

The breathtaking power of money. A case report of an unexpected, impaired intubation by a swallowed coin

E. HOFLAND (*), V. E. BERGSHOEFF (**), S. MAES (***) and R. SLAPPENDEL (***)

Summary : Two hours after swallowing of a two-euro coin, general anesthesia was administered in an 8-year-old girl for therapeutic esophagoscopy. Despite the absence of preoperative respiratory distress and a coronal position of the coin on a pre-operatively performed chest radiograph, a narrowing of the tracheal lumen unexpectedly complicated endotracheal intubation. Based on the age a much smaller endotracheal tube size was required, which could be placed with a rotating movement. The endoscopic removal of the foreign body from the upper esophagus was performed without further complications.

Anatomical, pathophysiological and anesthesiological aspects of the relation between the trachea and the bulging esophagus are being discussed.

Airway management must include awareness of an increased risk of airway obstruction by the esophageal foreign body. The anesthesiologist must be prepared for unexpected and changing situations.

Key words : esophageal foreign body ; airway management ; pediatric anesthesia ; tracheal compression ; foreign body ingestion ; ingested coins ; tracheal stenosis.

INTRODUCTION

When a child is presented with symptoms of a lodged foreign body in the upper part of the esophagus usually general anesthesia is requested for endoscopic removal. If no respiratory distress is present no problems are expected in regard to the airway. This case report describes an unexpected problem during endotracheal intubation.

CASE REPORT

After having swallowed a two-euro coin during her play two hours earlier, an 8-year-old girl was brought to the ER and presented to the E.N.T- surgeon. During swallowing the patient felt the coin in her throat. Swallowing of water was impossible, which suggested a total obstruction of the esophagus. When asked about the position of the corpus alienum the patient – albeit inaccurately – pointed at the level of the cricoid cartilage. No dyspnea or inspiratory stridor was present. Direct

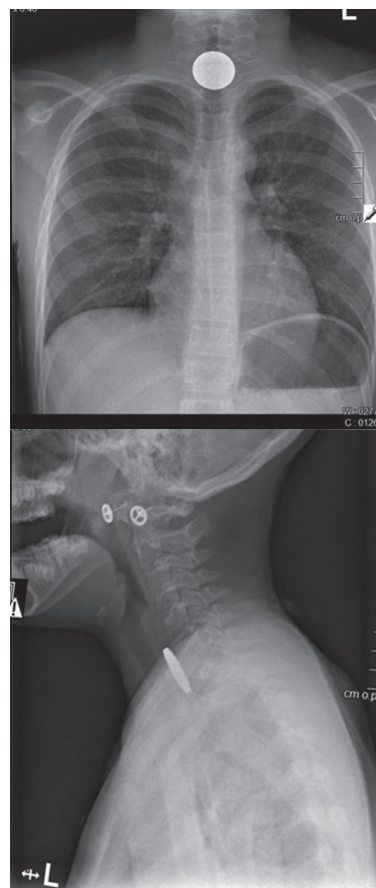


Fig. 1. — Frontal and lateral chest radiograph. The coin projects and face on the frontal radiograph and tangentially on the lateral view.

inspection of the oropharynx was difficult due to patient anxiety and the coin could not be visualized. Fiber endoscopic evaluation was not allowed by the patient. A performed X-ray (Fig. 1) showed a coronal oriented foreign body at the level of C6-C7.

Everhard Hofland M.D., Ewa Bergshoeff M.D., Sabine Maes M.D., Rob Slappendel Ph.D09-

(*) Department of Anesthesia, Zuyderland Medical Centre Heerlen, the Netherlands.

(**) ENT Surgery, Zuyderland Medical Centre Heerlen, the Netherlands.

(***) Anesthesia, University Hospital of Antwerpen, Belgium;

Correspondence address : Everhard Hofland, Department of Anesthesia, Zuyderland Medisch Centrum Heerlen, 6418KJ Heerlen, the Netherlands.

E-mail : hofland.e@home.nl

Patient was proposed for general anesthesia. She was fasted for over 6 hours. Mask induction with sevoflurane/N₂O was performed to allow for direct laryngoscopy. We expected a quick extraction of the foreign body from the post-cricoid area or just below (1). During direct laryngoscopy the anesthesiologist was able to get a good, direct view of the entrance of the esophagus and the glottis. There was no obstruction. The first attempt for endotracheal intubation performed with an uncuffed Endo Tracheal Tube (ETT), Mallinckrodt™ Murphy Eye, size 6.0 mm ID, appropriate for her age, failed, apparently due to an obstruction of the tracheal lumen. A second intubation attempt with a smaller ETT (size 5.5 mm ID) was undertaken. This attempt failed as well, due to the impossibility to pass the tube through the subglottic space. It became clear that the obstruction was located just below the vocal cords, where the tip of the tube met a firm resistance. Immediately after this, a third attempt was made using a tube size 5.0 mm ID. Only by a rotating movement of the tube it was possible to pass the obstruction. During the attempts SpO₂ remained > 92%. After intubation 50 µg of fentanyl was administered intravenously and the patient was ventilated.

During proximal esophagoscopy a vertical obliquely rotated two euro-coin (with a partly sagittal orientation) was found in the upper third part of the esophagus, approximately 2 cm under the level of the cricopharyngeal muscle. Small mucosal lesions proximal to the coin were detected. With some effort the coin could be removed by a forceps. Apparently the foreign body was displaced more distally and had turned into an oblique plane, possibly due to the manipulation with the ETT. During the 15 minutes procedure no ventilation problems occurred. The emergence from anesthesia was uncomplicated. The postoperative period was uneventful.

DISCUSSION

In this case report we described problems encountered during the intubation of an 8-year-old girl having swallowed a 2-euro coin. Although a pre-operatively performed chest radiograph did not show any airway obstruction and the patient did not have an impaired breathing, intubation turned out to be challenging.

Anatomy

Probably, the tracheal lumen was obstructed due to an impression of the dorsal part of the tra-

chea, which is directly bordered by the ventral esophagus. The dorsal tracheal wall is not reinforced by the C-shaped tracheal cartilages and is called the membranous part. On the cranial side the membranous part is adjacent to the cricoid cartilage.

The upper esophageal sphincter is more a physiological than an anatomical entity. This allows for an involuntary, muscular control in order to prevent air from entering the esophagus and reflux from gastric content in the pharynx. The sphincter covers a range of a few centimeters in the vertical direction behind the cricoid cartilage, both slightly extending cranially and caudally. It is also referred to as the lower pharyngeal sphincter because this zone starts in the hypopharynx bordering the entrance of the esophagus (2).

Pathophysiology

The upper esophageal sphincter is the narrowest part of the esophagus and the most common area of lodged foreign bodies, frequently coins (3). The presentation of a foreign body in this area may differ; however, a typical symptom is dysphagia. If the object becomes, due to its shape and size, lodged above the sphincter it can obstruct the larynx and cause choking.

In literature, early and late complications of esophageal foreign bodies have been described such as inspiratory stridor, esophageal perforation and tracheoesophageal fistulas, asthma and chronic respiratory infections (3-15). The vast majority of complications has been reported in children, but respiratory problems may also occur in adults (16).

In this case, initial radiographs revealed a coronal oriented coin, not compromising the airway. However, after having passed the upper esophageal sphincter the coin appeared to be rotated, possibly caused by the first intubation attempt, which caused an impression of the dorsal trachea (Fig. 2).

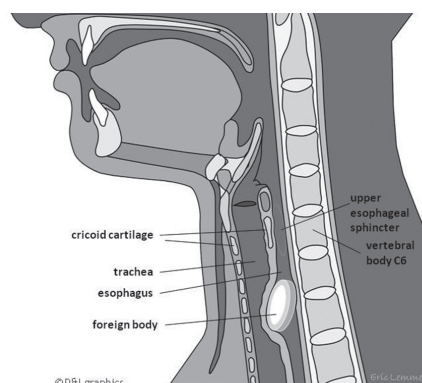


Fig. 2. — The anatomic relationship between foreign body, esophagus and trachea (midline sagittal cross-section).

No biometric data are reported on the diameter of the esophagus in childhood. While not swallowing actively the esophagus is in a collapsed state, but the lumen can extend to allow for the propulsion of a swallowed bolus. Most retained esophageal coins have a diameter between 23.45 and 26.00 mm (17). A two-euro coin has a diameter of 25.75 mm. The diameter of the trachea in an 8-year-old girl approximately amounts to 10,7 mm (18).

Although esophageal coins generally have a coronal orientation, they can be aligned in the sagittal plane. The initial position of the coin may change. Reorientation between the sagittal and coronal plane can occur (19).

Esophageal foreign body and anesthesia.

This is the first report in literature on unexpected difficulties during endotracheal intubation in a patient with an esophageal foreign body and a preoperative, apparently normal airway.

A case has been described of airway obstruction in the intensive care unit during ventilation caused by an esophageal foreign body. Also, it has been reported that during the endoscopic manipulation of an esophageal foreign body a smaller tube was required (20, 21). No reports have been published yet on a total tracheal obstruction after accidental swallowing of a foreign body.

Airway management of patients with ingested esophageal foreign bodies should involve awareness of the possibility of unexpected difficulties. We recommend having a variety of airway equipment readily available. A minor detail can be vitally important, such as the position of the bevel during tracheal intubation and during the esophagoscopy, which can be changed by rotating the tube. Also the use of a stylet can be necessary (22, 23). It is conceivable that the anesthesiologist can change the position of the foreign body during the endotracheal intubation, which may influence the level of the tracheal obstruction. Some authors recommend the use of a video laryngoscope to facilitate the removal of the foreign object if the whole object has not passed through the upper esophageal sphincter (24,25).

In case of a 'cannot ventilate cannot intubate' situation one should be prepared to perform an emergency cricothyrotomy and subsequent tracheostomy.

CONCLUSION

The anesthesiologist must be aware that an esophageal foreign body might cause tracheal narrowing. It is a false assumption that in a patient without respiratory distress a patent and stable airway will persist throughout the procedure. There is a risk of difficult endotracheal intubation which should be anticipated. Smaller endotracheal tubes must be readily available and a rotating movement during intubation might be necessary. Protocols to achieve emergency airway access should be executed if necessary.

References

1. Bao WK, *Study of foreign body- extraction form the upper third of the esophagus in children*, IRAN J. PEDIATR., Apr; **24**(2) : 214-8, 2014.
2. Mittal RK, *Motor Function of the Pharynx, Esophagus, and its Sphincters*. SAN RAFAEL (CA) : MORGAN & CLAYPOOL LIFE SCIENCES, 2011
3. Little DC, Sohail R, Shah *et al.*, *Esophageal bodies in the pediatric population : our first 500 cases*. J PEDIATR SURG., **41** : 914-918, 2006.
4. Riedler J, *Tracheal compression caused by a foreign body in the esophagus*. *Pediatr. Pathol.*, **25**(3) : 169-73, 1990.
5. Kim N, Atkinson N, Manicone P, *Esophageal foreign body: a case of a neonate with stridor*. PEDIATR EMERG. CARE, **24**(12) : 849-51, 2008.
6. Rodriguez H, Passali GC, Gregori D *et al.*, *Management of foreign bodies in the airway and oesophagus*. INT J PEDIATR. OTORHINOLARYNGOL., **6** Suppl. 1 : S84-91, 2012.
7. Poole SR, Mauro RD, Fan LL, Brooks J, *The child with simultaneous stridor and wheezing*. PEDIATR EMERG. CARE, **6**(1) : 33-7, 1990.
8. Liming BJ, Fischer A, Pitchr G, *Bronchial Compression and Tracheoesophageal Fistula Secondary to Prolonged. Esophageal Foreign Body*. ANN OTOL RHINOL LARYNGOL., **125**(12) : 1030-1033, 2016.
9. Taylor RB, *Esophageal foreign bodies*. EMERG MED CLIN NORTH AM., **5**(2) : 301-11, 1987.
10. Hiejema E, Nakase H, Uemoto S, Heike T, *Esophageal foreign body causing sustained stridor in an infant*. CLIN J. GASTROENTEROL., **5** : 146-149, 2012.
11. Singh B, Kantu M, Har-El G, Lucente FE, *Complications associated with 327 foreign bodies of the pharynx, larynx and esophagus*. ANN OTOL RHINOL LARYNGOL., **106** : 301-4, 1997.
12. Cheng W, Tam PK, *Foreign-body ingestion in children : experience with 1,265 cases*. J PEDIATR SURG, **34** : 1472-6, 1999.
13. Hamilton JM, Schraff SA, Notrica DM, *Severe injuries form coin battery ingestions : 2 case reports*. J PEDIATR SURG., **44** : 644-7, 2009.
14. Mohiuddin S, Siddiqui MS, Mayhew JF, *Esophageal foreign body aspiration presenting as asthma in the pediatric patient*. SOUTH MED J., **97** : 93-5, 2004.
15. Haegen TW, Wojtczak HA, Tomita SS, *Chronic inspiratory stridor secondary to a retained penetrating radiolucent . esophageal foreign body*. J PEDIATR SURG., **38** : 1-3, 2003.
16. Handler SD, Beaugard ME, Canalis RF *et al.*, *Unsuspected esophageal foreign bodies in adults with upper airway obstruction*. CHEST., **80**(2) : 234-7, 1981.

17. Tander B, Yazici M *et al.*, *Coin ingestion in children : which size is more risky?* J. LAPAROENDOC ADV SURG TECH A, **19** : 241-3, 2009.
18. Griscom NT, Wohl ME, *Dimensions of the growing trachea related to age and gender.* AJR AM J ROENTGENOL., **146** : 233-7, 1986.
19. Schlessinger AE, Crowe JE, *Sagittal orientation of ingested coins in the esophagus in children.* AJR AM J ROENTGENOL., **196**(3) : 670-2, 2011.
20. Caroll WD, *Beware the tooth fairy.* EMERG MED J, **19**(4) : 360, 2002.
21. Shah MK, Lim YC, *A case of tracheal obstruction during removal of a foreign body.* SINGAPORE MED J., **38**(3) : 120-2, 1997.
22. Vas L, Sanziri S, Patil B, Sanghvi V, *An unusual cause of tracheal stenosis,* CAN J ANAESTH., **47** : 261-4, 2000.
23. Lillie EM, Harding L, Thomas M, *A new twist in the pediatric difficult airway.* PAEDIATR ANAESTH., **25**(4) : 428-30, 2015.
24. Hiller KN, Hagberg CA, *Use of a video laryngoscope to facilitate removal of a long, sharp-pointed blade from the esophagus.* J CLIN ANESTH., **32** : 4-6, 2016.
25. Morris LM, Wax MK, Weber SM, *Removal of hypopharyngeal foreign bodies with the GlideScope video laryngoscope.* OTOLARYNGOL HEAD NECK SURG., **141** : 416-417, 2009.