

## **Esophageal perforation following foreign body ingestion in children: report of three cases**

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### **ABSTRACT**

We report three cases of foreign body esophagus, in two of them the foreign body was a coin, and the third child ingested a disc battery. In all three cases the foreign body was impacted in the mid esophagus. All were initially evaluated by chest X ray which confirmed the diagnosis. One underwent flexible endoscopic extraction initially followed by rigid esophagoscope later and in the other two extractions was performed using rigid esophagoscope, two of them ended with perforation of the esophagus and treated conservatively with only chest tube insertion and supportive management.

In the third child who ingested a disc battery, esophagoscopy revealed necrosis and perforation at the site of impaction with formation of trachea-esophageal fistula, extraction was performed but the fistula necessitated surgical closure which failed and therefore underwent stent placement to end with complete cure.

**Keywords:** Foreign body; esophageal perforation; children; rigid endoscope.

**F**oreign body ingestion is a worldwide problem. Infants and young children appreciate objects by tasting and swallowing them. The peak incidence of foreign body ingestion is between 6 months and 3 years<sup>1,2</sup>. In children the incidence is equal in males and females<sup>1,3</sup>.

Commonly ingested foreign bodies in children are coins, toys, batteries, and various other objects. At least 80% of swallowed foreign bodies pass the gastrointestinal system spontaneously whereas 20% will require endoscopic retrieval. On the other hand less than 1% of foreign body ingestion cases will require surgical intervention in order to retrieve them or to deal with complications<sup>1,4</sup>.

A plain radiographs, in the frontal and lateral

view is usually needed to determine the position of foreign body<sup>5</sup>.

Although perforation is estimated to happen in less than 1% of the cases<sup>6,7</sup>, some investigators have reported a higher rate of 4.5% and 5.6% [8, 9]. Perforation usually presents acutely and the presence of chronic aero digestive symptoms and signs in infants and small children should prompt physicians to consider foreign body ingestion<sup>1</sup>.

At least 75% of the coins are stuck at the upper esophagus<sup>10</sup>. The other two sites include the mid esophagus and the lower esophageal sphincter<sup>1</sup>.

Coins in the esophagus have to be removed, and observation for 24 hours awaiting passage of the coin to the stomach can be justified unless the patient is symptomatic, in contrast disc batteries should be removed urgently, as batteries are known to release alkaline solution which may cause liquefaction, necrosis and perforation<sup>1,11</sup>.

The presence of significant tissue injury warrants an oral contrast swallow study within 36 hours to rule out fistula formation, and another study is needed after 2-3 weeks to rule out stricture formation or later development of a fistula<sup>1</sup>.

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**Case 1:**

A girl of 4 years presented immediately following a failed trial of flexible endoscopic removal of a coin from the esophagus which was diagnosed by chest X ray (fig.1 A and B).

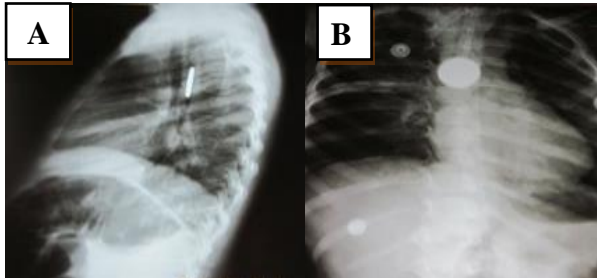


Figure1: FB in mid esophagus. A: Lateral view, B: AP view

She was noted to develop sudden onset of severe respiratory distress, cyanosis and massive surgical emphysema reaching up to the neck and face following the procedure. Air entry was absent bilaterally. Chest tubes were inserted on both sides and the patient was connected to a mechanical ventilator. The patient showed dramatic improvement and the coin was removed on the fifth day using rigid esophagoscopy. After 3 weeks a water soluble contrast study revealed complete healing of the perforated esophagus (fig.2 A and B).

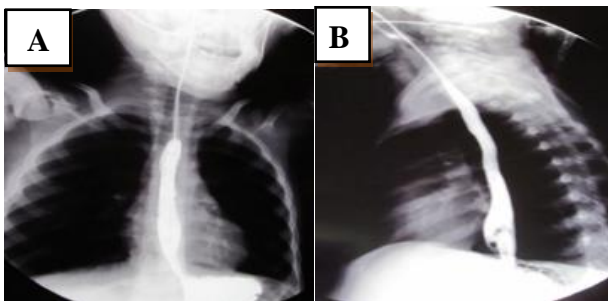


Figure 2: Contrast swallow shows complete healing of fistula. A: AP view, B: Lateral view.

**Case 2:**

A 3 years old boy presented to us with a history of five days of ingestion of foreign body (coin) which was stuck at the level of mid upper esophagus confirmed by plain chest radiograph. An endoscopic removal of the foreign body was attempted using rigid

esophagoscope, but failed to extract the foreign body and it was pushed downward (fig. 3 A, B and C).

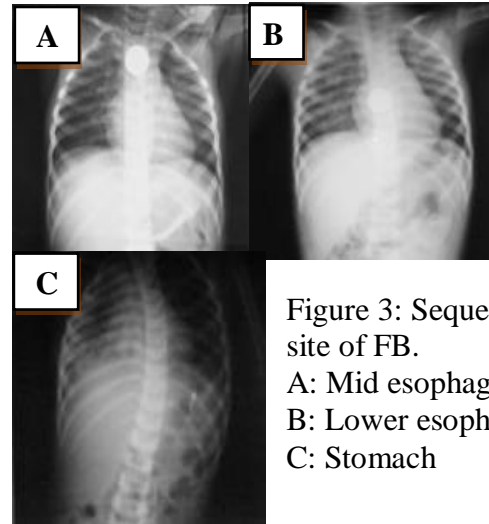


Figure 3: Sequential site of FB.  
A: Mid esophagus  
B: Lower esophagus  
C: Stomach

Next day the patient developed shortness of breath and another chest x-ray revealed massive right hydro-pneumo-thorax. A chest tube was inserted and the patient improved.

Three weeks later a water soluble contrastswallow was obtained to assess the esophagus and revealed an esophago-pleural fistula (fig. 4 A and B). The chest tube was kept in site for further three weeks at the end of which another follow up contrast swallow demonstrated complete healing of the fistula without any residual leak.

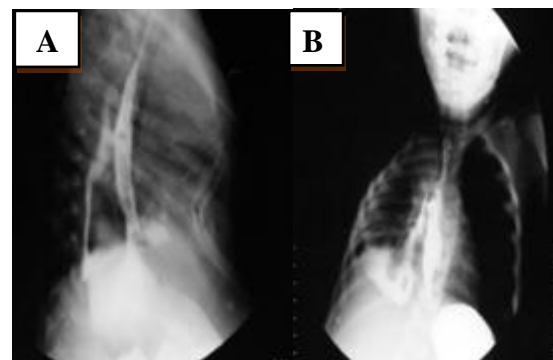


Figure 4: Esophago-pleural fistula  
A: Lateral view. B: AP view

**Case 3:**

A boy of 5 years presented to us after he has been seen at ENT department for ingestion of a disc battery with which he started to experience cough, stridor, wheezes, and respiratory distress. These symptoms were

aggravated when he was taking oral feeds. The chest radiograph (fig. 5A and B) demonstrates a disc battery at the mid esophagus.

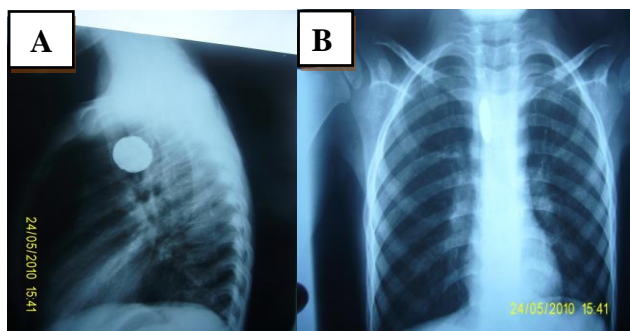


Figure 5: Shows disc battery. A: Lateral view, B: AP view.

An endoscopic removal of the battery was performed and the procedure revealed an acquired tracheo-esophageal fistula. After a period of 6 weeks the patients underwent a tracheo-esophageal fistula repair with surgical reinforcement through a right thoracotomy, however, the fistula recurred after two weeks (fig.6 A and B).

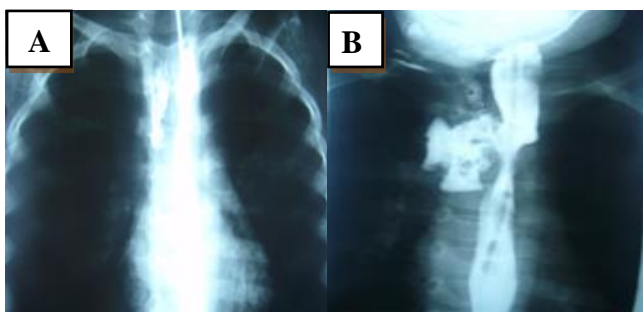


Figure 6: Tracheo-esophageal fistula. A: Fistula due to FB, B: Recurrent post-surgical repair

An expandable esophageal stent was inserted endoscopically under general anaesthesia (fig.7) and after six weeks period a water soluble contrast barium swallow performed under fluoroscopy (fig.8), revealed complete healing. The stent was removed endoscopically in 8 weeks and the patient had a good result and remained asymptomatic on a 3 months follow up.

### Discussion

Children usually swallow smooth rounded objects rather than sharp objects. An esophageal foreign body may lodge in the



Figure 7: Shows the esophageal stent in place

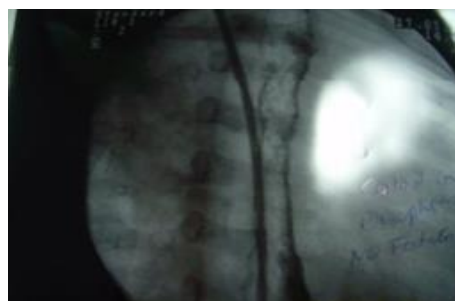


Fig 8: Shows contrast swallow with no fistula

thoracic inlet, the aortic arch area, or the gastro esophageal (GE) junction. Esophageal perforation may result in neck swelling, crepitus, and pneumo-mediastinum. Foreign body esophagus can present with a chronic morbidity due to esophageal damage that lead to stricture and tracheoesophageal fistula formation<sup>[12]</sup>. In all three cases reported here the objects were smooth and rounded and all were stuck at the mid esophagus.

Complications of coin ingestion due to prolonged impaction, such as perforation or stricture of esophagus and tracheoesophageal fistula have been reported in the literature<sup>13,14</sup>. If the object is lodged in the esophagus for more than two weeks, there is significant risk of erosion into surrounding structures, and surgical consultation should be obtained before attempting removal. Endoscopy generally is the preferred and accepted method of removing coins from the esophagus<sup>15</sup>. Paradoxically Tokar et al reported in their review of the medical records of 161 children no complication of coin ingestion observed before or during the retrieval procedure<sup>16</sup>. Our three cases presented after 72 hour which made the removal of the foreign body difficult and two ended with perforation. The third one

presented for the first time with trachea-esophageal fistula. The combination of the foreign body being a disc battery and the delayed presentation resulted in the spontaneous fistulation. Newman reported that a delay in diagnosing radiolucent esophageal FB resulted in trachea-esophageal fistula in two patients although they had respiratory symptoms for several months<sup>17</sup>.

On a plain radiogram, a coin in the esophagus is usually seen in a coronal plane on antero-posterior view. Plain radiography showing an increase in the distance between the cervical vertebrae and the larynx and trachea may lead to the suspicion of radiolucent FB in the esophagus<sup>18</sup>. MRI detects plastic or wooden foreign bodies<sup>19</sup>, while contrast-enhanced computed tomography is the imaging modality of choice for esophageal FB when the plain radiographic findings are negative<sup>20</sup>. Fortunately enough in our cases the foreign bodies were radio opaque and easily detected on plain chest X ray. The contrast study was used only to confirm the healing of the perforation and follow up.

Most of the objects located in or above the upper third of esophagus have an early diagnosis and could be easily removed by Magill forceps or endoscope. The complications, therefore, decrease significantly for the upper third FB<sup>14</sup>. In our series of three cases the foreign bodies were impacted in the mid esophagus and necessitated esophagoscopy removal. This location combined with the delayed presentation accounted for the difficulty in their retrieval and occurrence of the perforation.

With the most common location of perforation being the thoracic esophagus, perforation of the esophagus is life threatening because the esophagus lacks a serosa and is surrounded by loose areolar connective tissue which is unable to prevent the spread of infection and inflammation. Left-sided pneumothoraces and effusions are more likely due to upper thoracic perforation while right-sided findings are often from distal perforations<sup>21</sup>. Although in our first case the chest tube was inserted bilaterally it

did not indicate the site or severity of perforation. The patient presented soon after the flexible endoscopy and treated as severe tension pneumothorax. The condition was probably augmented by the leak of endoscopically insufflated air through a small perforation. As mentioned earlier the patient was connected to a mechanical ventilator, and during the follow up no leak was observed through the chest tubes neither after performing the contrast study. In the second case the chest tube was inserted on the right side and immediately drained a considerable amount of fluid, although on initial radiography the coin was noted at a mid-esophageal position. Perforation was caused by the esophagoscopy during the unsuccessful attempt of FB retrieval that resulted in pushing the coin to the lower esophagus as demonstrated by the contrast study.

Peng et al described eight children with esophageal perforations between 2000 and 2004. Six (75%) were from iatrogenic causes with the remaining two occurring from foreign body erosion<sup>22</sup>. Today, however, the most common cause of esophageal perforation in children is iatrogenic<sup>23</sup>. The first reported case of esophageal perforation due to an iatrogenic injury in a neonate cause by respiratory catheter suction was published in 1961 by Warden, a captain in the US Navy<sup>24</sup>. More recently, the causes of iatrogenic esophageal perforation are varied with Bougies dilation, endoscopic instrumentation, endo- tracheal intubation, respiratory suction catheters and nasogastric tube insertion being most commonly reported in the literature<sup>23, 25</sup>. In our cases the esophagoscope was the tool causing the perforation in the first two cases.

Controversy remains as to whether flexible or rigid endoscopy should be used in the management of these patients. The quoted esophageal perforation rates using flexible endoscopy have been reported as between 0.018 and 0.05% as opposed to between 0.2 and 1.2% using rigid endoscopy<sup>26</sup>. It has been recommended that the rigid endoscope is used for foreign bodies lodged at the level of the hypo pharynx and cricopharyngeus, while the



flexible endoscope was being reserved for obstructions distal to this<sup>27</sup>. In all our 3 cases with mid esophageal FBs a rigid esophagoscope was used therefore increasing the risk of perforation.

### Conclusion

From this series we conclude that delayed presentation increases the risk of esophageal perforation. The use of rigid esophagoscopy in the removal of foreign bodies in the middle and lower third should be discouraged because of the increased incidence of perforation.

Esophageal perforation following removal of foreign bodies can be managed effectively using a conservative approach with aggressive early resuscitation, chest tube insertion, and a naso-gastric tube feeding. The shortage in specialized paediatric endoscopists and anaesthetists in Sudan should be bridged to reduce the incidence of esophageal perforation following removal of foreign bodies in pediatric patients.

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