Caustic Ingestions and Foreign Bodies Ingestions in Pediatric Patients

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KEYWORDS

• Caustic ingestion • Foreign body • Coins • Button batteries • Magnets • Endoscopy • Pediatric

KEY POINTS

- Caustic ingestions continue to cause significant morbidity in children, and review of proper household storage should be considered at well child visits.
- Major or fatal complications from button battery ingestions has significantly increased in the past 3 decades as they became increasingly commonplace in household devices, especially the 20-mm lithium button battery.
- Rare-earth metal magnets in toys were recalled, and production was banned by the Consumer Product Safety Commission in 2014. However, they are already present in many households and multiple magnets swallowed together can cause necrosis of any bowel that comes between the magnets.
- The introduction of laundry and dishwasher packets or "pods" has presented a new harm if ingested, causing respiratory distress, hospitalization, and possible intubation. These packets cannot be removed with an endoscope.

INTRODUCTION

Inherently, children unintentionally ingest objects or substances within reach, most commonly in the household. Interestingly, the first pediatric foreign body ingestion of record was of a shoe buckle in 1692 by 4-year-old Friedrich Wilhelm I. It has been previously cited that "Friedrich the Great" swallowed the shoe buckle, but he was not born until 1712, and it was his father, born in 1688 and known as the "Soldier King," who reportedly achieved this unique honor. Both caustic and foreign body ingestions result in significant morbidity, mortality, and health care utilization. It is our job as health care providers to prevent and manage these ingestions. This article reviews the incidence, assessment, management, and complications of caustic and foreign body ingestions in children.

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CAUSTIC INGESTIONS

The 2014 annual report of the American Association of Poison Control Centers (AAPCC) documented more than 1 million documented substance exposures in children ≤5 years, which represent 50% of all exposures. Roughly 25% of these exposures were to cosmetics/personal care products or household cleaning substances.[1] More than 95% of the time, the exposure was due to a single substance. There is a male-to-female predominance of 1.3:1 in children ≤5 years of age. Of the 25 fatalities in children ≤5 years of age, only one was due to a caustic agent, sodium hypochlorite. As the ingestion in young children is accidental, the volume of the offending agent is typically low, resulting in low mortality as opposed to intentional ingestions in adolescents and adults, which are higher in volume. The AAPCC report does not have details of morbidity with respect to each ingested agent.

Caustic ingestions in young children more commonly occur once they are ambulating and have access to cabinets and shelves with common household products. Household laundry bleach is the most common caustic ingestion and traditionally contains sodium hypochlorite, an alkalotic chlorine solution. Household bleach typically contains sodium hypochlorite with a pH ≥11 and a low concentration of 5% to 12%, with the lower concentration making it less harmful. Sodium hypochlorite is also present in toilet bowl cleaner, drain cleaner, pool cleaner, and household sprays/wipes but at a much higher concentration than that found in household bleach, significantly increasing the risk of injury. Other sodium-based salts are often added to bleach at a low concentration to minimize splashing. Bleach alternatives or "stain removers" may contain hydrogen peroxide or boric acid. Lye is classically made of potassium or sodium hydroxide, which is also found in drain cleaner, homemade detergents/soaps, hair relaxers, and paint strippers. The original Liquid-Plumr on the market in 1967 contained 30% sodium hydroxide and resulted in numerous severe ingestions with subsequent esophageal necrosis requiring esophagectomy from exposure to even a few cubic centimeters. Within a few years, the concentration was reduced to 5%, where most of these products remain. Another problematic and often overlooked risk is the storage of harmful agents in improper containers, such as a reused food container that results in accidental ingestion by the unsuspecting child or adolescent. Detergent packets have also become a significant danger and are discussed later in the article.

In 26% of teenagers and 69% of adults, caustic ingestions are intentional, classified as suspected suicide, misuse, or abuse. Of the 1173 fatalities in the 2014 AAPCC report, 75% were intentional ingestions. Intentional ingestions are often characterized by ingestion of high-volume household agents with higher toxicity (higher concentration) due to the nature of the ingestion. Household bleach still accounts for 35% of the household cleaning substances ingested in teenagers and adults and 14% of ingestions in children ≤12 years of age.

There are caustic ingestion guidelines from both the pediatric and the adult literature, which are imperfect, but which serve as an excellent guide to the clinician managing the patient following ingestion.

Pathophysiology of Caustic Injury

The extent of mucosal injury from caustic ingestion depends on the concentration and pH of the substance in addition to the viscosity, location of contact, and contact time. Alkalis are typically colorless, odorless liquids posing an increased risk of a high-volume accidental ingestion.

Alkalis constitute most caustic ingestions, inducing liquefaction necrosis. Saponification of lipids allows deep penetration to submucosa and muscularis, resulting in