Comparison of Outcomes in Medical Therapy vs Surgical Intervention of Esophageal Foreign Bodies

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Abstract

Objectives. (1) Compare efficacy of primary medical therapy vs primary surgical intervention in patients with esophageal foreign bodies (EFBs). (2) Investigate variables that may predict successful outcomes in patients treated for EFBs.

Study Design. Case series with chart review.

Setting. Single-institution academic tertiary care medical center.

Subjects and Methods. Adult patients (older than 18 years) seen at the University of Michigan Emergency Department (ED) over an 8-year period with the diagnosis of EFBs (January 1, 2003, to December 31, 2011; N = 250). Decision was made by ED physicians whether to treat patients with first-line medical therapy vs surgical intervention. Pertinent clinical and demographic data were extracted from medical records and summarized by descriptive statistics.

Results. First-line treatment with surgical intervention (flexible or rigid esophagoscopy with foreign body removal) was much more likely to lead to resolution of symptoms than medical therapy (glucagon alone or in combination with other medical therapy) (98% vs 28%, \( P < .0001 \)). When delivered within 12 hours of symptom onset, medical therapy was more likely to be successful (34% resolution vs 12% resolution, \( P < .01 \)). There was no difference in complication rates for primary medical therapy vs surgical intervention (8% vs 8%).

Conclusions. Patients with EFBs are a commonly encountered consultation for both otolaryngologists and gastroenterologists. In these patients, first-line surgical intervention is superior to medical therapy and should not be avoided for a trial of medical therapy or concern for higher morbidity. Implementation of these findings has the ability to positively affect treatment patterns, outcomes, and patient quality of life.

Keywords

esophageal foreign body, glucagon, esophagoscopy, complications

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esophagoscopy with foreign body removal have been shown to be effective in greater than 90% of food impactions in multiple retrospective studies.1,15,16

Within this context, the purpose of this study was to compare the efficacy of first-line medical therapy with glucagon to the efficacy of first-line surgical intervention in the treatment of patients with EFBs and food impactions. In addition, to determine whether underlying variables might predict successful outcomes in patients treated for EFBs, we examined demographics, medical history, estimated time until ED presentation, and type of impaction. Our hypothesis was that first-line surgical intervention was more likely to lead to successful outcomes and more rapid resolution of symptoms compared to first-line medical treatment. In addition, we expected patients with a medical history significant for esophageal anatomic abnormalities to be less likely to respond to medical therapy as first-line treatment.

Methods
This study was approved by the University of Michigan Institutional Review Board. This study was a case series with chart review of patients presenting to the University of Michigan Emergency Department with EFBs. Cases were identified between January 1, 2003, and December 31, 2011, with the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code 935.1 (“foreign body in the esophagus”).

Esophageal foreign body and presentation to the ED were confirmed by chart review of each individual patient. Esophageal foreign body impaction was defined as ingestion of a foreign body or food that led to obstructive symptoms (eg, foreign body sensation, emesis, acute dysphagia, inability to tolerate secretions). Patients who did not present to the ED with the criteria described above were excluded. For the purposes of this study, date of visit was defined as earliest date patient presented to the ED for EFB. The data set was further limited to adults (age at date of visit ≥18) with a date of visit between January 1, 2003, and December 31, 2011 (N = 250).

Pertinent data were extracted from the records of the remaining patients and included ability to tolerate secretions, acute dysphagia, emesis, EFB item, approximate time from initial obstruction to ED presentation (aggregated into a 12-hour interval variable), esophageal history diagnosed by a previous doctor (ie, esophageal strictures, Schatzki’s ring, hiatal hernia, Barrett’s esophagus, eosinophilic esophagitis, esophageal tumor, metastatic cancer to the esophagus), position of foreign body (upper one-third vs middle one-third vs lower one-third of esophagus), first- and second-line interventions and effectiveness, complications, and treatment team associated with first- and second-line interventions. Complete impaction was defined as inability to tolerate secretions (eg, pooling of secretions, spitting saliva into a basin) based on chart review of ED and consult notes, whereas partial impaction was defined as ability to fully swallow saliva. First-line treatment was determined by the ED physician based on clinical judgment. Medical therapy was defined as receiving glucagon alone or in combination with other medical therapy, and surgical intervention was defined as flexible or rigid esophagoscopy with foreign body removal. Effectiveness was defined as resolution of symptoms after administration of medical treatment or surgical intervention. In addition, during the analysis, there was a subset of patients who underwent first-line interventions with symptom resolution independent of the intervention. In the case of first-line medical treatment, this subset of patients experienced spontaneous improvement more than an hour after glucagon was administered while awaiting endoscopy, experienced improvement after an imaging study involving oral contrast, or vomited up the foreign body. In the case of first-line surgical intervention, no foreign body was found on endoscopy within the esophagus, and the patient experienced improvement in symptoms during or after endoscopy.

Clinical variables were summarized by descriptive statistics, mean and standard deviation were calculated for continuous variables, and frequency of observation was used to summarize categorical variables. Patients were divided into 2 groups based on whether they received first-line medical treatment or first-line surgical intervention. For bivariate analysis, means were analyzed using an unpaired Student’s t test. Statistical significance was determined at a significance level of α = .05. All statistical analyses were performed using Excel 2013 (Microsoft, Redmond, Washington) or Stata version 13.0 (StataCorp, College Station, Texas).

Results
A total of 250 patients with an encounter for EFB were identified during the study period. Of those 250 patients, 61 patients (24%) had spontaneous resolution of their symptoms in the ED, 130 patients (52%) received first-line medical therapy (glucagon alone or in combination with other medical therapy), 40 patients (16%) received first-line surgical intervention (flexible or rigid esophagoscopy with foreign body removal), and 19 patients (8%) received neither first-line medical therapy nor surgical intervention. The 19 patients who received neither first-line medical therapy (glucagon alone or in combination with other medical therapy) nor surgical intervention (flexible or rigid esophagoscopy) based on the definitions of this study were excluded from further analysis and received alternative treatment. The 19 patients received the following treatments; Ativan; catheter insertion; Coca-Cola (2 patients); gastrointestinal (GI) cocktail (2 patients); laryngoscope but no esophagoscopy (3 patients); Mylanta; nitroglycerin; nasopharyngeal scope, but no esophagoscopy (5 patients); Reglan; Zofran; or foreign body extraction by hand by health care professional. Table 1 summarizes demographic data comparing patients who received first-line medical treatment with those who received first-line surgical intervention. Figure 1 presents a flow diagram showing the outcomes of each of the 250 patients in the analysis.

Comparing first-line therapies, 28% of patients who received medical therapy had resolution of symptoms
compared to 98% of patients who received surgical intervention ($P < .0001$). Table 2 summarizes the outcomes of first-line medical therapy and surgical intervention. First-line medical therapy was a more effective treatment when delivered within 12 hours of initial EFB symptoms (34% vs 12%, $P < .01$). Success of first-line medical therapy was not affected by type of obstruction (partial vs complete impactions, 38% vs 22%, $P = .06$) or by a history of esophageal abnormalities (33% vs 16%, $P = .06$). For patients who underwent first-line surgical intervention, 8% of patients underwent rigid esophagoscopy as part of their treatment ($n = 3$) vs 92% of patients who received flexible esophagoscopy ($n = 37$). Twenty-five percent of first-line surgical interventions were performed under general anesthesia ($n = 10$).

After failure of first-line medical therapy to resolve symptoms, the single patient who received an additional attempt at medical therapy did not have resolution of his or her symptoms compared to 100% of patients ($n = 93$) who received second-line surgical intervention with resolution of their symptoms. The single patient who underwent second-line medical therapy received intravenous (IV) glucagon and sublingual nitroglycerin after first-line medical therapy of IV glucagon, IV Phenergan, and IV morphine. The patient’s symptoms did not resolve after first-line or second-line medical therapy. A swallow study showed evidence of an EFB, and the patient underwent flexible esophagoscopy as third-line treatment. The foreign body was pushed distally into the stomach with resolution of the patient’s symptoms. For patients who underwent second-line surgical intervention, approximately 1% of patients underwent rigid esophagoscopy as part of their treatment ($n = 1$). In addition, for patients who underwent second-line surgical intervention, only approximately 2% received general anesthesia ($n = 2$). Table 3 presents a summary of outcomes for second-line medical therapy and surgical intervention after failed first-line medical therapy.

Of those patients who received second-line surgical intervention following failed first-line medical therapy, approximately 43% ($n = 40$) were found to have an obstruction in the lower one-third of the esophagus, approximately 27% ($n = 25$) were found to have an obstruction in the middle one-third of the esophagus, and approximately 13% ($n = 12$) were found to have an obstruction in the upper one-third of the esophagus. Approximately 5% ($n = 5$) of patients who received second-line surgical intervention following failed first-line medical therapy were found to have obstructions that spanned multiple portions of the esophagus, and the remaining 12% ($n = 11$) did not have a location specified in the operative report.

Table 1. Demographics of Patients Receiving First-Line Medical Treatment and Surgical Intervention.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>First-Line Medical Treatment ($n = 130$)</th>
<th>First-Line Surgical Intervention ($n = 40$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean, y</td>
<td>48.5</td>
<td>44.3</td>
</tr>
<tr>
<td>Sex, % male</td>
<td>65</td>
<td>63</td>
</tr>
<tr>
<td>Significant esophageal history, %</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>Time to admission within 24 hours, %</td>
<td>85</td>
<td>79</td>
</tr>
<tr>
<td>Patients experiencing complete impaction, %</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Top 3 most common objects</td>
<td>1. Meat (81%)</td>
<td>1. Meat (53%)</td>
</tr>
<tr>
<td></td>
<td>2. Pills (4%)</td>
<td>2. Pills (8%)</td>
</tr>
<tr>
<td></td>
<td>3. Vegetables (2%)</td>
<td>3. Dental objects (8%)</td>
</tr>
</tbody>
</table>

Figure 1. Esophageal foreign body patient flow diagram.
For first-line medical treatment complications (n = 11), 7 patients experienced nausea and/or emesis, 2 patients experienced hypotension, and 2 patients experienced lightheadedness or near syncope. Of the 11 patients who experienced first-line medical treatment complications, 1 patient required a 1 liter normal saline bolus for hypotension, and 1 patient required Reglan for treatment of emesis. For first-line surgical intervention complications (n = 3), 1 patient experienced emesis during endoscopy under conscious sedation that required intubation for airway protection, 1 patient experienced right lung collapse with reinflation after withdrawal of the endotracheal tube by 4 cm, and 1 patient with a cardiac history experienced a run of non-sustained ventricular tachycardia (NSVT) during recovery from endoscopy and conscious sedation that did not recur but required admission to the cardiology service for observation. First-line surgical intervention was not more likely to lead to complications compared to first-line medical treatment (8% vs 8%, \(P = .85\)).

**Discussion**

To the authors’ knowledge and based on literature search, this is one of the most extensive research studies to directly compare outcomes of medical therapy and surgical management of EFBs in adults presenting to an ED regardless of medical condition. This study demonstrates that patients who received first-line surgical intervention were much more likely to have resolution of their symptoms compared to those who received first-line medical treatment. In addition, this study shows that delayed medical therapy was less likely to be successful compared to early medical therapy. These findings are validated by previous research on EFBs, which concluded that delayed removal of foreign bodies and food impactions has been associated with decreased rates of successful removal and increased rates of perforation (particularly with sharp objects).3-4,17,18

For second-line surgical intervention complications (n = 15), 6 patients had evidence of bleeding on endoscopy after successful surgical intervention and/or resolution of symptoms, 5 patients had evidence of small mucosal tears or Mallory-Weiss tears, 3 patients experienced emesis, and 1 patient was admitted due to the length and complexity of the endoscopy. Surgical intervention following failed medical therapy did not lead to increased complications compared to first-line surgical intervention (16% vs 8%, \(P = .18\)).

**Table 2. Outcomes of First-Line Medical Treatment and Surgical Intervention.**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>First-Line Medical Treatment (n = 130), No. (%)</th>
<th>First-Line Surgical Intervention (n = 40), No. (%)</th>
<th>(P) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign body expelled/removed with no complications</td>
<td>12 (9)</td>
<td>24 (60)</td>
<td>&lt;.0001(^a)</td>
</tr>
<tr>
<td>Foreign body expelled/removed with complications</td>
<td>11 (8)</td>
<td>3 (8)</td>
<td>.8477</td>
</tr>
<tr>
<td>Symptoms resolved independent of treatment</td>
<td>13 (10)</td>
<td>12 (30)</td>
<td>.0017(^a)</td>
</tr>
<tr>
<td>Second intervention required</td>
<td>94 (72)</td>
<td>1 (2)</td>
<td>&lt;.0001(^a)</td>
</tr>
</tbody>
</table>

\(^a\)Statistically significant at a level of \(\alpha = .05\).

**Table 3. Outcomes of Second-Line Medical Treatment and Surgical Intervention after Failure of First-Line Medical Treatment.**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Second-Line Medical Treatment (n = 1), No. (%)</th>
<th>Second-Line Surgical Intervention (n = 93), No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign body expelled/removed with no complications</td>
<td>0 (0)</td>
<td>68 (73)</td>
</tr>
<tr>
<td>Foreign body expelled/removed with complications</td>
<td>0 (0)</td>
<td>15 (16)</td>
</tr>
<tr>
<td>Symptoms resolved independent of treatment</td>
<td>0 (0)</td>
<td>10 (11)</td>
</tr>
<tr>
<td>Third intervention required</td>
<td>1 (100)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
where the muscularis propria and lower esophageal sphincter are composed of smooth muscle as opposed to the upper one-third of the esophagus where the muscularis propria and upper esophageal sphincter are composed of skeletal muscle.6-8 The authors were able to identify location of impactions for second-line surgical intervention after first-line failed medical therapy. The results showed a larger proportion of impactions in the lower one-third of the esophagus compared with impactions in the upper one-third of the esophagus. However, without data on the locations of the foreign bodies that cleared after first-line medical treatment as a comparison point, it is difficult to determine whether the large number of obstructions in the lower one-third of the esophagus found on second-line endoscopy was a result of the glucagon treatment itself or if it was due to inherent demographics and characteristics of the patient population. To date, the authors are aware of only 1 randomized double-blinded study involving adults evaluating the efficacy of glucagon in treatment of EFBs.12 The study examined administration of glucagon and diazepam compared to placebo injections in patients treated for EFBs in Swedish EDs. The results did not show a statistically significant difference between treatment and placebo groups in rates of disimpaction. However, the sample size of the study was small (n = 43).12

Further research is warranted regarding whether first-line medical therapy might be more effective for patients experiencing an EFB vs a complete obstruction of the esophagus as our analysis did not reach statistical significance. However, a previous study by Sodeman et al13 suggested that patients with a meat impaction and/or organic obstruction were less likely to respond to glucagon therapy.

Our reported complication rate for surgical intervention of 8% was of a similar magnitude compared to previous research findings that estimated complication rates for flexible and rigid esophagoscopy to be 5% or less and 10% or less, respectively, based on a similar set of adverse outcomes (perforation, laceration, and dysphagia).1,19,20 Perforation rates from surgical intervention (0%) in this study were also in line with the results of 2 prior studies examining treatment of foreign body impaction (0% and <3% perforation rates for flexible and rigid esophagoscopy, respectively).1,20 Overall, for our study, complication rates between first-line medical treatment and first-line surgical intervention were similar (8% vs 8%). However, in general, it is difficult to compare rates of complications for first-line medical treatment and first-line surgical intervention given that the adverse effects for medical treatment and surgical intervention are different and require different remediation.

Conclusion

Current management strategies of EFBs appear to vary widely at different hospitals and even among different treatment teams within the same hospital. Based on our findings, in patients with EFBs, first-line surgical intervention is superior to medical therapy and should not be avoided for a trial of medical therapy or concerns for higher morbidity. Moreover, if first-line medical therapy is considered, it is more likely to be effective in patients with an EFB who present within the first 12 hours. Avoiding unnecessary delays in surgical intervention for EFB has the potential to positively affect treatment patterns and outcomes.

Author Contributions

Austin Y. Lin, acquisition of data, analysis and interpretation of data, drafting of the article, final approval, and agreement; Brittany N. Tillman, study conception and design, analysis and interpretation of data, drafting of the article, critical revision, final approval, and agreement; Aaron L. Thatcher, analysis and interpretation of the data, critical revision, final approval, and agreement; Casey R. Graves, study conception and design, acquisition of data, critical revision, final approval, and agreement; Mark E. Prince, study conception and design, analysis and interpretation of data, critical revision, final approval, and agreement.

Disclosures

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References


