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Case Presentation

# A Case of Iatrogenic Iron Overload Caused by Parenteral Iron Treatment

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## Abstract

Mutations of the High Iron Gene (HFE), which increases iron absorption, and an excessive amount of iron ingested or injected that exceeds the body's ability to eliminate it are the leading causes of iron overload. Increasing iron deposition in the parenchyma can damage organs and ultimately render them dysfunctional. Iron overload can lead to diabetes mellitus and liver cirrhosis. We reported iron overload caused by iatrogenic (IV) iron injections in a six-year-old girl. Iron toxicity can be an incidental finding, such as unexplained elevated serum ferritin levels or unexplained liver disease, triggering an iron overload investigation. This case illustrates the importance of prescribing intravenous (IV) iron to avoid toxicity.

**Keywords:** Iatrogenic iron overload; Hemochromatosis; Liver iron concentration; Parenteral iron therapy

## Introduction

Iron overload syndromes can be acquired or inherited, and excessive iron absorption is the most common genetic disorder caused by HFE mutation [1]. Anemias characterized by ineffective erythropoiesis [2], chronic transfusions [3-5], or a combination of both, such as thalassemia, may be associated with iron overload. Since iron has no excretory organ, epithelial sloughing and bleeding are the only ways to eliminate iron.

Iron overload, also known as hemochromatosis, results from an imbalance between iron intake and absorption that exceeds the body's ability to eliminate it. The disease hemochromatosis is characterized by the accumulation of iron in tissues. This disease's symptoms and signs include skin pigmentation, erectile dysfunction, joint pain, and fatigue. Still, the disease can progress to hepatocellular carcinoma, cardiomyopathy, diabetes, hypogonadism, hypopituitarism, hyperparathyroidism, liver cirrhosis, and fibrosis [6]. Differential diagnoses for iron overload and hemochromatosis are the same because iron overload is a precursor to hemochromatosis. In this paper, we describe a case of iron overload in a patient with iron deficiency anemia who received multiple intravenous (IV) iron treatments.

Case Presentation

A six-year-old girl was referred to the Minia University Poison Control Center in Minia, Egypt after her pediatrician noticed a persistent, unexplained elevation in her serum AST, ALT, and bilirubin levels. The child presented to the poison control center with anorexia, jaundice, and dark urine together with dark skin discoloration of one-month duration. Previous iron deficiency anemia was treated with IV iron preparation in ferric hydroxide polymaltose complex (200 mg) three times weekly for six weeks, prescribed by a general practitioner. The laboratory investigations showed serum iron of 730 µg/dL (50–120 µg/dL), TIBC of 190 mg/dL (204–360 mg/dL), serum ferritin of 6,392 ng/mL (7–140 ng/mL), total bilirubin of 3.4 mg/dL (0.1–1.2 mg/dL), ALT of 230 U/L (30–90 U/L), and AST of 340 U/L (8–33 U/L).

Her blood gases, blood sugar, kidney function tests, hemoglobin levels, white blood cell count, and platelets count were within the normal range for her age. Her reticulocyte count and hemoglobin electrophoresis excluded chronic hemolytic anemia and revealed no abnormalities. The child was diagnosed with iron overload and, accordingly, was treated as an outpatient after being infused with an IV test dose of deferoxamine (30 mg/kg) in normal saline over four hours. The treating doctor administered deferoxamine (30 mg/kg/day) IV and deferasirox (20 mg/kg/day) oral chelators and continued the treatment with deferasirox alone until the child became symptom-free or experienced the normalization of liver functions and serum ferritin. Follow-up was done weekly until the serum ferritin and liver function tests returned to normal levels. The duration of treatment was fourteen weeks.

## Discussion

Iron is a micronutrient that can lead to morbidity and mortality if deficient or in excess. Von Recklinghausen attributed diabetes to pancreas injury caused by iron overload in 1889. As a result of Von Recklinghausen's observations on iron homeostasis [7], the understanding of hemochromatosis has significantly improved.

In patients with secondary hemosiderosis, liver iron concentration indicates body iron levels since iron is mainly stored in the liver [8]. Heart failure, liver cirrhosis, and various endocrine disorders result from excess iron accumulation in the heart, liver, and endocrine organs [9–12].

There is a strong link between total body iron stores and serum ferritin. As ferritin levels rise, so does the risk of severe liver disease [13]. However, in the absence of iron overload, it can become high, and because of clinical similarities, it can be confused with comorbidities such as hepatic disease, steatosis, or viral infections. Many factors can lead to iron overload in patients. Formerly, iron overload among patients receiving IV iron injections was uncommon. A review of secondary causes revealed that the patient had received parenteral iron and had no prior hepatic disease.

Iron overload can cause chronic fatigue, cirrhosis, diabetes, congestive heart failure, arthritis, and osteoporosis [14]. Phlebotomy is the primary method of treating iron overload in non-anemic patients; iron chelation is used to treat anemic patients. Deferoxamine, deferiprone, and deferasirox are three commercially available iron chelates [15].

This report focuses on the iron toxicity caused by the excessive use of parenteral iron in children. Both patients and prescribers prefer IV injections over other treatment methods in Egypt. According to Bodenschatz et al., the reasons for widespread injection demand are the belief that injections are "strengthened" drugs that work faster and are a more advanced technology [16]. Among health-care workers, their motivations for administering injections are for various reasons, including their belief in the increased efficacy of injected drugs, their ability to ensure compliance, and financial incentives.

## Conclusion

Iron overload and secondary hemochromatosis may likely occur in patients receiving intravenous iron injections; knowing that this is treatable may reduce long-term morbidity. For pediatric patients receiving IV iron, measuring serum ferritin is suggested to avoid iatrogenic iron overload, preferably through MRI to measure liver iron levels.

**Conflicts of Interest:** The authors declare that their involvement in this article is not a conflict of interest.

Consent: The patient gave informed consent for this case report to be published.

**Conflicts of Interest:** None declared.

## Authors' contributions

This manuscript was written equally by both authors. Both are involved in this report's concept, design, and literature review. As well both authors contributed to the drafting and revising of this article. All authors have read and approved the final version.

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