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Recovery of Upper Gastrointestinal Bowel Movement After Rectosigmoid Cancer Surgery: A Pilot Transit Analysis

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Postoperative gastrointestinal bowel transit right after colorectal resection has not yet been clarified. Thirty patients with rectosigmoid cancer were treated in this pilot study. The nasogastric tube was removed on the first postoperative day. One Sitzmarks capsule was given to each patient on the second postoperative day. Abdominal X-rays were taken at 3, 6, 8, 24, 48, and 72 hours after capsule intake. Distribution of the remaining Sitzmarks capsules were counted on X-ray films to clarify postoperative gastrointestinal movement after bowel resection. All Sitzmarks capsules were observed in the stomach at 3 and 6 hours after capsule intake. At 8 hours (second postoperative day), the Sitzmarks capsules were distributed from the stomach to the small intestine. Sitzmarks capsules were distributed in the right side colon at 24 hours (third postoperative day) after intake.

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Although the main distribution was still in the right side colon, several patients had evacuations accompanied by the disappearance of the Sitzmarks capsules. In 50% of the patients, it took approximately 72 hours (fifth postoperative day) for the first defecation after intake of the capsules. However, the Sitzmarks capsules remained mainly in the right side colon. Eight hours after intake, the majority of the Sitzmarks capsules shifted to the small intestine. Therefore, medication or feeding should be safely possible starting on the second postoperative day. There was no particular impact of bowel resection on upper gastrointestinal transit in patients with rectosigmoid cancer.

Key words: Bowel transit study – Orocecal transit – Gastrointestinal transit – Radio-opaque marker

Colorectal cancer is increasingly the most prominent malignant neoplasm worldwide and surgical intervention is the best curative modality.[1] The postoperative course has been improved and become much more tidy by recent developments such as fast track recovery program[2,3] and multimodal rehabilitation.[4,5] After introducing those regimens, several medications were tested to speed up the patients' recovery.[6,7] Clarifying the issue of gastrointestinal motion recovery is important as to when to resume patients' oral intake after a bowel operation. Previous studies demonstrated that colonic transition was delayed due to bowel resection.[8] Oral feeding should be started after the resolution of gastric ileus.[9] However, the resolution of upper gastrointestinal ileus after a rectosigmoid cancer operation has not yet been well described by means of radio-opaque markers. Therefore, the present study was conducted to clarify gastrointestinal motion recovery after rectosigmoid cancer surgery.

Patients and Methods

From January 2009 to January 2011, 30 patients with locally advanced rectosigmoid cancer, who had potentially curative open bowel resection, were involved in the study. Inclusion criteria were as follows: the tumor was diagnosed as cancer by preoperative endoscopic biopsy and was located in the rectosigmoid area by preoperative barium study. Tumor stage was diagnosed by the preoperative computed tomography (CT) scan, which showed no distant metastasis, and potentially curative open abdominal resection was expected. Performance status was 0 or 1. Exclusion criteria were as follows: inability to take anything orally; previous history of abdominal operation; distant metastasis as shown on preoperative CT scan; laparoscopic case. The TNM staging of these patients was as follows: T2N0M0, 3 patients; T2N1M0, 3 patients; T3N0M0, 15 patients, and T3N1M0, 9 patients. All patients received preoperative mechanical bowel preparation including bowel irrigation and were treated by open bowel resection with lymph node dissection. This is a multiinstitutional experience. All operators participating in the present study were certified colorectal surgeons by the Japan Society of Coloproctology.

The nasogastric tube was removed on the first postoperative day. One radio-opaque marker (Sitzmarks; Konsyl Pharmaceuticals Inc, Texas) capsule was given to each patient on the second postoperative day (48 hours after operation). Abdominal X-ray films were taken at 3 (51 hours after the operation), 6 (54 hours after the operation), 8 (56 hours after the operation), 24 (72 hours after the operation), 48 (96 hours after the operation), and 72 hours (120 hours after the operation) after Sitzmarks capsule intake. Full-scheduled abdominal X-rays were not done in all patients to reduce radiation exposure (only 3–6 times per patient). Correspondence between time after Sitzmarks capsule intake and postoperative hours and days were shown in Table 1. Location of remaining Sitzmarks capsules was confirmed and was counted in up-right and lay-down abdominal X-ray films. The geographic distribution of the Sitzmarks capsules was determined as reported by Arhan *et al.*[10]

Results

The number of evaluated patients was as follows: 19 patients at 3 hours; 23 patients at 6 hours; 19 patients at 8 hours; 30 patients at 24 hours; 23 patients at 48 hours; and 30 patients at 72 hours after Sitzmarks capsule intake. Of the 30 patients involved in the present study, all of the Sitzmarks capsules remained in the stomach at 3 hours after intake, as shown on the X-ray film. At 6 hours, the abdominal X-ray films showed that the Sitzmarks capsules remained in the

Table 1 Correspondence between time after Sitzmarks capsule intake and postoperative hours and days

Postoperative day	Time after Sitzmarks intake (h)	Postoperative hours from operation (h)
POD 2	3	51
POD 2	6	54
POD 2	8	56
POD 3	24	72
POD 4	48	96
POD 5	72	120

POD, postoperative day.

stomach, although in some of the patients the capsules moved to the small intestine (Fig. 1). The 8-hour abdominal X-ray films showed that most of the capsules shifted to the small intestine. At 24 hours the X-ray films (fourth postoperative day) showed that some of the Sitzmarks capsules remained in the small intestine, but the majority moved into the right side colon. In addition, at this time point 4 patients had initial bowel movements. At 48 hours the X-ray films showed that the main distribution was in the right side colon. At 72 hours after Sitzmarks intake, the main distribution was still in the right side colon (Fig. 2). Half of the patients (15 of 30) had initial bowel movements. Table 2 showed the summary of all of the results. The stomach was empty 8 hours after the Sitzmarks capsule intake (second postoperative day) and they remained in the small intestine for a short time. At 24 hours after intake, the main distribution shifted to the right side colon until 72 hours of observation.

Fig. 1 Abdominal X-ray film of sigmoid colectomy at 6 hours after Sitzmarks capsule intake (54 hours after the operation). Although some Sitzmarks capsules moved to the pylorus, all Sitzmarks were still in the stomach.

Fig. 2 Abdominal X-ray film of sigmoid colectomy at 24 hours after Sitzmarks capsule intake (72 hours after the operation). The majority of the Sitzmarks capsules moved to the small bowel and right side colon.

Discussion

The evaluation of bowel transit has been developed by radio-opaque markers.[10–13] Total colonic transit time in healthy subjects, as reported in the literature, ranges from 62 to 93 hours.[10,11,13,14] After colorectal resection, such investigation has not been well documented. Total colonic transit time after bowel resection was 37 hours according to Iizuka *et al*,[15] which was relatively shorter than that of previous nonoperated cases. But this was measured more than 1 year after the operation. Another report[16] showed different results—90 hours of total colonic transit. Investigation of gastrointestinal motion recovery from the stomach to the colon after bowel resection had not yet been clarified.

Table 2 Mean distribution of Sitzmarks capsules

Time after Sitzmarks intake	Stomach	Small bowel	Right colon	Left colon	Sigmoid colon and rectum	Evacuated
3 h (POD 2)	20	0	0	0	0	0
6 h (POD 2)	18	1	1	0	0	0
8 h (POD 2)	3	16	1	0	0	0
24 h (POD 3)	1	6	11	1	1	0
48 h (POD 4)	0	2	15	2	0	1
72 h (POD 5)	0	2	14	1	1	2

POD, postoperative day.

It is generally acknowledged that the postoperative duration in the ileus is 3 to 5 days after the operation. In addition, laparoscopic surgery may provide an earlier recovery than that of open surgery, by ~1 day. Basse *et al*[4] reported that these multimodal efforts already became generalized and additional benefit between laparoscopic and open surgery was difficult to determine. Postoperative recovery acceleration is of importance to shorten patients' disability and save on hospital costs. Investigation of bowel recovery after operation is also important to shorten hospital stay and have the patients' postoperative course be more comfortable. We focused on the gastrointestinal recovery phase because colonic transit would not be improved any more as a result of the bowel resection for cancer. In the present study, Sitzmarks capsules were administered on the second postoperative day (48 hours after the operation) because very early oral feeding, such as the first postoperative day, would lead to nausea and vomiting.[9] Six to 8 hours after intake, the majority of the Sitzmarks capsules shifted to the small intestine. Therefore, medication or feeding would be possible starting on the second postoperative day. Tsunoda *et al*[9] reported that oral feeding could be safely resumed after the resolution of gastric ileus. This was also accelerated by oral intake of mosaprid.[7] Additional improvements in transit time may be achieved in the future.

In the present study all of the patients underwent open bowel resection, not laparoscopic resection. Excretion of the Sitzmarks capsules was concomitant with the first passage of stool. It took about 60 hours for first flatus and 100 hours for first bowel movement.[17–19] Normal gastric empting time is 3 to 6 hours.[9] Previous reports[20,21] showed that the oroileal transit time in unoperated, healthy subjects ranged from 100 minutes to 7 hours. Our results showed a similar duration within 8 hours after intake, even if the bowel was resected. In addition, the Sitzmarks capsules remained in the right side colon 24 to 72 hours after intake. If we could shorten this transit time, bowel motion recovery may be much more accelerated.

The present study counted markers at 3, 6, 8, 24, 48, and 72 hours by abdominal X-ray films to investigate gastrointestinal transit. This does not include total colonic transit because of further postoperative acceleration to shorten bowel recovery would be found in this period at the beginning of the present study. There were some limitations in the present study. There was no comparative counterpart such as gastrointestinal transit in healthy, unoperated subjects. Therefore, our results were compared with previous reports. Furthermore, the follow-up period was confined to 72 hours after Sitzmarks capsule intake to reduce excessive radiation exposure. In addition, it is acknowledged that individuals have different bowel transit times, even in the nonoperated status.[14] To verify the results, a prospective trial is needed.

In conclusion, the majority of the Sitzmarks capsules shifted to the small intestine 8 hours after their intake. Therefore, medication or feeding should be safely possible after the second postoperative day. There was no particular impact of bowel resection on upper gastrointestinal transit in rectosigmoid cancer operation.

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