TWO CASES OF SIMULTANEOUS LAPAROSCOPIC SURGERY FOR SYNCHRONOUS GASTRIC AND COLON TUMORS

Kiyotomi Maruyama, Ko Shimada and Kuniyuki Gomi

(received 29 May 2013, accepted 8 October 2013)

Department of Surgery, Suwa Red Cross Hospital, 5-11-50 Kogandoori, Suwa 392-0027, Japan

Abstract

Here we report two cases of the simultaneous laparoscopic surgery. Case 1 was a 63-year-old male who was referred to our hospital for the treatment of co-existing gastric cancer (T1aN0M0) and colon cancer (T1N0M0). We simultaneously performed laparoscopic sigmoidectomy and distal gastrectomy. It took 525 minutes and blood loss was 200 ml. Case 2 was a 77-year-old female who was referred to our hospital for the treatment of a low-risk gastrointestinal stromal tumor of the stomach co-existing with colon cancer (T2N0M0). We simultaneously performed laparoscopic ileocecal resection and partial resection of the stomach. The gastric tumor was treated by laparoscopic and endoscopic cooperative surgery. It took 451 minutes and the total blood loss was 100 ml. Each patient was discharged on postoperative day 13 without any complications. We believe that simultaneous laparoscopic surgery for synchronous malignant tumors under the guidance of an experienced surgeon is feasible and minimizes postoperative distress.

Key words : laparoscopic surgery, double cancer, gastric cancer, colon cancer

Introduction

Laparoscopic gastrointestinal surgery with lymphadenectomy is being increasingly performed in Japan ; however, it is rarely performed for multiple gastrointestinal tumors and its feasibility and safety are unknown. Most of the reports on this type of surgery have concerned small case series[1-4]. The reason for limited use is, to some extent, the possible disadvantage of simultaneous laparoscopic surgery, such as longer surgical duration, high-stress on the surgeon, and the use of additional laparoscopic ports compared with conventional open surgery. If these problems are resolved, simultaneous laparoscopic surgery can also be recommended for multiple gastrointestinal tumors so that the patient can have an improved postoperative quality of life. Conventional open surgery for gastric and colon tumors usually requires a wide laparotomy from the xiphoid to the pubic symphysis and manipulation of intestines. On the other hand, laparoscopic surgery has its own advantages such as the prevention of deterioration in respiratory function and decrease in the incidence of postoperative ileus[5,6].

We report the case of two patients, one with cancer of the stomach and colon, and one with a gastrointestinal stromal tumor (GIST) of the stomach and colon cancer, who successfully underwent simultaneous laparoscopic surgery for their synchronous tumors.

Correspondence : Kiyotomi Maruyama, M.D.
Department of Surgery, Suwa Red Cross Hospital, 5-11-50 Kogandoori, Suwa 392-0027, Japan
Tel : 81-266-52-6111
Fax : 81-266-57-6078
E-mail : kiyomaru@suwa.jrc.or.jp

Case 1

A 63-year-old-male was admitted for a gastric cancer after endoscopic submucosal dissection and a colon cancer after endoscopic mucosal resection. His body mass index was 25 kg/m^2. The gastric lesion was located on the anterior wall near the pyloric ring. The colon cancer was located in the sigmoid colon. Precise histopatho-

logical examination of the gastric specimen revealed a 30 × 25 mm type 0-IIa+IIc intramucosal lesion without lymphovascular invasion, that was predominantly papillary adenocarcinoma invading into the vertical margin. According to the International Union Against Cancer TNM Classification of Malignant Tumours, 7th edition, the tumor was T1aN0M0, stage IA. The 10×8 mm colon cancer was a type 0-IIa submucosal invasion (1.2 mm below the muscularis mucosa) with no lymphovascular involvement and negative horizontal/vertical margins ; this was also predominantly papillary adenocarcinoma. The tumor was T1N0M0, stage I (TNM). Consequently, it was determined that curative resection was necessary for both tumors ; additional resections involving simultaneous laparoscopic distal gastrectomy and sigmoidectomy with regional lymphadenectomy were performed.

During surgery, sigmoidectomy was performed first. Two 12 mm trocars were inserted into both sides of the lower abdomen, two 5 mm trocars were inserted into both sides of the middle abdomen at the level of the umbilicus, and a camera trocar was inserted into the umbilicus. Two 5 mm trocars were added in both sides of the upper abdomen, and the 5 mm trocars in the middle abdomen were exchanged for 12 mm trocars during gastrectomy (Fig. 1). The two trocar-sites in the lower abdomen were closed. Two surgeons were respectively assigned to perform sigmoidectomy and gastrectomy.

The patient was placed in the supine position with his legs apart and was administered general and epidural anesthesia. After dissection commenced at the posterior peritoneum adjacent to the descending colon and upper part of the rectum, the inferior mesenteric artery, left colic artery, and inferior mesenteric vein were ligated with the retrieval of lymph nodes along with these vessels. Next, the sigmoid colon was transected at the terminal portion using an endoscopic linear stapler. Then, the sigmoid colon was extracted through the umbilical incision, which was extended to 4cm in length, and was separated from the tumor after leaving an adequate safety margin. This was followed by colonic anastomosis using a double-stapling technique via an anal approach.

Gastrectomy was performed next. The umbilical incision was sutured to leave a 2 cm opening, and a camera trocar was inserted into this site. The greater omentum was divided 5 cm distal to the left gastroepiploic artery, followed by ligation of the left gastroepiploic artery at its origin. Then the right gastroepiploic vessels were ligated at their origin, followed by transection of the duodenum directly distal to the pyloric ring. Next, the right and left gastric arteries and veins were ligated. After dissection of the right cardial lymph nodes and the lymph nodes along the lesser curvature, distal two-thirds segment of the stomach was resected with endo-linear staplers, and it was extracted through the umbilical incision, which was re-extended to 4 cm in length. The lymph nodes along the common hepatic artery, splenic artery and celiac axis were not dissected because of the mucosal gastric cancer. Following gastric resection, Billroth I reconstruction was performed by a delta-shaped anastomosis[7].

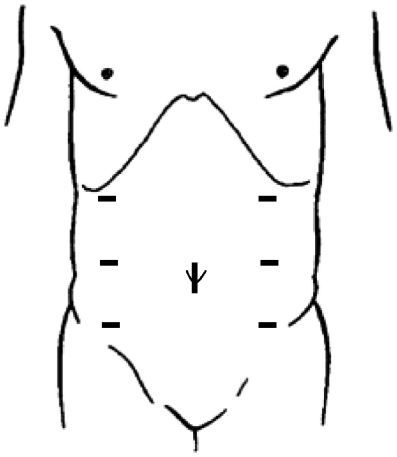

Fig. 1. Two 12 mm trocars in both sides of the lower abdomen, two 5 mm trocars in both sides of the middle abdomen were used during sigmoidectomy. Two 5 mm trocars were added in the both sides of upper abdomen during gastrectomy.

The surgery took 525 minutes and the total estimated blood loss was 200 ml. The massive amount of fatty tissue made the procedure slightly difficult. The patient resumed oral intake on the 4th postoperative day (POD) and was discharged on the 13th POD without any complications. Histopathological examination of the resected stomach and colon specimens revealed scars after endoscopic treatment without residual carcinoma and lymph

node metastasis.

Case 2

A 77-year-old-female was admitted to our hospital for a low of hemoglobin level (4.2 g/dl). Her body mass index was 21 kg/m^2. Gastroscopy revealed a gastric submucosal lesion with a 3 cm diameter and an ulcer on top of the tumor in the anterior wall of the middle body near the greater curvature. Histopathological examination of the tumor revealed low (<5 per 50 high power fields) mitotic activity and positivity for both CD117 and CD35, which indicated a low-risk GIST according to the modified-Fletcher classification. Colonoscopy revealed a type 1 tumor with a 5 cm diameter located in the cecum, and it was histopathologically confirmed to be a papillary and well-differentiated adenocarcinoma. Abdominal computed tomography showed gastric wall thickening without enlarged lymph nodes. From the above findings, the clinical stage of colon cancer was T2N0M0, stage I (TNM). Laparoscopic partial resection of the stomach and ileocecal resection were planned.

During ileocecal resection, a 12 mm trocar was placed in the left side of the middle abdomen at the level of the umbilicus and three 5 mm trocars were placed in the right side of the middle abdomen at the level of the umbilicus, the right lower quadrant and the left upper quadrant. A camera trocar was placed in the umbilicus. The trocar site of the right lower quadrant was closed and an additional 5 mm trocar was placed in the right upper quadrant during the resection of the stomach (Fig. 2). A surgeon performed both procedures and an endoscopist assisted during resection of the gastric tumor because the tumor was elevated toward the inside of the stomach and was invisible and undetectable from the outside of the stomach.

The patient was placed in the supine position with her legs apart under general and epidural anesthesia. After dissection commenced at the posterior peritoneum adjacent to the ascending colon toward the duodenum, the ileocolic artery and vein were ligated and divided at their origin with retrieval of lymph nodes along these vessels. After the ascending colon was fully mobilized, the terminal ileum and the ascending colon were extracted through the umbilical incision, which was extended to 4 cm in length. The terminal ileum was transected from the tumor, leaving an adequate safety margin. Then the colon was transected at the site of the hepatic flexure in the same manner, followed by an extracorporeal ileocolonic anastomosis using linear staplers.

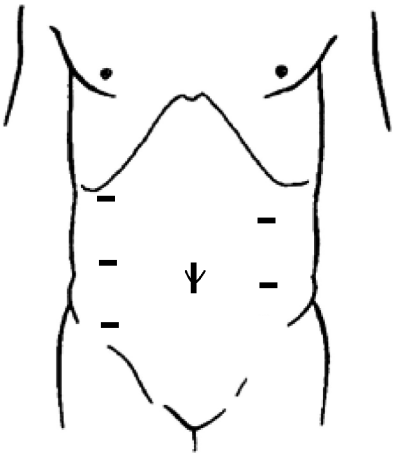

Fig. 2. A 12 mm trocar in the left side of the middle abdomen and three 5 mm trocars in the right side of the middle abdomen, the right lower quadrant and the left upper quadrant were used during colectomy. An additional 5 mm trocar was placed in the right upper quadrant during the resection of the stomach.

A surgeon and an endoscopist cooperated to perform partial resection of the stomach. The umbilical incision was sutured to leave a 2 cm opening and a camera trocar was inserted into the site. At first, the branches of the right gastroepiploic vessels around the gastric tumor were ligated and divided. Then, the endoscopist used an IT-knife through the endoscope to incise all layers of the gastric wall longitudinally half around the tumor with adequate safety margins. Next, the tumor was turned over outside of the stomach and resected with adequate safety margins using a endo-linear stapler under laparoscopic guidance (Fig. 3). The gastric wall defect was closed using endo-linear staplers along the horizontal axis of the stomach to prevent stricture formation in the stomach. After intraoperative histopathological examination revealed that the tumor was a GIST, the staple line was covered with serosal layer sutures.

The surgery took 451 minutes and the total estimated

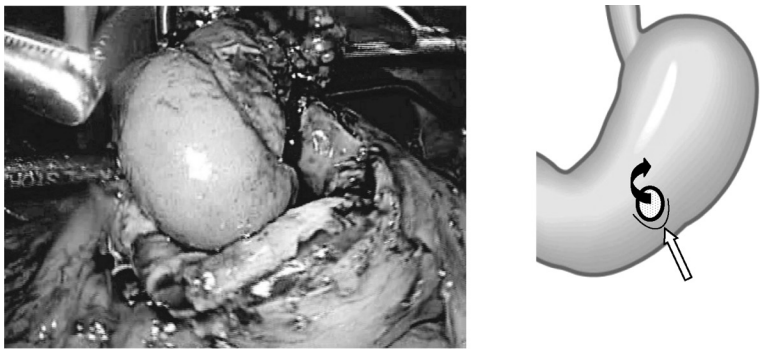

Fig. 3. The endoscopist used an IT-knife to incise all layers of the gastric wall longitudinally half around the tumor (continuous line). Next, the tumor (O) was turned over outside of the stomach very carefully. Tumor was resected and the gastric wall was sutured with adequate safety margins using a endo-linear stapler (white arrow) under laparoscopic guidance.

blood loss was 100 ml. She resumed oral intake on the 3rd POD and was discharged on the 13th POD without any complications. Histopathological examination of the resected gastric specimen confirmed a 3.5 cm diameter GIST with adequate safety margins, T2N0M0 with low mitotic rate, stage IA (TNM). The colon specimen was confirmed to be a T2N0M0, stage I (TNM), with a 6 cm diameter.

Discussion

The frequency of synchronous cancer in gastric cancer patients reportedly ranges from 1.1% to 3.4%, and colorectal cancer is reportedly the most common type of synchronous cancer in these patients[8-10]. Recently, the use of laparoscopic surgery for early gastric cancer and colorectal cancer has been extended and is considered to be an acceptable alternative to open surgery in Japan. In our hospital, laparoscopic surgery has been considered to be a treatment option for intramucosal and submucosal gastric cancers and all colorectal cancers without invasion to adjacent organs. If each tumor conforms to the conditions mentioned above, simultaneous laparoscopic surgery can also be used to treat synchronous cancer. Tokunaga reported seven consecutive patients (1.1%) who underwent simultaneous laparoscopy-assisted gastrectomy and colorectal surgery out of the 638 patients who underwent laparoscopy-assisted gastrectomy with lymphadenectomy for gastric cancer at the Cancer Institute Hospital[11]. Simultaneous laparoscopic surgery for both gastric and colorectal cancer may have many advantages such as lesser blood loss, shorter hospital stay and minimal incision, which in turn is associated with lesser postoperative pain and a decreased incidence of wound infection, adhesion or pulmonary complications[5,6,12-14]. Moreover, laparoscopic procedures involve minimal manipulation of the small intestine, resulting in decreased expression of inflammatory cytokines and decreased incidence of postoperative bowel obstruction due to adhesion[15]. The operation time, blood loss, morbidity, mortality and length of the postoperative hospital stay in these previous reports were shown in Table 1. There were no severe complications reported. In our cases, the blood loss was 100 g and 200 g, respectively, while the length of hospital stay was 13 days for both.

Although many advantages of laparoscopic surgery have been reported previously as above, it also has some limitations, especially simultaneous laparoscopic surgery. These include longer surgical duration, high-stress on the surgeon, and the use of additional laparoscopic trocars compared with conventional open surgery. In the previous reports, the surgical duration was 263-605 minutes (Table 1). In our cases, the surgical duration was 525 minutes and 451 minutes, respectively. The resection of each organ with lymphadenectomy was performed by specialists. Therefore, the effort of the surgeon was equivalent to that required for a single surgery such as gastrectomy or colectomy. The two trocar-sites in the

Table 1. Cases who underwent simultaneous laparoscopic surgery for gastric and colon tumors

Author	Case Number	Operation Time (min)	Blood Loss (g)	Morbidity	Mortality	Hospital Stay (days)
Maruyama	2	451-525	100-200	None	None	13, 13
Zhu[1)]	1	270	120	None	None	13
Nishikawa[3)]	3	315-495	80-440	None	None	10-19
Lee[4)]	1	400	500	None	None	17
Tokunaga[11)]	7	263-576	15-250	SSI, Enteritis, Gastric fullness	None	11-51
Hanai[14)]	4	390-605	36-245	None	None	12-29

upper side used during colectomy also were used during gastrectomy.

Wedge resection has been advocated for a majority of gastric GISTs. A laparoscopic approach may be the preferred approach for resection in most patients with small- and medium-sized gastric GISTs (<5 cm)[16)]. However, the techniques used must avoid direct tumor manipulation with laparoscopic instruments in an effort to eliminate the incidence of tumor rupture and tumor spillage into the intraperitoneal cavity. Moreover, the surgical goal should be complete resection with gross negative margins. In our case, because the tumor location was invisible by laparoscopy, an experienced endoscopist used a flexible upper endoscope to facilitate localization of the tumor and assisted in the evaluation of both the extent of resection margins and the integrity of the suture line. At first, all layers of the gastric wall were endoscopically incised half around the tumor with adequate safety margins. Then an endo-linear stapler was used under laparoscopic guidance to excise the tumor and close the gastric wall incised during endoscopy without causing tumor spillage.

Simultaneous laparoscopic surgery for synchronous gastric and colon tumor can result in lesser surgical damage compared with that resulting from individual laparoscopic resection or conventional laparotomy for gastric or colon tumor. We believe that simultaneous laparoscopic surgery under guidance of an experienced surgeon is feasible and relieves postoperative distress. Laparoscopic surgical teams with expertise in both gastrectomy and colectomy may be required for safely performing this surgery within a suitable time frame.

Reference

1) Zhu, Q.L., Zheng, M.H., Freg, B., *et al.* (2008) Simultaneous laparoscopy-assisted low anterior resection and distal gastrectomy for synchronous carcinoma of rectum and stomach. *World J. Gastroenterol.*, **14**, 3435-3437.

2) Tagaya, N., Kasama, K., Suzuki, N., Taketsuka, S., Horie, K. and Kubota, K. (2006) Simultaneous laparoscopic treatment for disease of gallbladder, stomach, colon. *Surg. Laparosc. Endosc. Percutan. Tech.*, **15**, 169-171.

3) Nishikawa, M., Higashino, M., Tanimura, S., Fukunaga, Y. and Tokuhara, T. (2010) Three cases of synchronous laparoscopic resection for gastric and colonic cancer. *Surg. Laparosc. Endosc. Percutan. Tech.*, **20**, 218-225.

4) Lee, J., Nam, Y. and Kim, W. (2010) Simultaneous laparoscopy-assisted distal gastrectomy and right hemicolectomy for synchronous advanced gastric and colon cancer. *Surg. Laparosc. Endosc. Percutan.* Tech., **20**, 257-261.

5) Kawamura, H., Yokota, R., Honda, Y. and Kondo, Y. (2010) Comparison of recovery in the early phase after laparoscopy-assisted gastrectomy and open gastrectomy. *Surg. Endosc.*, **24**, 2739-2742.

6) Ohtani, H., Tamamori, Y., Arimoto, Y., Nishiguchi, Y., Maeda, K. and Hirakawa, K. (2012) A meta-analysis of the short- and long-term results of randomized controlled trials that compared laparoscopy-assisted

and open colectomy for colon cancer. *J. Cancer*, **3**, 49–57.

7) Kanaya, S., Kawamura, Y., Kawada, H., Iwasaki, H., Gomi, T., Satoh, S. and Uyama, I. (2011) The delta-shaped anastomosis in laparoscopic distal gastrectomy : analysis of the initial 100 consecutive procedures of intracorporeal gastroduodenostomy. *Gastric Cancer*, **14**, 365–371.

8) Eom, B.W., Lee, H.J. and Yoo, M.W. (2008) Synchronous and metachronous cancers in patients with gastric cancer. *J. Surg. Oncol*., **98**, 106–110.

9) Ikeda, Y., Saku, M. and Kawanaka, H. (2003) Features of second primary cancer in patients with gastric cancer. *Oncology*, **65**, 113–117.

10) Lee, J.H., Bae, J.S. and Ryu, K.W. (2006) Gastric cancer patients at high risk of having synchronous cancer. *World J. Gastroenterol*., **12**, 2588–2592.

11) Tokunaga, M., Hiki, N., Fukunaga, T., Kuroyanagi, H., Miki, A., Akiyoshi, T. and Yamaguchi, T. (2010) Laparoscopic surgery for synchronous gastric and colorectal cancer : a preliminary experience. *Langenbecks Arch*. Surg., **395**, 20710.

12) Kawamura, H., Honma, S., Yokota, R., Watarai, H., Yokota, K. and Kondo, Y. (2009) Assessment of pain by face scales after gastrectomy : comparison of laparoscopically assisted gastrectomy and open gastrectomy. *Surg. Endosc*., **23**, 991–995.

13) Ding, J., Liao, G.Q., Liu, H.L., Liu, S. and Tang, J. (2012) Meta-analysis of laparoscopy-assisted distal gastrectomy with D2 lymph node dissection for gastric cancer. *J. Surg. Oncal*., **105**, 297–303.

14) Hanai, T., Uyama, I., Sato, H., Masumori, K., Katsuno, H., Ito, M. and Maeda, K. (2012) Laparoscopic assisted synchronous gastrectomy and colectomy with lymphadenectomy for double cancer in our experience. *Hepatogastroenterology*, **119**, 2177–2181.

15) Hiki, N., Shimizu, N., Yamaguchi, H., Imamura, K., Kami, K., Kubota, K. and Kaminishi, M. (2006) Manipulation of the small intestine as a cause of the increased inflammatory response after open compared with laparoscopic surgery. *Br. J. Surg*., **93**, 195–204.

16) Novitsky, Y.W., Kercher, K.W., Sing, R.F. and Heniford, B.T. (2006) Long-term outcomes of laparoscopic resection of gastric gastrointestinal stromal tumors. *Ann. Surg*., **243**, 738–747.