Gastric bypass for malignant esophagotracheal fistula
A series of 21 cases

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 Abstract

 Objective: Patients with cancer of the esophagus who develop an esophagotracheal fistula die within 1 month in dramatic conditions of malnutrition and asphyxia. We assessed the beneficial palliative effect of the Kirschner operation in the treatment of esophagotracheal fistula.

 Methods: Between January 1980 and August 1995, 21 patients among a continuous series of 847 with cancer of the esophagus developed an esophagotracheal fistula. Prior to surgery, 2 patients had an esophageal prosthesis followed by radio- or radiochemotherapy and 6 had radio- and/or chemotherapy at curative doses. The Kirschner operation was carried out in all patients with exclusion of the lower end of the esophagus using a Roux-en Y-loop (n = 19) or ligature (n = 2).

 Results: Within 1 month of surgery, 8 patients (38%) died. Median length of stay in the intensive care unit and hospitalization was 6 days (1–30) and 17 days (3–57), respectively. Among the 13 survivors, pulmonary infections (n = 2) and cervical fistulae (n = 5) complicated the postoperative period. Among the cervical fistula, 3 of them resolved favorably. Radio- and/or chemotherapy was given postoperatively in 7 patients without any improvement in survival. Among the 13 patients surviving beyond the postoperative period, median survival was 109 days; 7 were able to resume oral nutrition and quality of life was assessed as excellent in 6 of them.

 Conclusion: The Kirschner operation can provide a beneficial palliative effect in patients with an esophagotracheal fistula despite the high risk of operative mortality. Ideally, the Kirschner should be carried out in young patients who are still in good general health, before the development of respiratory complications compromises surgery. © 1998 Elsevier Science B.V. All rights reserved.

 Keywords: Cancer of the esophagus; Kirschner’s operation; Esophagotracheal fistula

 1. Introduction

 Cancer of the esophagus is usually diagnosed at an advanced stage because the neoplasia develops silently in an extensible organ. Dysphagia, generally the first manifestation of the disease, therefore occurs late after extensive local invasion. Some cases are complicated by the formation of a fistula between the esophagus and the trachea, leading to death within 1 month [1] in a dramatic state of malnutrition and asphyxia. At the risk of high operative mortality, patient suffering can be relieved by bipolar exclusion of the esophagus and gastric bypass as described by Kirschner [2], greatly improving quality of life during the survival period. The aim of this work was to assess our results [3,4] in patients with an esophagotracheal fistula who undergo gastric bypass surgery.
2. Patients and methods

Between January 1980 and August 1995, 847 patients underwent surgery for cancer of the esophagus. The Kirschner operation (Fig. 1) was carried out in 21 (2.4%) of these patients who had an esophagotracheal fistula. All 21 patients had a symptomatic esophagotracheal fistula. Patients with tracheobronchial invasion without a fistula were excluded.

Of these 21 patients, all men (mean age 59.2 ± 9.1 years, range 37–74), 19 (90.4%) had a squamous cell carcinoma and 2 an adenocarcinoma located in the upper (n = 4), middle (n = 16), or middle and lower (n = 1) third of the esophagus. All were undernourished and in poor general health. Mean weight loss was 13.3% over 4.6 ± 2.3 months (1–10). In 19 cases, surgery was the first therapeutic procedure, and in 2 patients, the fistula was treated first with esophageal prosthesis. Clinical manifestations at operation are presented in Table 1. Physical examination, radiography and CT imaging did not reveal any evidence of distant metastasis. The esophagotracheal fistula was evidenced by bronchial endoscopy (8/20), esophageal endoscopy (8/21), and barium studies (15/19). Localizations are shown in Fig. 2. Endoscopy of the airways in 16 patients revealed generalized inflammatory changes with mucosal redness and edema and copious mucopurulent secretions. In 6 patients (28.5%) the fistula occurred during or after completion of radio- and/or chemotherapy (Table 2).

Before bypass surgery, all patients were rehydrated and given exclusive parenteral nutrition. Antibiotics targeted at pulmonary infections were also prescribed together with endoscopy aspirations and respiratory physical therapy (including postural drainage). Between 1980 and 1986, 13 patients (62%) were operated, and only 8 between 1987 and 1995.

The Kirschner operation was carried out in all patients with retrosternal tubulization of the stomach and exclusion of the lower end of the esophagus using a Roux-en Y-loop (n = 19) or ligature (n = 2). In these 2 cases the lower end of the esophagus was not suitable. During this same study period, the colon was used for the retrosternal bypass in 3 patients (not included in this series) due to the lack of a usable stomach (earlier MacKeown, 2/3 gastrectomy for ulcer, descending tumor on the cardia). A pyloroplasty and a jejunostomy were installed in all 21 for enteral renutrition. The anastomosis was done manually in 13 (62%) patients and with an automatic stapler in 8. Previous transtumoral intubation in 2 patients was removed via the lower end of the esophagus before or during the procedure. All patients entered the intensive care unit after surgery and were extubated as soon as respiratory status was compatible with spontaneous ventilation. Gastric aspiration was maintained for a long period to avoid distending the retrosternal stomach and to minimize the risk of cervical fistula. Oral nutrition was resumed when possible at 10–12 days postoperatively, without prior barium study, in combination with adapted enteral nutrition.

Fig. 1. Modified double-bypass esophageal technique.

Fig. 2. The fistula involved the trachea (n = 11), the primary left bronchus (n = 5), the primary right bronchus (n = 3), or the carena (n = 2).

Table 1

<table>
<thead>
<tr>
<th>Manifestations</th>
<th>n (%)</th>
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<tr>
<td>Dysphagia</td>
<td>19 (90)</td>
</tr>
<tr>
<td>Intractable cough</td>
<td>14 (67)</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>10 (48)</td>
</tr>
<tr>
<td>Major false passage</td>
<td>10 (48)</td>
</tr>
<tr>
<td>Lung abscess</td>
<td>1</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Hematemeses</td>
<td>2</td>
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</tbody>
</table>
3. Results

Mortality at 1 month was 38% (8/21). Death was caused by major respiratory failure (n = 4), heart failure (n = 1), respiratory distress followed by cervical fistulae (n = 2), and in 1 patient who could not be extubated, by protrusion of the esophageal wall through a large esophagotracheal fistula which occluded the airway at inspiration.

Median length of stay in the intensive care unit was 6 days (range 1–30 days) and median hospitalization was 17 days (range 3–57). Overall median survival was 55 days (range 3–492) (Fig. 3). Excluding operative deaths (at 1 month), median survival was 110 days. Median age of the patients who died during the first month was 63 years (52–74), higher (but not significant, Mann–Whitney U test) than that of patients who survived beyond the postoperative period (56 years, range 37–70). Of the 8 who died postoperatively, 4 had been previously treated with radio-and/or chemotherapy. Among the patients who survived surgery, 2 had major pulmonary infections during the postoperative period and 5 developed a cervical fistula on an anastomosis which had been made manually. Of the patients with a cervical fistula, 3 were able to resume oral nutrition at 17, 30 and 54 days. Oral nutrition had never been achieved in the fourth patient, and anastomosis stenosis developed in the last patient requiring definitive esophagostomy. Considering all 7 of the observed fistulae, 6 occurred after manual anastomosis (among 13 carried out, i.e. 46%) and only 1 occurred after mechanical anastomosis (among 8 carried out, i.e. 12.5%). Adjuvant therapy was given in 7 patients during the postoperative period: 3 had radiotherapy, 3 chemotherapy, and 1 radiochemotherapy. During the chemotherapy protocol 2 patients died due to pneumonia. Median survival in patients given radio- and/or chemotherapy was 109 days (range 34–492), similar to that in those without postoperative treatment (202 days, range 62–420). Among the 13 patients who survived the postoperative period, 7 were able to resume normal oral food intake and 3 were able to eat chopped food. Quality of life was assessed as excellent in 6 patients (nearly normal lifestyle at home), acceptable in 4 (not hospitalized but bedridden at home), and poor (hospitalization) in 3. All the patients in this series have died, 11 caused by the underlying disease and 2 by respiratory complication during chemotherapy. Actuarial survival was calculated by the Kaplan–Meier method (Fig. 3).

4. Discussion

Malignant esophagotracheal fistulization creates an abnormal passage between the esophagus and the bronchus or trachea with a dramatic effect on nutritional status and pulmonary function. Transtumoral intubation is usually the best management option. Only a small number of surgical series have been reported. In 1970 Ong and Kwong [5], proposed radical surgery but at the cost of major operative mortality and with little benefit for the patient. Another possibility is a palliative procedure to exclude or bypass the esophagus.

Bipolar exclusion alone was first described [6], but operative mortality was very high [7] and quality of life was unacceptable and this type of definitive palliative surgery was abandoned. In the series reported by Ong [8], digestive tract continuity could be reestablished in only 1 of 15 patients. Presently, interest in this technique, applicable in very deteriorated patients, appears to have subsided with the advent of improved endoluminal material and the reintroduction of the Kirschner operation by Ong [9] in 1973. Bypass can be achieved with the stomach or the small or large bowel, but we prefer the Kirschner operation first described in 1920 [2] for benign stenosis of the esophagus. Our results show that this technique provides a good palliative effect though at the cost of substantial hospital mortality of 38%. There are several explanations for this high operative mortality which varies according to the series (Table 3). First of all, our patients were malnourished and in poor general health. In addition, the fact that all of our patients had a symptomatic esophagotracheal fistula, worsened the operative risk. Other authors [8], in order to reduce surgical mortality, reserve the Kirschner procedure for patients with better prognosis. As the predominant cause of death is respiratory failure resulting from fulminant bronchopneumonia, one way to reduce operative mortality would be to exclude patients with a high risk of respiratory infection. Prolonging the respiratory preparation does not improve the situation [7].

This procedure could be proposed to patients with fistula located in the thoracic esophagus even in the upper third. Obviously patients with fistula involving the cervical esophagus could not benefit from this technique. Certain authors use the entire stomach [10] in combination with an anti-reflux procedure while others

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Table 2
Preoperative radio- and/or chemotherapy before bypass

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
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<tbody>
<tr>
<td>RC at curative doses</td>
<td>3</td>
</tr>
<tr>
<td>R alone</td>
<td>3</td>
</tr>
<tr>
<td>Esophageal prosthesis + R ± C</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
</tr>
</tbody>
</table>

RC, radiochemotherapy; R, radiotherapy.

*One fistula developed during treatment; b R discontinued for 2 patients.
prefer the gastric tube which can be easily ascending to the neck [12] without excessive compression in the anterior mediastinum. Still others [13,14] use an isoperistaltic gastric tube modeled from the greater curvature of the stomach. Postlethwait [14] reported a series of 30 patients, including 5 with an esophagotracheal fistula. His operative mortality was 13% (4/30) with 13 (43%) cervical fistulae including 10 which followed a favorable course. An equivalent mortality (15%) was reported by Maillard in his series of 20 cases [13]. The main drawback with the technique is that gastroesophageal reflux could favor or maintain cervical fistulization. In order to reduce the very high risk of anastomotic cervical fistulae and the risk of compression on the retrosternal stomach, certain authors propose partial exeresis of the clavicle and manubrium sterni [10]. As have others [9,10], we have observed that the fistulae are usually temporary, rarely the cause of death and generally resolve within less than 1 month with medical treatment (nasogastric aspiration and enteral nutrition). Fistulization after the mechanical anastomosis is less frequent than after manual anastomosis as reported earlier [15] and confirmed in this series although the difference was not significant. In our opinion, bypasses with the small or large intestine are indicated only when the stomach cannot be used. The colon requires several anastomotic junctions and raises the risk of necrosis [16] even if mortality is similar. Jejunal bypass is rarely used in Europe, either with transplants revascularized with the lower thyroid pedicle, which imposes the risk of venous thromboses due to the past history of smoking, or with the jejunum after sectioning the secondary arcades and saving the primary arcade to vascularize the plasty [17]. Ong et al. [18] emphasize the need for a subcutaneous transplant in order to eliminate the risk of prolapus into the pleural cavity leading to volvulus and strangulation. This type of bypass is a high risk procedure since Ong, who recommends gastric bypass, reported a 27.7% mortality with bowel bypass and others a much higher mortality reaching 67% [19]. Draining the lower esophagus may also be important, but for many authors its drainage into the abdomen is unnecessary since it is unlikely that a esophageal mucocele would rupture during the short survival period [20]. Inversely, others prefer drainage, especially in patients with an esophagotracheal fistula. The absence of mucusal secretion in the esophagus theoretically justifies bipolar exclusion, but accumulation of neoplastic secretions or suppurations can form a true mucocele. This mucocele could rupture and flow into the abdomen creating acute peritonitis and requiring reintervention.

Theoretically the Kirschner operation as modified by Ong [9] eliminates false passages and the risk of asphyxia, allowing normal food intake. The operative mortality, however, is great and in our experience highly related to patient selection since 50% of our deaths were caused by respiratory complications. In addition, the Kirschner operation allows subsequent radiochemotherapy and is compatible with long survival (6 years 4 months for one case reported by Wong [21]) and excellent patient comfort (normal oral food intake and no symptomatic esophagotracheal fistula). In case of recurrence, tumor extension no longer has a direct effect on nutrition or respiratory function.

It is now accepted that prostheses [22] should be used for patients with neoplastic esophagotracheal fistulae, and today the majority of these patients can be treated with these less invasive methods using coated expandable esophageal stents blocking adequately the fistula while allowing feeding capacity. But in some cases their placement is unsuccessful or the prosthesis could migrate. Moreover the tolerance of such endoprostheses in patients previously irradiated [23] is questionable, some cases of ischemic necrosis having been described. In such cases and in young patients in relatively good health with recent fistulization, palliative stomach bypass before respiratory complications aggravate their
Despite better awareness of symptoms and easier access to diagnostic techniques such as flexible endoscopy, diagnosis of esophageal carcinoma is often made in an advanced stage. In a number of those patients, therapy will be strictly palliative. What procedure constitutes best palliation for such patients remains controversial. This is especially the case for patients with malignant tracheo- or bronchoesophageal fistula.
fistula presenting themselves usually with severe malnutrition, disabling cough, and asphyxiating bronchopneumonia due to aspiration of saliva and food particles. Although life expectancy is no more than a few weeks or a couple of months, the agony of these patients is often considered unbearable and humiliating, prompting doctors to lessen symptoms even at a price of high procedure-related mortality. Surgical palliation of malignant tracheoesophageal fistula therefore remains, even today, despite major advances in surgical techniques and peri-operative management, a major challenge. Indeed the surgeon’s goal is to get the patient out of the hospital within a reasonable time after the operation and with as few complications as possible and enabling him or her to live and die in dignity if possible within his or her family environment.

Although a malignant tracheoesophageal fistula remains, fortunately enough, a quite uncommon phenomenon, a rise in incidence is to be expected as a result of increasing use of chemoradiotherapy regimens to downstage voluminous esophageal tumours. Therefore the experience as reported by Meunier et al. in this paper deserves our attention.

In view of the complexity of the problems the authors were able to obtain very good results reflecting their wide experience in dealing with the treatment of esophageal carcinoma in general. The 30-day mortality was ‘only’ 38% and among the 13 patients surviving beyond the postoperative period, 7 were able to resume oral nutrition, and quality of life was assessed as excellent in 6 of them.

However, we can argue that today a 38% 30-day mortality has become unacceptable and that in view of the actual health care economics, the costs of such a major surgical procedure are to be considered too high.

The major concern is definitely related to the quality of life. Indeed besides the procedure-related mortality a major complication was seen in 7 patients: 5 cervical anastomotic leaks, and 2 major pulmonary complications. Needless to say, these complications, although resolved within less than 1 month, were compromising the quality of life for a substantial length of the patients’ remaining days.

Furthermore, although 7 patients were able to resume normal oral food intake and 3 others were able to take chopped food, 3 patients never were discharged from the hospital, and 4 patients remained bedridden, i.e. probably too weak to improve their condition and to enjoy the remainder of their life.

So only 6 (28.5%) patients really met the criteria of meaningful palliation. One can only assume that in the hands of a less-experienced surgical team the outcome would be even more gloomy.

As a result it is not surprising that over the last decade much attention has been paid to developing other, less radical procedures to palliate malignant tracheoesophageal fistula. Traditionally, stenting has been proposed as a valuable alternative to palliative surgery. Stents nowadays are easy to position through flexible endoscopy and can be carried out as an outpatient procedure. The overall procedure-related mortality is below 5% and 30-day mortality is around 10%. The major drawbacks of stenting for esophageal malignancy in general are displacement, ±10%; obstruction, ±2%; perforation, 5%; and occasional bleeding. Almost all patients are able to swallow a liquid or soft diet and to avoid the risk of obstruction a solid diet is usually not allowed or attempted. Another difficulty specifically related to malignant tracheoesophageal fistula has been persistent leaking of saliva and food particles between stent and esophageal wall resulting in an unsatisfactory relief of aspiration and aspiration-related symptomatology. Over the last few years however, major improvements were obtained through the development of the so-called self-expandable soft seal wall stents. These stents, once in position, expand within their environment and are therefore tightly fitting within the esophagus. As a result these stents have little tendency to dislocate or to cause ischemic necrosis and are therefore very efficient in sealing off adequately the fistula on a permanent basis. Moreover, the shape of these stents allow adequate positioning even in high cervical tumours, and they are well-tolerated even when the tumour is located just below the cricopharyngeal muscle. The only drawback of these stents is their high cost. It is clear that the authors’ experience as reported in this issue dates from a period before the development of these new generation of stents. But it is equally clear that today the indication for surgical palliation of malignant tracheoesophageal fistula is becoming increasingly superfluous. Only in case of a very large fistula, when permanent positioning might become problematic, is surgical palliation using a bypass procedure to be considered, provided the patient is still in good general condition, and provided general anesthesia and orotracheal intubation is technically feasible.