

CASE REPORT

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Pediatric push pin aspiration: clinical, radiologic, and pathologic correlation — case report

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Abstract

Background: Aspiration of foreign bodies is not uncommon in the pediatric setting, and the consideration and recognition of an aspiration event are vital to prompt management. Pointed and sharp-edged foreign bodies have the potential to lodge in the airway and increase the difficulty of identification and removal. Here, we describe a fatal aspiration of a push pin that was unrecognized prior to death.

Methods: Review of police and medical records was completed prior to postmortem CT imaging and full pediatric autopsy with high resolution photography.

Case presentation: A 15-month-old boy was playing at home when he acutely vomited and then became unresponsive. Paramedic and hospital physicians performed pediatric CPR protocols, including intubation, without success. Postmortem radiographic imaging revealed a metallic foreign body at the level of the larynx. Autopsy demonstrated a push pin fully occluding the trachea at the level of the vocal cords.

Conclusions: The diagnosis of aspirated FBs may be elusive, and clinicians and autopsy pathologists ought to be mindful that children with FBs may have atypical presentations. Use of postmortem radiologic imaging can assist in the diagnosis and allow for a targeted autopsy approach to best visualize the offending foreign body.

Keywords: Pediatric, Push pin, Aspiration, Choking, Postmortem imaging, Autopsy

Background

Aspiration of foreign bodies (FB) in young children and infants is a persistent risk for injury and death as this age group may put small objects in their nose or mouth while exploring their environment and may not differentiate food and non-food objects (Oboodi et al. 2019). The most common FB aspirated (or ingested) in young children and infants are organic items (e.g., nuts and bones) and coins, respectively (Oboodi et al. 2019; Boufersaoui et al. 2013). Aspiration with choking is an acute medical emergency. Pediatric aspiration of push pins appears to

be a rare event given the paucity of published literature (Scerbo et al. 2019; Azurara and Lemos 2016). Here, we describe the clinical, radiological, and pathological findings of a fatal event involving a young boy choking on a push pin.

Case presentation

A healthy 15-month-old boy was playing independently at home when he spontaneously vomited and then became unresponsive. He did not appear to be choking or cyanotic. Paramedics and hospital physicians performed pediatric resuscitation protocols; however, the child remained in asystolic arrest throughout. As the cause of the sudden death was unknown, the coroner requested an autopsy.

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The child's past medical history included common pediatric illnesses of viral gastroenteritis and upper respiratory tract infections. The normally developed child was the product of an uncomplicated pregnancy with up-to-date vaccinations. A postmortem skeletal survey and computed tomography (CT) imaging were obtained prior to autopsy and reviewed by a forensic pathologist and pediatric radiologist. The endotracheal tube (ETT) was removed prior to radiologic imaging as per in-house protocol. On the plain-film x-ray, the only pertinent finding was a pointed, linear, radiodense object within the larynx measuring 16 mm × 1 mm (Fig. 1A). The postmortem CT (sagittal skull and c-spine reformat) showed a 23 mm foreign body occluding the trachea at the level of the glottis, with a profile resembling a push pin (Fig. 1B). A standard pediatric autopsy was completed according to local protocols. The external examination showed a young boy without injuries. There was normal development and evidence of acute medical resuscitation.

Dissection of the upper airway in the posterior sagittal plane revealed a household push pin made of clear plastic (23 mm long, with maximal plastic handle diameter being 10 mm) within the glottic orifice (diameter of 8.5 mm) at the level of the vocal cords (Fig. 1 C and D). The push pin fully occluded the airway lumen at this site. The provided cause of death was choking due to a push pin.

Conclusions

The aspiration of FBs in children is not uncommon; however, delayed diagnosis may lead to medical complications, including death, when aspiration (or ingestion) is unwitnessed (Azurara and Lemos 2016). Indeed, clinical signs of respiratory distress after FB aspiration may be absent in 13–29% of cases (Oboodi et al. 2019; Boufersaoui et al. 2013). In this case, the aspiration was unwitnessed, and the child was not thought to be choking.

The removal of aspirated FBs must be completed with caution, as upsetting the child may make the

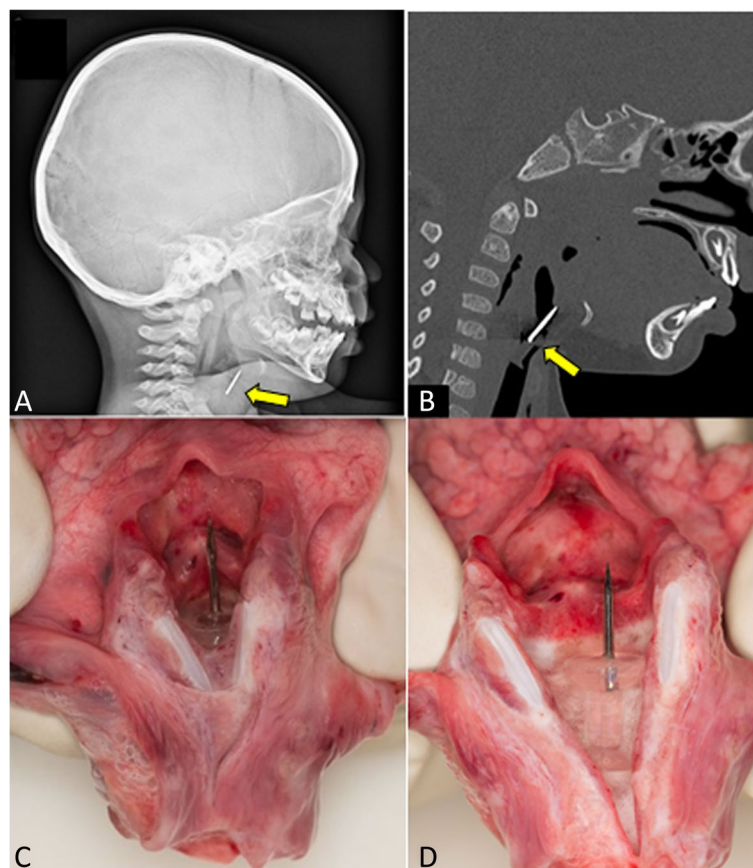


Fig. 1 Postmortem diagnosis of push pin aspiration in a child. **A** Postmortem lateral head x-ray demonstrating a hyperdense, linear, pointed foreign body in the region of the larynx (identified with yellow arrow). **B** Postmortem CT (sagittal skull and c-spine reformat) demonstrating the same foreign body in larynx (identified with yellow arrow). **C** and **D** Sequential autopsy dissection photographs of the larynx, demonstrating the aspirated push pin made of clear plastic occluding the airway at the level of the vocal cords

situation worse. If the site of lodgment within the oropharynx is accessible, removal with long forceps may be considered. Alternatively, urgent operating room transfer for rigid bronchoscopy is considered the standard of care for removal of less-accessible items, particularly for sharp objects, as the physician can better visualize and remove the FB as well as provide better ventilation for patients (Azurara and Lemos 2016; Ludemann and Riding 2007).

It has been noted that sharp or pointed FBs may directly injure the pharynx and/or esophagus and promote impaction within the anatomically narrow lumen (Ludemann and Riding 2007). Also, most pointed metallic FBs are impacted such that the tip is pointed superiorly (as seen in our case) (Ludemann and Riding 2007). Furthermore, it is noted that the tip of the pin appears to have injured the underside of the epiglottic base, as evidenced by focal punctate congestion/hemorrhage at this site (see Fig. 1 C–D). It is uncertain whether this trauma occurred while the child was still alive or during intubation attempts. Given this, it is noted that the possibility of vagal inhibition (with resultant cardiac arrest) may have arisen due to reflex respiratory obstruction, as described in prior studies on this topic (Bamber et al. 2014; Byard 1996). It is also noted that during autopsy, the risk for sharps injury may exist, and this case provides an example of the importance of visualizing structures during autopsy prior to reaching hands or digits into occluded cavities and luminal spaces.

In our case, the aspirated push pin was not detected during the acute resuscitative efforts. This may have been due to multiple reasons:

- 1) The provided history by the family member suggested the child was not choking, only vomiting.
- 2) The push pin may have been difficult to visualize by paramedics due to the presence of foam in the upper airway and the plastic portion of the push pin being clear.
- 3) We must infer esophageal placement of the ETT as the push pin fully occluded the trachea.

As a result, it may have been assumed that an occlusive FB was unlikely with an appropriately positioned ETT in place. Given this consideration, we have changed our in-house protocols to leave the ETT in situ prior to medical imaging so ETT placement can be confirmed prior to commencement of autopsy dissection.

In conclusion, the diagnosis of aspirated FBs may be elusive in the absence of someone witnessing the choking event. First responders and clinicians ought to be

mindful that children with aspirated FBs may have atypical presentations. Finally, we demonstrated the value of postmortem imaging as a tool to assist in diagnosis and promote safety (i.e., avoiding sharps injury) during the autopsy.

Abbreviations

CPR: Cardiopulmonary resuscitation; CT: Computed tomography; ETT: Endotracheal tube; FB: Foreign body.

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Authors' contributions

TH completed the autopsy, case report concept, and case report writing, review, editing, and creation of figure. RM participated in writing the case report original draft. MP supervised the autopsy, reviewed radiographic imaging, and participated in case report review and editing. The authors read and approved the final manuscript.

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Availability of data and materials

All data relevant to this case report is shared in the publication.

Declarations

Ethics approval and consent to participate

Institutional ethical approval and consent were not required in view of the retrospective and anonymized nature of this postmortem case study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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