamins, especially toddlers who have infant-age siblings.



## DISCUSSION

- There is a paucity of literature to support management of severe iron toxicity, efficacy of exchange transfusion, or renal replacement therapy
- Our patient's case is unique, given the exceptionally high serum iron concentration
  - Upon literature review, there have not been previously reported serum iron concentrations approaching that of our patient's
- Intravenous deferoxamine is the antidote for serious iron toxicity
  - Chelating agent forming water-soluble ferrioxamine for renal excretion
  - Hypotension secondary to histamine release may occur
  - In this case, the deferoxamine infusion dose was limited due to refractory shock & cardiovascular collapse
- Despite aggressive therapies & resuscitation, this patient could not be stabilized even on extracorporeal support

## CONCLUSION

- We propose early initiation of ECMO for life-threatening iron ingestions
  - Allows for more aggressive deferoxamine titration
  - Earlier hemodialysis in the clinical course
  - The risks of worsening coagulopathy must be weighed with bleeding complications
- Extracorporeal methods of iron removal are only capable of eliminating free-circulating iron, so these methods are not useful once intracellular iron transport has occurred
- It is imperative that these procedures are initiated early following the ingestion, before refractory shock ensues
- Literature is lacking in iron toxicity reports & management experience
- More importantly, it is crucial to advocate for preventative measures

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## DISCLOSURES

Dr. Liebelt is the author of "Acute Iron Poisoning" in Up to Date and is paid an annual royalty fee by Wolters-Kluwer Publishing for her contribution. Dr. Liebelt is on the Senior Editorial Board of "ToxEd"—an online point-of-care clinical toxicology resource and receives an annual honorarium from Elsevier. No other financial disclosures. No federal funding. All other authors have no financial relationships to disclose.