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Reconstruction after total pharyngolaryngoesophagectomy

Comparison of elongated stomach roll with microvascular anastomosis with gastric pull up reconstruction or something like that

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Abstract *Background:* We have performed total pharyngolaryngoesophagectomy in case of double cancer, head–neck and thoracic esophageal cancer, or cervical esophageal cancer that extended down to the level of aortic arch. The procedure is very challenging.
Methods: From April 1984 to May 1998, 14 patients underwent the procedures for double cancer of head–neck and thoracic esophagus (*n*=10), hypopharyngeal or cervical esophageal cancer (*n*=3), and synchronous esophageal cancer (*n*=1). The grafts used were whole stomach (*n*=6), elongated stomach roll (*n*=5), and stomach roll with free jejunum (*n*=3). The routes of reconstruction were posterior mediastinum (*n*=10), antesternal (*n*=3), and retrosternal (*n*=1). *Results:* Elongated stomach roll with microvascular anastomoses was long enough for reconstruction and the blood supply of the graft was sufficient. There was no fatal complication in this procedure. Oral feeding was achieved in 13 (93%) patients. *Conclusions:* The elongated stomach roll with microvascular anastomosis is efficient and the placement of the conduit in the posterior mediastinum is recommended to allow a better alimentary comfort in total pharyngolaryngoesophagectomy.

Key words Total pharyngolaryngoesophagectomy · Elongated stomach roll microvascular anastomosis · Alimentary comfort

Introduction

Reconstruction after total pharyngolaryngoesophagectomy has been one of the most challenging operations for its distance covered, adequate routes selected, maintenance and provision of adequate blood supply to the segment of gut used for the reconstruction. We have performed the procedure in cases of simultaneous malignancies in the larynx/pharynx and in the esophagus or cervical esophageal cancer that extended down to the level of aortic arch. Reconstructive procedures also affect swallowing and other alimentary functions. These are very important with regard to the postoperative quality of life in individual patients. In this study, we reviewed our own experience with this procedure regarding different methods of reconstruction and their effects on the alimentary function.

Materials and methods

We performed 14 pharyngolaryngoesophagectomies from April 1984 to May 1998 (Table 1). The 14 patients in our series included 3 with hypopharyngeal or cervical esophageal cancer, 1 with synchronous cancer of the cervical and thoracic esophagus, 4 with double cancer of the larynx and thoracic esophagus, 5 with double cancer of the hypopharynx and thoracic esophagus, and 1 with double cancer of the thyroid gland and thoracic esophagus. The age of the patients ranged from 38 years to 74 years, with a mean of 58 years. Four of the patients with double cancer had received preoperative radiation and chemotherapy. We performed reconstructions of the whole stomach without microvascular anastomosis in six cases. However, from 1993 on, we consecutively performed reconstructions with microvascular anastomosis in all the remaining eight cases. The procedures included elongated stomach roll [1] in five cases and free jejunal graft and stomach roll in three cases. The routes of reconstruction were posterior mediastinum in ten cases, antesternal in three, and retrosternal in one.

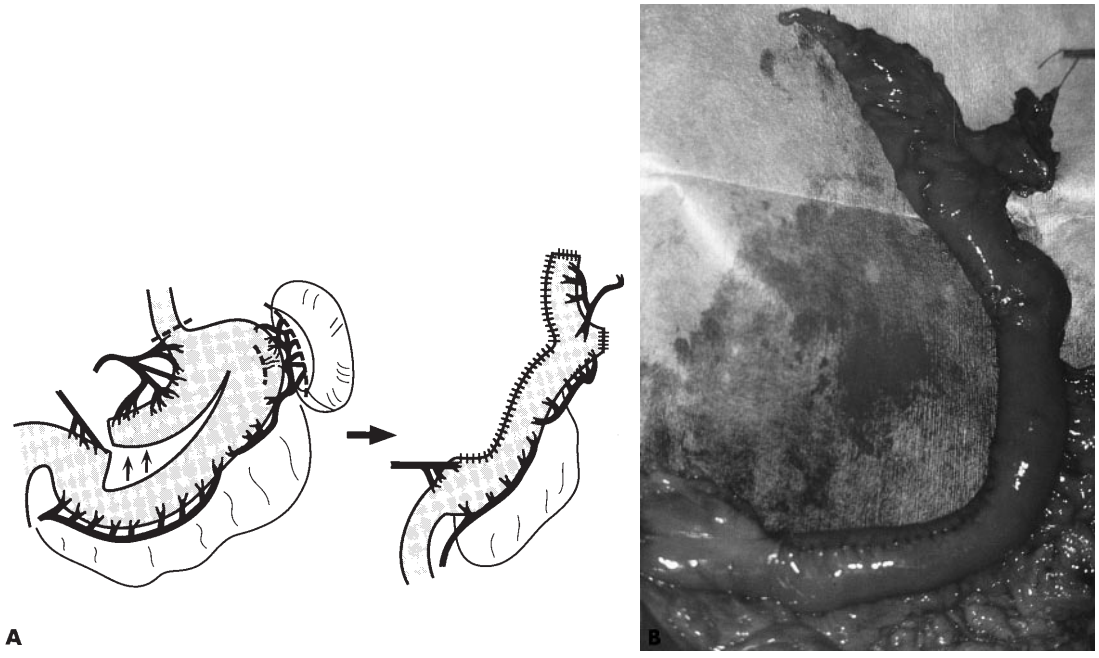

Fig. 1 Elongated stomach roll. The short gastric arcades of the stomach are preserved and the stomach is incised with linear staplers. The left gastric vessels are anastomosed to the cervical vessels. Procedure (**A**) and completion (**B**)

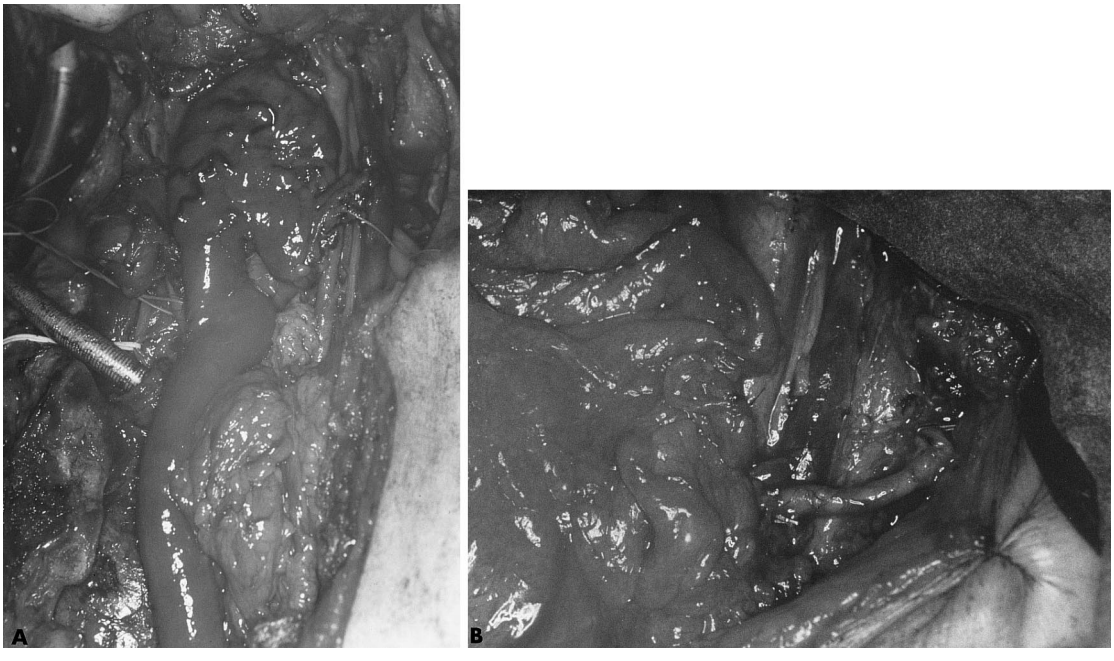

Fig. 2 The constructed elongated stomach roll was placed on the patient's chest (**A**) and the microvascular anastomoses were completed (**B**)

The elongated stomach roll is constructed using the following procedures. The spleen is removed by dividing the short gastric vessels proximal to the splenic hilum, preserving the communication between the short gastric vessels. The splenic artery and vein are divided proximal to the splenic hilar vessels. After the splenectomy, the left gastric artery and vein are divided. The stomach is divided at the esophagogastric junction and is incised with linear staplers to make an elongated stomach roll (Fig. 1A, B). After pharyngolaryngoesophagectomy, the left gastric vessels are anastomosed with the cervical vessels. We usually apply intestinal anastomoses before microvascular anastomosis. The grafts are anastomosed to the oral end using a hand-suturing technique in an end-to-end or end-to-side fashion. Microvascular anastomosis is performed with the aid of microscopy by a team of plastic and reconstructive surgeons. Anticoagulant administration is not neces-

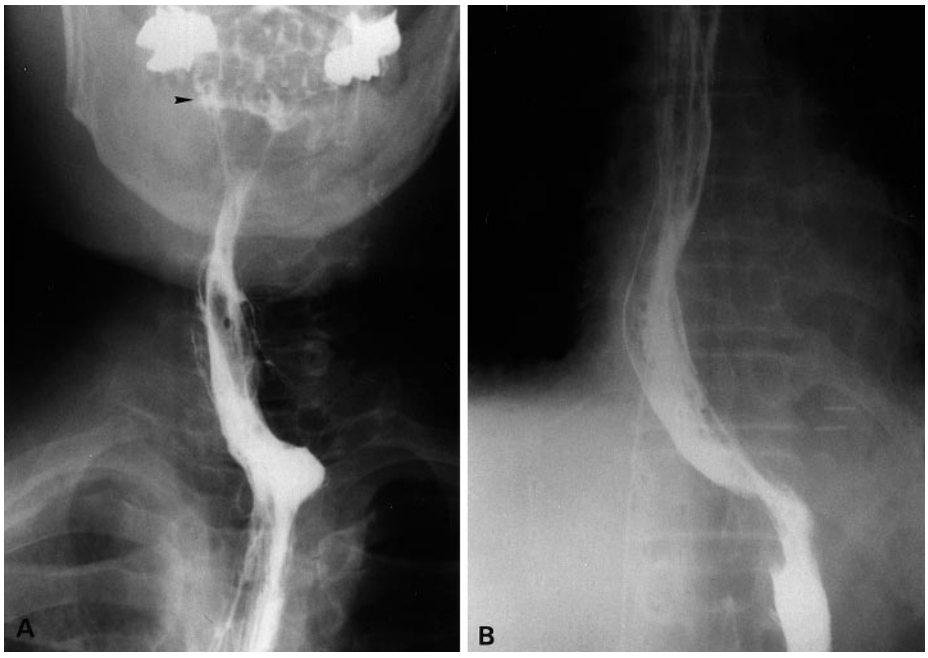

Fig. 3 Postoperative gastrointestinal barium studies: reconstruction with elongated stomach roll. An *arrowhead* indicates pharyngogastric anastomosis, anterosuperior (**A**) and anteroinferior oblique views (**B**)

Table 1 Background of patients and grafts with stomach

Age (mean)	38–74 (58)
Gender (male/female)	11/3
Tumor sites	
Pharynx and thoracic esophagus	5
Larynx and thoracic esophagus	4
Thyroid and thoracic esophagus	1
Cervical and thoracic esophagus	1
Cervical esophagus	3
The grafts for reconstruction	
Whole stomach	5
Elongated stomach roll	6
Stomach and free jejunum	3

Table 2 Anastomotic complications of the graft with stomach

Complications	Elongated stomach roll	Whole stomach	Stomach roll and free jejunum
Graft necrosis	1[a]/5 (20%)	1/6 (16.7%)	0/3 (0%)
Anastomotic leakage	0/5 (0%)	1/6 (16.7%)	1/3 (33.3%)

[a] The left gastric vessels are generally used for blood supply in elongated stomach roll, but one case that was fed blood supply by splenic artery resulted in graft necrosis. The patient required reoperation with free jejunum

sary. First, the artery is anastomosed with 10–0 nylon by a tie suture and the vein is thereafter anastomosed in the same manner. The transverse cervical artery is anastomosed to the artery of the graft; it can be substituted by the superior thyroid artery or other arteries. The vein of the graft is anastomosed to the internal or external jugular vein. The time required for microvascular anastomosis of one vessel is less than 20 min (Fig. 2A, B). The omentum is filled into dead space around the anastomosis and tracheostoma to prevent postoperative complications.

The anastomosis of the graft was checked routinely by means of a barium study on the 14th to 21st postoperative days, depending on the state of the patient. All morbidities were counted. Pulmonary disturbances included pneumonia and the need for prolonged or recurrent mechanical respiratory support. A diagnosis of pneumonia was made when the patients presented fever, abnormalities on chest X-ray, and/or blood–gas disturbances. Long-term results were investigated in 13 patients who survived the operation with a mean follow-up period of 19 months (maximum 87 months). The alimentary comfort was assessed by review of outpatient records for the patients who survived after the operation but died by the time of this study. The patients who were alive at the time of this study were interviewed for alimentary comfort. The patient's alimentary comfort was graded as good if the patient could be fed entirely with oral feeding, fair if the patient needed supplemental nutrition, and poor if the patient could not be fed by the oral route.

Result

The postoperative nonfatal complications were wound infection in seven patients, pulmonary complications in five, partial necrosis of the tracheal stump in two and minor leakage in one. One patient with elongated stomach roll, the blood supply to which was from the splenic artery, developed necrosis of the graft and required reoperation with free jejunum (Table 2). The postoperative fatal complications were graft necrosis in one case and acute heart failure in one. The graft necrosis occurred in a case in which reconstruction was done using the whole stomach without microvascular anastomosis. The necrosis is most likely as-

cribed to insufficient blood supply. The patient died of arterial bleeding 29 days after the operation. The patient with acute heart failure had a good course after operation and had been eating, but he died of acute heart failure 25 days after the operation. Microvascular anastomoses were all successful although four of them received preoperative irradiation. None had stenosis of the tract in the postoperative barium study (Fig. 3A, B). Oral feeding was achieved in 13 (93%) patients. The alimentary comfort was scored as good in six patients and fair in seven. Long-term follow-up showed that five patients died of cancer and six died of other diseases. Three patients were alive at the end of this study (May 1998). The mean survival time was 19 months.

Discussion

Various techniques of reconstruction after total pharyngolaryngoesophagectomy have been reported along with their problems of wide defects, insufficient blood supply and extensive distance covered [2, 3]. We performed a whole-stomach grafting in reconstruction in the past but were confronted with some problems, such as wide defects or scarce blood supply. Applications of microvascular anastomoses for esophageal reconstruction were reported by Logmire in 1946 [4]. In 1959, Seidenberg reported successful reconstructions of the cervical esophagus with free jejunal grafts [5]. In 1962, Jurkiewicz confirmed the clinical usefulness of the procedure [6]. Similar to our method, Buchler in 1997 reported the usefulness of fundus rotation gastroplasty for reconstruction after esophagectomy, but did not apply microvascular technique [7]. We consecutively performed microvascular anastomosis, with the aid of a team of plastic and reconstructive surgeons, for reconstruction after total pharyngolaryngoesophagectomy, since we experienced a postoperative death due to necrosis of the whole stomach graft without microvascular anastomosis. Revascularization was successful in all of the eight patients, and we confirmed the safety and clinical usefulness of the procedure.

Total pharyngolaryngoesophagectomy has various problems in relation to the distance, route, and blood circulation of the graft. It was reported in the literature that gastric pull-up procedures resulted in up to 3% organ necrosis due to lack of blood supply and the long distance [8, 9, 10]. Several sites for free or pedicle bowel transfer are available in utilizing the colon, unlike gastric pull-up [2, 9, 10]. Several distinct disadvantages of these techniques, however, do exist. The anastomotic suture lines of the interposed grafts are increased in number and sufficient preoperative bowel preparation is necessary for free or pedicle colon transposition [10]. We do not regard these procedures as our first choice for reconstruction.

We advocate elongated stomach roll with microvascular anastomoses for reconstruction. Only one anastomosis is required for gastrointestinal continuity in this procedure. The left gastric vessels are constantly available and generally large in diameter [1]. The procedure is not indicated for cases in need of lymph-node dissection of the abdominal area for curative operation or in cases with a past history of gastrectomy. However, free or pedicled jejunal grafts may not be reasonable for reconstruction in total pharyngolaryngoesophagectomy because long lengths of jejunum occasionally result in indigestion. Complications for reconstruction of the trachea is also one of the most serious problems [11]. We must be cautious not to impair the bronchial arteries and keep the tracheostoma separated from the major vessels, using a mesenterium flap, e.g., a greater omentum flap and a pectoralis major myocutaneous flap [11, 12, 13]. When the resection of trachea extends over three rings, a tracheostoma in the upper chest must be created. The blood supply of the graft is also important because even a minor intrathoracic anastomotic leakage can easily lead to fatal complications. Therefore, microvascular anastomosis is essential for reconstruction after the procedure.

In this series, we also reviewed the routes of reconstruction regarding alimentary comfort. It was described in the literature that the posterior mediastinal route was useful for reconstruction after esophagectomy with respect to postoperative alimentary comfort [14]. Swallowing is entirely deprived when total pharyngolaryngoesophagectomy is performed. In the posterior mediastinal route, the food falls mainly by gravity and negative pressure in the thorax [14]. The route is shorter and more direct.

Conclusion

The elongated stomach roll with microvascular anastomosis is efficient and the placement of the conduit in the posterior mediastinum is recommended to allow a better alimentary comfort in total pharyngolaryngoesophagectomy.

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