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## Original Article

# Intestinal Contents Stayed After Discharge as Low Anterior Resection Syndrome

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### ABSTRACT

**Background:** The lower anastomosis after low anterior resection (LAR) is associated with the development of low anterior resection syndrome (LARS). However, pathophysiology of fragmentation of defecation which is one of LARS remains unknown.

**Patients and Methods:** Between January 2015 and December 2017, eight patients with temporary ileostomy who underwent LAR with double stapling technique (DST) for rectal cancer at our hospital were studied. As the control group, nine patients with temporary ileostomy who underwent proctocolectomy (PC) with DST for ulcerative colitis in the same period were recruited. Defecography was performed two weeks after closure of the ileostomy. The defecation of all patients was evaluated by defecography.

**Results:** In all patients, the descent of the perineum and linearization of the anorectal angle were observed. In patients after PC, all barium could be discharged by some abdominal pressures. On the other hand, in all patients after LAR, barium located anal to the anastomosis could be discharged through the anus, while barium located oral to the anastomosis stayed after discharge, which could not be expelled by maximal abdominal pressures more than 5 minutes after starting evaluation.

**Conclusion:** Remnant intestinal contents after defecation seems to be one of disturbance for defecation after LAR.

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### Introduction

A sphincter-saving surgery, such as low anterior resection (LAR), has been developed for many rectal diseases. However, the lower anastomosis after LAR is associated with the development of low anterior resection syndrome (LARS) [1, 2]. LARS including symptoms of incontinence for flatus, urgency, and frequent bowel movements, has been associated with a negative impact on the quality of life (QOL) [3, 4]. The main causes of LARS have been considered to be poor function of the neorectum or anal sphincter damage, and surgical denervation of the rectum or anal sphincter as documented by anorectal manometry or questionnaire [5]. However, pathophysiology of fragmentation of defecation which is one of LARS remains unknown. We try to evaluate pathophysiology of fragmentation of defecation by defecography as an imaging evaluation.

### Patients and Methods

**Patients.** Between January 2015 and December 2017, eight male patients with temporary ileostomy who underwent LAR using double stapling technique (DST) for lower rectal cancer at our hospital were examined in this study (Table 1). The defecography was performed two weeks after closure of the ileostomy. The rectal function during defecation after LAR was evaluated by defecography. During the same period, nine patients (six male and three female) underwent proctocolectomy (PC) which pouch-anal anastomosis using DST for ulcerative colitis, who served as the control group (Table 1) [6]. Their anastomoses were located in their anal canal. The defecography was performed two weeks after closure of the ileostomy.

### Protocol for defecography

For all patients, a 16-Fr catheter was inserted into the rectum through the

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anus, sat on a radiolucent seat and remained in that position throughout the test. After 50 ml of barium was injected into the rectum through the

catheter, the catheter was removed, and defecography was started.

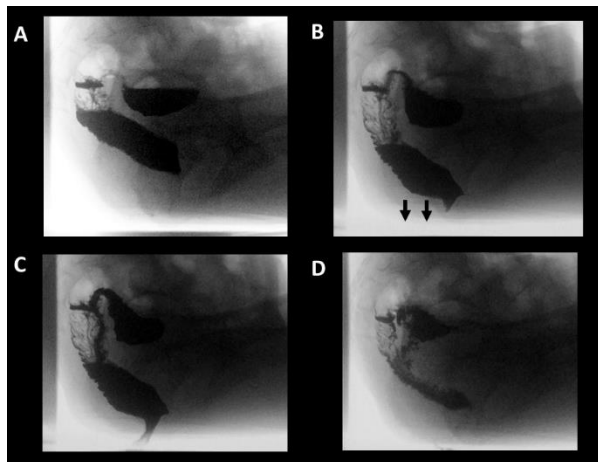
**Table 1:** Comparison of characteristics between two groups

Characteristic	Low anterior resection (n=8)	Proctocolectomy (n=9)	p value
Mean age (range), years	64.1 (35 - 80)	36.0 (19 - 62)	<0.001
Gender, n (%)			0.245
Male	8 (100)	6 (67)	
Female	0 (0)	3 (33)	
Mean LBAA (range), mm	57.5 (50-70)	21.1 (20-25)	<0.001
Size of circular stapler, n (%)			<0.001
28 mm	8 (100)	0 (0)	
25 mm	0 (0)	9 (100)	
Surgical procedure			1.000
Laparoscopic surgery	8 (100)	8 (89)	
Open surgery	0 (0)	1 (11)	
Incontinence of barium			—
Presence	0 (0)	0 (0)	
Absence	8 (100)	9 (100)	
Stay after discharge			<0.001
Presence	8 (100)	0 (0)	
Absence	0 (0)	9 (100)	

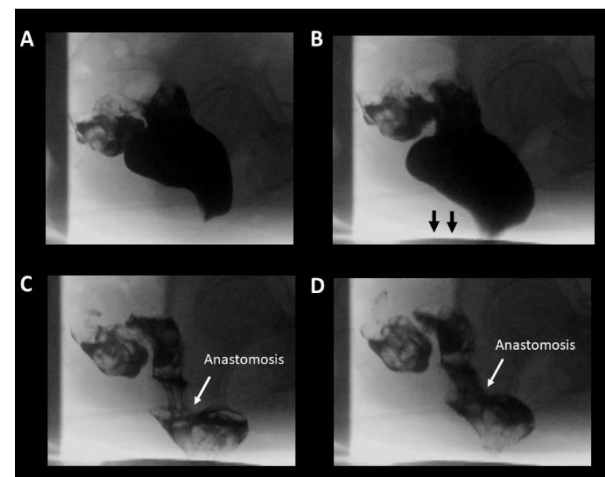
LBAA: Length between anastomosis and the anal verge

### Statistical Analysis

The Wilcoxon rank-sum test was used for the comparison of continuous variables, and the chi-square test was used for the comparison of categorical data. A p-value of less than 0.05 was considered to indicate significance. All data were analyzed using the Statistical Package for Social Sciences (SPSS) 24.0, (IBM SPSS, Tokyo, Japan).



**Figure 1:** Defecography of proctocolectomy group. (A) Resting, (B) The descent of the perineum and linearization of the anorectal angle, (C) Discharged by abdominal pressure, (D) End of defecation, Black arrows point out descent of the perineum.



**Figure 2:** Defecography of low anterior resection group. (A) Resting, (B) The descent of the perineum and linearization of the anorectal angle, (C) Discharged by abdominal pressure, (D) End of defecation, Black arrows point out descent of the perineum.

### Results

#### Comparison between control and after PC in defecography

Their anastomoses were detected in their anal canal. The descent of the perineum and linearization of the anorectal angle were observed in all

the patients. Incontinence of barium was not shown by the defecography in all patients. In patients after PC, all barium could be discharged by some abdominal pressures (Figure 1). On the other hand, in patients after LAR, barium located anal to the anastomosis could be discharged through the anus, while barium located oral to the anastomosis stayed after discharge (Figure 2). No peristalsis could not be observed at the intestine oral to the anastomosis. The residual barium could not be expelled by maximal abdominal pressures more than 5 minutes after starting evaluation.

## Discussion

Abdominoperineal resection (APR) requires a permanent colostomy which was reported to be associated with depression, low self-esteem, and low rates of social participation [7]. However, APR tended to show better physical, emotional, and social function and reported less fatigue and gastrointestinal symptoms than patients after LAR [8, 9]. A negative impact on the QOL of patients after LAR has been associated with LARS [3, 4]. LARS occurs in approximately half of all patients who underwent sphincter-preserving operation for rectal cancer. Among them, 33.6% suffers from major LARS [10]. The main causes of LARS have been considered to be poor function of the neorectum, sphincter damage, and surgical denervation of the rectum or anal sphincter as documented by anorectal manometry or questionnaire [5]. However, pathophysiology of fragmentation of defecation which is one of LARS remains unknown. We try to evaluate pathophysiology of fragmentation of defecation by defecography an imaging evaluation. Defecational functions consist of two main factors. One is motional function, which is evaluated by defecography, and the other is time course of pressure distribution during defecation which is evaluated by fecoflowgram [11].

With regard to motional function after sphincter-saving surgery, the descent of the perineum and linearization of the anorectal angle were observed in all the patients. Incontinence of barium was not shown by defecography in all patients. The temporary injury of the anal sphincter was largely attributed to anal dilatation by stapling instruments during surgery, which finally resulted in the decreased anal pressures. Anal resting pressure and maximal squeeze pressure are significantly reduced at 3 months postoperatively, but gradually improves to preoperative level at 6 and 9 months [12]. PC is a procedure by which anastomosis creates in the anal canal with DST using staplers [6]. Sphincter damage may recover to preoperative level approximately 6 months after surgery. As to time course of pressure distribution during defecation, all barium in PC group could be discharged within ten seconds after starting defecation by some abdominal pressures. On the other hand, barium located oral to the anastomosis could be discharged through the anus however barium located proximal from the anastomosis stayed after discharge in LAR group. No peristalsis could not be observed at the intestine located proximal from the anastomosis. The residual barium could not be discharged by maximal abdominal pressures more than 5 minutes after starting evaluation. In this study, we used barium to imitate stool, but it would be more difficult to discharge the real stool through the anus. These intestinal contents that stayed after discharge has a negative impact on the QOL of patients after LAR. To our knowledge, this is the first report of remnant intestinal contents after discharge in patients who underwent LAR. In conclusion, intestinal contents that stayed after discharge seems to be a form of disturbance for defecation

after LAR.

## Contributions

All Authors performed operations, analyzed the data of patients regarding their clinical features, and have been involved in drafting the manuscript. KY had given final approval of the version to be published. All Authors read and approved the final manuscript.

## Conflict of Interest Statement

The Authors declare that there are no conflicts of interest regarding this study.

## Ethical approval

The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30-147 (9168)], and all patients or their family members provided their written informed consent to participation.

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