



# Acute Aluminum Toxicity from Combination Therapy Sucralfate and Citric Acid in a Cardiac Surgery Patient

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## Abstract

### Background

Sucralfate is used as adjunctive therapy in the management of duodenal ulcers [1]. Because sucralfate is an aluminum salt of sucrose sulfate, the typical dosing regimen of 1 gram every 6 hours provides approximately 828 mg of elemental aluminum (Al) daily; however less than 0.02% is systemically absorbed [3]. This intake contributes to the recommended daily intake of 0.12 mg aluminum/kg/day and aluminum toxicity has been previously reported as a known side effect of sucralfate administration [2]. Aluminum toxicity is defined as an aluminum blood concentration greater than 60 ng/mL. Neurologic abnormalities, including encephalopathy, confusion, and seizures, are the primary presenting symptoms [3]. Aluminum toxicity with sucralfate has been primarily described as a chronic toxicity in patients with end stage renal disease (ESRD) due to multiple sources of aluminum combined with the inability to properly excrete aluminum [1]. Historically, ESRD patients faced high aluminum loads due to the use of aluminum containing phosphate binders in addition to the high concentrations of aluminum in the dialysate fluids. Additionally, some non-aluminum containing medications such as ascorbic acid and citric acid reduce Al<sup>3+</sup> to Al<sup>2+</sup>, which leads to enhanced gastrointestinal tract absorption [4].

The National Kidney Foundation guidelines have recommended against administration of aluminum and against concomitant administration of aluminum and citrate salts in chronic kidney disease patients [5]. Due to changes in guidelines recommending the use of non-aluminum containing phosphate binders and reduced aluminum content in dialysate fluids, the risk of chronic toxicity has been considerably reduced. Additionally, the general practice of using sucralfate in the intensive care unit setting has waned due to superiority of alternative agents for stress ulcer prophylaxis. Experts still caution against the use of sucralfate in those with renal dysfunction due to the long term risk of accumulation and toxicity. We report an unusual case of acute aluminum toxicity (level 137 ng/mL) associated with the concomitant use of sucralfate and citric acid-sodium citrate occurring in a non-dialysis dependent cardiac surgery patient.

## Introduction

A 66 year old female with history of hypertension, gastroesophageal reflux disease (GERD), and peripheral vascular disease presented with fever and lethargy. She was diagnosed with infective endocarditis complicated by aortic regurgitation and acute heart failure requiring aortic valve replacement. The post-operative course was complicated by sepsis and prolonged respiratory failure. On hospital day (HD) 21, sucralfate was added to her proton pump inhibitor for GERD and possible gastric bleeding. On HD 30, citric acid-sodium citrate was started to mitigate metabolic acidosis. A blood aluminum level was collected on HD 47 as part of diagnostic workup for difficult reusability, which returned elevated at 137 ng/mL. An electroencephalogram demonstrated sub-clinical seizure activity, which was treated with levetiracetam. Aluminum toxicity was treated by chelating therapy with deferoxamine and

hemodialysis per Poison Control Center recommendations. The aluminum level subsequently dropped to normal accompanied by an improvement in neurologic status.

## Discussion

In assessing for the likelihood of association, the Nariño Adverse Drug Reaction Scale (score 5), indicates a “probable” association between the adverse drug event and sucralfate therapy. The Horn Drug Interaction Probability Scale (score 6) indicates a “probable” drug interaction between citric acid sodium citrate and sucralfate. The Nariño and Horn Scales suggest that a drug interaction associated with sucralfate was probably present. Reports of chronic aluminum toxicity have diminished due to improving hemodialysis practices, which limit the amount of systemic aluminum found in

the dial sate [1]. Citric acid has been shown to enhance intestinal absorption of aluminum, and this relatively unappreciated drug-drug interaction was probably associated with the acute toxicity observed [4]. We conclude that enhanced awareness of the potential for acute toxicity with concomitant sucralfate and citric acid administration in a non-dialysis dependent, cardiac surgery patient is recommended.

## References

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