



False Acute Kidney Injury Alert due to Model Car Fuel Ingestion

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Abstract

We report a case of accidental ingestion of model car fuel (Optifuel) resulting in an apparent elevation of serum creatinine of 274 µmol/L (3.1 mg/dL) as measured by the Jaffe (alkaline picrate) reaction and this has generated an acute kidney injury (AKI) stage 3 alert. Optifuel contains nitromethane, which has been reported to interfere in the Jaffe reaction causing falsely high creatinine measurements. The laboratory staffs were vigilant about this potential interfering substance so have repeated the analysis of the creatinine using an enzymatic method which showed a result of 47 µmol/L (0.5 mg/dL). This report highlights the importance of being aware of the limitations of biochemical tests to avoid misinterpretation of results.

Introduction

Non intentional model car fuel ingestion is not commonly encountered in clinical practice and usually has no significant clinical consequences. Nitromethane (CH_3NO_2) is the main chemical component in such fuel along with methanol and synthetic oil. Therefore ingestion of this material may result in methanol intoxication if an adequate amount is ingested [1]. It has been reported that nitromethane can cause a false elevation of serum creatinine when measured using the common Jaffe reaction method [2,3]. We hereby report a case of toy car fuel ingestion that resulted in false elevation of serum creatinine thus generating AKI stage 3 alerts.

Case Presentation

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A 61-year-old woman presented to the Emergency Department following an accidental ingestion of 1-2 mouthfuls of a model car and aviation fuel known as 'Optifuel'. The patient initially had severe burning pain in her mouth and retching which settled down and clinical assessment was unremarkable. However, it was noted that the serum creatinine level was 274 µmol/L (3.1 mg/dL), eGFR of 15 mL/min/1.73m² thus triggering an AKI stage 3 alert despite normal urea of 4.7 mmol/L (blood urea nitrogen 13.2 mg/dL) and electrolyte concentrations, all measured by a Siemens Advia 2400 chemistry analyser. The UK National Poisons Information Service was contacted and it emerged that Optifuel contains nitromethane, synthetic oils and possibly methanol. However, the osmolar and anion gaps, as well as serum bicarbonate were within normal ranges thereby excluding methanol toxicity. A review of the literature indicated that ingestion of nitromethane may be the cause of the high serum creatinine [2-6]. Measurement of the serum creatinine by an alternative enzymatic method (Roche Elecsys analyser) showed that the creatinine level was 45 µmol/L (0.5 mg/dL). A subsequent creatinine level was measured as 228 µmol/L (2.6 mg/dL) by the Jaffe, but was only 47 µmol/L (0.5 mg/dL) by the enzymatic method.

Nitromethane interferes with the determination of creatinine by the Jaffe reaction, where creatinine reacts with alkaline picrate to form an end product that is measured spectrophotometrically [2-4]. At the highly alkaline pH conditions of the Jaffe reaction, nitromethane exists in a form that includes an active methylene group. This group reacts with picrate to form a chromophore that is indistinguishable from that normally formed with creatinine. Therefore, the observed increased creatinine as measured by the Jaffe reaction reflects the concentration of the nitromethane.

Discussion

Creatinine is derived mainly from metabolism of skeletal muscle creatine phosphate and is released into the blood at a constant rate resulting in minimum day to day variation in its serum concentration; therefore it is being used as an indicator of glomerular filtration rate. The

standard method of measurement of serum creatinine by most labs is a colorimetric Jaffe reaction which non-specifically measures non-creatinine chromogens but the effect is usually minimal [2]. There are a number of sources of interference with the Jaffe reaction including ketone bodies, ascorbic acid, and cephalosporin antibiotics [7]. This case report highlights the importance of being aware of the interference of nitromethane with this assay. This interference is not well recognized by the clinicians and there is a risk that the creatinine result may be misinterpreted to indicate renal failure. In this case we have documented the real serum creatinine concentration by applying a specific enzymatic creatinine method using the Roche analyser. Clinicians and laboratory professionals should be aware of the potential interfering substances with the colorimetric creatinine method whenever there is a discrepancy between serum urea and creatinine results as this case highlighted. Rapid recognition of such scenario would obviate the misdiagnosis of acute kidney injury and unnecessary hospitalisation and management.

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