

Retrospective analysis of endoscopic management of foreign bodies in the upper gastrointestinal tract of adults

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Abstract

Background: Foreign body impaction in the upper gastrointestinal (UGI) tract is considered an emergency worldwide. This article reports our experience in the endoscopic management of foreign bodies in the UGI tract of adults.

Methods: A retrospective chart review was conducted on adult patients (aged >18 years) who received endoscopic management of foreign bodies in the UGI tract at Shuang Ho Hospital between November 2008 and November 2016.

Results: A total of 280 patients (male/female: 107/178; mean age: 56 years) were included. Fish bones were the most common ingested foreign bodies ($n = 162$; 56.8%), and the esophagus was the most common lodgment site ($n = 222$; 77.9%). The presence of symptoms indicated that the ingested foreign bodies were lodged in the hypopharynx or esophagus rather than in the stomach or duodenum ($p < 0.01$). The detection rate of ingested foreign bodies in the UGI tract through plain radiography was 53% (122/230). The average “door-to-scope” was 5.9 hours, and 99.2% of the patients received endoscopic management of the ingested foreign bodies within 24 hours. The complication rate was relatively low ($n = 14$; 4.9%). No patient received surgical intervention or died of endoscopic management.

Conclusion: Endoscopic management is a safe and highly effective procedure for extracting ingested foreign bodies. Rapid endoscopic intervention should be provided to reduce the risk of complications.

Keywords: Esophagus; Foreign bodies; Gastrointestinal tract; Hypopharynx

1. INTRODUCTION

Ingestion of foreign bodies is a relatively common clinical problem in emergency departments worldwide. Most ingested foreign bodies (80%-90%) pass spontaneously. However, approximately 10% to 20% of foreign bodies require an endoscopic procedure for removal and <1% require surgery.¹ Approximately 1500 deaths occur in the United States annually because of ingestion of foreign bodies.² Foreign body ingestion is associated with a high risk of complications because of the size or shape of the foreign body or the host's comorbidity.³ Foreign body ingestion occurs most commonly in children (80%), with a peak incidence from 6 months to 3 years of age.⁴⁻⁶ The remaining patients (20%) are adults. By contrast, adult patients with mental or psychiatric disorders, alcoholism, and drug abuse may ingest foreign bodies with nonfood objects.⁷ Foreign body ingestion and food bolus

impaction are extremely common in Taiwan. Because only a few cases of foreign body ingestion have been reported in Taiwan,⁸ the aim of this study was to report our experiences in the endoscopic management of foreign bodies in the upper gastrointestinal (UGI) tract.

2. METHODS

2.1. Patients

A retrospective chart review was conducted on adult patients (aged >18 years) who received endoscopic management of foreign bodies in the UGI tract at Shuang Ho Hospital between November 2008 and November 2016. In total, 280 patients (285 incidents) who met the inclusion criteria were enrolled in the study.

2.2. Endoscopic procedures and settings

In this study, most of the patients were initially screened by an otolaryngologist and examined through either plain radiography or computed tomography (CT). Subsequently, we used a flexible endoscope (GIF-H260; Olympus Optical Co., Ltd., Tokyo, Japan) for examination. Various endoscopic devices, including biopsy forceps, graspers, retrieval baskets, Roth nets, polypectomy snares, and overtubes, were used to remove the ingested foreign bodies, depending on their nature and location. All the patients received endoscopic management of foreign bodies under local pharyngeal anesthesia.

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2.3. Data collection

In this study, clinical variables, such as age, sex, type and location of foreign bodies, symptoms, underlying gastrointestinal diseases, endoscopic methods and devices used, and complications, were analyzed. The “door-to-scope” was defined as the time interval between the patients presenting at our hospital and the endoscopy procedure being performed on the patients. Complication was defined as any adverse event, such as perforation or bleeding, which was related to foreign body injury or endoscopic procedure during manipulation of foreign body.

2.4. Statistical analysis

Categorical variables were compared using Pearson's χ^2 test. A two-tailed *p* value of 0.05 indicated a significant difference.

3. RESULTS

3.1. Patient characteristics and clinical presentations

The mean (\pm SD) age of the 280 adult patients (285 incidents) who received endoscopic management of foreign bodies was 56 (\pm 16) years. Female patients predominated in our study (*n* = 178; 62.5%), and 83.9% patients (*n* = 239) were symptomatic. The common clinical symptoms after mis-swallowing were foreign body sensation, dysphagia, and odynophagia.

Because 16.1% (*n* = 46) patients did not complain of any symptoms after foreign body ingestion, they were classified as asymptomatic patients. Among these patients, 44.7% (17/38) foreign bodies lodged in the stomach or duodenum were asymptomatic compared with the foreign bodies lodged in the hypopharynx or esophagus (11.7%; 29/247).

Table 1

Location of foreign bodies

Location	Total (%)
Hypopharynx	25 (8.8)
Esophagus	222 (77.9)
U/3 (<25 cm from the incisors)	170 (59.6)
M/3 (\geq 25 cm or <35 cm from the incisors)	35 (12.3)
L/3 (\geq 35 cm from the incisors)	17 (6.0)
Stomach	35 (12.3)
Duodenum	3 (1.1)
Total	285 (100)

Table 2

Type of foreign body

Type of foreign body	Total (%)
Sharp-pointed objects	230 (80.7)
Fish bones	162 (56.8)
Chicken bones	21 (7.4)
Duck bones	2 (0.7)
Dentures	25 (8.8)
Medication foil	19 (6.7)
Toothpicks	1 (0.4)
Food bolus	31 (10.9)
Others	24 (8.4)
Total	285 (100)

Table 3

Foreign body detection rate through plain radiography

Location of foreign body	Positive plain radiography (%)	Negative plain radiography (%)	Total
Pharynx and esophagus	105 (50.7)	102 (49.3)	207
Stomach and duodenum	17 (73.9)	6 (26.1)	23
Total	122 (53)	108 (47)	230

3.2. Types and locations of foreign bodies

The most common site of foreign body lodgment was the esophagus (*n* = 222; 77.9%), with the upper esophagus (*n* = 170; 59.6%) being the predominant site. Other lodgment sites were the stomach (*n* = 35; 12.3%), pharynx (*n* = 25; 8.8%), and duodenum (*n* = 3; 1.1%; Table 1). The major types of foreign bodies were fish bones (*n* = 162; 56.8%), followed by food boluses (*n* = 31; 10.9%) and dentures (*n* = 25; 8.8%). Other types of foreign bodies included chicken bones, duck bones, medication foil, tongue rings, nasogastric tube fragments, coins, batteries, toothpicks, metal balls, eggshells, and plastic fragments (Table 2). Of the 31 patients with food bolus impaction in the esophagus, stomach, or duodenum, 20 patients (64.5%) presented with complications of an underlying esophageal pathology, mainly esophageal stenosis secondary to previous esophageal carcinoma following surgery or stenting (*n* = 7) and corrosive injury (*n* = 5). The remaining patients had underlying disorders such as achalasia, esophageal web, diverticulum, and peptic stricture.

3.3. Detection rates of plain radiography and CT

Before undergoing esophagogastroduodenoscopy (EGD), 230 (80.7%) and 11 (3.9%) patients received plain radiography and CT scan, respectively. The detection rate of foreign bodies in the UGI tract through plain radiography was 53% (122/230). Through plain radiography, the detection rate of foreign bodies lodged in the stomach and duodenum was higher than that of foreign bodies lodged in the pharynx and esophagus (73.9% vs 50.7%; *p* < 0.05; Table 3). The CT detection rate of foreign bodies, included food bolus, was 100% (11/11).

3.4. Timing of endoscopic management

With the exception of 34 patients (for which the time interval could not be traced), the mean “door-to-scope” was 5.9 (\pm 5.2) hours in our study. Most patients (*n* = 249, 99.2%) underwent urgent (within 24 hours) EGD following foreign body ingestion. Among the patients, 66.5% (167/251) received emergency (within 6 hours) EGD examination. For sharp-pointed objects in the esophagus, 62.2% of the patients (130/209) in our study received endoscopic management within 6 hours in emergency settings.

3.5. Endoscopic management methods and devices

Selection of methods for endoscopic management depends on the type and the location of the foreign body ingested. In the study, for the retrieval of sharp-pointed foreign bodies (fish bones and medication foil), biopsy forceps and graspers were most commonly used with the overtube method (Figure 1). We used polypectomy snares, Dormia baskets, or Roth nets with the overtube method for most cases of denture retrieval (Figure). For food bolus impaction, the push technique (pushing the food bolus into the stomach) was used, followed by retrieval by using Dormia baskets or Roth nets or through piecemeal extraction, if the food bolus was too large to pass through the duodenum.

3.6. Complications

The complication rate of the endoscopic management of foreign bodies was 4.9% (14/285). Among the patients with complications, nine had minor lacerations with or without bleeding and were discharged from the emergency department

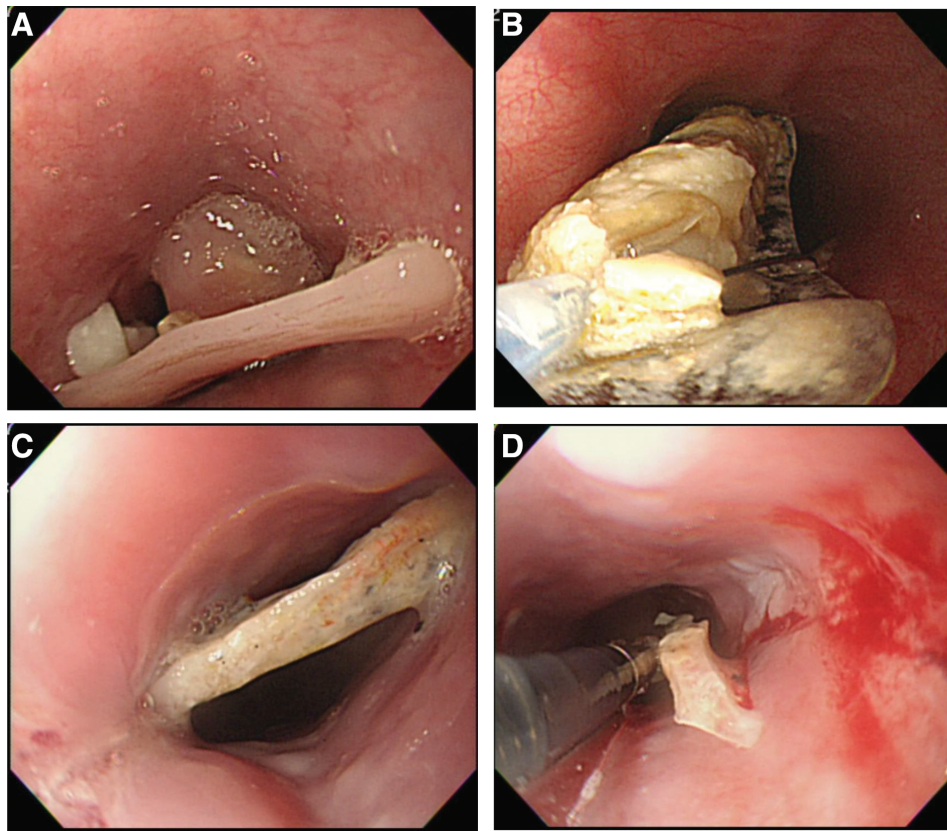


Fig. 1 A and B, A denture lodged at upper esophagus and was removed with the snare. C and D, A fish bone impacted at middle esophagus and was removed by grasper. Mild complication with laceration wound was noted.

Table 4

Admission cases and management

No.	Type of foreign body	Complications and management	Hospitalization, days
1	Chicken bone	Esophageal microperforation with mediastinal abscess Conservative therapy	CS admission, 3 days
2	Fish bone	Esophageal microperforation with regional pneumomediastinum Conservative therapy	CS admission, 4 days
3	Fish bone	Esophageal microperforation with mediastinitis and abscess Conservative therapy	CS admission, 38 days
4	Fish bone	Esophageal microperforation Conservative therapy	CS admission, 8 days
5	Fish bone	Microabscess over retropharyngeal space Conservative therapy	ENT admission, 3 days

Conservative therapy: Intravenous antibiotics with parenteral alimentation.

CS = chest surgery; ENT = ear nose throat (otorhinolaryngology).

with oral antibiotics and sucralfate. Only five patients (1.8%) were admitted to the chest surgery ward and treated with intravenous antibiotics and parenteral alimentation because of esophageal microperforation with pneumomediastinum, mediastinitis, or abscess formation (Table 4). Among them, four patients received short-term intravenous antibiotics (amoxicillin/clavulanic acid or cefmetazole) treatment and were discharged within 10 days after trying diet smoothly. Only one patient had been hospitalized for more than 30 days due to underlying comorbidity. None of them received further surgical intervention.

4. DISCUSSION

Foreign body ingestion is a common global problem. In the current study, fish bones (56.8%) were the most commonly

ingested foreign bodies. This observation differed from reports from Western countries.⁹ Our observation on fish bone ingestion may be because of the high consumption of seafood in Taiwan, which is an island. Food bolus impaction (10.9%) was the second most common condition and was often combined with an underlying structural abnormality (64.5%) such as esophageal web, esophageal rings, or a benign or malignant esophageal stricture.

According to our observation, most foreign bodies were lodged in the esophagus (77.9%), predominantly in the upper third. This finding is consistent with previous studies.^{10,11} The esophagus has four physiologically narrow sites, namely, the upper esophageal sphincter, level of the aortic arch, main stem bronchus, and lower esophageal sphincter.¹² In our study, most foreign bodies were inadvertently lodged in the physiologically narrow sites of the esophagus without any underlying pathology.

The clinical presentation of foreign body ingestion is associated with the type of foreign body, lodgment location, and duration after ingestion. Because of easy access to hospitals in Taipei, most of the patients presented at the emergency department with foreign body sensation. In our study, the presence of symptoms may show that the foreign bodies were lodged in the hypopharynx or esophagus instead of the stomach or duodenum ($p < 0.01$; Table 5).

The endoscopic strategy of foreign body ingestion management varies with the ingestion time, foreign body type, and onset of symptoms. Hypersalivation and the inability to swallow liquids indicate complete esophageal obstruction. Once foreign bodies have traversed the esophagus, most objects pass within 4 to 6 days. Objects which are >2 to 2.5 cm in diameter cannot pass through the pylorus or ileocecal valve, and objects longer than 5 to 6 cm cannot pass through the duodenal sweep.¹³

Most of the patients were examined by otolaryngologists, followed by plain radiography or CT examination before undergoing EGD. The detection rate of foreign bodies through plain radiography was 53% (122/230), which was consistent with a previous report.¹⁴ Plain radiography assisted in detecting the presence of as well as assessing the location, size, configuration, and number of ingested foreign bodies. CT is a considerably more sensitive method for the detection of foreign bodies than plain radiography. All patients with a risk of perforation or other complications that may require surgery should undergo CT examination.¹³ In our series, 11 patients (3.9%) received a CT scan, and in all the patients (11/11; 100%), the ingested foreign bodies were detected. Three of them had food bolus impaction that were due to underlying esophageal disease.

According to the clinical guidelines of the European Society of Gastrointestinal Endoscopy (ESGE), esophageal foreign objects and food boluses affected in the esophagus should be removed within 24 hours to reduce the risk of major complications,¹³ such as perforation with or without mediastinitis, retropharyngeal abscess, and aortoesophageal fistula. Therefore, the timing of the endoscopic management after foreign body ingestion is a crucial factor influencing the outcome. In our study, the mean “door-to-scope” was 5.9 (± 5.2) hours. All except two patients (99.2%) received foreign body removal within 24 hours in urgent settings. For sharp-pointed objects, batteries, and other foreign bodies causing complete obstruction of the esophagus, retrieval is recommended within 6 hours under emergency conditions.¹³ In our study, rapid endoscopic management within 6 hours might reduce the risk of complications compared with over 6 hours for the sharp-pointed objects lodged in the esophagus (6.92% vs 7.60%; $p = 0.93$; Table 6), but no statistical significance due to small case numbers.

Various endoscopic methods and equipment were used, depending on the type and location of the ingested foreign

bodies. For food bolus impaction in the esophagus, the priority endoscopic method is the “push technique.” This method was used on 12 patients (41.4%). Pressure was gently applied to the food bolus using the tip of the endoscope after air insufflation. However, if gentle pressure did not dislodge the bolus, then fragmentation with a snare or pulling en bloc by using a retrieval basket or Roth net was attempted. Approximately 75% to 100% of patients with food impactions are reported to have esophageal pathology during treatment or follow-up endoscopy.^{15,16} Esophageal stricture resulting from postoperative esophageal carcinoma or stenting and corrosive injury were the most common causes in our study (20/31; 64.5%). For linear, sharp-pointed foreign bodies, such as fish bones, biopsy forceps, or graspers, were used to hold the tip and retrieve the fish bone by using an overtube to protect the airway. For blunt or irregular sharp-pointed foreign bodies, such as dentures or medication foils, we used biopsy forceps, graspers, polypectomy snares, or baskets to retrieve these objects by using the overtube method.

The mortality associated with foreign body ingestion is not accurately known.¹ Crucial factors, including the presence of a sharp foreign body and impaction duration, might predispose patients to complications.¹⁷ The mean “door-to-scope” of patients who had complications was longer than the patients who had no complications in our study (7.36 ± 5.82 hours vs 5.78 ± 5.18 hours). Early endoscopic interventions within 24 hours after ingestion are associated with favorable outcomes.¹⁸ If the foreign body remains affected for >24 hours, the risk of a major complication increases 14-fold.¹⁹ The complication rate was notably low in our study (4.9%) compared with that in another study (7%).⁹ For patients with major complications, such as large laceration wound with active bleeding or macroperforation, initial endoscopic hemostasis and wound closure by hemoclips were suggested. Surgical intervention was reserved for the patients who failed of conservative therapy. In our series, five admission patients with microperforation and mediastinitis were treated via conservative therapy successfully under empiric antibiotics and parenteral alimentation. None of them had further adverse events after discharge.

All our patients received endoscopic management of foreign bodies without deep sedation because of emergency settings and the prevention of aspiration during the procedure. After successful and uncomplicated endoscopic removal of ingested foreign bodies, ESGE clinical guidelines suggest that the patient may be discharged. Oral antibiotics or sucralfate may be prescribed for minor esophageal laceration incurred during the procedure.

Our study had some limitations. First, we used “door-to-scope” instead of the time interval between foreign body ingestion and endoscopic management due to unavailable data of foreign body ingestion time. We assumed and emphasized that early “door-to-scope” may influence the outcome and reduce the risk of complications (as “door-to-balloon” in ST-elevation myocardial infarction and “door-to-needle” in acute ischemic stroke). Second, due to small case numbers and relatively low complication rate, the risk factors for foreign body removal-related complications in the UGI tract need further prospective studies with larger numbers of patients to be confirmed.

In conclusion, the ingestion of foreign bodies is a common clinical problem worldwide. Various instruments can be used to remove the ingested foreign bodies. Endoscopic management is a highly effective procedure for extracting ingested foreign bodies with relatively low complication and mortality rates. Rapid endoscopic intervention should be provided to patients who have ingested foreign bodies to reduce the risk of complications.

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Table 5

Comparisons between symptomatic and asymptomatic patients

Location of foreign body	Symptomatic, n	Asymptomatic, n	<i>p</i>
Pharynx and esophagus	218	29	<0.01
Stomach and duodenum	21	17	

Table 6

Comparisons the complications between endoscopic management within 6 hours and over 6 hours for the sharp-point foreign body in the esophagus

	Within 6 hours	Over 6 hours	<i>p</i>
Complications	9	6	0.93
No complications	121	73	...

REFERENCES

1. ASGE Standards of Practice Committee, Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, et al. Management of ingested foreign bodies and food impactions. *Gastrointest Endosc* 2011;73:1085–91.
2. Webb WA. Management of foreign bodies of the upper gastrointestinal tract. *Gastroenterology* 1988;94:204–16.
3. Eisen GM, Baron TH, Dominitz JA, Faigel DO, Goldstein JL, Johanson JF, et al. Guideline for the management of ingested foreign bodies. *Gastrointest Endosc* 2002;55:802–6.
4. Sugawa C, Ono H, Taleb M, Lucas CE. Endoscopic management of foreign bodies in the upper gastrointestinal tract: a review. *World J Gastrointest Endosc* 2014;6:475–81.
5. Romine M, Ham PB 3rd, Yon JR, Pipkin WL, Howell CG, Hatley RM. Multiple magnet ingestion in children. *Am Surg* 2014;80:e189–91.
6. Strickland M, Rosenfield D, Fecteau A. Magnetic foreign body injuries: a large pediatric hospital experience. *J Pediatr* 2014;165:332–5.
7. Blaho KE, Merigian KS, Winbery SL, Park LJ, Cockrell M. Foreign body ingestions in the Emergency Department: case reports and review of treatment. *J Emerg Med* 1998;16:21–6.
8. Yao CC, Wu IT, Lu LS, Lin SC, Liang CM, Kuo YH, et al. Endoscopic management of foreign bodies in the upper gastrointestinal tract of adults. *Biomed Res Int* 2015;2015:658602.
9. Geraci G, Sciume C, Di Carlo G, Picciurro A, Modica G. Retrospective analysis of management of ingested foreign bodies and food impactions in emergency endoscopic setting in adults. *BMC Emerg Med* 2016;16:42.
10. Li ZS, Sun ZX, Zou DW, Xu GM, Wu RP, Liao Z. Endoscopic management of foreign bodies in the upper-GI tract: experience with 1088 cases in China. *Gastrointest Endosc* 2006;64:485–92.
11. Zhang S, Cui Y, Gong X, Gu F, Chen M, Zhong B. Endoscopic management of foreign bodies in the upper gastrointestinal tract in South China: a retrospective study of 561 cases. *Dig Dis Sci* 2010;55:1305–12.
12. Smith MT, Wong RK. Foreign bodies. *Gastrointest Endosc Clin N Am* 2007;17:361–82, vii.
13. Birk M, Bauerfeind P, Deprez PH, Hafner M, Hartmann D, Hassan C, et al. Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy* 2016;48:489–96.
14. Pfau PR. Removal and management of esophageal foreign bodies. *Tech Gastrointest Endosc* 2014;16:32–9.
15. Longstreth GF, Longstreth KJ, Yao JF. Esophageal food impaction: epidemiology and therapy. A retrospective, observational study. *Gastrointest Endosc* 2001;53:193–8.
16. Lacy PD, Donnelly MJ, McGrath JP, Byrne PJ, Hennessy TP, Timon CV. Acute food bolus impaction: aetiology and management. *J Laryngol Otol* 1997;111:1158–61.
17. Hong KH, Kim YJ, Kim JH, Chun SW, Kim HM, Cho JH. Risk factors for complications associated with upper gastrointestinal foreign bodies. *World J Gastroenterol* 2015;21:8125–31.
18. Lin HH, Lee SC, Chu HC, Chang WK, Chao YC, Hsieh TY. Emergency endoscopic management of dietary foreign bodies in the esophagus. *Am J Emerg Med* 2007;25:662–5.
19. Wu WT, Chiu CT, Kuo CJ, Lin CJ, Chu YY, Tsou YK, et al. Endoscopic management of suspected esophageal foreign body in adults. *Dis Esophagus* 2011;24:131–7.