Treatment of intrathoracic esophageal anastomotic leaks by means of endoscopic stent implantation

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Abstract

Intrathoracic anastomotic leakage in patients with esophagectomy is associated with high morbidity and mortality. Until recently surgical reexploration was the preferred way of dealing with this life-threatening complication. But mortality remained significant. After the first successful reports we adopted endoscopic stent implantation as a primary treatment option. The aim of this study was to investigate the feasibility and the results of endoscopic stent implantation. Between January 2004 and December 2009, 167 patients underwent an esophageal resection. Surgery was mainly the result of esophageal cancer. An intrathoracic esophageal anastomotic leak was endoscopically verified in 17 patients. Twelve patients received an implantation of a self-expanding stent as a primary treatment. An endoscopic stent placement was accomplished in all 12 patients. In nine patients a definitive closure of the leak was achieved and the stent could subsequently be removed. Two patients died due to severe sepsis in spite of sufficient stent placement. Because of early recurrence of very malign small cell cancer the stent remained in situ in one patient. In conclusion, stent implantation for intrathoracic esophageal anastomotic leaks is feasible and compares favorable with the results of surgical reexploration. It is an easily available minimally-invasive procedure which may reduce leak-related mortality and morbidity.

Keywords: Esophageal cancer; Esophagectomy; Intrathoracic anastomotic leakage; Self-expanding stent; Endoscopic stent implantation; Sepsis

1. Introduction

In the past two decades the outcome in esophageal surgery has constantly improved [1, 2]. In specialized esophageal surgery units morbidity and mortality have been considerably reduced [1]. Notwithstanding this favorable trend anastomotic leakage remains a major source of death after esophagectomy [3]. Particular intrathoracic anastomotic leakage is associated with high morbidity and mortality. The lethality of this devastating complication is up to 40% [3–6]. Until recently surgical reexploration was the preferred way of dealing with this life-threatening complication. But the results have not been convincing and in some studies surgical treatment of esophageal anastomotic leaks has led to high mortality [4]. While sepsis source control, sufficient drainage of the leakage and prevention of further mediastinal contamination are generally accepted aims of the immediate treatment the way to achieve these goals remain controversial [3]. Conservative treatment of minor leaks became an established treatment alternative [7] and in the recent years we have also seen the first reports of successful endoscopic stent insertion in patients with intrathoracic esophageal anastomotic leaks [8]. Therefore, we adopted an endoscopic placement of a self-expanding metal stent as a primary treatment option in patients with endoscopically verified intrathoracic anastomotic leaks if there was no ischemia or necrosis of the pulled up gastric tube. The aim of this study was to investigate the feasibility and the results of endoscopic stent implantation.

2. Patients and methods

2.1. Patients

The study includes 167 consecutive patients who underwent an esophageal resection between January 2004 and December 2009 at the Department of General and Thoracic Surgery of the Klinikum Nuernberg Nord. The median age was 61.8 years and there were 142 male (85%) and 25 female (15%) patients.

The main reason for surgery was esophageal cancer: there were 73 squamous cell carcinomas (43.7%), 66 adenocarcinomas of the esophagogastric junction (AEG) type I (39.5%), 19 AEG type II (11.4%), which is a cancer of the gastric cardia with involvement of the distal esophagus [9–11], four other malignant tumors (2.4%) and five benign lesions (3.0%) (Table 1).
Table 1. Histological classification of tumors

<table>
<thead>
<tr>
<th>Histology</th>
<th>Total number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamos cell carcinoma</td>
<td>73</td>
<td>43.7</td>
</tr>
<tr>
<td>Adenocarcinoma of the esophagogastric junction type I (adenocarcinoma of the distal esophagus)</td>
<td>66</td>
<td>39.5</td>
</tr>
<tr>
<td>Adenocarcinoma of the esophagogastric junction type II (adenocarcinoma of the gastric cardia with involvement of the esophagus)</td>
<td>19</td>
<td>11.4</td>
</tr>
<tr>
<td>Neuroendocrine esophageal cancer</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Adenosquamous carcinoma</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Leiomyosarcoma of the esophagus</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Benign lesions</td>
<td>5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

A total of 39 patients (23.4%) received neoadjuvant therapy, either neoadjuvant chemoradiotherapy in the presence of squamous cell carcinoma or neoadjuvant chemotherapy alone in the case of adenocarcinoma of the distal esophagus or the gastric cardia (AEG type I and II).

In 125 patients an abdomino-thoracic esophagectomy with gastric pull up and intrathoracic-stapled anastomosis was performed (74.9%). Furthermore, four transmediastinal esophagectomies (2.4%), 15 extended total gastrectomies with transhiatal resection of the distal esophagus and intrathoracic-stapled esophago-jejunostomy (9%), 12 trans-thoracic esophagectomies with delayed reconstruction (7.2%) and 11 other procedures (6.5%) were carried out. All patients routinely received thoracic epidural analgesia for improved postoperative pain control.

2.2. Diagnosis of anastomotic leakage

An intrathoracic esophageal anastomotic leak was endoscopically verified in 17 patients. If leakage of the intrathoracic anastomosis was clinically suspected it was always identified by endoscopy and computed tomography (CT) of the chest and abdomen. Only endoscopically verified leakages are part of this study.

2.3. Stent insertion

A self-expanding, covered metal stent (Ultraflex™, Boston Scientific™, Natick, MA, USA) was used to close the anastomotic leak. The stent placement was performed by a gastroenterologist well trained in interventional endoscopy. The exact position of the leakage was marked on the patients skin and afterwards the stent was inserted under radioscopical guidance. After implantation the correct placement of the stent and the successful closure of the leak were always endoscopically and radioscopically checked (Figs 1–4).

3. Results

In 12 out of the 17 endoscopically verified intrathoracic anastomotic leaks endoscopic implantation of a self-expanding metal stent was successfully accomplished (Table 2). Rethoracotomy was mandatory in the five other cases because of either necrosis and ischemia of the pulled up gastric tube or advanced pleural empyema that required surgical debridement.

After stent placement contrast swallow esophagography and endoscopy showed a complete sealing of the anastomotic leak (Figs. 1–4). Stent migration occurred but endoscopic reintervention was always feasible.

All patients were treated at the intensive care unit and received sepsis therapy including antibiotherapy, hemody-
amic monitoring and management, hemofiltration if necessary and adjunctive therapies. Physiotherapy and inhalation with positive airway pressure were administered as soon as possible. Tube thoracostomy was performed in all patients and some patients received irrigation of the pleural cavity with Ringer solution via the inserted chest tubes.

Besides stent dislocation, which could always be corrected endoscopically, one severe and lethal complication occurred. One patient developed a stent related erosion of the aorta thoracica 17 days after stent insertion which led to a fistula between the aorta and the esophagus. The patient died of sudden massive hemorrhage. The aortic erosion and the consecutive fistula were confirmed by autopsy.

Stent removal was performed in 10 patients routinely. After stent explantation the underlying mucosa showed neither necrosis nor severe morphological changes. However, mucosal hyperproliferation was observed at the stent margins. In nine patients endoscopy showed no sign of leak persistence. In one case after stent removal a tiny fistula with a diameter of c. 3 mm was detected and successfully sealed with cyanoacrylate glue. In spite of accomplished healing of the anastomotic leakage one patient died 24 days after successful stent explantation because of massive pulmonary aspiration.

In one case the stent remained in situ. The 47-year-old patient suffered from a extremely malignant G4 neuro-endocrine and small cell cancer of the esophagus. Because of anastomotic leakage a stent was inserted and closure of the leak was successfully achieved. The patient was then transferred to a rehabilitation clinic. About three months later he complained about pain and a cancer recurrence in the mediastinum was diagnosed. He died six months after the initial esophagectomy because of rapid progressing cancer with local recurrence and distant metastasis.

The in-hospital mortality was 16.7% (2/12), in 10 patients (83.3%) successful closure of the anastomotic leakage was achieved and the patients were transferred to rehabilitation facilities and finally discharged home.

4. Discussion

Advances in surgical technique and perioperative care including intensive care and anesthesia has improved the outcome in esophageal surgery in the last decades. This has been attributed to the development of specialized

Table 2. Characteristics of patients with stent implantation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients treated with endoscopic stent implantation</td>
<td>12</td>
</tr>
<tr>
<td>Median age</td>
<td>59.5 years</td>
</tr>
<tr>
<td>Squamos cell carcinoma</td>
<td>2</td>
</tr>
<tr>
<td>Adenocarcinoma of the esophagogastric junction type</td>
<td>8</td>
</tr>
<tr>
<td>Neuroendocrine esophageal cancer</td>
<td>2</td>
</tr>
<tr>
<td>Neoadjuvant chemoradiotherapy</td>
<td>1</td>
</tr>
<tr>
<td>Stents explanted</td>
<td>10</td>
</tr>
<tr>
<td>Median time between stent implantation and final explantation</td>
<td>48.4 days (16–99 days)</td>
</tr>
</tbody>
</table>
esophageal surgery units with greater experience, selection of patients and refinement and standardization of surgical procedures and perioperative management [1, 2]. The in-hospital mortality after esophageal resection has decreased from 29% to 7.5% in the period between 1950 and 2000 [1, 2, 7]. Notwithstanding this favorable trend, anastomotic leakage is still the most common severe postoperative complication [3, 7]. Intrathoracic anastomotic leaks account for c. 40% of postoperative deaths after esophagectomy [6]. The fatality of this crushing complication is up to 40% [3–6]. If proper drainage of the anastomotic leakage is not achievable the fatality reaches 80% [3]. Surgical reexploration is associated with a high mortality between 60% and even 100% [4, 12]. Because of this unfavorable result conservative treatment options with drainage, total parenteral nutrition, nasogastric decompression and antibiotic therapy have been suggested [6, 7]. The problem with this conservative treatment is the continued pollution of the mediastinum and the pleural cavity through the anastomotic leak. This accounts for mediastinitis, pleural empyema and sepsis. The mortality rate of this conservative treatment has been similar to surgical reexploration and up to 40%. For this reason conservative treatment without endoscopic closure of the leak is nowadays only accepted in small anastomotic dehiscences which are well drained [3, 6].

Therefore, adequate external drainage of the leak as well as prevention of further mediastinal contamination are the primary therapeutic goals in the management of intrathoracic anastomotic leakage [3]. While sufficient drainage can be achieved by tube thoracostomy or interventional drainage the best way to prevent further pollution and contamination of the mediastinum remains controversial.

Several endoscopic devices have been suggested for closure of anastomotic leaks. For example endoscopic clipping or endoscopic sealing with cyanoacrylate glue [8, 13–15]. However, all these techniques are again only feasible and practical in small leaks and so the problem of larger dehiscences remains unsolved.

Self-expanding endoscopic stents have been successfully used in the treatment of inoperable esophageal obstructions. The first reports of endoscopic stent implantation in the treatment of intrathoracic anastomotic leaks after esophagectomy have been published [8]. Self-expanding, covered metal stent (e.g. Ultraflex™) can close leaks regardless of size as long as the pulled up gastric tube is not ischemic and there is no complete dehiscence of the anastomosis.

As a result, in the Department of General and Thoracic Surgery at the Klinikum Nuernberg we changed our treatment approach for anastomotic leaks in January 2004 and adopted endoscopic stent insertion as the primary treatment option. The aim of this study was to investigate the feasibility and the results of endoscopic stent implantation. The study includes 167 consecutive patients who underwent esophageal resection between January 2004 and December 2009.

The rate of postoperative anastomotic leakages was 10% (17/167). This is comparable to other series, where in the last two decades anastomotic leakage rates between 4% and 11% have been reported [13].

If leakage of the intrathoracic anastomosis was clinically suspected it was always identified by endoscopy and CT of the chest and abdomen. All 17 anastomotic leaks were endoscopically verified.

The convincing advantage of endoscopy over radiographic contrast-medium swallow in the diagnosis of intrathoracic anastomotic leakage is the possibility of direct visual examination of the anastomosis, quantification of the leak and determination whether the pulled up gastric tube is ischemic or not [3, 8]. Therefore, an immediate decision whether endoscopic stent insertion is feasible or not can be made out of the endoscopic inspection of the leakage. In addition to the endoscopy a CT of the chest and abdomen is mandatory to rule out advanced pleural empyema or mediastinal abscess which would require either percutaneous interventional or surgical drainage.

In 12 patients an endoscopic stent insertion was successfully accomplished. Immediate closure of the leak was achieved in all 12 patients. In five patients either because of necrosis of the pulled up gastric tube or because of advanced pleural empyema and subsequent severe sepsis or even septic shock a rethoractomy was mandatory. In such cases a surgical reexploration with take down of the anastomosis, resection of the ischemic gastric tube as well as debridement and irrigation of the pleural cavity are unavoidable [5, 6, 12].

There was one devastating stent-related complication. One patient developed an erosion of the aorta thoracica which led to a fistula between the aorta and the esophagus. The patient died due to sudden massive hemorrhage. However, such septic vascular erosions are a rare but not unknown complication of anastomotic leaks with consecutive contamination of the mediastinum [12]. They are not restricted to patients with implanted stents but can be seen in all patients with intrathoracic anastomotic leaks independent of their initial treatment. Nevertheless stents might be an additional risk for vascular erosion because of the mechanical alteration of the surrounding tissue.

Another patient died because of severe pulmonary aspiration 24 days after successful stent explantation. The total in-hospital mortality was 16.7% (2/12).

This in-hospital mortality of only 16.7% is comparable with reports of other groups, that describe a mortality of c. 25%, and is far better than the outcome of conservative therapy without a stent, where a fatal outcome in up to 40% of patients is to be expected.

The anastomotic leaks of 83.3% of the patients (10/12) were successfully managed by stent insertion. All these patients were transferred first to a rehabilitation facility and were finally discharged from hospital. Out of these 10 patients nine had an excellent outcome. The stents were removed in these patients and proper oral food intake was possible. Stent removal could be performed without complications. One younger patient (47 years) with an exceptional malignant neuroendocrine and small cell carcinoma of the esophagus suffered from an early cancer recurrence in the mediastinum with involvement of the trachea. Hence, the stent remained in situ to prevent a esophago-tracheal fistula and to secure the oral ingestion of food. The patient died c. six months after initial esophagectomy due to local cancer progress and distant metastasis. However, this death
was not related to the anastomotic leak but represents the extreme malignity of the underlying disease.

In conclusion, this outcome study shows that successful treatment of intrathoracic anastomotic leaks after esophagectomy by means of endoscopic stent insertion is feasible with good results regarding closure of the leak and recovery of the patients.

References


eComment: Treatment of thoracic anastomotic leaks after esophagectomy

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We have read with interest the report by Michael Schweigert and colleagues on self-expanding stent as primary treatment of intrathoracic leak after esophagectomy [1].

Controversies still exist regarding the best treatment in cases of post-esophagectomy anastomotic leak. When this complication occurs, the related mortality rate can reach more than 60% also due to lack of standardized treatment algorithm [2]. The comprehensive classification from Lerut and co-workers [3] provides a good stratification in the case of esophageal fistulas.

We agree with the authors that the use of modern endoscopic techniques would potentially reduce morbidity but we consider this into a multidisciplinary therapeutic algorithm based on a specific classification of the fistula that can be resumed as I) subclinical (drainage passage of methylene blue solution, without a clear radiological confirmation); II) minor (radiologically proven fistula with minor clinical complications); III) major (radiologically proven fistula with major clinical complications); IV) complete (gastric necrosis). Therefore, we generally use the self-expanding stents as primary choice only in the treatment of major intrathoracic leak or after unsuccessful conservative treatment of cervical anastomotic leaks in transthiatal esophagectomy. According to encouraging results in the closure of intrathoracic anastomotic leakage reported by the authors, it would be very useful to keep in mind the definite size of the ‘leak’ in the selection criteria for stent placement, this crucial data being not mentioned by the authors themselves.

Finally, although the obvious benefits of self-expanding prosthesis in intrathoracic fistulas, we believe that transthiatal esophagectomy, when technically feasible, could represent the safest procedure to substantially decrease the mortality rate of anastomotic leaks [4].

References


eComment: Intrathoracic esophagogastric anastomotic leakage following esophageal surgery

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We have read with great interest the article by Schweigert et al. concerning the treatment of intrathoracic esophageal anastomotic leaks by means of endoscopic stent implantation [1].

An important issue which is not clarified by the authors, is the relation between the fistula size and success of the proposed method, as well as the optimal time for stent removal.

We also have three points for interactive discussion. The first point is that successful sealing of the leak is gratifying and important but it is not the complete management of an esophageal leakage. Other important components are the drainage of extraluminal fluid collections, decortication for pleural sepsis and separation of esophagus from adjacent structures, such as the aorta or airway, with vascularized tissue making the choice of the appropriate method of management difficult and debatable. The second point is how much we trust the scar that results from the stent alone. Another issue we would like to highlight is the reinforcement of esophagogastric anastomosis during surgery with vascularized tissue (pleural tenting or muscular flap) in order to prevent leakage.

Reference