



# Intranasal Septal Perforation in a 4-Year-Old by an Impacted Button Battery: A Case Report and Review of the Literature

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## INTRODUCTION

*While intranasal foreign bodies account for less than 1% of pediatric emergency room visits, proper diagnosis and management is critical to minimize significant morbidity and mortality. Intranasal button batteries in particular pose a significant threat to the pediatric population as nasal mucosal necrosis, septal perforation, facial cellulitis, and lateral nasal wall necrosis can occur within hours of insertion. The incidence of impacted button batteries has risen with the increased prevalence in common electronics like hearing aids, watches, and musical greeting cards. One study estimated that button batteries comprised 7% of intranasal foreign bodies removed from pediatric patients in a 6-month period.<sup>1</sup>*

*We report a case of intranasal button battery impaction in a 4-year-old male that resulted in significant tissue injury and required general anesthesia for extraction.*

## CASE REPORT

*A 4-year-old 24-kg previously healthy male was referred to our ER for removal of an intranasal foreign body inserted 10 hours previously. An ENT consult was obtained and after obtaining history, physical examination and an x-ray that demonstrated a metallic foreign body in the right nasal cavity, likely diagnosis was determined to be an impacted button battery. As visualization of battery was obscured by significant inflammation, ENT decided to remove the button battery and explore the nasal cavities under general anesthesia.*

*Upon arrival to the preoperative area, the patient was noted to have purulent, unilateral rhinorrhea with no signs of respiratory distress and vital signs were stable. In the operating room, after placement of monitors and an intravenous catheter, general anesthesia was induced via rapid sequence with a 2 mg·kg<sup>-1</sup> propofol bolus and 0.1 mg·kg<sup>-1</sup> morphine. After placement of a 4.5 cuffed endotracheal tube, anesthesia was maintained with propofol 100 µg·kg<sup>-1</sup>·min<sup>-1</sup> and O<sub>2</sub> and N<sub>2</sub>O (50-50). Examination under endoscope revealed a 1 x 1 cm button battery in the right nasal cavity which was removed with forceps.*

*Further exploration of the right nasal cavity revealed a 3 x 3 mm septal perforation with extensive necrosis of the right inferior turbinate, nasal floor, right nasal septum, and right unciniate process (Photo 1). The left nasal cavity was subsequently visualized and demonstrated a 1.5 cm area of demarcated necrosis (Photo 2). Following suctioning of the nasal cavity and oropharynx, the patient was awakened and extubated without incident and was stable when he was transferred to the post anesthesia care unit.*

## DISCUSSION

*Button batteries produce tissue damage through four distinct mechanisms. The first is leakage of battery contents. Battery anode cells are bathed in an alkaline sodium and potassium hydroxide solution that is separated from the cathode by a plastic seal. This seal corrodes once it is introduced to a moist, electrolyte-rich environment like the inflamed nasal mucosa. The second and third are due to battery currents that cause electrochemical and direct tissue burns. When the battery's anode and cathode ends are in direct contact with nasal mucosa, the battery discharges an electron-rich current that causes a direct tissue burn and reacts with hydrogen ions in the nasal mucosa to produce hydrogen gas. The hydroxyl ion by-products produced in this reaction combine with electrolytes in the nasal mucosa to produce harmful alkaline by-products. An ischemic pressure mechanism has also been proposed. Given the small size of most button batteries, its contribution to tissue damage remains controversial, however, this mechanism may be of some significance when considering the anatomy of the pediatric airway.*

*Once diagnosis of intranasal button battery impaction is determined, removal of the battery and complete visualization of the nasal cavity will be required. Fortunately, the majority of button batteries can be removed in outpatient clinics. However, as button batteries produce significant inflammation within hours of insertion, visualization and removal can often be difficult, if not impossible, in the pediatric population. The average time for septal perforation to occur remains unclear, though one study indicates it may be as little as 7 hours.<sup>2</sup> Furthermore, a time consensus might do little to assist in clinical decision making as histories are often unclear or unreliable. The benefits of delaying surgery to ensure adequate NPO status must be carefully weighed with the risks posed by button battery impaction. Furthermore, as button batteries become more prevalent in everyday electronics, we stress the need for continued efforts in educating the public on the risks posed by such batteries and the need for their urgent removal.*

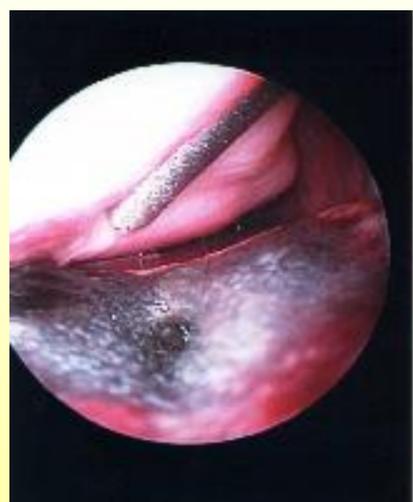


Photo 1: Right nasal cavity

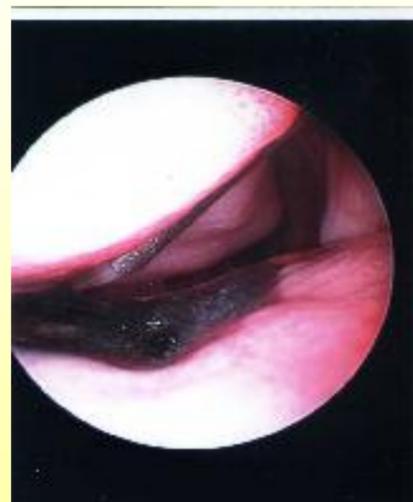


Photo 2: Left nasal cavity

## REFERENCES

1. Glynn F, et al. Ped Emer Care 2008;24:217-218.
2. Loh WS, et al. Ann Oto Rhino & Laryngo 2003;112:379-83.