in vivo *31*: 1019-1021 (2017)
doi:10.21873/invivo.11163

Gastric Tube Reconstruction with Superdrainage Using Indocyanine Green Fluorescence During Esophagectomy

HIROYUKI KITAGAWA, TSUTOMU NAMIKAWA, JUN IWABU and KAZUHIRO HANAZAKI

Department of Surgery, Kochi Medical School, Nankoku, Japan

Abstract. *We report a case of gastric tube reconstruction with superdrainage using indocyanine green fluorescence during esophagectomy for esophageal cancer. A 53-year-old man with a history of early esophageal cancer treated with endoscopic mucosal dissection experienced esophageal cancer recurrence. There was no evidence of lymph node involvement or distant metastasis on computed tomography; therefore, we performed thoracoscopic esophagectomy. After thoracoscopic esophagectomy, we created a gastric tube. When pulling up the gastric tube through the post-mediastinum route, a root of the right gastroepiploic vein was injured. We subsequently performed superdrainage to avoid congestion of the gastric tube with omental vein and pre-tracheal vein anastomosis at the neck, and confirmed venous flow using the indocyanine green fluorescence method. No postoperative anastomotic leakage was observed, and the patient was discharged 22 days after surgery. Thus, we recommend the indocyanine green fluorescence method in cases involving superdrainage during esophagectomy.*

Esophagectomy followed by gastric tube reconstruction is a common surgical technique utilized in the management of esophageal squamous cell carcinoma (ESCC) because the stomach wall is supplied by a rich arterial network. Therefore, there is a low risk of necrosis compared with that in other organ conduits including the colon (1).

Although an arterial blood supply to the anastomosis is essential, adequate venous return is also important to avoid congestion, which might result in anastomotic leakage (2) during esophagectomy for ESCC. Herein, we report a case of an ESCC patient who underwent superdrainage using indocyanine green (ICG) fluorescence during thoracoscopic esophagectomy followed by gastric tube reconstruction.

Case Report

A 53-year-old man with a history of early esophageal cancer treated with endoscopic mucosal dissection presented with esophageal cancer recurrence. Endoscopy revealed a circumference type-0-I tumor, located 27 cm from the teeth, characterized by submucosal invasion (Figure 1). Biopsy revealed a squamous cell carcinoma. Computed tomography (CT) revealed no evidence of lymph node metastasis. We diagnosed the patient with a middle thoracic ESCC, and performed thoracoscopic esophagectomy after obtaining informed consent from the patient.

After completing the mediastinal lymph node dissection by thoracoscopy, we created a gastric tube and pulled it through the post-mediastinal route. However, we injured the right gastroepiploic vein (RGEV) at the root. We subsequently performed superdrainage to avoid congestion of the gastric tube with omental vein and pre-tracheal vein anastomosis at the neck (Figure 2). After completing the venous anastomosis, we confirmed venous flow using the ICG fluorescence method (Figure 3). No postoperative anastomotic leakage was observed, and the patient was discharged 22 days after surgery.

Discussion

Anastomotic leakage is a problematic complication after esophagectomy and might affect postoperative survival (3). Both reduced arterial blood supply and venous return in the gastric tube might contribute to anastomotic leakage during esophagectomy. Superdrainage with anastomosis of a gastric vein in the gastric tube has been reported to improve gastric circulation, resulting in avoidance of congestion of the

Correspondence to: Tsutomu Namikawa, Department of Surgery, Kochi Medical School, Kohasu-Okocho, Nankoku, Kochi, 783-8505, Japan. Tel: +81 888802370, Fax: +81 888802371, e-mail: tsutomun@kochi-u.ac.jp

Key Words: Superdrainage, gastric tube, esophageal cancer, indocyanine green fluorescence.

Figure 1. *Endoscopy revealed a superficial elevated tumor at the esophagus.*

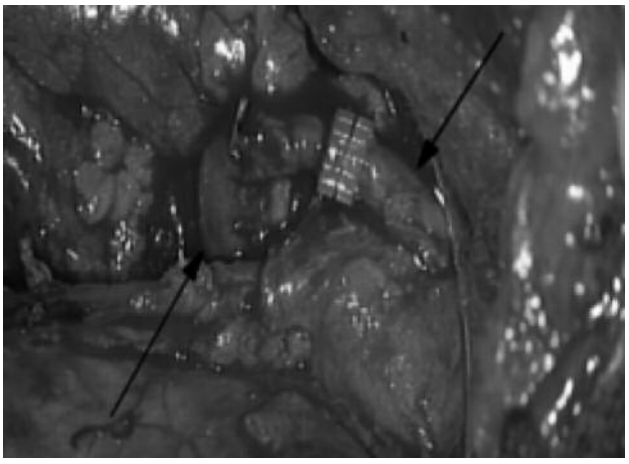

Figure 2. *Anastomosis between an omental vein (right arrow) and pretracheal vein (left arrow) as superdrainage was performed at the neck.*

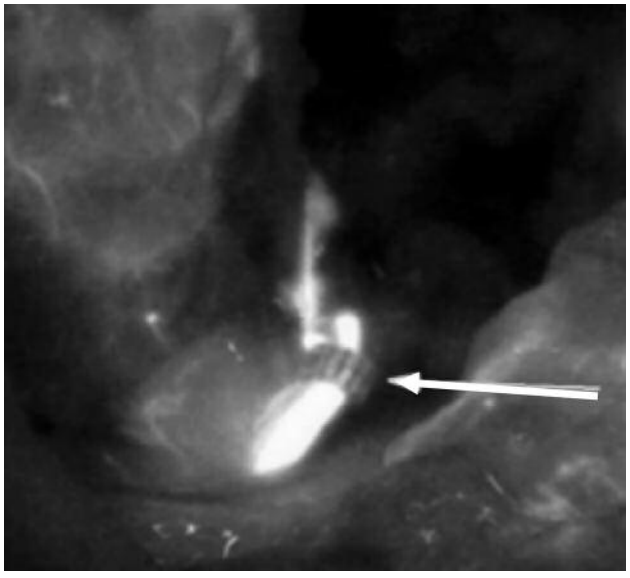

Figure 3. *Visualization of venous flow through the anastomosis (arrow) using the indocyanine green fluorescence method.*

gastric tube (4). However, it is imperative to confirm venous flow through the anastomosis to avoid occlusion or thrombosis (5) after venous anastomosis.

The usefulness of an ICG fluorescence method during reconstruction after esopagectomy (6) or angiography of a coronary bypass graft (7) has been reported. We have previously used ICG to visualize the arterial networks in the stomach before creating the gastric tube during esophagectomy (1). In the present case, we could visualize the blood flow through the venous anastomosis, resulting in successful reconstruction despite the RGEV injury. In addition, the ICG test can be performed repeatedly without any adverse events.

One of the limitations of the ICG assessment is that this is a subjective assessment and no standardized cut-off for anastomotic leakage has been established to date. Therefore, future studies should aim to establish more quantitative assessment methods such as measuring ICG intensity (8) or blood flow speed (9).

Conclusion

The ICG fluorescence assessment might be useful not only for visualizing the arterial blood supply to the gastric tube, but also for venous return during superdrainage. We recommend the use of ICG fluorescence in cases where venous anastomosis is needed during reconstruction after esophagectomy.

Conflicts of Interest

None declared.

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Received July 11, 2017
Revised August 4, 2017
Accepted August 6, 2017