Esophageal Perforation: Emphasis on Management
Bradley L. Bufkin, MD, Joseph I. Miller, Jr, MD, and Kamal A. Mansour, MD
Division of Cardiothoracic Surgery, Joseph B. Whitehead Department of Surgery, Emory University School of Medicine, Atlanta, Georgia

Background. Perforation of the esophagus is a deadly injury that requires expert management for survival.

Methods. We performed a retrospective clinical review of 66 patients treated at Emory University affiliated hospitals for esophageal perforation between 1973 and 1993.

Results. Iatrogenic perforations accounted for 48 injuries (73%), barogenic perforations occurred in 12 patients (17%), trauma was causative in 3 (5%), and 3 patients had esophageal infection and other causes. Lower-third injuries occurred in 43 cases (65%), middle third in 14 (21%), and upper third in 9 (14%). Early contained perforations were managed successfully by limiting oral intake and giving parenteral antibiotics in 12 patients. Cervical perforations were drained without attempt at closure of the leak. Perforations with mediastinal or pleural contamination recognized early were managed by primary closure and drainage in 28 patients. Reinforcement of the primary closure using stomach fundus, pleural, diaphragmatic, or pericardial flap was performed in 16 patients. Those perforations that escaped early recognition required thoughtful management, using generous debridement and drainage and sometimes esophageal resection. The esophageal T tube provided control of leaks in 3 of these patients and was a useful adjunct. Using these management principles, we achieved a 76% survival rate for all patients. Six patients with perforations complicating endoesophageal management of esophageal varices were a high-risk subset with an 83% mortality rate.

Conclusions. Esophageal perforation remains an important thoracic emergency. Aggressive operative therapy remains the mainstay for treatment; however, conservative management may be preferred for contained perforations and the esophageal T tube may be used for late perforations.

Esophageal perforation remains a difficult operative problem. The predominance of iatrogenic injuries allows good results for the overall management of esophageal perforation, with earlier detection and prompt attention. The outcomes for spontaneous perforations are worse by comparison, but can be improved with a high degree of suspicion combined with timely intervention and principled intraoperative care. Although the interval between perforation and treatment remains a predictor of survival, its significance is contingent on experienced assessment of the severity of injury [1-3]. Accurate management of esophageal perforations requires mastery of an array of operative procedures for an organ of little plasticity. A review of operative principles used to manage esophageal perforation in a series of patients from a united institution allows recommendations based on successful outcomes to be incorporated into current thoracic surgery. To accomplish this end, we reviewed our 20-year experience in the management of perforation of the esophagus.

Material and Methods
Sixty-six patients with esophageal perforation were identified from the Emory University Hospital and Emory affiliated Crawford Long Hospital medical record data bases from 1973 to 1993. All clinical data were analyzed and reviewed. All causes of esophageal perforation were included in this review. Underlying esophageal diseases were categorized as none, benign, or malignant. The location of the perforation was defined as upper third (cervical), middle third (thoracic), and lower third (lower thoracic, including gastroesophageal junction and intra-abdominal esophagus). Iatrogenic injuries (n = 48) were subdivided into distinct causes: esophagoscopy, 16 patients; pneumatic dilation, 10; esophagoscopy and dilation, 8; intraesophageal intubation, 5; intraoperative, 4; sclerosis of varices, 3; and bougienage, 2.

Nonoperative Management
Nonseptic patients with early defined and contained leaks were managed conservatively. No intake by mouth, parenteral nutrition, and antimicrobial agents were continued for 7 to 10 days. A contrast esophagram was then obtained to document healing of the perforation, and oral intake was then resumed.

Operative Management
Septic patients, those with uncontained free ruptures, perforations of prolonged duration, and iatrogenic intraoperative injuries were managed by a variety of operative procedures. Specific operative strategies were chosen based on location of the injury, presence of underlying esophageal disease, and degree of tissue damage, combined with the overall condition of the patient.
Cervical perforations from endoesophageal procedures were managed by drainage alone, whereas those identified during cervical operations were repaired during the neck procedure. Middle- and lower-third perforations with malignant underlying esophageal disease were treated by resection with immediate or delayed reconstruction, depending on the state of the tissues and the condition of the patient. Stable patients with middle- and lower-third perforations with benign motility disorders and viable tissue underwent primary repair with wide mediastinal and pleural drainage. Severe tissue damage that precluded repair was managed by wide mediastinal and pleural drainage. Esophageal T-tube drainage was combined with this approach in a few cases. Closed-tube thoracostomy drainage was also used for diagnosis and therapy in several patients.

All patients undergoing operative therapy were maintained with no oral intake and received enteral or parenteral nutrition as well as parenteral antimicrobial agents. After uneventful primary repairs, patients underwent contrast esophagram at 7 to 10 days postoperatively, with oral intake resumed if the perforation was healed. Patients who were unable to have primary repair were managed as for controlled esophageal fistulas, with gastrostomy and feeding jejunostomy or central hyperalimentation for long-term nutritional support until fistula closure was achieved.

Results

Sixty-six patients (39 male and 27 female) underwent treatment for esophageal perforation, with an overall survival rate of 76%. The mean age was 60 ± 16 years, with no difference between survivors and nonsurvivors. The average time between perforation and diagnosis was 40.6 ± 61.9 hours. The perforation was located in the upper third in 9 patients, middle third in 14 patients, and lower third in 43 patients. The average length of stay was 25.4 ± 22.6 days.

Nonoperative management was applied without a death in 12 patients (4 upper third, 3 middle third, 5 lower third). The average time between perforation and diagnosis was 27.8 ± 33.1 hours. These patients required an average of 19.3 ± 17.5 hospital days for resolution of the perforation.

Operations were performed in 54 patients, with 70% survival (Table 1). The average time between perforation and diagnosis was 40.5 ± 63.4 hours. Hospitalization was required for an average of 26.9 ± 23.4 days in this group. Primary closure was performed in 28 patients; pleural drainage, mediastinal drainage, or both in 15 patients; and esophageal resection in 7 patients. Three patients with delayed presentation were managed by esophageal T-tube and 1 by exclusion and diversion.

Iatrogenic injuries produced 48 perforations in the group. Spontaneous perforations occurred in 12 patients, and trauma and infection caused 6 other perforations. Iatrogenic injuries were recognized in the first 24 hours in 75% of patients, whereas only 39% of all other injuries were discovered within 24 hours. Despite earlier recognition in the iatrogenic group, death rates were equivalent for all causes (Table 2).

Benign and malignant underlying esophageal disease was present in 37 and 7 patients, respectively. A similar mortality rate was observed between those patients with and without underlying esophageal disease. However, the subgroup of esophageal perforations that accompanied endoesophageal management of esophageal varices was particularly lethal, with 5 of 6 patients dying.

Comment

Esophageal perforation currently has a broad clinical spectrum, ranging from contained small leaks to barogenic lower esophageal rupture. This spectrum results from more frequent iatrogenic causes, introducing less severe esophageal injury that is recognized earlier than historic spontaneous perforation. This range of disease has been accompanied by the development of an array of esophageal procedures to manage perforation. Most of the operative literature is committed to the treatment of severe esophageal injury, and the appropriate procedure remains disputed among leaders in the field [2, 4–6]. Nonoperative management of contained esophageal perforation has expanded the algorithm for management [7, 8]. This report details the spectrum of injury over a 20-year period and outlines the principles and strategies used for successful management of esophageal perforation.

A high incidence of preexisting esophageal disease has been reported in recent series [3]. Underlying esophageal disease was present in 44 of 66 patients (67%) in this series, reflecting a similar experience. This high incidence of preexisting esophageal disease has been reported in recent series [3]. Underlying esophageal disease was present in 44 of 66 patients (67%) in this series, reflecting a similar experience.

Table 1. Operations for Esophageal Perforation

<table>
<thead>
<tr>
<th>Operation</th>
<th>No. of Patients</th>
<th>Hours to Diagnosis</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary repair</td>
<td>28</td>
<td>19.7 ± 38.2 (1–192)</td>
<td>23/28—82%</td>
</tr>
<tr>
<td>Drainage</td>
<td>15</td>
<td>52.6 ± 43.2 (3–144)</td>
<td>8/15—53%</td>
</tr>
<tr>
<td>Open</td>
<td>8</td>
<td>41.6 ± 33.9 (9–96)</td>
<td>7/8—88%</td>
</tr>
<tr>
<td>Closed</td>
<td>7</td>
<td>65.1 ± 48.9 (7–144)</td>
<td>1/7—14%</td>
</tr>
<tr>
<td>Resection</td>
<td>7</td>
<td>14.3 ± 10.6 (1–56)</td>
<td>4/7—57%</td>
</tr>
<tr>
<td>T-tube drainage</td>
<td>3</td>
<td>216.0 ± 98.0 (96–336)</td>
<td>2/3—67%</td>
</tr>
<tr>
<td>Exclusion and diversion</td>
<td>1</td>
<td>120</td>
<td>1/1—100%</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>40.5 ± 63.4 (1–336)</td>
<td>38/54—70%</td>
</tr>
</tbody>
</table>

Table 2. Causes of Perforation

<table>
<thead>
<tr>
<th>Cause</th>
<th>No. of Patients</th>
<th>Underlying Disease</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Iatrogenic</td>
<td>48</td>
<td>38</td>
<td>10</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>12</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Trauma</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Infection</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>44</td>
<td>22</td>
</tr>
</tbody>
</table>
ence of preexisting associated esophageal disease is a marker for the iatrogenic nature of esophageal perforation. A defined few iatrogenic perforations lend themselves to conservative management, ie, those presenting as contained disruptions draining back into the esophagus with no signs of general sepsis.

Classic teaching cites time from perforation to diagnosis as a predictor of outcome, and various series have identified the first 24 hours as the interval acceptable for successful primary repair [3, 9–11]. The average time to diagnosis in this report was 40 hours, emphasizing the propensity for late diagnosis of esophageal perforation. Although iatrogenic injuries were recognized within the first 24 hours more frequently than other injuries (75% versus 39%; p < 0.015), this did not translate into improved survival. Some have used the time from diagnosis as a determinant of appropriate operative therapy, avoiding primary repair after the first 24 hours [12]. This and other recent reports identified the high frequency of late diagnosis and displayed improved survival rates with primary repair for injuries recognized outside the first 24 hours when compared with results from the literature [2, 13, 14]. The changing patterns of injury and refined intensive care practices play an important role in the better results; however, accurate intraoperative evaluation and precise operative repair form the foundation of this improvement.

Nonoperative management of esophageal perforation was applied without any deaths in a selected group of 12 patients in this series. We strictly observed the requirements for conservative therapy as outlined in earlier reports: contained perforation, drainage of the perforation into the esophagus, and absence of clinical sepsis [7].

These patients require careful assessment during the observation period, and deterioration in clinical status requires crossover to operative management. Antimicrobial agents with activity against oropharyngeal flora are combined with elimination of oral intake for 7 days. Successful conservative management is confirmed at this time by repeat contrast esophagram, which displays healing or decreased size of the contained leak. Oral intake is then resumed.

Although conservative management of perforation can be applied successfully, it is appropriate in only a small subgroup of esophageal perforations [8]. The majority of esophageal perforations are not contained and require operative attention. In the group of patients reported, 83% underwent operations for esophageal perforation, underscoring the limited role of conservative management for this injury.

Our approach to the operative care of these patients differs based on the location of injury. Upper-third perforations that are not contained on contrast esophagram or occur during adjacent operation require operation for repair and drainage to prevent the development of mediastinitis. For noncervical, uncontained esophageal leaks, debridement of necrotic tissue, generous irrigation, and complete mediastinal and pleural drainage are a part of all operations designed for therapy of these esophageal perforations. However, care for the injured esophagus varies based on the location, nature of the esophageal tissue, underlying disease, and overall condition of the patient. The major decision at operation concerns the repair of the esophageal perforation.

Primary repair with or without reinforcement was performed in 52% (28 of 54) of the patients in this series, with an 82% survival rate. The average time to diagnosis was 20 hours from the onset of symptoms. There were no leaks documented on postoperative contrast esophagram in these patients. The success of primary repair in this group of patients is based on timely diagnosis, careful intraoperative assessment, and meticulous repair. Normal tissue with usual tensile strength and pliability is absolutely required for successful primary repair, and necrotic esophageal tissue that flanks the wound requires debridement. Circumferential injuries of large magnitude and perforated, nondilatable esophageal strictures require esophageal resection and reconstruction.

Successful primary repair begins with debridement of devitalized tissue and identification of the muscular and mucosal layers of the esophagus, as the mucosal tear is usually longer than the muscular tear. Reinforcement of the primary repair has proven useful in 16 of 28 patients undergoing primary closure. We currently favor use of the gastric fundus for lower-third injuries and the pleural flap for those repaired in the middle third.

Perforations of the noncervical esophagus that escape early recognition, with esophageal tissue that is beyond repair, represent the controversial category for management. This series of patients included 12 injuries that were beyond repair. Wide debridement and drainage was performed in 5 patients, resection in 3, and T-tube drainage in 3; a single patient underwent exclusion and diversion. The survival rate in these patients was 85%. Wide debridement and drainage was a useful modality that provided quick and effective therapy.

Our preferred treatment of lower-third esophageal perforations that are beyond early repair, based on our previous experience, is placement of the esophageal T tube to divert all secretions and to allow time for healing of the surrounding injury [6, 15]. In two other detailed reports of T-tube drainage in this decade, 12 of 15 patients survived, with resolution of the controlled fistula [16, 17].

Placement of the esophageal T tube in the lower-third injuries should be precise. The long arm is directed toward the stomach, with the short arm in the esophagus proximal to the site of injury (Fig 1). The T tube should be brought out through a separate stab incision and secured in a lateral position away from the aorta. These tubes remain in place for 2 to 3 weeks to allow development of a defined tract. There have been reports of aortic erosion from malpositioned T tubes, so attention to these details is important [15]. Concomitant laparotomy, decompression gastrostomy (in lieu of nasogastric decompression), and placement of feeding jejunostomy are performed for nutritional support. Central hyperalimentation is an alternative.

Some advocate exclusion and diversion for management of delayed esophageal perforations [5, 18]. We used this technique for an irreparable injury in the middle third of the esophagus, with a good outcome. In selected
circumstances, this option may be considered. Careful attention should be directed to creation of the lateral cervical esophagostomy to ensure diversion of the oropharyngeal secretions. The need for a second operation to establish cervical esophageal continuity and the creation of distal esophageal stricture after temporary banding are undesirable consequences of exclusion and diversion. We tend to avoid exclusion and diversion for these reasons. We perform resection with primary or delayed secondary reconstruction for late-recognized, middle-third or distal-third lesions that cannot be handled with wide drainage or T-tube techniques.

Resection was applied to 7 patients in this series, and was reserved for irreparable perforations (3 patients) or perforations that occurred with esophageal neoplasms (4 patients). Spontaneous or iatrogenic perforation with malignancy requires esophageal resection, as healing will universally fail in cancerous tissue. Primary reconstruction with gastric pull-up should be used if the patient's condition permits. Resection and drainage with end-cervical esophagostomy and gastrostomy can be used in those patients whose condition is of concern and with plans for secondary reconstruction. The short-term outlook for perforation with malignancy was grim, with only 1 of 4 surviving hospitalization.

Patients presenting in extremis with late-recognized esophageal perforation remain candidates for open procedures. Closed-tube thoracostomy was unsuccessful in controlling mediastinal and pleural sepsis in 6 of 7 patients in this series. Perhaps some of these patients would have survived had we followed a more aggressive approach using open debridement and drainage, exclusion and diversion, or even esophageal resection.

Esophageal perforation as a complication of management of esophageal varices secondary to portal hypertension was a particularly lethal injury. This cause accounted for 9% of perforations in this series, reflecting the continued interest in liver disease at our institution. Incorrect positioning of the gastric balloon of the Sengstaken-Blakemore tube and perforation secondary to variceal sclerosis were the causes. The only survivor in this set of patients had a contained perforation that was managed by conservative measures. The poor general condition of cirrhotic patients and the high mortality rate from refractory variceal bleeding make esophageal perforation a lethal injury in this group of patients.

In summary, perforation of the esophagus remains a critical injury with a high mortality rate. The algorithm in Figure 2 is a distillation of the recommended approach to esophageal perforation. Nonoperative management can be successful in a selected group of patients, but most perforations require operation. Careful attention to appropriate critical care and antimicrobial therapy and correct management of esophageal injury are required for success.
References


DISCUSSION

DR HAROLD C. URSCHEL, JR, (Dallas, TX): Thank you, Dr Bufkin, for a very clear presentation. Our approach back in the early 1960s was very similar to that presented here, with the exception of the T-tube. When we saw a fairly early large perforation and repaired it primarily, reinforcing it with pleura or intercostal bundle or even occasionally omentum, we would still see leaks in a certain percentage of patients secondary to that repair. Because of that, in the mid-1960s we began to use exclusion and diversion on all the larger esophageal perforations regardless of the time we saw them, early or late, and the ones that we basically could not treat conservatively.

This procedure involves preventing a continued chemical burn from the stomach. We exclude the esophagus below the perforation after we close the perforation. We close it either with pleura, the intercostal bundle, or with omentum. We started with Teflon, and now we use Silastic. We tie it with either chromic or, if we want to bring out a Rumel tourniquet, with Prolene or something like that and bring it out below the diaphragm with a gastrostomy.

We do this in every case regardless of how secure it looks because we can never trust the situation completely. At the same time, we do a side-to-side cervical esophagostomy to the skin. Although this is side to side, it provides 100% diversion because of the angulation of the esophagus.

The advantage of this technique is that the patients can usually go home in a week, and they do not need a second general anesthetic. If you use a chromic tie, this comes undone by itself in about 3 weeks. If you use the Rumel, you can release it in about 3 weeks. You can close the esophagostomy under local anesthesia, converting the side to side to a Heineke-Mikulicz. Some patients need one dilation. We have not had to resect any cases.

We presented the early cases in 1972 at the Southern Surgical Association. Since then we have accumulated about 106 patients, but nobody has required resection and almost no one has needed a second operation. Although this initially appeared to be radical treatment, it is actually the simplest and safest approach to the large or late perforation.

DR BUFKIN: We recognize Dr Urschel's important contribution to the treatment of esophageal perforation. We did not experience large problems with leak after our primary repairs. We used exclusion and diversion in 1 patient with irreparable middle-third perforation and found it useful in that setting. Based on our experience with primary repair, we believe that routine exclusion and diversion is not necessary.

DR URSCHEL: What do you put the T-tube in for?

DR BUFKIN: We prefer to manage the patients with irreparable injuries as a controlled esophagocutaneous fistula because it is a simple technique in a very sick group of patients. We use the T-tube to provide precise control of the esophageal secretions. It can be done easily, and we have enjoyed good results with it.

DR URSCHEL: But you have to operate on them to put the T-tube in them, and I think this increases the morbidity of the procedure. These are the cases for which you ought to be using primary repair and exclusion. This was the technique that Osler Abbott presented at the American Association of Thoracic Surgery, at which he discussed all the other papers. Dr Sweet got up and said he thought that Dr Abbott did not have a good concept. To put a T-tube in holds the perforation open. You still have to operate on them a second time anyway.

DR MANSOUR: This is in answer to Dr Urschel's question. The question is that you still have to open the chest to close the hole in the exclusion procedures. When we open the chest to close the hole, we find that the tissues are very inflamed and edematous and cannot be repaired primarily. One of our patients had
gangrene of the lower lobe of the lung, which we had to take care of as well. While we are there, we place the T tube. We are not talking about another operation. As a matter of fact, our operation is one: yours is two.

The T tube has been used very successfully, not only in this country, but also abroad. Naylor and colleagues [1] used it in 10 patients with excellent results. In rapidly deteriorating patients with gross pleural sepsis, drainage of mediastinal and pleural patients with excellent results. In rapidly deteriorating patients remains the fundamental problem of the underlying esophageal defect. In our experience, T-tube intubation led to rapid clinical stabilization with marked reduction in hospitalization. Esophageal exclusion, however, has the theoretic disadvantage of creating a distal obstruction, which might promote drainage of mucus through the perforation and will require two surgical procedures.

DR JOSEPH S. McLAUGHLIN (Baltimore, MD): Doctor Bufkin, I thoroughly enjoyed your report. It was well presented, and I believe the data are fine.

Doctor Mansour was kind enough to supply me with the manuscript yesterday, and your series is very similar to the one that we presented some years ago at this meeting. We had 64 patients at that time: 20 with perforation in the cervical region, 43 in the thoracic region, and 1 abdominal.

Our series is a bit different from yours in that we had a large number of traumatic lesions: There were 30 due to gunshots, three were traumatic lesions due to blunt trauma, and one was due to a stab wound. Nineteen patients had iatrogenic causes, or about 27% of the total series. At the time we presented our series, Dr Mansour commented that we had a 27% iatrogenic rate, and he asked how many of these Dr Attar and I had perforated. I noticed today that you had a 70% iatrogenic rate. I will not ask you about that, but I will ask Dr Mansour, as such a turnabout is fair play. Sixteen of ours were spontaneous.

We treated 30 of these patients by primary repair, and 9 by primary esophagectomy at the primary operation. Three or 4 of these had reconstruction at a later date. We drained 17 patients with late perforations who were sick and had other problems. We also used exclusion and diversion in 5 of these. Most of these people died. We used the Thal procedure in just 1 patient. There were two nonoperative cases: One man with cancer died later on, and the other got well.

We agree with your individualized approach to dealing with this problem. It is a terrible problem, and the mortality rate is high. Although we will do a primary closure after 24 hours if the tissues look good, often this simply is not the case. And in our series, there was a marked difference between those patients who we operated on early and those patients we operated on late. When operation was done in less than 24 hours and in the cervical region, 91% survived. After 24 hours, many of these patients had mediastinitis, pleuritis, and empyema, and only 60% survived. In the thoracic patients, 83% survived if we reached them in the first 24 hours. These are mostly primary repairs. We patch them. Only half of the patients survive if it is greater than 24 hours.

Finally, I am curious about the use of T tubes. It seems to me this is a very worthwhile thing, although we have not used these in this circumstance. I wondered whether these patients have late sequelae from these T tubes. If you take the mucosa out of something, it forms strictures; do these patients end up later on with strictures? Do you have to reoperate on them? Have you got a good follow-up?

DR BUFKIN: In answer to your last question, our T-tube patients have not had problems with late esophageal strictures. Reports on esophageal T-tubes from across the Atlantic, a total of 15, did not report strictures as a major finding postoperatively [1, 2].

Most of our patients, in fact two thirds of them, were diagnosed within 24 hours of the injury, and that was the case in all groups—the spontaneous, the iatrogenic, and others. The majority of patients, both those that died and those that survived, were diagnosed within 24 hours. Approximately half of the deaths occurred in patients diagnosed within the first 24 hours. An important fact that was not evident in the presentation but is in the paper is that our operative group included a set of 7 patients that were managed on their deathbeds, and 6 of these 7 patients died. All of these patients were diagnosed late, after 24 hours. As you point out, time to diagnosis remains an important predictor of survival; however, the degree of tissue injury and physiologic status of the patient are the final determinants of survival. Unfortunately, unlike time to diagnosis, these are subjective measurements that require long experience to quantitate.

With regard to iatrogenic esophageal perforation, 4 of the 48 patients had intraprocedural perforations: 2 during cervical procedures and 2 with intraoperative esophagoscopy that preceded an elective esophageal operation. Our iatrogenic injuries occurred mostly during endoesophageal procedures performed by nonsurgeons. A high rate of iatrogenic injuries has been observed in other series as well.

DR WATTS R. WEBB (New Orleans, LA): I have a couple of quick points. For upper esophageal perforations, we always perform closure; we do not just drain them. We believe there is no reason not to close them and reinforce them with a strap muscle or something else at the same time. Not enough has been said, I think, about the obstructive lesions, whether they be carcinoma or benign. I think that any time you have a perforation with a distal obstruction, you must take care of that at the time you first do your operation. If it is malignant, early or late, we resect it. We may or may not put the esophagus back together; that is, we may not do a gastric pull-up until later. But you have to get rid of the tumor then because it is your only chance of cure. If it is benign, you must take care of the obstruction at that point. We frequently have done a Thal procedure, myotomy, or something else to get rid of the obstruction and close the perforation at that time, and to make sure we have good drainage and good support.

DR BUFKIN: We would agree with those principles.

References