Fatal Gastrointestinal Bleeding 1 day after Ingestion of Lithium Battery in 2-year-old Boy

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The ingestion of foreign bodies in children is very common, with most affected ages ranging between 3 months to 6 years. Batteries represent less than 2% of the ingested FB and the mortality rate related to FB ingestion is less than 1 % (1). In 70 - 90% of cases, the FB is located in the upper esophagus, but in our case, the battery was located in mid-esophagus *(image 1*).

Case Description

A 2-year-old, 12 kg male, with no significant past medical history was admitted for generalized abdominal pain, swallowing difficulty, and headache with normal vital signs.

Day 0:

Symptoms started in the evening, patient was found to have a Foreign body (FB) in the esophagus on CXR done at outside facility and was then transferred to Children's Medical Center- Dallas. Repeated CXR PA/LAT confirmed the presence of lithium battery in mid esophagus.

Day 1 | 5:00 AM:

Surgery consulted for urgent esophagosopic FB removal under GA The esophagoscope revealed the presence of a 2 cm length of 75% circumferential esophageal injury with mucosal sloughing, ulceration, and edema at the site of impaction *(image 2).*

Day 1 | 7:00 AM:

The esophagram immediately done following FB removal revealed:

1. Abnormal esophagus extending from T3 to T5 with narrowing, irregularity, and delayed peristalsis (*image 3*).
2. A collection of contrast seen extending from the esophageal lumen (*image 4*).
3. Irregular collection of contrast extending into left mediastinum after emptying of esophageal lumen from contrast, consistent with contained perforation *(image 5).*

Patient admitted to the ICU for strict conservative management, monitoring, NPO, and antibiotics.

Day 2 | 9:00 AM:

PICC line placement and TPN started. No events during anesthesia.

Day 2 | 12:00 PM:

Patient suddenly decompensated with severe bradycardia, desaturation, hypotension and presence of blood from his mouth, nose and rectum. CPR and massive transfusion protocol initiated. Patient transported to OR for immediate left thoracotomy and clamping of the presumed aorto-esophageal fistula. Internal CPR was performed by the surgeon and no identifiable hole in the empty aorta detected.

Imaging

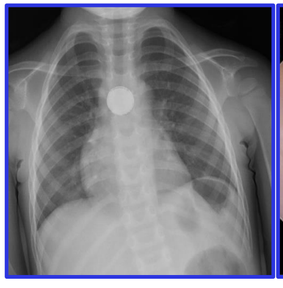

Image 1

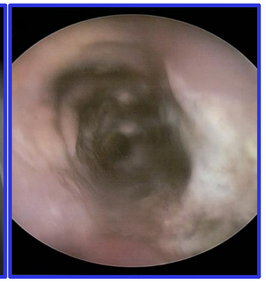

Image 2

Image 3

Image 4

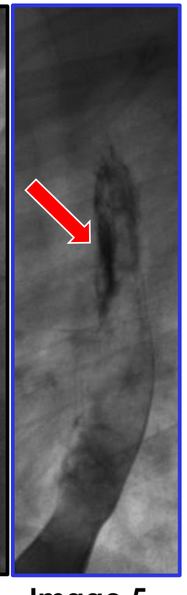

Image 5

Day 2 | 3:00 PM:

Patient remained unresponsive despite resuscitative efforts and was pronounced dead in OR about 50 minutes later, about 36 hours post-admission. The family refused to proceed with a postmortem autopsy.

Discussion

The exact time of FB ingestion when the patient presented to the ER was unknown, but only a few hours are needed for a lithium battery to cause major complications, even death (1).

Mechanisms of Action

Button batteries can cause tissue damage by 4 mechanisms of injury:

1. Alkaline leakage with direct corrosive effect
2. Mucosal burn by direct electric current effect
3. Pressure necrosis
4. Local toxic effect related to absorption of contents(2)

Diagnosis & Surgery

Early plain x-ray films are standards for diagnosis of FB ingestion. The double ring or halo of the lithium batteries is a distinctive appearance on radiographs. Immediate surgical removal of FB by endoscopy is recommended followed by an esophagram, which in our case, detected the extent of esophageal damage and the mediastinal leak of the contrast.

Literature Review

According to the National battery ingestion registry from 1977-2008 (*Table* 1), 13% of death complications were due to tracheal injuries, 7% to tension pneumothorax, and 80% secondary to fetal hg. 60% of exsanguinous was caused by AEF and data about site of impaction indicate that 15% were in mid-esophagus (3).

The gold standard for esophageal disruption and contained perforation is conservative management. This includes admission to ICU, NPO, TPN, antibiotics, serial imaging or fluoroscopy, and stool guaiacs (5).

Unfortunately, most cases reported in literature with suspected vascular injury are complicated by severe exsanguinating hemorrhage leading to cardiac arrest and death (4). Aortal-esophageal fistula is extremely uncommon with no clear invasive medical or surgical management to contain the fistula and prevent exsanguination. Despite immediate intensive resuscitation and rapid transfer to OR, the surgeon was unable to identify the fistula to stop the bleeding through lateral thoracotomy incision.

Author year	Gender Age	Symptoms	Size	Time	Injury	Location	Outcome
Blatnik[30] 1977	M 2,5 y	Dysphagia Fever	23	16 h	EB	Upper esophagus	Vascular damage
Shabino[31] 1979	F 16m	Fever Irritability	22	4 d	EB, tension neumothorax	Upper esophagus	Vascular damage
Janik[32] 1982	M 2 y	Dyspnea		14 d	TEF	Upper esophagus	Colonic interposition
Votteler[33] 1983	M 2 y	Dysphagia Dyspnea	21	5 d	TEF	Upper esophagus	Colonic interposition
Litovitz[34] 1983	F 5 y	Odynophagia	23	4 h	EB	Coger esophagus	
Litovitz[34] 1983	16 m	Odynophagia	23	6 h	Perforation	Upper esophagus	Conservative management
Maves[35] 1984	F 10 m	Dysphagia Fever	15,6	20 h	TEF	Upper esophagus	Stenosis
McNicholas[36] 1984	M 3 y	Dyspnea		21 d	TEF	Upper esophagus	Stenosis
Esomi[37] 1984	10 m	Dysphagia Irritability	15,6		TEF	Upper esophagus	Stenosis
Van Asperen[38] 1986	F 9 m	Dyspnea Dysphagia	16	7 d	TEF	Upper esophagus	Stenosis
Rivera[39] 1987	M 3 y	Disphagia	23	2 d	Perforation	Upper esophagus	Stenosis
Kost[40] 1987	M 18 m	Vomiting Dysphagia	20	29 d	EB	Upper esophagus	Stenosis
Sigalet[41] 1988	M 4 m	Dyspnea Dysphagia Fever	12	30 h	TEF	Upper esophagus	Colonic interposition
Vaishnav [42] 1989	F 16 m	Dysphagia	10	28 d	TEF	Upper esophagus	
Peralta[43] 1991	F 11 m	Cough Fever Vomiting		30 h	TEF	Upper esophagus	Died
Litovitz[44] 1992	F 10 m	Dysphagia Irritability	20	9 h	EB	Upper esophagus	Stenosis
Gordon[45] 1993	F 18 m	Dysphagia		3 d	Perforation	Upper esophagus	Stenosis
Senthilkumaran[46] 1996	M 5 m	Dyspnea	22	12 d	TEF	Upper esophagus	Conservative management
Samad[20] 1999	F 4 y		20	36 h	Perforation	Upper esophagus	Conservative management
Samad[20] 1999	F 5 y	Dysphagia	20	5 h	Perforation	Middle esophagus	Conservative management
Chiang[47] 2000	M 20 m	Dysphagia Fever Cough	23	3 d	EB	Upper esophagus	TEF
Anand[48] 2001	M 3,5 y	Dysphagia	21	10 d	Perforation	Upper esophagus	TEF
Yardeni[49] 2004	M 7 y	Epigastric pain	20	6 h	EB	Upper esophagus	
Okuyama[50] 2004	M 20 m	Dysphagia	20	7 d	TEF	Upper esophagus	Surgery
Imamoglu[51] 2004	F 2,5 y	Cough	22	17 d	TEF	Upper esophagus	Surgery
Flores[52] 2006	M 20 m	Cough	20	4 h	Peforation	Upper esophagus	Conservative management
Hammond[53] 2007	M 15 m	Cough	22	7 d	TEF	Upper esophagus	Surgery
Hamilton[54] 2009	M 19 m	Abdominal pain		1 d	Perforation	Upper esophagus	Vascular damage, death
Hamilton[54] 2009	F 9 m	Vomiting		6h	Perforation	Upper esophagus	Vascular damage, death
Case 1 2007	F 7 y	Vomiting Sialorrhea	20	6 h	EB	Upper esophagus	Stenosis
Case 2 2007	M 2 y	Vomiting	20	6 h	EB	Upper esophagus	Stenosis
Case 3 2008	F 5 y	Vomiting	20	6 h	EB	Middle esophagus	

Time: Approximate time passed since the theoretical moment of swallowing until definitive treatment; M: Male; F: Female; Y: Years; M: Months; D: Days; H: Hours; EB: Esophageal burn; TEF: Tracheoesophagic fistula

Table 1: Complications of Battery ingestion Cases. 1977-2008. Severe esophageal injuries by battery ingestion Sara Fuentus et al. J Emerg Trauma Shock 2014 7(4)316-321

References

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