**Surgeon at Work**

# PedunculatedGastric Conduit Interposition with Duodenal Transection Following Salvage Esophagectomy: An Option for Increasing the Flexibility of the Gastric Conduit

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## INTRODUCTION

A gastric conduit is the first choice for esophageal reconstruction, because of its robust blood supply and the need for only a single anastomosis to reestablish continuity with good results. In cases where the stomach is unavailable, a colon conduit is preferentially selected as an esophageal substitute.[1]However, a colon reconstruction is more highly invasive compared to a gastric conduit reconstruction.Salvage esophagectomy after definitive chemoradiotherapy is associated with high morbidity and mortality rates.[2] Gastric conduit necrosis is one of the most critical complications after salvage esophagectomy, potentially leading to in-hospital death. Gastric conduit necrosis may occur when the upper part of the stomach is included in the radiation area of definitive radiotherapy; thus, a damaged stomach with edematous changes and/or redness should be resected (**Figure 1**). In such cases, we have previously performedfree-jejunal graft interposition or used a colon conduitto avoid anastomosis of the damaged stomach to the cervical esophagus.Here, we present our experience withduodenal transection,which preserves the right gastroepiploic vessels, enabling safe anastomosis at the lower level of the gastric conduit where the effect of definitive radiation therapy is absent. Given the non-necessity

formicrovascular anastomosis, this method may representa suitable minimally invasive technique that minimizes organ sacrifice in this surgical setting.

## SURGICAL TECHNIQUE

When the upper part of the stomach is damaged due to radiation therapy, the gastric conduit should be elevated to a higher level for the purposes of avoiding anastomosis of the damaged stomach to the cervical esophagus. In such cases, we may select a short gastric conduit using the right gastroepiploic artery as a vesicular pedicle in place of a free-jejunal graft interposition or a colon conduit. The gastric conduit, which is 4cm in width, is constructed using linear staplers while avoiding the damaged part of the upper stomach (**Figure 2A**). The branches of the right gastroepiploic vessels are carefully cut 5 cm distallyto the pylorus, and this procedure is extended downward to the pylorus. The duodenum is divided immediately distal to the pyloric ring utilizing a linear stapler. The distal stamp of the gastric conduit is anastomosed to the upper jejunum for a Roux-en-Y reconstruction (**Figure 2B and Figure 3A**). The gastric conduit is pulled up through the anteriormediastinum and anastomosed to the cervical esophagususing a triangulating stapling technique.

## DISCUSSION

The incidence of anastomotic leakage after salvage esophagectomyhas been reported to be higher (6–38%) than that after esophagectomy without preoperative treatment.[3]Asanastomotic leakage may be partially due to radiation-induced tissue injury, it is preferable to avoid anastomosis using the damaged part of the gastric conduit.In such cases, a colon conduit or a free-jejunal graft interposition represent alternative procedures. However, colon conduitsare commonly associated with anunstable blood supply and/or drainage with a high frequency of anastomotic leakage and thus frequently require microvascular anastomosis;further, free-jejunal graft interpositionsnecessitate reconstruction of the jejunal artery and vein by a plastic surgeon.[4, 5]

Interposition with a pedunculated gastric conduit in a Roux-en-Y fashion was reported for the first time by Yamagishi et al. in 1970.[6] They utilized this technique for bypass surgery for advanced esophageal cancer, and then extended it to formal esophageal reconstruction. This technique can improve gastric tube flexibilityand enable safe anastomosis at the lower level of the

gastric conduit, where the blood supply is sufficient (**Figure 3B**). The top of the gastric conduit can be elevated to the level of the chin, as shown in **Figure 3C**. Thus, this technique may also be applied to other surgical situations. To date, we have utilized this technique during reconstruction in5 patients:2 patients after salvage esophagectomy, 2 patients after pharyngolaryngoesophagectomy, and 1 patient for insufficient elevation of the gastric conduit after usual esophagectomy. Complications, including anastomotic leakage or gastric conduit necrosis, have not been experienced by any of these patients. It may also be important to identify whether transection of the intra-gastric wall vascular network and/or blood flow from the right gastric vessels causes the failed blood supply withinthe gastric conduit.Siewert et al. stated that the right gastric artery can be divided if preservation results in tension to the esophagogastric anastomosis.[7]Further surgical experience is needed to evaluate the short- and long-term clinical outcomes of this technique, as well as to establish a clearer indication for the technique in a surgical setting.

In cases where the gastric conduit needs to be elevated to a higher level in the neck, pedunculated gastric conduit interposition combined with duodenal transection may be a suitable minimally invasive surgical technique that

minimizes organ sacrifice. Microvascular anastomosisby a plastic surgeon is not necessary for this procedure. Thus, this procedure may be a suitable option in this surgical setting.

## FIGURE LEGENDS

**Figure1:**

The resected stomach after gastric conduit construction during salvage operation.

The upper part of the stomach is damaged due to definitive radiation therapy,showing edematous changes and redness.

**Figure2:**

A: Schematic diagram of gastric conduit construction.

B: Schematic diagram of pedunculated gastric conduit interposition with duodenal transection and Roux-en-Y reconstruction.

**Figure 3**:

A: Photograph showingpedunculated gastric conduit interposition with duodenal transection and Roux-en-Yreconstruction during salvage operation.

B: Gastric tube flexibility is significantly increased by pedunculated gastric conduit interposition with duodenal transection. This technique was utilized during reconstruction after pharyngolaryngoesophagectomy in patients with

advanced inferior pharyngeal carcinoma and superficial esophageal carcinoma.

C: The gastric conduit can be elevated to the level of the chin.

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