

Stacked coins ingestion and double rim sign on x-ray: A case report and review of literature



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Introduction

Young children are known for their curious ways of exploring their surroundings. As a normal part of their development, they use all senses to familiarize themselves with new objects. Every new texture, smell, color, or taste will naturally attract a child and entice them to further explore. This instinctive behavior can however lead a child into harm's way. The same curiosity that enhances their development can also pose a risk of accidental ingestion of foreign body [1,2]. These incidences become dangerous and complications vary in severity depending on the type of foreign body ingested, the duration until the time of presentation and site of impaction [1,2]. The most common objects accidentally ingested by children are coins. However, many of these incidences are unwitnessed by the child's guardians. An x-ray revealing a coin shaped object may in fact be something far more dangerous, such as a button battery. Button batteries are easily accessible to children as they are found in different toys and electronic devices. Due to their higher risk of causing complications, prompt intervention is required. A button battery appears as a circular, radiopaque object with a double halo or

rim on an anteroposterior (AP) x-ray film [3,4]. However, these characteristics do not always confirm that the object is in fact a button battery. In our case, we are going to show that sometimes the double rim seen on an x-ray can be attributed to other types of ingested foreign bodies.

The Case

A four-year-old girl with no known medical issues presented to pediatric ER at the Armed Forces Hospitals Southern Region (AFHSR) seven hours after she accidentally ingested a coin. The incident was witnessed by the girls' mother. The patient vomited twice and had difficulty swallowing. The ENT team was notified. Medical and surgical history was unremarkable. Upon examination, the patient was conscious, oriented, afebrile, and vitally stable. The patient had no difficulty in breathing, she maintained an O₂ saturation of 97%-100% on room air. Upon chest auscultation, equal bilateral air entry was noted with no adventitious sounds. There was no stridor or hoarseness of voice. The oropharyngeal examination was unremarkable.

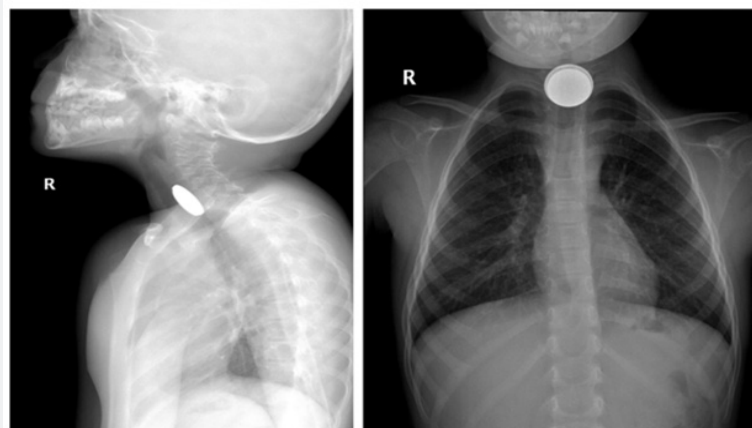


Figure 1: Left: X-ray film, lateral view showing the foreign body. Right: X-ray film, anteroposterior view, showing the double ring look of the foreign body.

AP and lateral chest x-rays (Figure 1) were obtained and revealed a round opacified foreign body measuring 2cm in diameter and appeared to have halo or "double ring sign" on AP view and a step-off shape was noted on the lateral view in the upper esophagus. A suspected diagnosis of an ingested button battery was made. The patient was kept NPO right away and family was counselled about our findings.

After informed consent, direct rigid esophagoscopy was

performed under general anesthesia and a metallic object was identified distal to the cricopharyngeal muscle and removed without any complications. After inspecting the removed foreign body, two coins (50 Saudi halalas and 25 Saudi halalas) were found pressed together in a concentric stack (Figure 2). The patient went to the recovery room for close observation post operatively with instructions to keep her off analgesics. After a period of 6 hours had passed, a repeated chest x ray was done and showed normal findings with no foreign body. The patient was discharged home.



Figure 2: Left: Coins after removal stacked on top of each other. Right: The same coins after they were separated.

Discussion

Unfortunately, many cases of children ingesting foreign bodies are unwitnessed by their caregivers, and as a result present late to their health care provider. Clinical presentation can differ based on the age. Children commonly present to ER 12-24 hours post-ingestion, and complain of vomiting, drooling, and/or difficulty swallowing [1]. According to the statistics published by the American national capital poison center for the period between July 2016-June 2018, the most common intended uses of the ingested batteries (all battery types) is in hearing aid (36.5%), toys (22%), lights (16.5%), remote control (5.4%) [5]. In their statistics they measured the frequency and the severity of moderate, major, and fatal outcomes in the period between 1985-2017, they showed a slight decrease in the frequency however with a marked increase in the moderate, major, or fatal outcomes [5].

Many patients were under the age of six [5,6]. Seeing a disc (button) shape object in the esophagus on anteroposterior x-ray film with a double halo indicates a high possibility of button battery ingestion and warrants prompt intervention, especially if the diameter is estimated to be more than 20mm [7]. Button batteries come in different types and sizes. Injury to the esophagus

be early as 2 hours post-ingestion. The larger the diameter of the battery, the higher the risk for major complications, particularly if the diameter is more than 20mm [7-9].

According to Ibrahim et al. study, button battery ingestion was associated with a higher rate of major complications compared to coins (43% vs 0% respectively). Because of that, a high index of suspicion and a timely intervention should always be carried out when a double rim sign is seen on a plain anteroposterior x-ray film [1]. Several cases have reported a similar misdiagnosis that resulted from the similar radiological findings that button batteries share with stacked coins [10-12] (Table 1). As a result of that, it was suggested analyzing radiological densities might help directing the diagnosis to one instead of the other. However, based on a retrospective study done in UPMC where they analyze the x-rays taken for patients who were found to have ingested button batteries (n=22) and those who appeared to have stacked coins instead (n=47) and they found that measuring radiological densities was poorly correlated with differentiating stacked coins from button batteries [13]. It is in our best practice to err on the side of caution and provide a timely intervention when a double rim/halo sign is found on x-ray to avoid the potentially devastating complications of button batteries.

Table 1: Comparison of published case reports of patients who were diagnosed as button battery ingestion based on x-ray where post removal, they were found to have stacked batteries.

| Study | Patient's Age | Gender | Time Until Presentation | Presenting Symptom | Witness of Ingestion |
|--|---------------|--------------|-------------------------|---------------------------------|----------------------|
| Silverberg, Mark MD, et al. Esophageal Foreign Body Mistaken for Impacted Button Battery [10] | 9 years | Female | Not reported | Mild dysphagia | Unwitnessed |
| Gan RW, Nasher O, Jackson PB, Singh SJ. Diagnosis of button battery ingestion by 'halo' radiographic sign [11] | 3 years | Not Reported | Not Reported | Retrosternal pain and dysphagia | Unwitnessed |
| Frumkin K, Lanker M. Suspected esophageal coin--look again [13] | 4 years | Not Reported | Not Reported | Vomiting and Throat pain | Unwitnessed |

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