

Esophageal Leaks Repaired by a Muscle Onlay Approach in the Presence of Mediastinal Sepsis

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Background. Nineteen patients were evaluated after closure of intrathoracic esophageal leaks by a pediculated muscle flap onlay repair in the presence of mediastinal and systemic sepsis.

Methods. Intrathoracic esophageal leaks with mediastinitis and systemic sepsis occurred after delayed spontaneous perforations ($n = 7$) or surgical and endoscopic interventions ($n = 12$). Six patients presented with fulminant anastomotic leaks. Seven patients had previous attempts to close the leak by surgery ($n = 4$) or stenting (2) or both ($n = 1$). The debrided defects measured up to 2×12 cm or involved three quarters of the anastomotic circumference and were closed either by a full thickness diaphragmatic flap ($n = 13$) or a pediculated intrathoracically transposed extrathoracic muscle flap ($n = 6$). All patients had postoperative contrast esophagography between days 7 and 10 and an endoscopic evaluation 4 to 6 months after surgery.

Results. There was no 30-day mortality. During follow-up (4 to 42 months), 16 patients (84%) revealed functional and morphological restoration of the esophago-intestinal integrity without further interventions. One patient required serial dilatations for a stricture, and 1 underwent temporary stenting for a persistent fistula; both patients had normal control endoscopy during follow-up. A third patient requiring permanent stenting for stenosis died from gastrointestinal bleeding due to stent erosion during follow-up.

Conclusions. Intrathoracic esophageal leaks may be closed efficiently by a muscle flap onlay approach in the presence of mediastinitis and where a primary repair seems risky. The same holds true for fulminant intrathoracic anastomotic leaks after esophagectomy or other surgical interventions at the gastroesophageal junction.

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Minor intrathoracic esophageal perforations can be successfully managed without surgery, especially those occurring after instrumentation contained within the mediastinum and with minimal or no local symptoms and systemic sepsis [1]. The same holds true for small intrathoracic esophageal leaks at the anastomotic site after esophagectomy or other surgical interventions, and for contained moderate-sized leaks that spontaneously drain back into the esophagus in the absence of systemic sepsis [2]. However, any intrathoracic esophageal leak associated with mediastinal and systemic sepsis requires prompt surgical exploration, debridement of all necrotic and devitalized tissue and secure closure of the leak, irrespective of its origin. For esophageal perforations, primary repair of the esophageal defect with or without reinforcement of the suture line by vascularized tissue has been advocated for the closure of esophageal perforations even in situations of delayed diagnosis [3–5]. In contrast, esophageal exclusion and diversion, or drainage alone may be considered in critically ill patients with severe mediastinal contamination [1].

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Richardson and coworkers [6] have described the successful closure of esophageal perforations in the context of mediastinal sepsis by use of muscle flaps without attempting a primary repair in situations where direct closure of the defect was judged risky because of tissue friability. We have adopted this technique for delayed (more than 72 hours) esophageal perforation and for postoperative fulminant intrathoracic esophageal leaks with mediastinal and systemic sepsis to restore gastrointestinal continuity while avoiding esophageal exclusion. In our institution, intrathoracically transposed muscle flaps have been successfully used as airway substitutes even in the presence of empyema or infected residual pleural spaces [7–9].

This report summarizes our experience with the pediculated muscle flap onlay approach for the closure of intrathoracic esophageal leaks in the presence of mediastinal and systemic sepsis in a consecutive series of 19 patients.

Patients and Methods

Patients

From 2003 to 2008, 19 patients presented with intrathoracic esophageal leaks associated with mediastinitis and

Table 1. Spontaneous Intrathoracic Esophageal Perforations Closed by Muscle Flap Online Technique

No.	Age (years)	Cause of Leakage	Defect (cm)	Closure	Complication	Imaging/Endoscopy
1	71	Boerhaave plus RLL abscess ^a	3 × 6	LD	Prolonged MV	No leak/stenosis
2	61	Boerhaave	2 × 4	D	Decortication d10	Stenosis, stenting d32 Fatal GI bleeding d360
3	46	Boerhaave	3 × 4	D	No	No leak/stenosis
4	48	Boerhaave	3 × 4	D	No	No leak/stenosis
5	56	Boerhaave (reoperation)	4 × 6	D	No	No leak/stenosis
6	72	Boerhaave (stenting)	4 × 6	D	Prolonged MV	No leak/stenosis
7	54	Pancreatic pseudocyst	2 × 12	SA	GI bleeding d35 (ulcer)	Leak, stent d10–42, normal endoscopy

^a Right lower lung (RLL) abscess treated by lobectomy during esophageal repair.

D = diaphragmatic flap; GI = gastrointestinal; LD = latissimus dorsi flap; MV = mechanical ventilation; SA = serratus anterior flap.

systemic sepsis. There were 11 men and 8 women with a mean age of 57 years (range, 41 to 72). All patients presented with fever, hypoxemia, a catecholamine-dependent hemodynamic instability, leukocytosis, and a rise of C-reactive protein. The majority of patients (65%) were intubated at referral and had previously received broad-spectrum antibiotics. In all patients, initial computed tomography scanning revealed signs of mediastinitis with mediastinal air-fluid collections as well as an ipsilateral loculated pleural effusion with pleural enhancement. In addition, a contralateral pleural effusion was found in 80% of the patients. Contrast studies of the esophagus were performed by upper gastrointestinal tract gastrografin computed tomography in all patients and revealed signs of extravasation at the level of the intrathoracic esophagus in all patients. Flexible esophageal endoscopy was performed in all patients, except for those in whom anastomotic dehiscence was suspected, to visualize the nature and extent of the leak and to exclude additional esophageal disorders. Microbiological analy-

sis of intraoperative specimens revealed a mixed spectrum of gram-positive and gram-negative organisms in all patients and *Candida* species in 30% of the patients. During the perioperative and early postoperative phase, all patients received broad-spectrum antibiotics (namely, Imipenem). A targeted antibiotic treatment was installed according to the results obtained from microbiological analysis of the surgical specimens. Antibiotic regimens were stopped after 4 to 6 weeks of uneventful course. After the operation, the patients were transferred intubated to the intensive care unit and were progressively weaned from mechanical ventilation. All patients received parenteral nutrition at postoperative day 1 until restoration of intestinal integrity was documented on control contrast imaging on postoperative day 7 to 10. At that time point, enteral nutrition, either oral or through a feeding nasojunal catheter, was initiated progressively. Oral nutrition was started after exclusion of laryngopharyngeal dysfunction to avoid bronchoaspiration-related pneumonia. All patients received thrombosis prophylaxis

Table 2. Postoperative Esophageal Leakage Closed by Muscle Flap Onlay Technique

No.	Age (years)	Cause of Leakage	Defect (cm)	Closure	Complication	Imaging/Endoscopy
8	49	Lewis esophagectomy	2 × 3 or ½ A ^a	SA	Left EB fistula ^c	No leak/stenosis
9	55	Lewis esophagectomy	2 × 3 or ½ A	SA	Prolonged MV	No leak/stenosis
10	60	Lewis esophagectomy	3 × 5 or ¾ A	SA	No	No leak/stenosis
11	50	Gastrectomy	2 × 3 or ½ A	D	No	No leak/stenosis
12	41	Gastrectomy	3 × 5 or ¾ A	D	Septic vein thrombosis	No leak/stenosis
13	54	Bypass (reoperations)	3 × 5 or ¾ A	D	No	No leak/stenosis
14	58	Diverticulum (reoperation)	2 × 5	D	No	No leak/stenosis
15	70	Nissen (reoperations plus stent)	3 × 4	D	No	No leak/stenosis
16	45	Dilation achalasia (stent)	3 × 5	D	No	No leak/stenosis
17	72	Dilation caustic stricture	3 × 8	D	Lung abscess	No leak/stenosis
18	51	Cervical resection ^b	3 × 4	PM	No	Stenosis, 4 × dilation, normal endoscopy
19	61	Right inferior bilobectomy	3 × 10	D	Prolonged MV	No leak/stenosis

^a Anastomotic disruption: size of defect in relation to the anastomotic circumference.

^c Esophagobronchial (EB) fistula closed by pedicled intercostal muscle flap.

^b Thyroidectomy and partial esophagectomy for thyroid cancer.

D = diaphragmatic flap; MV = mechanical ventilation; PM = pectoralis muscle flap; SA = serratus anterior muscle flap.

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