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Utility of Laparoscopic Surgery for Multiple Synchronous Colorectal Cancers With Two Anastomotic Sites

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The frequency of multiple synchronous colorectal cancers is reported to be 2% to 7%. The surgical resection of 2 lesions and having 2 anastomotic sites are rare. According to previous studies, even if there are 2 anastomotic sites, the rate of complications associated with laparotomy will not increase. However, the number of studies confined to cases of laparoscopic surgery is limited. This study investigated effective methods for laparoscopic colorectal resection and their short-term results in cases of multiple synchronous colorectal cancers with 2 anastomotic sites. The safety of these methods were also evaluated. The study was comprised of 4 patients with multiple synchronous colorectal cancers who underwent resection using laparoscopy between January 2011 and March 2015. We retrospectively examined patients with 2 anastomosis sites. A total of 3 patients underwent multiport laparoscopic surgery (5-port) and 1 patient underwent single-port laparoscopic surgery. Complications due to the conversion to laparotomy or intraoperative or postoperative complications were not observed in any patient. Laparoscopic colorectal resection, resulting in 2 anastomosis sites, was performed safely. Compared to open colorectal resection with 2 anastomotic sites, laparoscopic resection was a smaller incision and minimally invasive. Therefore, laparoscopic colorectal resection with 2 anastomotic sites is regarded as a feasible and safe option for multiple synchronous colorectal cancers when tumors are located distantly from each other.

Key words: Multiple synchronous colorectal cancers – Laparoscopic colorectal resection – Two anastomosis sites

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The adaptation of laparoscopic surgery for colorectal cancer has been expanded and is now commonly performed for normal colorectal cancer in many facilities.

Although the frequency of multiple colorectal cancers that develop simultaneously at the time of the first surgery is reported to be 2% to 7%,[1,2] surgical resection is rarely required for multiple lesions. In surgery for multiple synchronous colorectal cancers that require resection, when tumors are located close to one another, lesions may be resected simultaneously, resulting in only 1 anastomotic site. However, when the tumors are located distantly, they must be resected separately, and thus separate anastomoses need to be performed. According to previous studies,[3,4] even if there are 2 anastomotic sites, the rate of complications associated with laparotomy will not increase; however, the number of studies confined to cases of laparoscopic surgery is limited.[5–9] When we searched the Igaku Chuo Zasshi/PubMed database of the Japan Medical Abstracts Society (keywords: "multiple cancers of the colon, laparoscope"; "multiple colorectal cancer, laparoscopic surgery"; period: 1994–2015 / "any data"), we only found 5 studies (16 cases) in which laparoscopic colorectal resection was performed on 2 sites for multiple synchronous colorectal cancers (Table 1).[5–9] However, the feasibility of laparoscopic surgery for multiple synchronous primary colorectal cancers remains unknown. In the present study, we evaluated the safety and feasibility of laparoscopic resection of simultaneous laparoscopic colorectal resection on 2 separate sites.

Patients and Methods

Among 394 patients who underwent laparoscopic colon cancer surgery at our hospital between January 2011 and March 2015, we selected 4 patients who had multiple synchronous colorectal cancers, underwent surgery, and had 2 anastomotic sites as our study targets. We examined short-term surgical results and complications.

Surgical Technique

Multiport laparoscopic surgery (MLS) has been recently adopted more frequently worldwide for the treatment of colon cancer. Compared with open surgery, MLS has been associated with less pain, a quicker recovery of gastrointestinal function, improved pulmonary function, shorter hospital stays, and a better postoperative quality of life.[10] Single-port laparoscopic surgery (SILS) is a newer innovation proposed to further the outcomes of multiport laparoscopy. SILS was first reported in 1999 for cholecystectomy,[11] and then applied to colorectal resection in 2008 by Remzi and Bucher.[12,13]

Multiport laparoscopic surgery

MLS required 5 ports, with the first 12-mm trocar or wound protector (Lap Protector, Hakkou Shoji, Nagano, Japan) placed in the umbilicus as a camera port, another 12-mm trocar, and three 5-mm trocars. The trocars were inserted in the upper and lower abdominal quadrants on the right and left sides, under laparoscopic guidance. The camera port was expanded to extract the specimen through an incision of 4 to 5 cm.

*Single-port laparoscopic surgery.*Under general anesthesia, the patient was placed in the modified lithotomy position. A wound protector (Hakkou Shoji) was inserted through a 30-mm transumbilical incision. A single-port access device (EZ-access, Hakkou Shoji) was then mounted into the wound protector and three 5-mm ports were inserted (Fig. 1). The surgical procedures and instruments used were identical to those for standard laparoscopic surgery with a flexible 5-mm scope (Olympus Medical Systems Corp, Tokyo, Japan). A pneumoperitoneum was established by the insufflation of 10 mmHg CO_2. An additional incision or trocar port was placed without hesitation when necessary for completing the procedure, and conversion to open laparotomy was maintained as an option. The decision to use an additional trocar or convert to open laparotomy depended on the opinion of the surgeon. In lymphadenectomy, complete mesocolic excision with central vascular ligation was performed. The final incision was extended to a length similar to the size of the specimen.

Results

The backgrounds of the 4 patients were as follows (Table 1): their mean age was 71.5 years (range: 66–76 years) and all 4 patients were male. Their mean body mass index (BMI) was 27.6 kg/m^2 (23.7–29.0), indicating that they were slightly obese; however, all American Society of Anesthesiologists (ASA) statuses were 1, which was good. Their tumor locations were as follows: the right colon (cecum and ascending colon) and left colon (descending colon

Table 1 Patient characteristics

	Case 1	Case 2	Case 3	Case 4
Age, y	75	76	66	68
Sex	Male	Male	Male	Male
BMI, kg/m^2	26.1	31.7	23.7	29.0
ASA status	1	1	1	1
Prior surgery	–	–	–	–
Tumor location	A	A	Ce	T
	Ra	D	S	S

Ce, cecum; A, ascending colon; T, transverse colon; D, descending colon; S, sigmoid colon; Ra, rectum above the peritoneal reflection.

and sigmoid colon) in 2 patients; the ascending colon and rectum in 1 patient; and the transverse colon and sigmoid colon in 1 patient. The tumors on both the oral and anal sides were stage III or lower, and there were no cases of invasion into other organs.

The results of surgery were as follows (Table 2): 3 patients underwent multiport laparoscopic surgery (5-port) and 1 patient underwent single-port laparoscopic surgery. The policy of our hospital changed in April 2014: we now perform single-port laparoscopic surgery for colon cancers, except for transverse colon cancer. Both cases of ascending colon and sigmoid colon cancer and the case of transverse colon and sigmoid cancer were encountered after April 2014. We performed single-port laparoscopic surgery for patients with ascending colon and sigmoid colon cancer, but not for the patient with transverse colon cancer.

Minor laparotomies for extracting and anastomosing specimens were performed in 1 region on the umbilicus in all cases, and the median length was 47.5 mm (range: 30–65 mm). Super-extended lymphadenectomies were performed in all cases. Temporary ileostomies or colostomies were not performed. Conversion to laparotomy and the addition of ports were not performed in any case.

The postoperative follow-up was as follows (Table 3). Complications including anastomotic leakage were not observed in any case, and no cases required reoperation.

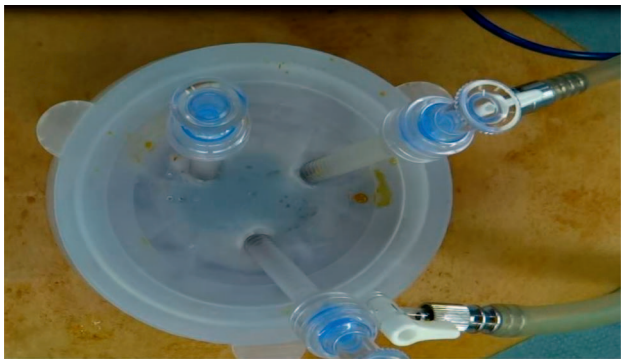

Fig. 1 In patients with colon cancers, EZ-access was mounted to the Lap Protector mini and three 5-mm ports were made in EZ-access.

Discussion

The frequency of developing multiple colorectal cancers concomitantly at the time of first surgery for colorectal cancer has been reported to be 2% to 7%.[1,2] Nakae *et al*[14] investigated the positional relationship of each tumor in multiple synchronous colorectal cancers and divided them into 6 regions: cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum, and anus. A total of 37 out of 47 patients had tumors in the same or adjacent areas, while the remaining 10 (21.3%) had tumors that were at least 2 regions apart.

When patients have multiple colorectal cancers in which surgical resection is required and the tumors are in different regions, one of the following surgical procedures may be selected: (1) Each tumor is excised simultaneously and there is 1 anastomotic site and (2) each tumor is excised and sutured, resulting in 2 anastomotic sites. In the case of simultaneous excision, the digestive tract between each tumor is extensively resected and thus, the extent of the impact is larger, which may cause excessive invasion. Furthermore, after resecting the extra intestinal tract, the remaining intestine will be shorter, which may decrease the QOL of a patient due to defecation disorders. In contrast, in the case of 2 anastomotic sites, the range of intestinal resection may be minimized; however, the risk of developing complications may increase due to multiple anastomotic sites.

Whelan *et al*[3] performed laparoscopic colorectal resection with multiple anastomotic sites on 30 patients. The complications that developed were as follows: anastomotic leakage, 1 case (3%); wound seroma, 2 cases (6%); wound infection, 1 case (3%); hydronephrosis, 1 case (3%); and urinary tract infection, 1 case (3%). These complications were similar to those of colorectal resection with 1 anastomotic site. They suggested that multiple colorectal anastomoses without temporary colostomy are safe and desirable if all of the following conditions are satisfied: preoperative treatment sufficient to reduce the risk of fecal contamination,

Table 2 Surgical outcomes

	Case 1	Case 2	Case 3	Case 4
Operation	MLS	MLS	SILS	MLS
Operative time, min	669	460	305	399
Blood loss, mL	70	110	0	0
Final incision, mm	40	65	30	55
Conversion of laparotomy	–	–	–	–
Additional trocars required	–	–	–	–
Anastomosis method	FEEA+DST	FEEA+FEEA	FEEA+DST	FEEA+DST
Number of harvested lymph node, n	54	25	35	44

DST, Double stapling technique; FEEA, functional end-to-end anastomosis.

adequate blood flow to anastomosis sites, no technical issues with anastomosis, and no tension around the anastomotic sites. Furthermore, Holubar *et al*[4] performed laparoscopic colorectal resection with multiple anastomosis sites on 69 patients (10 were originally laparoscopic cases, but almost half were changed to laparotomies). Complications developed in 25 cases (36%), but there were no cases of anastomotic leakage; they reported that this rate was similar to that in cases of colorectal resection with 1 anastomotic site.

Among cases of laparoscopic colorectal resection, the frequency of wound-related complications was less than that in laparoscopic colectomy and resection. No significant differences have been reported in the frequency of other complications.[11] However, the number of reports on cases of laparoscopic surgery with 2 anastomotic sites is limited. When we searched the Igaku Chuo Zasshi (database of the Japan Medical Abstracts Society) and PubMed (keywords: "multiple cancers of the colon, laparoscope"; "multiple colorectal cancer; laparoscopic surgery"; period: 1994–2015 / "any data"), there were only 5 studies (16 cases) in which laparoscopic colorectal resection was performed on 2 sites for multiple synchronous colorectal cancers (Table 4).[5–9] In all of these cases, there were no intraoperative complications, complications due to the conversion to laparotomy, or postoperative complications. Surgery was performed safely. In the present study, no complications were observed in any of the 4 cases.

Table 3 Postoperative course

	Case 1	Case 2	Case 3	Case 4
Length of hospital stay, d	13	12	6	8
Days until feces after surgery, d	2	4	3	2
Complications, n	0	0	0	0
Wound infection, n	0	0	0	0
Anastomotic leakage, n	0	0	0	0
Ileus, n	0	0	0	0
Others, n	0	0	0	0

In the case of laparoscopic colorectal resection, if there are 2 anastomotic sites, careful consideration is required for body position, port placement, the order of resection, and order of anastomosis. Regarding surgery positions, the left and right positions are required because the positions will be the lower left and lower right; thus, there is a need for extracorporeal fixation to correspond to these positions.

Since patients who underwent single-port laparoscopic surgery had cecum lesions and lesions proximal to the sigmoid colon, we did not need to consider port placement. However, when we selected orthogonal resection of the rectum with an automatic suturing device in 5-port surgery, we placed a 12-mm port into the lower right abdomen, outside the inferior epigastric vessels and to the caudal side as much as possible. Furthermore, when it was necessary to perform mobilized surgery on the splenorenal ligament, we focused on placing a 5-mm port in the upper abdomen above the navel. Our policy is that if forceps are unable to reach the tumor at the time of mobilization and dissection, we do not hesitate to add a port; however, this was not necessary for any of the subjects in the present study.

Regarding small laparotomies, we started with 3-cm incisions in the umbilical region. There was 1 case in which we had to add a skin incision because the size of a tumor was large; however, in all cases, it was possible to draw the intestinal tract out of the abdominal cavity and anastomose it.

Regarding resection, we started with more advanced lesions. If the stages of the lesions were approximately the same, we started with that in which the expected mobilization operating time was shorter. In the 3 cases in the present study, we started mobilized surgery from the right side of the colon, except for the patient with concurrent

Table 4 Previous cases of laparoscopic colorectal surgery with 2 anastomotic sites

Reference	N	Type of surgery	N	Conversion of laparotomy	Complications
Lauter[5]	2	Right hemicolectomy + low anterior resection	1	–	–
Jafari[6]	1	Right hemicolectomy + low anterior resection	1	–	–
Kawaguchi[7]	1	Transverse resection + anterior resection	1	–	–
Tan[8]	1	Right hemicolectomy + anterior resection	1	–	–
Furutani[9]	11	Right hemicolectomy + sigmoid colectomy	6	–	Ileus 2
		Right hemicolectomy + anterior resection	4		
		Transverse resection + low anterior resection	1		
Our cases	4	Ileocecal resection + sigmoid colectomy	1	–	–
		Right hemicolectomy + descending resection	1		
		Ileocecal resection + low anterior resection	1		
		Transverse resection + sigmoid colectomy	1		

transverse colon and sigmoid colon cancer. We dissected the lesional tract on the anal side of the left side of the colon first, dissected the oral side outside the body, and then dissected the oral and anal sides of the lesional tract on the right side of the colon.

Concerning anastomosis, based on tension at the time of anastomosis, we performed this procedure after left and right colon dissection was completed. We initially performed anastomosis (functional end-to-end anastomosis) on the right colon outside the body, and then on the left colon inside the body using the double stapling technique. We also conducted single-port laparoscopic surgery without any complications using similar procedures and techniques to those used in 5-port surgery.

Although the median BMI in all patients was 27.6, which is somewhat high and indicates slight obesity, complications during surgery or due to the conversion to laparotomy were not observed, and we were able to safely perform surgery. Compared to the results that previously reported about laparoscopic surgery for colorectal cancers,[16,17] all variables were similar and laparoscopic colorectal resection with 2 anastomotic sites were shown to be sufficiently safe and minimally invasive.

When right and left colectomies are required at the same time, laparoscopic surgery reduces the size of the surgical wound from that of open surgery, which is very advantageous.

However, this study was a single-center, retrospective case series of 4 patients that aimed to evaluate the feasibility of laparoscopic resection of 2 separate specimens containing malignancies for multiple synchronous colorectal cancers. The relevance of laparoscopic surgery for multiple colorectal cancers from an oncologic aspect needs to be addressed by studies with larger patient numbers and a longer follow-up.

Conclusions

Laparoscopic colorectal resection with 2 anastomotic sites requires a relatively long surgical time. However, we were able to perform surgery without complications, including anastomotic leakage. Therefore, laparoscopic colorectal resection with 2 anastomotic sites may be regarded as an option for multiple synchronous colorectal cancers when tumors are located distantly from each other.

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