

Techniques for Avoiding Saccular Extended Obstruction at the Anastomotic Site of Functional End-to-End Anastomosis

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How to cite this paper: Yoshida, K., Ietsugu, K., Okamoto, J., Hayashi, S., Asaumi, Y., Ota, N., Sugawara, H., Tabata, S., Kaneki, M., Sakatoku, M. and Kiyohara, K. (2017) Techniques for Avoiding Saccular Extended Obstruction at the Anastomotic Site of Functional End-to-End Anastomosis. *Surgical Science*, 8, 305-311.

<https://doi.org/10.4236/ss.2017.87033>

Received: June 14, 2017

Accepted: July 15, 2017

Published: July 18, 2017

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Abstract

Saccular extended obstruction is generated when the anastomotic site of functional end-to-end anastomosis is extended saccularly and blocked by intestinal contents. This is a specific complication of functional end-to-end anastomosis. Saccular extended obstruction of the anastomotic site of functional end-to-end anastomosis causes postoperative intestinal obstruction. Saccular extended obstruction places a heavy burden on patients because surgery is necessary for treatment of intestinal obstruction due to saccular extended obstruction. However, saccular extended obstruction is not a commonly recognized complication. The greatest factor contributing to the development of saccular extended obstruction is an acute angle between the portions of the intestinal tract oral and aboral to the anastomotic site. When this angle approaches obtuse angle, preferably close to a straight line, stagnation of the intestinal contents does not occur at the anastomotic site of functional end-to-end anastomosis and saccular extended obstruction is avoided. For making the angle of anastomotic intestinal tracts obtuse or straight, it may be effective that the entry hole of stapling suture instrument creating the anastomotic stoma is closed perpendicular to the intestinal axis.

Keywords

Functional End-to-End Anastomosis, Stapling Anastomosis, Anastomosis, Postoperative Complication, Intestinal Obstruction

1. Introduction

Functional end-to-end anastomosis (FEEA) has gained popularity as an easily performed stapling anastomosis technique. In rare cases, however, the anasto-

motoc site of FEEA is extended saccularly because of stagnation of intestinal contents and becomes blocked. We use the term saccular extended obstruction (SEO) to describe this obstruction of the anastomotic site of FEEA. SEO is a specific complication of FEEA and a cause of postoperative intestinal obstruction. However, SEO is not a commonly recognized complication because few reports relevant to this complication have been published. SEO places a heavy burden on patients because surgery is necessary for treatment of intestinal obstruction due to SEO. Therefore, SEO must be given sufficient attention to avoid its development. We herein report the pathogenesis of SEO and techniques for avoiding SEO at the anastomotic site of FEEA. This report is a clinical investigation in our institution.

2. SEO

2.1. Pathogenesis of SEO

When the angle between the portions of the intestinal tract oral and aboral to the anastomotic site is acute, flow of intestinal contents folds backward and stagnation of these intestinal contents make the anastomotic site expanded saccularly. This saccular extended anastomotic site of FEEA generates a relative stenosis of the portion of the intestinal tract aboral to the anastomotic site, eventually leading to intestinal obstruction (**Figure 1** and **Figure 2**).

2.2. Notes of Caution for the Avoidance of SEO

The principle for prevention of SEO is avoidance of stagnation of intestinal contents. Thus, it is important that the angle between the portions of the intestinal tract oral and aboral to the anastomotic site is obtuse angle, preferably close to a straight line for the avoidance of SEO. In addition, a larger anastomotic stoma of FEEA is associated with poorer clearance of the anastomotic site when the angle between the two portions of the intestinal tract is acute (**Figure 3**).

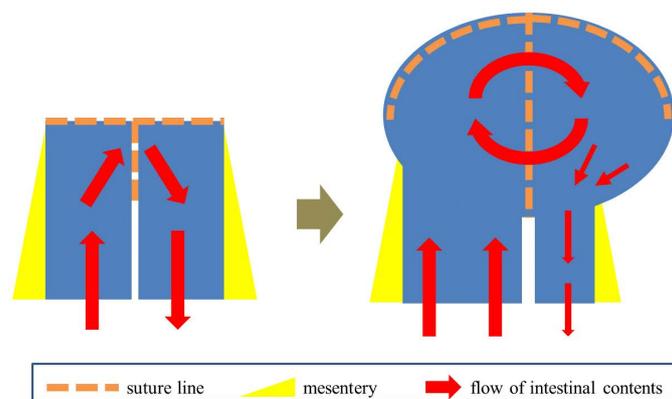


Figure 1. The saccular extended anastomotic site of FEEA generates a relative stenosis of the aboral intestinal tract. This relative stenosis leads to an intestinal obstruction of the aboral intestinal tract.

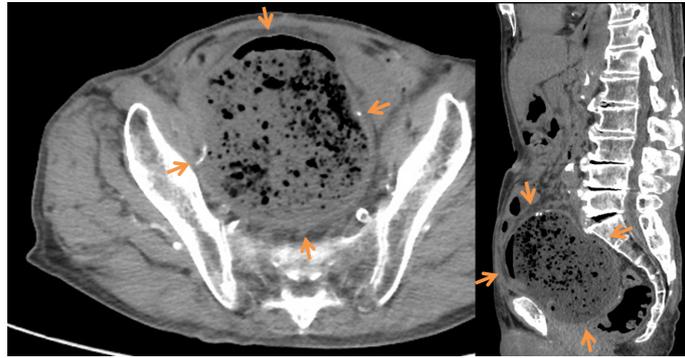


Figure 2. Our case of SEO. The anastomotic site is extended saccularily due to stagnation of the intestinal contents and has become blocked (arrows).

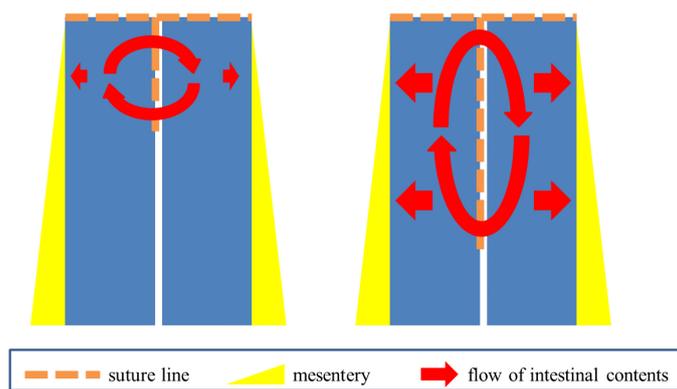


Figure 3. A larger anastomotic stoma of FEEA is associated with poorer clearance of the anastomotic site.

3. Surgical Techniques for Avoiding SEO

Various methods of FEEA are available. Basically, the anastomotic stoma is created using a stapling suture instrument on the other side of the mesentery, the entry hole is closed with the stapling suture instrument, and the FEEA is completed. Closure of the entry hole is important for avoiding SEO. When the entry hole is closed in parallel with the intestinal axis, the angle between the portions of the intestinal tract oral and aboral to the anastomosis tends to become acute (**Figure 4**). However, if the entry hole is closed perpendicular to the intestinal axis, the angle between the two portions of the intestinal tract becomes more obtuse or straight (**Figure 5**). An obtuse angle or straight line is important for avoiding SEO. Additionally, Lembert suture on the stapler line of the entry hole and closing or pulling the mesentery are also effective in making this angle more obtuse or straight (**Figure 6** and **Figure 7**).

4. Results in Our Institution

We have performed FEEA with these techniques since 2010. We have not experienced SEO on the anastomotic site of FEEA since introducing these techniques. We summarized the patients who received FEEA over the last two years, between April 2015 and March 2017 (**Table 1**). 89 patients had received FEEA. The

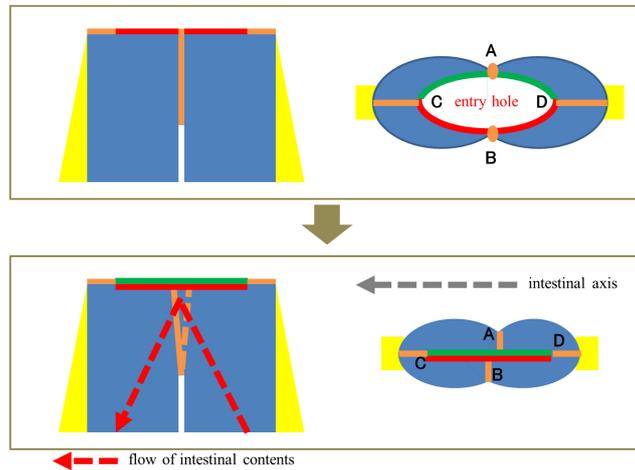


Figure 4. When the entry hole is closed in parallel with the intestinal axis, the angle between the portions of the intestinal tract oral and aboral to the anastomosis becomes acute.

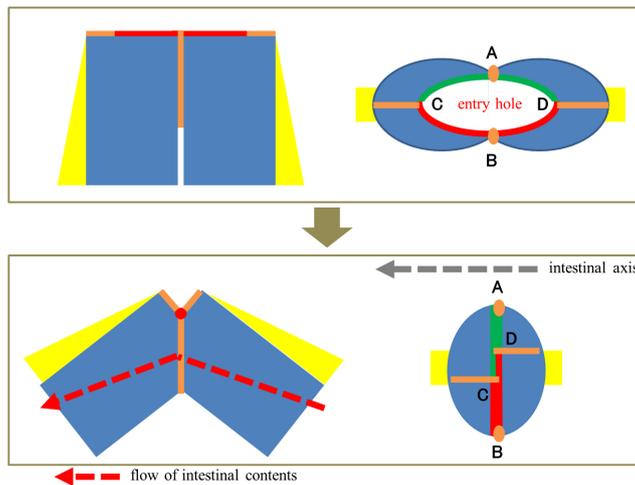


Figure 5. When the entry hole is closed perpendicular to the intestinal axis, the angle between the two portions of the intestinal tract becomes more obtuse or straight.

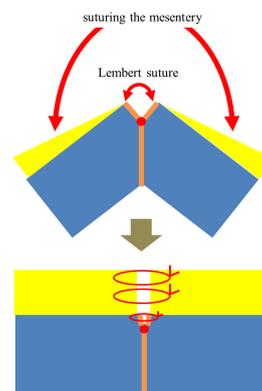


Figure 6. Lembert suture on the staple line of the entry hole and suturing the mesentery are also effective in making this angle more obtuse or straight.

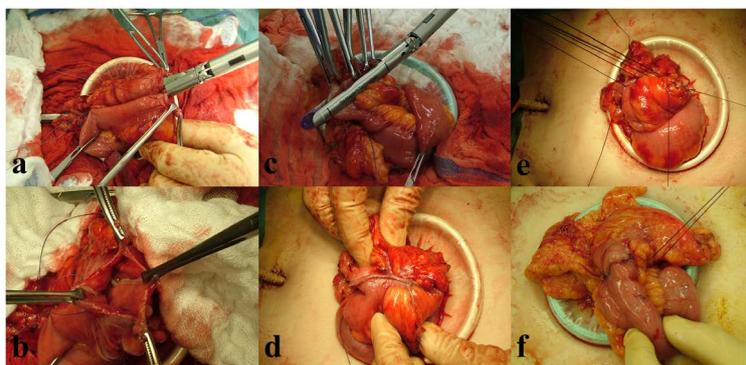


Figure 7. Actual intraoperative photographs. (a) (b) An anastomotic stoma is created using a stapling suture instrument on the other side of the mesentery; (c) (d) The entry hole is closed perpendicular to the intestinal axis with the stapling suture instrument; (e) Lembert suture is placed on the staple line of the entry hole; and (f) a few sutures are placed on the mesentery near the intestinal tract.

Table 1. Summary of FEEA on our institution during the last 2 years (April 2015-March 2017).

Variable	Data
Number of patients, n	89
Gender, n	
Male	48
Female	41
Age, mean \pm SD (range), y	73.1 \pm 12.3 (30 - 93)
Primary disease, n	
Colonic cancer	52
Intestinal obstruction	13
Stoma closure	11
Others	13
Approach, n	
Laparoscopic	48
Open	41
Emergency, n	18
Anastomosis, n	
Small intestine-large intestine	59
Small intestine-small intestine	25
Large intestine-large intestine	5
Postoperative complication related to the anastomotic site, n	
Intestinal obstruction	0
Leakage	0
Others	0

anastomosis between the small intestine and the large intestine was majority and was performed in 59 patients. Postoperative complication related to the anastomotic site was none.

5. Discussion

FEEA was first reported by Steichen in 1968, and today it is a standard stapling anastomosis method [1]. Factors that have helped FEEA to become more widespread include its convenience and association with few complications. In Japan, however, a few reports of intestinal obstruction due to saccular extension of the anastomotic site of FEEA with blockage by intestinal contents have been published in recent years [2] [3] [4]. Because only a few reports are available, an official term for this condition has not been established. Therefore, we have termed this complication SEO in the present report. The greatest factor contributing to the development of SEO is an acute angle between the portions of the intestinal tract oral and aboral to the anastomotic site. When this angle approaches a straight line, stagnation of the intestinal contents does not occur at the anastomotic site of FEEA, and SEO is avoided.

Generally, FEEA may be performed with the techniques based on procedure reported by Steichen [1]. However, the entry hole of stapling suture instrument creating the anastomotic stoma is closed in parallel with the intestinal axis in that procedure, so this angle is an acute angle. In order to make this angle obtuse or straight, we consider that it may be effective that the entry hole is closed perpendicular to the intestinal axis.

Recently many surgeons may not perform suture closure of the mesentery of the reconstructed intestinal tract. However, pulling this mesentery helps to linearize the reconstructed intestinal tract. Therefore, we recommend placing a few sutures in the mesentery near the intestinal tract.

SEO develops by deformation of the anastomotic portion over a long period of several months to several years postoperatively. In principle, surgical treatment of SEO is required because conservative treatment cannot guarantee improvement of the deformation that forms during this chronic course [3] [4]. There was also a report that intestinal perforation has developed from the anastomotic site expanded with SEO [4]. We had experienced a case of SEO that required surgical treatment. We performed a bypass between the portions of the intestinal tract oral and aboral to the anastomotic site. Because the anastomotic site of FEEA extended saccularly was strongly adhered to the back of the pubic bone, we abandoned a resection of the anastomotic site and reanastomosis. The need for surgical repair of SEO places a heavy burden on patients. Therefore, it is important to take measures to avoid SEO.

We have performed the FEEA by this reported technique since 2010 and have not experienced SEO since introducing these techniques. We recommend that the entry hole is closed perpendicular to the intestinal axis and Lembert suture on the stapler line of the entry hole and placing a few sutures in the mesentery near the intestinal tract are performed.

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