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# Fallback technique with circular stapler prevents anastomotic obstruction after esophagectomy A case report of surgical approach

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#### Abstract

**Rationale:** While performing esophago-ileal anastomosis after esophagectomy with circular staplers, the mucosal folds of the ileum can complicate stapling and lead to obstruction, especially when the diameter of the circular stapler is equal or greater than that of the small bowel lumen.

**Patient concerns:** A 53-year-old man, presented with complaints of difficulty in swallowing for 2 weeks. Fifteen years previously, he had undergone partial gastrectomy for gastric ulcers.

**Diagnosis:** The endoscopy showed that there was a large ulcer in the middle-third of the esophagus, about 28 to 32 cm from the incisors. Biopsy of the ulcer confirmed esophageal squamous cell carcinoma.

**Interventions:** We performed an esophageal replacement using the right colon with circular staplers, but anastomotic site occurred due to stacking of the mucosa ahead of the stapler. To revise the anastomosis, we inserted the stapler 2 to 3 cm farther into the lumen than the intended site of anastomosis, and then pulled it back and rotated the stapler to complete the anastomosis. Consequently, the obstruction was corrected.

**Outcomes:** With nearly 16 months' follow-up duration until now, the patient has no difficulty swallowing and has twice received chemotherapy, and returned to his normal life relatively.

Lessons: In the event of potential anastomotic obstruction due to accumulated mucosa, the stapler fallback technique can be successfully used achieve patent anastomosis.

**Abbreviations:** EEA = Premium Plus CEEA autosuture circular stapler, EEA-25 = circular staplers of 25-mm diameter, HSA = hand-sewn anastomosis, STA = stapled anastomosis.

Keywords: colon, esophagectomy, esophago-ileal anastomosis, ileum, mechanical anastomosis

# 1. Introduction

The surgical resection is the available treatment of esophageal cancer. To restore the continuity feed, the esophagogastric anastomosis can be performed with stapled anastomosis (STA) or hand-sewn anastomosis (HSA). The STA is associated with reduced time to anastomotic construction and decreases the

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Received: 24 September 2018 / Accepted: 16 November 2018 http://dx.doi.org/10.1097/MD.00000000013571 occurrence of trauma, allows the uniformity of the anastomosis, but increased the risk of anastomotic stricture.  $^{\left[ 1-3\right] }$ 

The stomach is the most commonly used esophageal substitute after esophagectomy. However, for cases in which a gastric tube cannot be constructed, the right colon and a portion of the terminal ileum are considered an appropriate conduit to reconstruct the esophagus.<sup>[4,5]</sup>

Unlike the gastric tube, the luminal diameter of the bowel is small, and in the small intestine there are many rugal (mucosal) folds. Due to these factors, there is a tendency while using a stapler for esophago-ileal anastomosis for the intestinal mucosa and submucosa to be pushed in advance of the stapler, especially when using circular staplers.<sup>[3]</sup> This phenomenon can cause crowding of the intestinal mucosa at the site of anastomosis leading to intestinal obstruction, particularly when the diameter of the circular stapler is slightly greater than the luminal diameter of the bowel.

We report such a case of anastomotic obstruction caused by mucosal crowding, which was successfully treated by reanastomosis using a fallback technique with the stapler.

# 2. Case description

A 53-year-old Chinese man presented with complaints of difficulty in swallowing for 2 weeks. Fifteen years previously, he had undergone partial gastrectomy for gastric ulcers.

The endoscopy showed that there was a large ulcer in the middle-third of the esophagus, about 28 to 32 cm from the



Figure 1. Preoperative, intraoperative, and postoperative findings of the patient: (A) schematic representation of the mid-esophageal ulcer found on the endoscopy; (B) intraoperative photograph showing the transthoracic view of the colonic conduit; (C) oral contrast study with water-soluble medium on postoperative day 7 showed smooth passage of the contrast without leakage or stenosis of the anastomosis.

incisors (Fig. 1A). Biopsy of the ulcer confirmed esophageal squamous cell carcinoma. After obtaining written informed consent, the patient was planned for surgery (Informed written consent was obtained from the patient for publication of this case report and accompanying images.).

We performed an esophageal replacement using the right colon. During the operation, we initially tried to use the residual stomach to reconstruct the esophagus. However, after 10 min constructing the gastric tube, the gastric conduit became ischemic. Hence, we chose the right colon and a long segment of the terminal ileum supplied by the ileocolic artery for reconstruction (Fig. 1B).

After preparing the colonic conduit, we used circular staplers of 25-mm diameter (EEA-25) to perform the esophago-ileal anastomosis. After performing the esophago-ileal anastomosis with the EEA-25, we checked the patency of the anastomosis by passing the nasogastric tube and an index finger into the efferent loop. Remarkably, we found that the lumen was blocked at the anastomotic site. On cutting the anastomotic stoma, we found that the luminal obstruction had occurred due to crowding of the intestinal mucosa, a result of inserting the circular stapler through the blind end. The mucosa was caught in the staple line upon rotating the stapler to construct the anastomosis.

To revise the anastomosis, we used the same-sized circular stapler and inserted it 2 to 3 cm farther into the lumen than the intended site of anastomosis, and then pulled it back and rotated the stapler to complete the anastomosis. This time the nasogastric tube was smoothly introduced into the loop.

Digital radiography with water-soluble medium 7 days after the surgery confirmed the patency of the anastomosis (Fig. 1C). The postoperative course was uneventful. Histopathology revealed esophageal squamous cell carcinoma at stage G2pT2N1M0. Presently, with nearly 16 months' follow-up duration until now, the patient has no difficulty swallowing and has twice received chemotherapy, and returned. to his normal life relatively.

# 3. Discussion

Indeed, reconstruction after subtotal esophagectomy requires sometimes the use of colon (particularly right colon), when the stomach cannot be used. Differently, in the small intestine, loose areolar tissue in the submucosa allows the mucosal layer to move over the outer muscular layer. When the stapler is inserted into the lumen forcefully, the mucosa may be pushed ahead of it, where it can accumulate at the tip of the stapler (Fig. 2A). When the stapler is rotated 90° to join the nail seat in a straight line, the accumulated mucosal and submucosal tissue at the tip of device on the mesenteric side can be caught in the staple line (Fig. 2B and C). After firing the stapler to complete the anastomosis, the mucosal and submucosal tissue of the mesentery is nailed to the anastomotic wall, thus obstructing the anastomosis (Fig. 2D). In such cases, the most common techniques to overcome the obstruction include revision by hand sutures; using a smaller stapler; expansion of the lumen of the bowel by enterotomy; or lubrication of all the moving parts, as much as possible.

In the present case, we explored an alternative method to prevent or correct the obstruction of the anastomosis, and refer to this as the stapler fallback technique, described as follows. The site of the anastomosis is marked. The stapler is then inserted 2 to 3 cm farther in relation to the marked site (Fig. 3A). Before rotating the stapling rod by 90° to construct the anastomosis, the stapler is then pulled back (returned) to the marked site, so that the clumped mucosal tissue at the tip of the stapling rod is not caught in the staple line (Fig. 3B–D).

Unfortunately, in the present case we did not have the required equipment at hand or sufficient time to take intraoperative images to illustrate our technique. Hence, we have provided schematic diagrams (Fig. 3).

In general, the size of ileum is smaller than jejunum, so we selected the HSA or using smaller size of circular stapler. Also, we expand the intestinal lumen using various size of dilators if the circular stapler is difficult to insert to the intestinal lumen. The larger size of circular stapler was better to prevent the anastomotic stenosis. But, there is a possibility that intestinal mucous will be split if a larger size of stapler inserted the intestinal lumen to prevent anastomosis. The fallback technique with circular stapler might dilate the intestinal lumen using larger size of circular stapler, then pullback the stapler and performed esophagoileostomy. Additionally, to prevent obstruction in surgery, there are some new methods such as the delta-shaped anastomosis,<sup>[6]</sup> endoscopic treatment of knife to correct obstruction,<sup>[7]</sup> and use of endoscopic stents,<sup>[8]</sup> which have been reported to work effectively with gastrointestinal anastomotic obstruction and might be a certain inspiration for us. Existing evidence shows that fallback technique with circular stapler allows a shorter surgical time and might be suitable for some patients regardless of using dilators of circular stapler.



Figure 2. Schematic diagram showing the mechanism of anastomotic obstruction caused by inappropriate application of the circular stapler: (A) clumping of the mucosa at the tip of the stapler; (B and C) rotation of the stapler causes the clumped mucosa to get caught in the staple line; (D) luminal obstruction at the site of anastomosis.



Figure 3. Schematic representation of the stapler fallback technique used to avoid anastomosis obstruction caused by accumulation of the mucosa: (A) pushing of the stapler 2 to 3 cm farther inside the bowel from the marked point; (B) withdrawal of the stapler up to the marked point followed by the rotation; (C) firing of the stapler; (D) successful construction of the anastomosis without luminal obstruction.

### 4. Conclusion

We suggest that while constructing an esophago-ileal anastomosis after esophagectomy, the surgeon should take care to insert the circular stapler into the small bowel lumen in a manner that prevents accumulation of the mucosa at its tip. In the event of potential anastomotic obstruction due to accumulated mucosa, the stapler fallback technique can be successfully used to achieve a patent anastomosis.

### Author contributions

Peng Zhou and Ya-Li Wang contributed to the literature search and the writing of the manuscript. Quan Liu and Jin-Song Li contributed to the review and revision of the manuscript, they should be considered co-correspondence authors.

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