

## Button Battery Impaction in Nasal Cavity

A button battery inserted in the nose of children is an unusual foreign body which is capable of causing extensive tissue damage, resulting from electrical and chemical burns. We report a case of button battery in the nose of a 4-year-old boy presenting with unilateral nasal discharge, and necrosis in the septum and turbinate of the right nasal cavity. Mercury level in concentrated urine was within normal limit. Microscopic examination disclosed extensive liquefaction necrosis with calcification and fibrosis. Numerous dark brown to black granules were noted in the elastic and collagen fibers and interstitium. Dark-field examination of the section revealed brilliantly refractile granules. Polarized microscopy failed to show the granules. Most brown pigments reacted to prussian blue. Tissue mercury analysis yielded a mercury content of 8.01 ppm. We report this case to emphasize the hazards of button battery impaction and to draw attention to the significance of the problem through histopathologic examination.

Key Words : Foreign bodies Nose; Mercury

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Received : 9 October 1998  
Accepted : 12 November 1998

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### INTRODUCTION

Button batteries have become increasingly popular as an energy source for many small electronic devices and are attractive to small children to insert into their mouths or other orifices. Button battery foreign bodies in the gastrointestinal tract (1, 2), nose (3) or ear (4) pose a hazard to the patient and require immediate attention by clinicians. A button battery in the nose of children is an unusual foreign body which is capable of causing extensive tissue damage, resulting from electrical and chemical burns (5). The results are necrosis, scarring, septal perforations and cosmetic deformity in the nose, and these problems pose a major challenge to long-term management. Some cases (3, 4) of button battery in the nose are reported by clinicians. However, button battery impaction in the nose emphasizing histologic features and tissue mercury level has rarely been reported.

We present a case of button battery impaction in the nose to emphasize the hazards of battery impaction and to draw attention to the clinical significance of the problems through histopathologic examination.

### CASE REPORT

A 4-year-old boy visited the division of otolaryngology with complaints of nasal discharge. Four days before his visit, he had inserted a button battery into his nostril and his

parents have removed the battery from the right nasal cavity one day later. The duration of button battery impaction was about one day. Nasal examination revealed a profuse purulent discharge and necrosis in the septum and turbinate

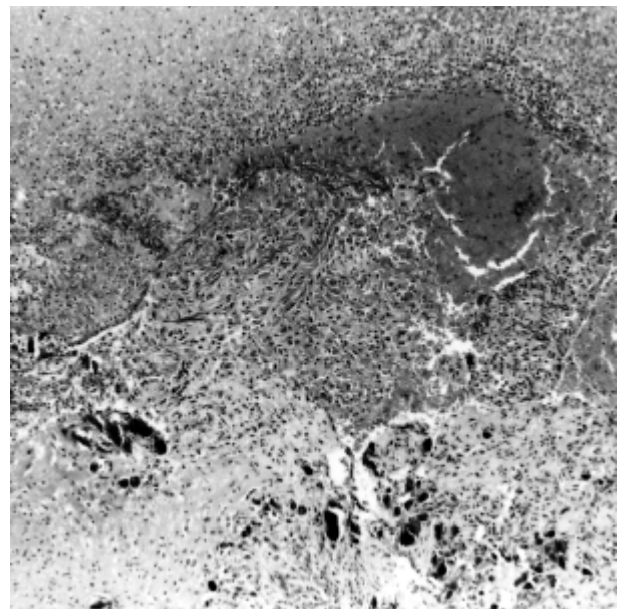


Fig. 1. Extensive liquefaction necrosis with calcification and fibrosis (H-E,  $\times 40$ ).

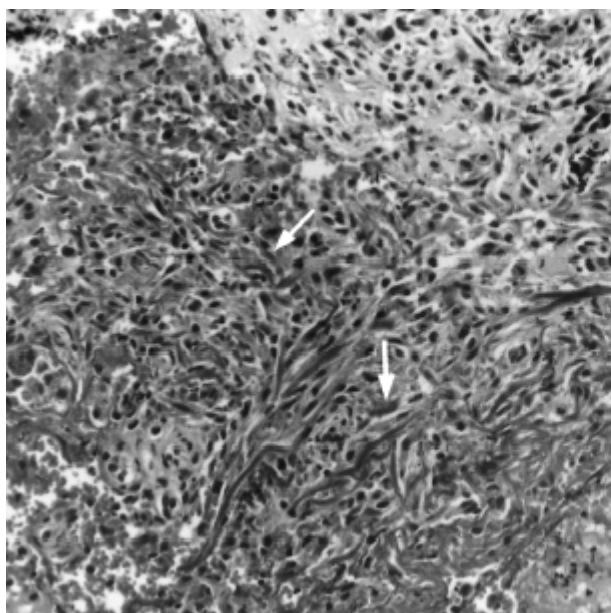


Fig. 2. Numerous dark brown to black granules were noted in the elastic fibers (elastic stain,  $\times 100$ ).

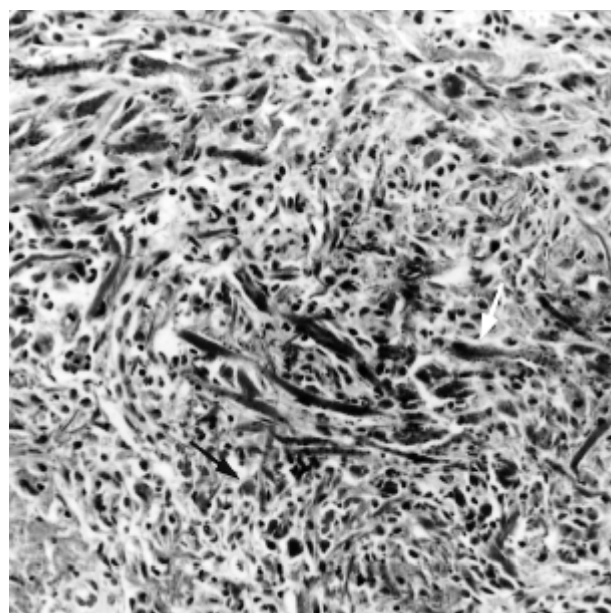


Fig. 3. Numerous dark brown to black granules were noted in the collagen fibers (Masson trichrome,  $\times 100$ ).

of the right nasal cavity. The nasal cavity was irrigated with sterile saline and started systemic broad spectrum antibiotics therapy. After 3 weeks, the necrotic nasal mucosa was removed under general anesthesia. Debris from nasal cavity were composed of tan to brownish necrotic soft tissue. Mer-

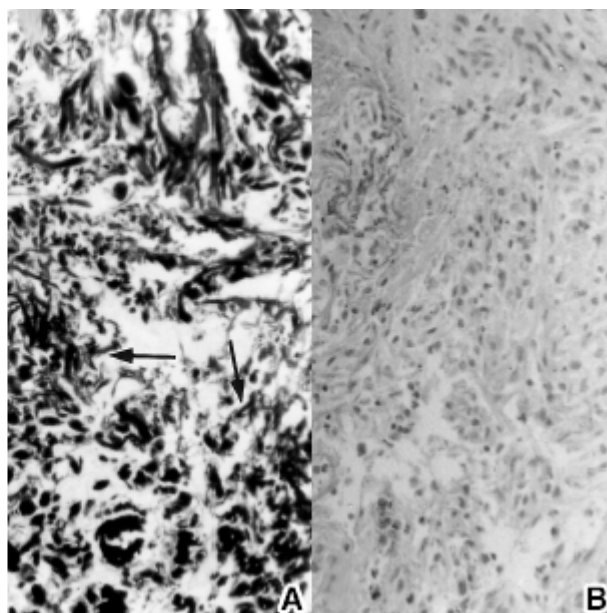


Fig. 4. Most brown pigments were positive for prussian blue stain (A) and negative for Fontana-Masson stain (B) ( $\times 100$ ).

cury level of concentrated urine was within normal level.

Microscopic examination disclosed extensive liquefaction necrosis with calcification and fibrosis (Fig. 1). Numerous dark brown to black granules were noted in the elastic (Fig. 2), collagen fibers (Fig. 3) and interstitium. Dark-field examination of the section revealed brilliantly refractile granules. Polarized microscopy failed to show the granules. Most brown pigments were positive for prussian blue stain (Fig. 4A) and negative for Fontana-Masson stain (Fig. 4B).

The tissue mercury level was measured with atomic absorption spectrophotometer, cold-vapor with Hg lamp (Perkin Elmer, New Jersey, U.S.A.) after pretreatment by Niosh method 7300. This analysis yielded mercury content in the tissue section of 8.01 ppm. Four weeks after operation, the patient was cured without other complications, such as septal perforation or external nose deformity.

## DISCUSSION

Button battery impaction was first reported as a foreign body in the esophagus in 1977 (6). Since the first case, there have been many cases of button battery impactions in the external auditory canal (4) and ingestion (1, 2). However, a few cases of button battery in the nasal cavity were reported. The ingestion of a button battery is known to be potentially fatal and impaction in the esophagus is uniformly associated with severe morbidity (1). The close contact between these foreign bodies and mucosal surfaces will always result in tis-

sue destruction (3).

The electrolyte compositions of button batteries are potassium hydroxide, magnesium dioxide and either mercuric or silver oxide. The electrolyte is held within a metal container, the sides and bottom of which form the positive pole with the negative pole forming the top of the battery. Leakage of the electrolyte is prevented by a plastic seal, which separates the positive and negative poles. This seal is consistently the site of leakage (3).

Possible mechanisms of injury by these batteries to the gastrointestinal tract have been proposed by Litovitz (1) : 1. spontaneous electrolyte leakage, with liquefaction necrosis and cumulative destruction of tissue, 2. the corrosive effects of mercuric oxide after leakage, 3. the generation of an electrical current creating an electrical burn. In the presence of an electrolyte solution, the current produces chlorine gas and sodium hydroxide resulting in the formation of a precipitate. 4. pressure necrosis from the impacted foreign body. Based on observations from our case, all four mechanisms were considered as possible mechanisms.

In this case, numerous brownish granules were found in elastic fibers, collagen fibers and within the cytoplasm of macrophages. In a special stain, these granules were positive for iron stain, but negative for Fontana Masson stain. It is well known that the presence of the heavy metals stimulates melanin pigmentation (7). It has been speculated that this action results from increasing oxidative process. However, in our case, the melanin pigment is not noted. This is probably due to the short duration of mercury exposure. The iron deposition was probably derived from the metal container. The tissue mercury level was increased in our case up to 8.01 ppm, which is well above the normal for a biologic material of 1 ppm (7).

The clinical presentation can be unilateral nasal discharge with or without features of secondary infection as in our case. The earlier the foreign body is removed, the less chance

of morbidity. The longer it stays in the nose, the more likely it results in necrosis of the nasal mucosa, scarring and septal perforation. Injury resulting from button battery impaction can leave a life-long sequelae. In this case, profuse purulent discharge and necrosis were noted in the septum and turbinate of the right nasal cavity, but scarring or septal perforation was not observed. Growth and maturation of the nose may be altered by destructive damage to the septal cartilage and bone. The area of maximal damage is routinely found in relation to the negative pole of the battery. If the negative pole of the battery is in contact with the septum, particularly for an extended period, perforation was a likely result (3).

In this paper, we report a case of button battery impaction in the nose of a 4-year old boy. Button battery poses a significant household danger to children and it is important that parents, general practitioners and otolaryngologists become fully aware of the significance of the problem.

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