A New Method of Esophageal Bypass: Gastric Tube with Good Flexibility and a Safe Anastomosis

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Unresectable esophageal cancer can be managed with a bypass operation. There are advantages and disadvantages to this strategy, and the indication varies by institution.[1-3] Long-term survival with preservation of quality of life can be achieved with postoperative chemoradiation. We perform bypass for patients with disease deemed unresectable before the operation. Additionally, we perform bypass in cases deemed to be unresectable during an operation for a planned oncologic resection. Before 2014, we performed bypass using the modified Postlethwait method.[4] After that time, we devised a method that omitted use of the circular stapler to divide the cardia, and instead uses a radial-type stapler. In this method, the radial-type stapler is used for the first stapler load. We start stapling from the cardia of the stomach.

Our patients experienced minimal complications after the bypass operation. The quantity of each meal increased for our patients, and respiratory symptoms improved. Approximately one-half of the patients were able to receive postoperative chemoradiation. Anastomotic leaks occurred in 4 of 34 patients. This rate is similar to that after esophagectomy during the same period. From our experience, we concluded that the following are causes of an anastomotic leak:

1. In cases in which a thoracotomy is not used, securement of enough length of esophagus is difficult from the cervical incision.
2. Gastric tube formation is more difficult than in the typical method because the lesser curvature side is fixed.
3. When the gastric tube is brought cephalad, torsion occurs in relation to the remnant stomach.

These problems may increase the risk for leak or obstruction. We refined our techniques to deal with these issues. First, a gastric tube with a long vascular pedicle (right gastroepiploic artery) is freed from the stomach. The proximal stump of the cervical esophagus is anastomosed to the gastric tube and the distal end of the gastric tube is anastomosed to the jejunum. All of these anastomoses can be done with a stapling device.

TECHNIQUE

Method A

The greater omentum is separated for esophageal reconstruction using a gastric tube, preserving the right gastroepiploic artery and vein. The left gastroepiploic artery and vein are divided at their origin. The short gastric vessels are divided as close to the spleen as possible.

The GIA Radial Reload (Covidien Japan) is used for the first stapler load (Fig. 1A). With a linear stapling device used sequentially, gastric tube creation is accomplished (Fig. 1B). The sections of the gastric tube with overlapping staple lines are reinforced with sutures. An incision is then made in the neck, and the cervical esophagus is transected. If a Radial Reload is used for this, it is easy to achieve esophageal division at the level of the sternum horizontally (Fig. 1C). Subcutaneous tunneling of the gastric tube is used in our institution. After tunneling from the abdomen to the neck in the subcutaneous tract, the gastric tube is brought cephalad. Finally, an end-to-side anastomosis between the cervical esophagus and the gastric tube is made using a circular stapler.

Method B

Separation of the greater omentum and division of blood supply proceeds as in method A. Depending on the shape of the stomach, the starting point of the gastric tube formation is 6 cm proximal to the pylorus (Fig. 2, point a). After deciding on point a, we mark the initial points toward the cardia of the stomach (Fig. 3B). The width of the gastric tube is 3 to 5 cm. It is necessary for the lumen of the stomach on the lesser curvature side to be secured. Branches of the gastroepiploic vessels to the gastric wall

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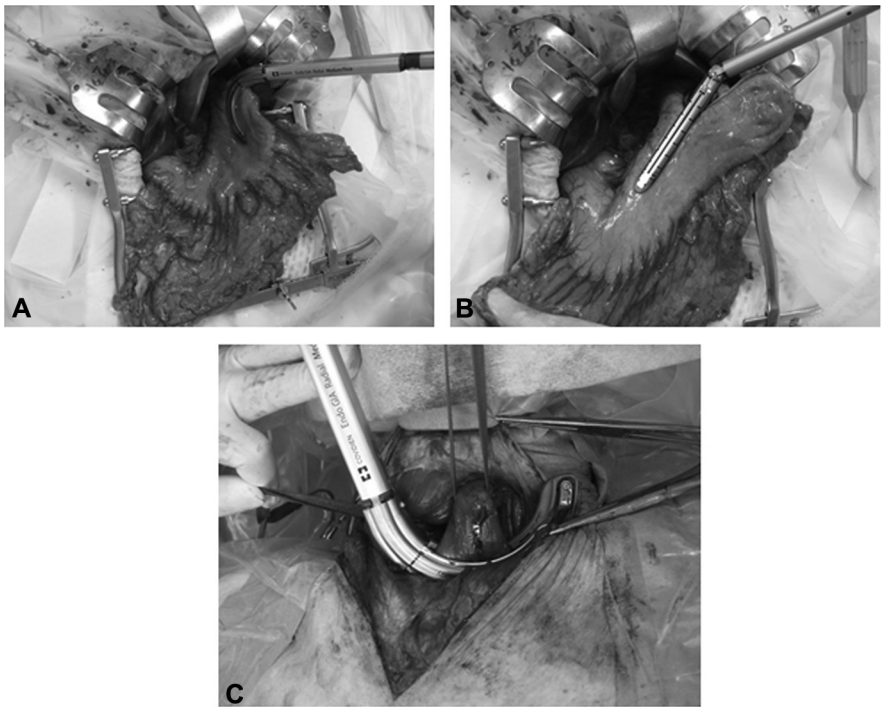

Figure 1. Surgical view: method A. (A) The Radial Reload is used for the first stapler load. (B) A gastric tube is created with a linear stapler. (C) The cervical esophagus is transected.

are divided approximately 3 cm from the marked point proximally (Fig. 2, points a to c, Fig. 3A). The GIA Radial Reload is used for the first stapler load (Fig. 2, points a→b, Fig. 3C and D). With a linear stapler used sequentially, gastric tube formation is accomplished (Fig. 3E and F). During formation of the gastric tube, we are careful about the position and direction of the staplers to minimize staple overlap. We are also mindful not to disturb the vascular pedicle (the right gastroepiploic artery and vein). After the gastric tube has been isolated, we reinforce the overlapping staple lines. In addition, point a is buried.

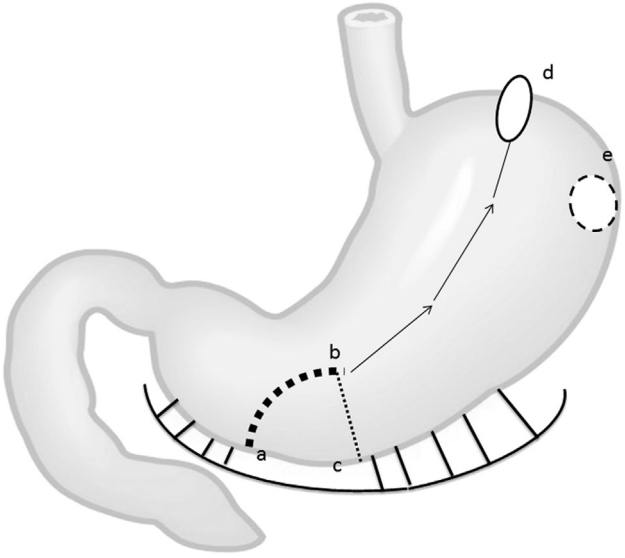

Figure 2. Schema of gastric tube creation. Point a, starting point of gastric tube formation; b, the end of the first stapler load; c, the oral point of dividing the branches of the gastroepiploic vessels to the gastric wall; d, the top of the gastric tube where the stapler is inserted; e, site of the esophago-gastric anastomosis.

The procedure of esophageal separation and subcutaneous tunneling are the same as in method A. The gastric tube is located on the chest wall, and we determine the optimal location of the esophago-gastric and gastro-jejunal anastomoses. To do this, we consider the following:

1. The esophago-gastric anastomosis is an end-to-side anastomosis. Close attention must be paid to the blood supply of the anastomosis and the proximal part of the gastric tube.
2. There are 2 ways to lift the gastric tube. One is via Kocher's mobilization and the other method is by further dividing the gastroepiploic vessels.
3. The gastro-jejunal anastomosis is end-to-side with the Braun anastomosis.
4. By dividing branches of the epiploic artery, elevation of the gastric tube can be achieved. However, in

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