

Surgical Consideration of Esophagectomy Combined with Tracheobronchoplastic Procedure for the Treatment of Esophageal Cancer

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Four cases who underwent a resection of the esophagus in combination with tracheo-bronchoplasty were reported in evaluating an operative efficacy as well as in overcoming a surgically bothersome problem.

- 1) Obliquely cutting edges of the bronchial stumps, which can adjust to fit the anastomosed bronchi, are a weak point of their approximations because of loss of the supporting ability of the cartilages as indicated in case 1.
- 2) Combined resection of the esophagus with the bronchus seems to reduce the blood flow in the bronchial anastomotic site. One must account into consideration that bronchial wrapping with the pleura may inhibit a new development of vascular networks in the bronchial anastomosis as shown in case 2.
- 3) Irradiation of as large 60 Gy interferes with the healing process due to damages of severely fibrous changes with a finding of vasculitis to the bronchial wall as presented in case 3.
- 4) Inevitable truncal vagotomy by a resection of the esophagus leads at times to bile stasis, followed by cholecystitis and bile-transudation peritonitis, reflecting serious operative

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insult as exhibited in case 4.

INTRODUCTION

Great strides in the treatment of esophageal cancer have been achieved with advanced in diagnostic techniques, and pre- and postoperative cares.

Most of esophageal cancer patients are impossible to allow food and/or fluid intakes by mouth. Therefore, it is taken into account that only a desperate surgery warrants palliation and allowance of oral intake of food as far as possible, even if a surgical efficacy may last for a short period of time and lose their radical nature of surgery.

The esophagus is anatomically specific of a composition of the adventitia on its outer, which is voiding the serosa. Consequently the esophagus is susceptible to cancer invasion, which extend easily outwards across its wall. In advanced cases, therefore, combined resections with the involved adjacent organs such as the bronchus, lung and descending aorta have become necessary to ensure their radical natures if it were not for

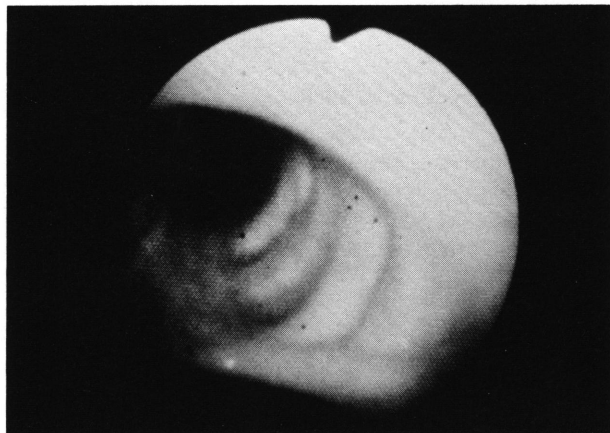


Fig. 1. Bronchoscopic finding in case 1, showing an uneven mucosal surface with disappearance of cartilage contours and red color on the posterior wall of the right main bronchus.

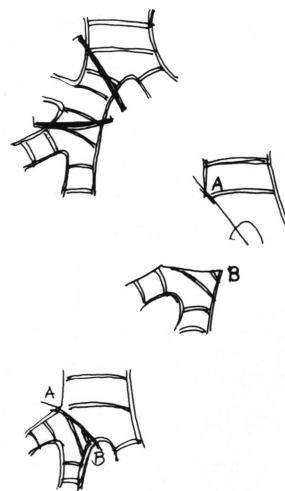


Fig. 2. Schema of bronchoplasty in case 1, illustrating the cut lines (upper), cut edges are shown against the carina and distal intermedius bronchus. The point A illustrates a cut edge of the tracheal cartilage and the point B also shows an oblique cut edge against the distal bronchial cartilages (middle). Anastomotic line is present. The A and B points are shown as a weak point to approximate together (lower).

a greater degree.

The combined resection with the trachea and bronchus for the treatment of carcinoma of the esophagus is a matter of great concern as to whether radical nature of surgery will be enhanced or not. So far little information is available with regard to surgical safeguards. A bothersome problem in surgery was discussed to achieve an operative security of the basis of our clinical experiences.

PATIENTS

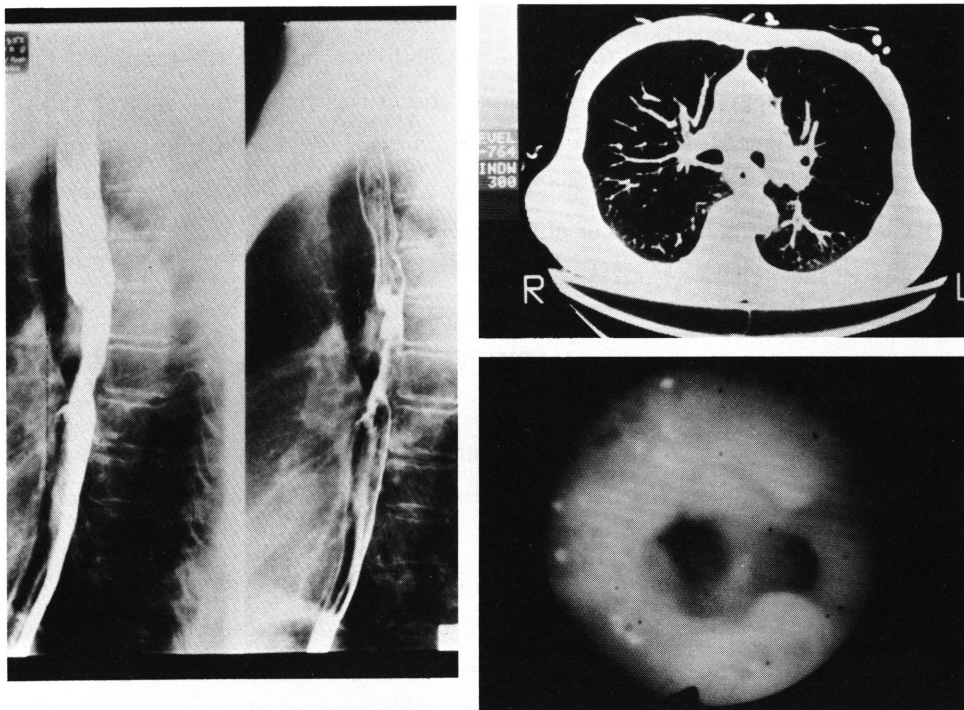
Case 1: A 65-year old Japanese woman complained of dysphagia with a spiral defect, which was located in the upper third to middle of the thoracic esophagus on the fluoroesophagogram.

Bronchoscopy preoperatively performed revealed an uneven mucosal surface on the right main bronchus with red color (Fig. 1). At surgery, it is noticed that cancer invasion from the esophagus reached the point extending from the posterior wall of the right main bronchus to the lateral wall of the lower trachea. The right main bronchus, measuring 3 × 4cm, was resected including a part of the lateral wall of the lower trachea.

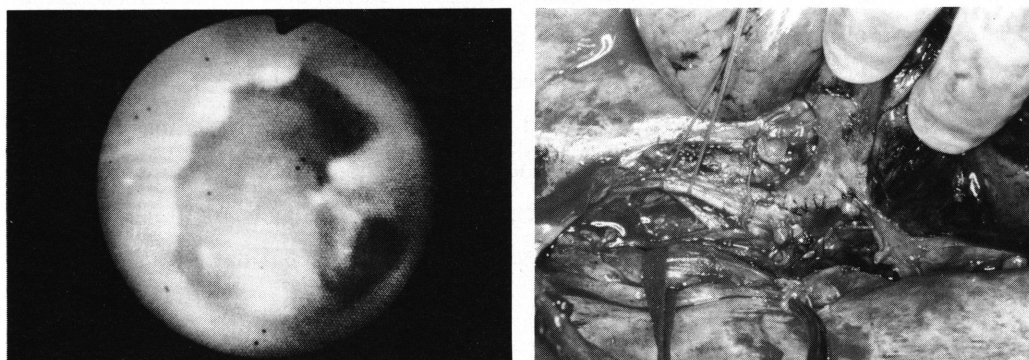
The bronchial edges were sutured with use of 3-0 Dexon. On the first day of surgery, air leak accidentally occurred.

The 2nd thoracotomy on that day identified a small air leak from the upper edge of the suture line. Additional two stitches were sufficient for a repair of air leakage. On the 3rd day of surgery, air leak took place again. At the 3rd thoracotomy performed on that day the origin of air leak was confirmed to be an opposite edge of the suture line to that previously sutured and necessitated three stitches to achieve a complete repair. Repeated air leaks occurring in early postoperative period in this case alert us to hinderance of healing on the suture line which has the jeopardy of the impaired blood flow and is more susceptible to tension due to losing the continuity of the cartilages in oblique cut edges as shown in Fig. 2. The patient's condition, thereafter, was stable until she died 357 days after surgery of pneumonia.

Case 2: A 68-year old Japanese man complained of dysphagia with spiral shadow defect on the fluoroesophagogram in the upper third and middle of the esophagus (Fig. 3). Preoperative bronchoscopy revealed a deformity of the left main bronchus and also CT scan showed a stenosis to some extent in both the main bronchi (Fig. 4). At the time of performing a thoracotomy, it was noted that cancer infiltration on the left bronchus was



- Fig. 3.** Preoperative fluoroesophagogram in case 2, showing a spiral type of shadow defect with an aberration of the small penetration.
- Fig. 4.** CT scan in case 2, showing a cancer invasion to both the main bronchi which was lessened in their lumens.
- Fig. 5.** Bronchoscopic finding in case 2 at 1 week after surgery, showing an anastomotic site of the left main bronchus, which remained patent with edematous change in the anastomosis line.



- Fig. 6.** Bronchoscopic finding in case 2 at 3 week after surgery, showing a detached bronchial wall in the anastomotic site and remaining a patent lumen with fibrous tissues.
- Fig. 7.** Operative finding in case 3, showing a patch repair with pericardium for a defect of posterior wall of the carina.

extending from its beginning to 3cm distal to its attachment. After performing a resection of a 3cm left main bronchus from the carina and a mobilization of the right lung by dividing the pulmonary ligament and skeletonizing the hilar vessels and the main bronchus.

The bronchial edges after a resection of the left main bronchus were sutured with use of 3-0 Vicryl without tension, adding a procedure of pleural bronchial wrapping

At 1 week after surgery the bronchoscopy revealed that healing at the anastomotic site was satisfactory except for edema in the anastomotic site (Fig. 5). An anemic and edematous mucosal membrane was visualized.

In contrast, at 3 weeks the bronchial anastomosis was disrupted and the fibrous tissues surrounded to maintain a continuity of the lumen between the separated edges of the left bronchus (Fig. 6).

Surgery to reanastomose was not predicted until pneumonia on the left would be cured. During a waiting period for improving a lung shadow of pneumonia, violent hemoptysis unexpectedly occurred to entail his death on day 45.

Case 3: A 69-year old Japanese woman received a 60 Gy irradiation therapy for the treatment of esophageal cancer. At that time, the fluoroesophagogram demonstrated a small penetrating lesion with mild fever of 37.5°C in body temperature. Surgery was indicated for fear of the ensuing perforation and/or bleeding. At thoracotomy, the esophagus adjacent to the tracheal carina was firmly adherent to the trachea, suggesting a presence of the inflammatory and cancer-infiltrating lesions around the penetrating fistula. The operative steps to ablate the esophagus resulted in 53cm defect of the membranous portion of the trachea. A defect was repaired with free pericardial patch graft (Fig. 7). Further esophageal resection approach was abandoned on account of a technical difficulty due to tight adhesion.

Postoperative pneumonia worsened her condition so that she died on day 7. Autopsy showed that the pericardial patch was partly detached from the tracheal wall and also histologic irradiation damage to the bronchial wall, which was composed of severely fibrous changes with vasculitis (Fig. 8), had become evident.

It is defined that irradiation damage to the walls of the trachea and bronchus may well result in worsened healing process in the suturing lines.

Case 4: A 64-year old Japanese man complained of dysphagia and hematemesis with spiral shadow defect on the fluoroesophagogram in the upper third to middle portion of the esophagus.

Preoperative bronchoscopy revealed a reddish mucosal change and a circumferential disappearance of cartilage contours in a 3cm left main bronchus from 1.0cm distal to the

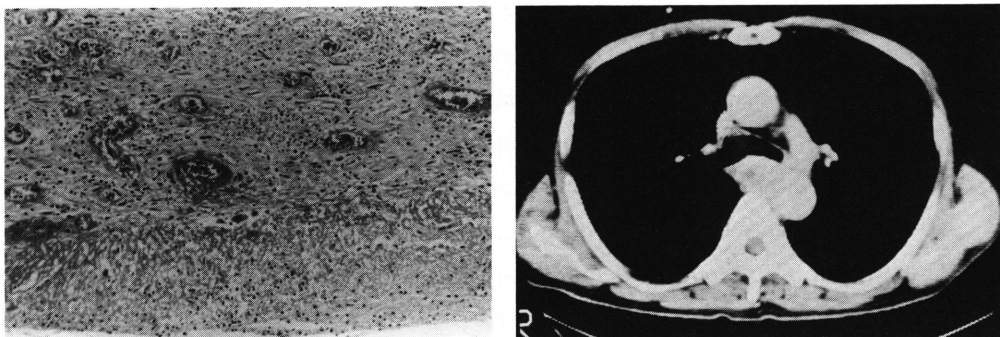


Fig. 8. Histologic finding of the tracheal wall at autopsy in case 3, showing a fibrous change with vasculitis of a 6000R irradiation damage to the tracheal wall.

Fig. 9. CT scan in case 4 showing a cancer invasion to the carina and the descending aorta.

carina to just proximal to the attachment of the right upper bronchus.

Preoperative CT scan also indicated that there was a cancer infiltration lying in the medial half the circumferential wall of the descending aorta (Fig. 9). He underwent a combined resection of the esophagus with the circumference of a 9cm descending aorta from a point caudal to the attachment of the left subclavian artery (Fig. 10) and the left main bronchus of 3 cartilaginous rings (1.5cm) by using a temporary external bypass with a 12mm diameter cooley graft between the left subclavian artery and distal descending aorta just above the diaphragma via left thoracotomy. Immediately after surgery, postoperative course was uneventful, but on day 3 he complained of abdominal distension and the gallbladder has become palpated. The sign of bile-transudation peritonitis due to bile stasis, followed by cholecystitis was evident.

Drainage tubes were introduced into the gallbladder by an echoguide (Fig. 11). His condition was stable 1 month after surgery. Pneumonia on the bilateral lower lung secondary to bile-transudation peritonitis led his condition to aggravate. On day 36, he died of MOF.

DISCUSSION

Extended operation for carcinoma of the esophagus vitiate the surgical results for poorly nutritional condition and great risk of occurrence of various complications related



Fig. 10. Surgical specimen in case 4, showing the resected esophagus with the descending aorta.

Fig. 11. Cholecystography in case 4, showing a catheter introduced by echo-guide and a small part of perforation of the gallbladder wall.

to death.

THOMPSON²⁾ first reported a surgically successful case who underwent lower tracheal and carinal resection with subtotal esophagectomy.

This report has been encouraging to extend the indication of a combined resection with the trachea and/or bronchus for the treatment of esophageal cancer.

However, every effort should be made to ensure the operative safety as well as to improve the prognosis. Symptoms referable to this disease are vexing and threaten their lifetimes. Therefore, no surgeons hesitate to extend the surgical indication, wherever possible. Needless to say, the prognosis of an extended operation is still poor because of their advancing disease stages. It is in hope that a minimum of relief of their suffering is desirable even during a short period of time.

With advances in surgical techniques and pre-postoperative cares, the goal of curing the early cancer patients is established although the cure rate in advanced cancer diseases has been unsatisfied. We are now challenging to surgically deal with the advanced disease patients. For the ultimate purpose, the patients with advanced cancer stage must benefit from a combined resection with the adjacent organs involved.

In this study, a resection of the esophagus with bronchoplasty evaluated in the four patients. Their prognoses were grimy. Emphasis can be placed on clinical feasibility. However, we call attention to the healing process at anastomotic site.

It is obvious that bronchial anastomosis healing is precipitated by rich blood flow at anastomotic site. In contrast, bronchoplasty combined with resection of the esophagus causes a diminished blood flow on the bronchial walls. It may be due to removal of the esophagus with which the bronchial artery is connecting. In addition, paratracheal and bronchial node dissection also is a major contributing factor.³⁾

Bronchopulmonary fistula as one of the postoperative complications after bronchoplasty is so infrequent. If it occurs, the patient has become fatal. Therefore, wrapping procedure of the anastomotic site with the pedicled pericardial and/or muscular flaps is recommended for the prevention of complications.⁴⁾

Recently, ISHIHARA *et al*⁵⁾ reported that wound healing at bronchial anastomotic site is not improved by pleural bronchial wrapping. As identified by them, we hesitate to wrap the bronchial anastomosis in combined resection with the esophagus. Particular emphasis was placed on the fact that not only protection of the anastomotic site but promotion of increasing blood flow in an anastomosed bronchial wall are achieved with pedicled muscular flap and/or omentum.

Pre- and postoperative irradiations also provide a delayed healing of bronchial anastomosis, depending on the irradiation dosis.⁶⁾

Indication for the combined resection with involved trachea and bronchus, however, should be extended to avoid occurring an ominous complication of the ensuing massive hemoptysis which prompts surgeon to resect completely regardless of their prognoses. Although little information is available with regard to the benefit of an extended operation on their prognoses, a more accumulated experience is required and more time will be required to determine as to whether an extended operation leads to improved outcome.

With advances in surgical techniques and pre-postoperative cares, the goal of curing the early cancer patients is established although the cure rate in advanced cancer diseases has been unsatisfied. The authors are now challenging to surgically deal with the advanced disease patients. For the ultimate purpose, the patients with advanced cancer stage must benefit from a combined resection with the adjacent organs involved.

In this study, the resections of the esophagus with bronchoplasty were reported in the four patients. Although their prognoses were grimy, emphasis can be placed on clinical feasibility in hope of gain of an improved survival and low operative mortality.

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