

# Early postoperative endoscopy for targeted management of patients at risks of anastomotic complications after esophagectomy

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**Background.** Early postoperative endoscopy after esophagectomy is assumed to be effective in detection and prediction of anastomotic complications, but overall effects of early postoperative endoscopy remain uncertain. The aim of this study was to investigate whether mucosal status assessed by early postoperative endoscopy could offer an approach to individualized management after esophagectomy.

**Methods.** Endoscopy was performed in 176 of 214 patients who underwent esophagectomy at either 1 week or 2 weeks postoperatively. Mucosal damage in the proximal region of the graft was classified as follows: intact mucosa, mild mucosal degeneration, and severe mucosal degeneration. We examined the association of the severity of mucosal damage and the incidence of anastomotic complications.

**Results.** Twenty-eight patients (16%) developed anastomotic stricture. Symptomatic anastomotic leaks occurred in 15 patients (8.5%), including 6 with stricture. The frequency of intact mucosa, mild mucosal degeneration, and severe mucosal was 7%, 20%, and 73% for leaks; 4%, 11%, and 85% for strictures; and 28%, 62%, and 10% for no complications, respectively ( $P < .001$ ). Asymptomatic leaks were found in 4 patients in the 1-week endoscopy group. Sensitivity and specificity for the development of stricture in 1-week/2-week were 0.88/0.83 and 0.85/0.98, respectively. Positive and negative predictive values were 0.52/0.91 and 0.97/0.96, respectively. Early postoperative endoscopy could be carried out without any adverse events in all patients.

**Conclusion.** Assessment of the anastomosis and graft with early postoperative endoscopy was safe and resulted in a high predictive value for subsequent anastomotic complications. Early postoperative endoscopy may lead to targeted management for a subset of patients undergoing esophagectomy. (Surgery 2016;■:■-■.)

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ESOPHAGECTOMY is an extremely invasive procedure during which aged patients or those with comorbid cardiovascular or pulmonary diseases frequently develop potentially fatal postoperative complications.<sup>1</sup> Compared with anastomotic complications after other gastrointestinal procedures, there is a high incidence of serious complications and mortality after esophagectomy.<sup>2,3</sup> Although rare, it is

noteworthy to recognize that necrosis of the reconstructed conduit by impaired tissue blood flow can cause fatal complications.<sup>4,5</sup> Therefore, the quality of the postoperative course for patients with esophageal cancer primarily depends on the prevention and management of anastomotic complications. Surgeons have attempted to reduce the incidence of anastomotic complications after esophagectomy with refinements in surgical techniques and reductions in modifiable risk factors, but it seems impossible to prevent them completely.<sup>6-8</sup> Oral contrast study has been used to determine the integrity of anastomosis, but it often is difficult to elucidate the direct causes of anastomotic insufficiency from a radiological study.<sup>9</sup>

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Endoscopy enables direct observation of the anastomosis and the inner lining of the reconstructed conduit. Performing early postoperative endoscopy (EPE), therefore, may help confirm the causes of anastomotic complications and provide important information for postoperative management of the patient. However, overall validities of EPE remain undetermined. The aim of this study was to investigate whether mucosal status assessed by EPE could offer an approach to individualized management after esophagectomy and to clarify the safety profile of EPE.

## METHODS

**Patients.** Between July 2008 and July 2015, esophageal reconstructions were performed after esophagectomy in 214 patients with esophageal diseases. Of the 214 patients, 176 underwent endoscopic examination either 1 or 2 weeks after operation. Thirty-eight patients were excluded from the analysis. Among them, 14 patients underwent endoscopy earlier because of severe sepsis, major leaks, elevated inflammatory markers suggesting infectious complications, suspected impairments in blood flow of reconstructed organs, or presence of air bubbles around the anastomosis on enhanced computed tomography (CT). Postoperative endoscopy was not possible for logistical reasons or non-availability of the surgical team in 18 patients, and 6 refused to receive an endoscopy. Written informed consent regarding the risk of anastomotic complications and the potential benefit and harm of receiving EPE was obtained from all patients.

**Surgical procedures.** All patients underwent subtotal esophagectomy ( $n = 155$ ) or total esophagectomy ( $n = 21$ ) using a thoracotomy ( $n = 116$ ) or thoracoscopic ( $n = 48$ ) or transhiatal approach ( $n = 12$ ). During total esophagectomy, the pharynx and larynx were concomitantly resected by the otorhinolaryngologist, and a posterior mediastinal route was used for reconstruction with a gastric tube and free jejunum (FJ). After subtotal esophagectomy, a retrosternal or posterior mediastinal route was selected when a gastric tube was used. A subcutaneous route was selected for reconstruction with small/large intestine ( $n = 5$ ), and the gastric pull-up ( $n = 4$ ) was used in frail patients who had undergone preoperative chemoradiotherapy for advanced cancer. For total esophagectomy, an anastomosis was completed between the gastric tube and the FJ in the neck using a hand-sewn technique. For subtotal esophagectomy, anastomosis was performed using a triangular technique (posterior wall inversion, anterior wall eversion)

**Table I.** Baseline demographics of patients

| <i>Demographic characteristics</i>        | <i>No. of patients</i> |
|---|------------------------|
| Age (y)                                   | 64.7 (36–83)           |
| Sex                                       |                        |
| Male                                      | 158 (90%)              |
| Female                                    | 18 (10%)               |
| Disease                                   |                        |
| Malignant                                 |                        |
| SCC                                       | 159 (90%)              |
| Adeno.                                    | 5 (3%)                 |
| Others                                    | 11 (6%)                |
| Benign                                    | 1 (1%)                 |
| TNM classification (UICC seventh edition) |                        |
| Stage 0                                   | 9 (5%)                 |
| Stage I                                   | 47 (26%)               |
| Stage II                                  | 48 (27%)               |
| Stage III                                 | 52 (30%)               |
| Stage IV                                  | 20 (12%)               |
| Esophagectomy                             |                        |
| Transthoracic                             | 164 (93%)              |
| Transhiatal                               | 12 (7%)                |
| Esophageal substitute                     |                        |
| Gastric tube                              | 150 (85%)              |
| Intestine                                 | 5 (3%)                 |
| FJ + gastric tube                         | 21 (12%)               |
| Reconstruction route                      |                        |
| Posterior mediastinal                     | 137 (78%)              |
| Retrosternal                              | 30 (17%)               |
| Subcutaneous                              | 9 (5%)                 |
| Anastomotic technique                     |                        |
| Triangular                                | 142 (81%)              |
| End-to-side                               | 4 (2%)                 |
| Hand-sewn                                 | 30 (17%)               |
| Neoadjuvant therapy given                 | 93 (53%)               |

*Adeno*, Adenocarcinoma; *SCC*, squamous cell carcinoma; *TNM*, tumor/node/metastasis; *UICC*, Union Internationale Centre le Cancer.

with linear staplers. Otherwise, end-to-side anastomosis using circular staplers was preferentially carried out for the intrathoracic esophagogastrostomy (Table I).

**Timing of endoscopy.** Sixty-three patients (35.8%) received an endoscopy 2 weeks after operation (2-week endoscopy) during the period from July 2008 to October 2010. The remaining 113 patients (64.2%) underwent an endoscopy 1 week after operation prior to oral refeeding (1-week endoscopy) from November 2010 until the end of the study. This change in endoscopy timing was based on our experience that most anastomotic leaks occur around 1 week after esophagectomy.

**Postoperative management.** Postoperative physical status was observed carefully. CT scans were performed for patients with suspected intra-abdominal and/or intrathoracic complications.

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