Safe and effective management of esophageal coins in children with bougienage

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Background. *Coins are the foreign body most commonly ingested in infants and children. Coins retained in the esophagus require intervention to prevent complications. Management of retained esophageal coins remains variable both between and within institutions. We hypothesize that the incorporation of bougienage in the management of pediatric esophageal coins is safe and more cost-effective compared with traditional management strategies that use endoscopy.*

Methods. *We conducted a retrospective review of infants and children diagnosed with an esophageal foreign body managed at Children's Hospital of Wisconsin between January 2003 and June 2012. Pediatric otolaryngologists (ear-nose-throat, ie, ENTs) or pediatric surgeons manage all children with esophageal foreign bodies in a prospective call schedule that alternates weekly.*

Results. *During an 8.5-year period, 1,642 children were diagnosed with esophageal foreign bodies and 518 had a retained coin. For esophageal coins, ENT managed 218 cases and pediatric surgery managed 300. ENTs preferentially used endoscopy for coin removal, whereas pediatric surgeons used either endoscopy or esophageal bougienage for selected children meeting specific criteria. Bougienage was successful at advancing the coin into the stomach in 94% of patients, and endoscopy was successful at removing the coin from the esophagus in 100% of patients. The mean duration of stay was 0.6 days for endoscopy by ENT, 0.6 days for endoscopy by pediatric surgery, and 0.1 days for bougienage (*$P < .05$*). The median hospital charge was $4,593 for endoscopy by ENT, $5,379 for endoscopy by pediatric surgery, and $579 for bougienage (*$P < .05$*). There were 3 complications each in the endoscopy group for ENT and pediatric surgery. There were no complications in children undergoing bougienage.*

Conclusion. *This is the first case series evaluating the management of children with esophageal coins using a prospective assignment to endoscopy versus endoscopy or bougienage. Our data support bougienage as a safe and cost-effective treatment for managing retained esophageal coins in selected children. (Surgery 2015;158:1065-72.)*

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Coins retained in the esophagus account for 50–60% of all ingested solid objects in infants and children.[1] In adolescents and adults, the majority of ingested coins pass through the esophagus without incident; however, given the smaller esophageal diameter in infants and children, coin retention in the esophagus is observed more commonly. Once lodged in the esophagus, acute signs and symptoms may include drooling, dysphagia, and discomfort; prolonged esophageal retention can result in aspiration, infection, or mucosal ulceration. If left untreated, esophageal coins can cause esophageal stricture and/or transmural perforation, leading to mediastinitis, aortoenteric fistula, or even the formation of a tracheoesophageal fistula.[2] Because of the increased risk of significant complications, prompt diagnosis and management of esophageal coins is essential.

The management strategy for esophageal coins is highly variable both between and within institutions. The simplest method of managing esophageal coins is observation, with anticipated passage of the coin into the stomach. The progress of the esophageal coin can be monitored by chest radiograph. Some investigators have discussed giving the child water or bread to aid passage of the

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coin into the stomach[3]; because of patient discomfort and potential complications, including aspiration, observation is usually limited to 12–16 hours.[3,4] Another method of managing the esophageal coin is removal using a Foley-type balloon catheter passed into the esophagus under fluoroscopy.[5] The balloon of the catheter is passed distal to the coin and inflated with contrast. The coin is brought into the oropharynx under fluoroscopic guidance. One of the most invasive and commonly used methods for the removal of an esophageal coin is rigid esophagoscopy. This method typically requires admission to the hospital, general anesthesia, and intervention by a surgeon. Rigid esophagoscopy affords the opportunity to inspect the esophagus visually for full-thickness mucosal injury or fistula formation.

Esophagoscopy remains the procedure of choice in any infant or child with an esophageal coin and known esophageal abnormalities, previous esophageal surgery, respiratory distress, multiple coins, or an unknown duration from ingestion. Finally, some investigators advocate the management of esophageal coins by esophageal bougienage. Several case series have supported esophageal bougienage as a safe and effective means for advancement of a coin into the stomach in selected children.[2,5-8] This method uses a blunt-tipped, weighted esophageal dilator that is passed through the mouth and into the esophagus. Bougienage has several advantages, including the ease of use and the ability to perform the procedure without general anesthesia and to monitor results with a chest radiograph. In addition, selected use of bougienage may be safely performed by both surgical and emergency department providers with limited training requirements.[6]

The goal of this study is to compare 2 distinct management strategies used at a freestanding children's hospital for management of children presenting with esophageal coins. We hypothesized that incorporation of bougienage in the management of intraesophageal coins in children is safe and more cost-effective compared with traditional management strategies that require the use of endoscopy. This study is a retrospective comparison of these 2 alternative management strategies via a prospective, aerodigestive tract, foreign body call schedule.

MATERIALS AND METHODS

Study design. We conducted a retrospective review approved by the Institutional Review Board of all children ≤18 years of age who presented or were transferred to Children's Hospital of Wisconsin with an intraesophageal coin from January 1, 2003, to June 30, 2012. The Children's Hospital of Wisconsin is the largest pediatric health care provider in the state, with approximately 24,000 inpatient admissions per year and an emergency department (ED) that evaluates and manages more than 66,000 infants, children, and adolescents annually.[9]

Table I. Criteria required to qualify for bougienage of an esophageal coin

Criteria for bougienage
Single coin
Present within 24 h of ingestion
No esophageal abnormalities or surgeries
Coin located below the clavicles and above the diaphragm
No respiratory distress
No prior foreign body ingestions

Study population. Charts were reviewed based on a discharge diagnosis of an esophageal foreign body (*International Classification of Diseases*, 9th Revision, codes 935.1 and 935.2) or airway foreign body (*International Classification of Diseases*, 9th Revision codes 938, 933.0, 933.1, 934.0, 934.1, 934.8, 934.9). Children with foreign bodies other than coins were excluded from the study. During the course of the study period, three different charting systems were used, including paper charts and 2 electronic medical record systems.

Methods. Children presenting with a foreign body in the aerodigestive tract are managed by the pediatric otolaryngology (ENT) or pediatric surgery service on alternating weeks based on a prospective call schedule. Two management strategies are used for children with esophageal coins at our institution. All children managed by pediatric ENT undergo rigid endoscopy under general anesthesia. Conversely, pediatric surgeons selectively manage children meeting specific inclusion criteria with esophageal bougienage in the ED without anesthesia or sedation. Selection criteria for bougienage are listed in Table I. If bougienage is unsuccessful or contraindicated, rigid esophagoscopy under general anesthesia is performed by the pediatric surgeons for coin removal. The time since last oral intake is not considered a prerequisite for bougienage, because the risk of emesis and aspiration with passage of the bougie is low. In addition, age younger than 1 year is not exclusionary for bougienage; however, children younger than 1 year of age typically do not present with a clear timeline of ingestion, and the coins generally are cephalad to the clavicular heads on chest radiograph.