Gastrointestinal Tract

ORIGINAL ARTICLE

Radiographic and endoscopic management of unintentional versus intentional foreign body ingestion

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ABSTRACT

Background and Objectives: Foreign body (FB) ingestion is a condition managed with esophagogastroduodenoscopy (EGD). This study compared the differences in demographics, utilization of imaging, endoscopic findings, and clinical outcomes between patients with unintentional versus intentional FB ingestion. **Methods**: Adult patients with FB ingestion, including food impactions, were included at a large tertiary academic medical system between 2010 and 2021 in this retrospective case series. Patients with unintentional ingestion of FBs (Group A) were compared to patients with intentional ingestion of FBs (Group B). **Results**: A total of 479 patients were included: 397 patients in Group A (83%) and 82 patients in Group B (17%). In Group A, 221 patients (56%) underwent imaging compared to 79 patients (96%) in Group B ($P < 0.001$). A FB was visible on imaging in 73 patients in Group A (34%) and 70 in Group B (89%) ($P < 0.001$). Group A patients more frequently underwent EGD after routine business hours (6 PM–7 AM) (40% *vs*. 27%, $P = 0.03$), and less frequently had ingested FBs identified on EGD (74% *vs*. 85%, $P = 0.04$). Excluding food impactions from Group A, imaging was utilized less frequently in Group A (80%) compared to Group B patients (96%) for evaluation of true FB ingestion ($P = 0.016$). Additionally, true FBs were visible on imaging less frequently in Group A (59%) than in Group B (87%) ($P = 0.002$). **Conclusion**: Unintentional FB ingestion patients were less likely to undergo imaging or to have FBs identified on imaging or EGD; They were more likely to undergo EGDs after routine business hours. Further investigation of the role of imaging in unintentional FB ingestion is needed to decrease unneeded emergent endoscopy for patients with FBs that are no longer easily reachable by EGD.

Key words: foreign body, ingestion, esophagogastroduodenoscopy, imaging

BACKGROUND

Foreign body (FB) ingestion, including food bolus impaction, is a frequently encountered clinical presentation in the US that generally garners an expansive clinical investigation, involving imaging and procedures.[1] FB ingestion presentations can be categorized into unintentional and intentional ingestion. Intentional FB ingestion occurs most often in incarcerated individuals, psychiatric disorders, alcohol intoxication, and developmental delay.[2]

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The American Society for Gastrointestinal Endoscopy (ASGE) guidelines noted that most ingested FBs will pass spontaneously.[1] These ASGE guidelines discuss the initial diagnostic role of biplane radiographs to confirm location, size, shape, and number of ingested FBs; however, radiographs may not detect radiolucent objects such as food.[1,2] These guidelines also recommend endoscopy for patients with suspected FB ingestion and persistent esophageal symptoms even if radiographic evaluation is negative.[1] Additionally, ASGE noted for patients with nonbony food bolus impactions without complications, endoscopy can be performed without radiographs.[1] Given the limitations of diagnostic radiographs and despite these recommendations, computed tomography (CT) scanning without contrast demonstrates improved detection of FBs in 80%–100% of cases.[1] Regardless of diagnostic imaging, if a patient is unable to pass a FB spontaneously, endoscopic intervention is recommended within twenty-four hours of ingestion or sooner if concern for a sharp object or button battery in the esophagus.[3]

There is a paucity of information comparing the differences between US patients presenting with unintentional versus intentional FB ingestion; therefore, we investigated the differences in baseline demographics, imaging utilization, endoscopic findings, and clinical outcomes between unintentional and intentional FB ingestion patients in a US population. We hypothesized that unintentional FB ingestion patients would primarily present with food-related FB ingestion and lower rates of radiographic detection compared to intentional FB ingestion patients.

METHODS

Purpose of this study was to determine if clinical management and outcomes differed between patients who presented with unintentional versus intentional FB ingestion. Primary outcome was to determine utilization of radiographic usage for evaluation of FB ingestion. Secondary outcome included endoscopic foreign body removal success rate.

In this retrospective case series, we identified adult patients who presented with FB ingestion and underwent esophagogastroduodenoscopy (EGD) from 2010 to 2021 in our large tertiary academic center and two affiliated community centers. Patients were identified *via* ProVation (endoscopy reporting system) by indication for endoscopy being: "food bolus", "food impaction", "foreign body in the esophagus", and "foreign body in the stomach". Patients were divided into two groups: unintentional FB ingestion (Group A) and intentional FB ingestion (Group B). FBs were categorized as true foreign bodies or food impactions. When referenced, the term FB includes both types of foreign bodies unless otherwise specified. Unintentional ingestion was defined as the accidental ingestion of a true FB or a food impaction. Intentional ingestion was defined as the ingestion of a FB with the purpose of self-harm and/or purposeful swallowing of a true FB. Study protocol was approved by our institutional research board (IRB Study 20210082).

Demographic information collected included age and gender. Clinical information included intention to ingest FB, timing of presentation, imaging features, admission to hospital, and hospital length of stay (LOS). X-ray imaging is defined as chest and/or abdominal plain radiography. CT imaging is without contrast of the chest and abdomen. Endoscopic features included timing of endoscopy, FB characteristics, FB retrieval, esophageal stricture etiology, mucosal ulceration, adverse events, and need for repeat procedure. Successful FB retrieval for food impaction was defined as both conventional endoscopic removal of FB and by pushing of food bolus from esophagus into stomach. All data collected were compared between Groups A and B.

Statistical methods

A series of univariate analyses were used to describe the data for patients altogether, and separately by group. Differences between groups were examined using chi square or Fisher's Exact test for categorical variables, and independent *t*-tests for continuous variables. Power calculations for outcomes of imaging utilization, FB identified on EGD, and FB retrieved on EGD were all $\geqslant 0.99$. All tests were two-tailed and p values less than 0.05 were considered statistically significant. Statistical analyses were conducted using R version 3.5.1.

RESULTS

Demographics

We analyzed 479 patients presenting with FB ingestion and subsequently underwent EGD. Three hundred and ninety-seven patients presented with unintentional FB ingestion in Group A. 82 patients presented with intentional FB ingestion in Group B. The average age of patients in both Groups A and B was different (57.85 *vs.* 28.78, $P < 0.001$). Majority of the patients in Group A were 60 years or older [205 patients (52%)], whereas 73 patients (89%) in Group B were 18–39 years ($P < 0.001$). No difference in gender distribution was noted between the two groups (Table 1).

Imaging

In Group A, 221 patients (56%) underwent imaging evaluation whereas 79 patients (96%) in Group B were imaged ($P < 0.001$). The most common imaging modality for both Groups A and B was an X-ray (78%

Table 1: Demographics and imaging evaluation for unintentional and intentional foreign body ingestion

Variables	Unintentional FB ingestion (Group A, *n* = 397)	Intentional FB ingestion (Group B, *n* = 82)	*P* value
Demographics			
Age (years)[b]	57.85 (± 20.53)	28.78 (± 14.44)	< 0.001
Age category (years)[a], *n* (%)			< 0.001
18–39	89 (22)	73 (89)	
40–59	103 (26)	8 (10)	
60+	205 (52)	1 (1)	
Male gender[a]	236 (59)	42 (51)	0.21
Imaging evaluation, *n* (%)			
Imaging[a]			< 0.001
Yes	221 (56)	79 (96)	
No	176 (44)	3 (4)	
Imaging modality[a]			0.03
XR	173 (78)	52 (66)	
CT	44 (20)	27 (34)	

FB: foreign body; XR: x-ray; CT: computed tomography. Differences between groups were examined using chi square or Fisher's Exact test for [a]categorical variables, and independent *t*-tests for [b]continuous variables.

and 66%, $P = 0.03$). CT imaging was utilized less frequently in Group A [44 patients (20%)] compared to Group B [27 patients (34%)] ($P = 0.03$). 4 patients (2%) underwent esophagrams in Group A with none in Group B. Of patients imaged, FBs were visible on imaging in 73 Group A patients (33%) and 70 Group B patients (89%) ($P < 0.001$) (Table 1).

Endoscopy

All patients in both groups underwent EGD. There was no significant difference in timing of emergency department (ED) presentation to endoscopic intervention noted between Groups A and B. However, patients in Group A more frequently underwent EGD outside of business hours (6 PM–7 AM) when compared to Group B patients (40% *vs.* 27%, $P = 0.03$). FBs were identified in the EGDs of 294 Group A patients (74%) versus 70 Group B patients (85%) ($P = 0.04$), whereas no FB was identified with EGD in 103 Group A patients (26%) and 12 Group B patients (15%) ($P = 0.04$). Group A FBs were primarily food-related (64%), whereas Group B had no food-related FBs identified ($P < 0.001$).

Majority of FBs were endoscopically identified in the esophagus for Group A [278 patients (70%)] versus in the stomach for Group B [50 patients (61%)] ($P < 0.001$). FB retrieval rate for Group A was 72% compared to 83% for Group B ($P = 0.05$). Esophageal stricture pathologies were noted in 56% of Group A patients with most common etiologies including peptic/Schatzki rings [65 patients (16%)] and eosinophilic esophagitis (EoE) [77 patients (19%)]. Group B only had two patients (2%) with esophageal strictures of any etiology. Mucosal ulcers were infrequently identified in Groups A and B (12% *vs.* 9%, $P = 0.47$). Overall adverse event rates were less than five percent for both groups ($P = 0.09$) (Table 2).

Hospital admissions

Group A patients were admitted for medical reasons (not including psychiatric admissions) less frequently than Group B patients (22% *vs.* 43%, $P < 0.001$). Additionally, the average LOS for Group A patients was 0.51 days (± 1.57) versus 2.06 days (± 3.55) for Group B patients ($P < 0.001$). Both groups required repeat procedures in 5% of patients (Table 3).

True foreign body

Comparing Group A patients who only swallowed true FBs and excluding food impactions ($n = 39$) to Group B patients ($n = 70$) (all true FBs), those patients in Group A (49.33 ± 19.85 years) were much younger than Group B patients (29.41 ± 14.43 years) ($P < 0.001$). Imaging was utilized less in Group A true FBs patients [31 patients (80%)] compared to Group B patients [67 patients (96%)] ($P = 0.016$). True FBs were visible on imaging less frequently in Group A [23 patients (59%)] than in Group B [61 patients (87%)] ($P = 0.002$). No differences noted in true FB identification and retrieval with endoscopy between groups ($P = 1.00$, 1.00) (Table 4).

DISCUSSION

Foreign body ingestion is a commonly encountered clinical presentation in the US; however, we were unable to find literature discussing the differences in US

Table 2: Endoscopy management for unintentional versus intentional foreign body ingestion

Variables	Unintentional FB ingestion (Group A, *n* = 397)	Intentional FB ingestion (Group B, *n* = 82)	*P* value
Endoscopic management			
EGD, *n* (%)	397 (100)	82 (100)	–
ED presentation to EGD (hours)[b]	15.21 (± 7.50)	15.35 (± 7.34)	0.70
Timing of EGD[a], *n* (%)			0.03
7 AM–6 PM	238 (60)	60 (73)	
6 PM–7 AM	159 (40)	22 (27)	
FB identified[a], *n* (%)			0.04
Yes	294 (74)	70 (85)	
No	103 (26)	12 (15)	
Lumenal contents[a], *n* (%)			< 0.001
Food impaction	255 (64)	0 (0)	
True FB	39 (10)	70 (85)	
Nothing	103 (26)	12 (15)	
FB ingestion location[a], *n* (%)			< 0.001
Esophagus	278 (70)	11 (13)	
Stomach	13 (3)	50 (61)	
Duodenum	3 (1)	9 (11)	
Not identified	103 (26)	12 (15)	
FB retrieved[a], *n* (%)			0.05
Yes	284 (72)	68 (83)	
No	113 (28)	14 (17)	
Esophageal stricture etiology[a], *n* (%)			< 0.001
Peptic/schatzki ring	65 (16)	1 (1)	
EoE	77 (19)	1 (1)	
Malignant	4 (1)	0 (0)	
Infectious esophagitis	6 (2)	0 (0)	
Achalasia	9 (2)	0 (0)	
Idiopathic	49 (12)	0 (0)	
Other	14 (4)	0 (0)	
No stricture	173 (44)	80 (98)	
Mucosal ulcer[a], *n* (%)			0.47
Yes	48 (12)	7 (9)	
No	349 (88)	75 (91)	
Complications[a]			0.09
Yes	17 (4)	1 (1)	
No	380 (96)	81 (99)	

FB: foreign body; ED: emergency department; EGD: esophagogastroduodenoscopy; EoE: eosinophilic esophagitis. Differences between groups were examined using chi square or Fisher's Exact test for [a]categorical variables, and independent *t*-tests for [b]continuous variables.

patients presenting with unintentional versus intentional FB ingestion.[1–3] In this study, we characterized the demographics, imaging utilization, endoscopic findings, and clinical outcomes of unintentional and intentional FB ingestion in US patients.

Our study identified many more patients presenting with unintentional FB ingestion (397 patients) than intentional FB ingestion (82 patients). Geriatric patients (⩾ 60 years old) composed most unintentional FB ingestions [205 patients (52%)]. Factors that are known to increase the risk of aspiration in elderly patients such as dysphagia, diminished saliva production, impaired cough reflex, and history of cerebrovascular disease may likely predispose these same patients to unintentional FB ingestion.[4] Additional predisposing etiologies of unintentional FB ingestions in non-geriatric patients included eosinophilic esophagitis, Schatzki rings, malignancy, and esophageal dysmotility.

Intentional FB ingestion is generally associated with incarceration, psychiatric disorders, intoxication, and

Table 3: Hospital course for unintentional versus intentional foreign body ingestion, *n* (%)

Variables	Unintentional FB ingestion (Group A, *n* = 397)	Intentional FB ingestion (Group B, *n* = 82)	*P* value
Hospital course			
Hospital admission[a]			< 0.001
Yes	87 (22)	35 (43)	
No	310 (78)	47 (57)	
Length of stay (days)[b]	0.51 (± 1.57)	2.06 (± 3.55)	< 0.001
Repeat procedure[a]			1.00
Yes	20 (5)	4 (5)	
No	377 (95)	78 (95)	

FB: foreign body. Differences between groups were examined using chi square or Fisher's Exact test for [a]categorical variables, and independent *t*-tests for [b] continuous variables.

developmental delay, which we considered may have served as barriers to seeking medical care.[2,5,6] Nevertheless, patients who presented with intentional FB ingestion were generally younger (< 40 years old) in our study cohort [73 patients (89%)]. In a study of 1325 Chinese patients, Zong *et al.* noted similar age discrepancies with unintentional FB ingestions primarily occurring in elderly patients (> 60 years old) and intentional FB ingestions seen more often in younger patients (< 45 years old) ($P < 0.05$).[7] We did not identify any gender predilections based on intention of FB ingestion although Zong *et al.* noted intentional FB ingestion patients were predominantly male.[7] Grimes *et al.* identified male sex as a risk factor for recurrent FB ingestion without distinguishing between FB ingestion intents.[8]

Imaging was used significantly less to evaluate patients presenting with unintentional FB ingestion (56%) than for intentional FB ingestion patients (96%) ($P < 0.001$). One hundred and seventy-six patients (44%) presenting with unintentional FB ingestion underwent EGD without any form of imaging evaluation. Plain radiography was the primary modality of imaging evaluation for both patient cohorts in our study. CT scans were utilized less frequently for unintentional FB ingestion [44 patients (20%)] than for intentional FB ingestion [27 patients (34%)] ($P = 0.03$).

In general, radiography is effective for identification of radiopaque objects (most true foreign bodies) but may not detect radiolucent objects such as food boluses.[1] The current paradigm is initial diagnostic evaluation with plain films, but with increasing access to CT technology, Liu *et al.* questioned this practice, concluding CT imaging as a reliable and trustworthy means to detect esophageal FBs with high sensitivity and specificity.[9] In our study, unintentional FB ingestion patients primarily had food impactions [255 patients (64%)] and only 39 patients (10%) with true foreign bodies. The above finding explained the poor detection of FBs on imaging in unintentional FB ingestion patients (33%) as most of these patients underwent x-rays [173 patients (78%)] despite being shown to be inadequate to identify radiolucent food impactions.

Unintentional FB ingestion patients were less likely to undergo imaging (44% *vs.* 4%, $P < 0.001$) and more likely to have nothing found on endoscopy (26% *vs.* 15%, $P = 0.04$). This begs to question the role of imaging, specifically CT, in the management of unintentional FB ingestions to evaluate both for the presence and the accessibility of FBs prior to endoscopic evaluation. Whereas, for intentional FB ingestion patients, FBs were detected in 89% of patients on imaging with endoscopy identifying true FBs in 70 patients (85%) and nothing in only 12 patients (15%). Despite primarily plain radiography utilized for intentional FB ingestion patients, this mode of imaging was sufficient as most of the patients had swallowed radiopaque true FBs that were able to be identified on both imaging and EGD.

Shrime *et al.* studied the cost effectiveness of diagnosis of ingested foreign bodies, noting Medicare reimbursement as followed: plain radiography ($30.72), CT ($308.01), endoscopy with FB identified ($995.95), and endoscopy without FB identified ($950.04).[10] The authors concluded that CT scanning is the most cost-effective strategy for a patient complaining of a retained ingested FB and that plain radiography is more costly and less effective than either CT or endoscopy.[10] The conclusions of Shrime *et al.* reflected our concerns of management of unintentional FB ingestion patients with initial plain radiography rather than immediately pursuing CT imaging with potential EGD.[10] Nevertheless, the additional considerations of radiation exposure with CT and sedation exposure plus procedural risk with endoscopy need to be acknowledged when compared to the lower risk and accessibility

Table 4: Comparison of unintentional versus intentional true foreign body ingestion

Variables	Unintentional true FB ingestion (Group A, *n* = 39)	Intentional true FB ingestion (Group B, *n* = 70)	*P* value
Demographics			
Age (years)[b]	49.33 (± 19.85)	29.41 (± 14.43)	< 0.001
Age category (years)[a], *n* (%)			< 0.001
18–39	15 (39)	62 (89)	
40–59	11 (28)	7 (10)	
60+	13 (33)	1 (1)	
Male gender[a]	24 (62)	38 (54)	0.60
Imaging evaluation, *n* (%)			
Imaging[a]			0.016
Yes	31 (80)	67 (96)	
No	8 (20)	3 (4)	
Imaging modality[a]			0.309
XR	22 (71)	45 (67)	
CT	8 (26)	22 (33)	
Esophagram	1 (3)	0 (0)	
Visible on imaging[a]			0.002
Yes	23 (59)	61 (87)	
No	16 (41)	9 (13)	
Endoscopic management			
EGD	39 (100)	70 (100)	–
ED presentation to EGD (hours)[b]	17.28 (± 7.82)	15.33 (± 7.33)	0.114
FB identified[a], *n* (%)			1.00
Yes	39 (100)	70 (100)	
No	0 (0)	0 (0)	
FB retrieved[a]			1.00
Yes	38 (97)	68 (97)	
No	1 (3)	2 (3)	
Complications[a]			1.00
Yes	1 (3)	1 (1)	
No	38 (97)	69 (99)	

FB: foreign body; ED: emergency department; EGD: esophagogastroduodenoscopy; XR: x-ray; CT: computed tomography. Differences between groups were examined using chi square or Fisher's Exact test for [a]categorical variables, and independent *t*-tests for [b]continuous variables.

of plain radiography.

There was no significant difference in timing of ED presentation to EGD that could account for increased rates of spontaneous passing of FBs for unintentional FB ingestion patients. Esophagram was rarely utilized with only 4 patients in the unintentional FB ingestion group (2%). ASGE guidelines noted concerns with oral contrast studies due to aspiration risk and oral contrast coating the FB and esophageal mucosa, compromising subsequent endoscopy.[1]

All patients in our study underwent endoscopy for evaluation of FB ingestion. Our institution conducts endoscopic interventions in the endoscopy suite during weekdays generally from 7 AM–6 PM. Endoscopy outside of these hours is possible for urgent cases by contacting of endoscopists and endoscopy technicians from home, coordination of procedure in the endoscopy suite, operating room, or ICU, and often involvement of anesthesia care teams for airway protection. Unintentional FB ingestions patients were more likely to undergo outside business hours (6 PM–7 AM) EGDs (40% *vs.* 27%, $P = 0.03$). Ramiah *et al.* demonstrated increasing trends of outside business hours endoscopy, primarily for gastrointestinal bleeding indications, with fewer positive findings and less need for therapy over their five-year study period.[11] ASGE guidelines recommended endoscopic removal of esophageal foreign objects and food impactions within 24 hours because delay decreased the likelihood of successful removal and increased risk of complications.[10] Additionally, if the FB entered the stomach, most objects passed in 4–6 days.[1] In our study, average time

from ED presentation to EGD was approximately 15 hours for both patient cohorts. We queried the role of imaging in the triaging process, primarily for unintentional FB ingestion patients due to lower FB identification rates on EGD, to decrease the hospital burden of unneeded outside business hours urgent EGDs.

EGD in unintentional FB ingestion patients primarily identified FBs in the esophagus [278 patients (70%)] with few FBs being identified in the stomach [13 patients (3%)] and duodenum [3 patients (1%)]. The higher percentage of esophageal location of FBs in these patients was likely attributed to the increased presence of esophageal strictures [224 patients (56%)] compared to intentional FB ingestion patients [2 patients (2%)] ($P < 0.001$). FBs in intentional FB ingestion patients were mainly found in the stomach [50 patients (61%)] which is consistent with the lack of esophageal pathology. Zong *et al.* noted similar results with FBs primarily located in the esophagus in cases of unintentional FB ingestion versus in the stomach in cases of intentional FB ingestion.[7]

FB retrieval rates were falsely higher in intentional FB ingestion patients due to denoting FB retrieval failure in patients where FB was not identified on EGD. When corrected for this, FB retrieval success was > 95% for both patient cohorts. Corrected FB retrieval failure was 4% in unintentional FB ingestion patients and 3% in intentional FB ingestion patients. Our results differed from Zong *et al.* who noted a 0.5% failure rate in endoscopic removal of unintentional FB ingestion patients compared to 10% failure rate in intentional FB ingestion patients.[7] We did not appreciate a significant difference in retrieval rates between unintentional and intentional FB ingestion patients. Incidence of mucosal ulcers (12% and 9%) and other complications (4% and 1%) were low for both unintentional and intentional FB ingestion groups. Our study reflected the known high safety profile of endoscopy in FB retrieval.[1]

Hospital admissions were required for medical (non-psychiatric) reasons in 87 unintentional FB ingestion patients (22%) and 35 intentional FB ingestion patients (43%) ($P < 0.001$). The average length of stay was lower in unintentional FB ingestion patients (0.51 days *vs.* 2.06 days) ($P < 0.001$). Repeat EGD was required in only 5% of patients in both groups.

Controlling for differences in true FB ingestion versus food impactions, we still noted that patients in Group A presenting with true FB ingestion were still less likely to be imaged than Group B patients with true FB ingestion (80% *vs.* 96%, $P = 0.016$). Additionally true FBs were less likely to be detected on imaging in Group A patients than Group B patients (59% *vs.* 87%, $P = 0.002$), which may partially be attributed to types of objects ingested by each group (*i.e.* metallic objects). No differences were noted in endoscopic identification or retrieval in true FBs between groups.

Limitations of our study include fallacies of being a retrospective cohort study. Our study demonstrated a larger number of FB ingestion patients who presented to the hospital after unintentional rather than intentional FB ingestion. FB ingestion was determined by patient admission of ingestion, often without corroborating evidence. We were unable to collect data of timing of initial ingestion of FB and clinical symptoms due to incomplete data. We noted a concern of barriers to seeking medical care in intentional FB ingestion patients. Unintentional FB ingestion patients were overall imaged less, and if imaged, were less likely to undergo CT imaging. We were unable to identify any clear deterrents to imaging unintentional FB ingestion patients specifically. Unintentional FB ingestion patients had lower rates of positive findings on imaging, which we attributed to a higher proportion of plain radiography utilization and primarily radiolucent food boluses as ingested FBs. However, this was less of a concern for intentional FB ingestion patients who generally ingested radiopaque objects that are more easily detected on both plain radiography and CT imaging.

Unintentional FB ingestion patients underwent EGD outside of business hours more frequently and had lower admission rates. A possibility for the above finding was that EGD was completed overnight due to availability of overnight endoscopy, to prevent unneeded hospital admission, and to increase ED bed availability. Indication for outside of business hours EGD was not collected due to incomplete data. Our study noted a larger rate of unintentional FB ingestion patients had no FB identified on EGD. We did not note a significant difference in ED presentation to EGD between each cohort; however, we were unable to account for timing of initial FB ingestion. It is possible that prolonged time from ingestion to EGD allowing for spontaneous passing of FB. Types of FBs ingested, location of FBs, and presence of esophageal pathologies for each cohort was consistent with other studies. FB retrieval rate once corrected for patients in which FB was not identified on EGD was high for both cohorts without a significant difference—higher success rate may reflect the experience and availability of endoscopists at our institution plus trainee involvement. For the same reason, the lower rate of mucosal ulcers, complications, and repeat procedures may have also been noted. Patients who presented with FB ingestion and did not undergo EGD were not included, which may underestimate the benefit of clinical observation and spontaneous passing of FBs. No clear indication was identified for lower hospitalization rates and LOS for unintentional FB ingestion patients was identified.

In our study, we noted unintentional FB ingestion patients were less likely to undergo imaging or to have FBs identified on imaging or EGD; however, they were more likely to undergo EGDs after routine business hours. Further investigation of the role of imaging in unintentional FB ingestion is needed to decrease unneeded emergent endoscopy for patients with FBs that are no longer easily reachable by EGD.

DECLARATIONS

Author contributions

Chittajallu V, Karb DB, Delozier S, Raad D, Dumot JA, Mok S designed the study, collected data, wrote and reviewed the manuscript.

Informed Consent

Informed consent was obtained from all subjects involved in the study.

Ethical Approval

Not applicable.

Conflicts of interest

The authors report no conflicts of interest.

Data sharing statement

No additional data is available.

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