

Laparoscopy-Assisted Radical Subtotal Gastrectomy for Early Gastric Carcinoma

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In order to evaluate whether it is possible to perform a minimal invasive operation without compromising to the radicality, we analyzed six patients who had been performed laparoscopy-assisted radical subtotal gastrectomy at Yongdong Severance Hospital, Yonsei University College of Medicine between September 1995 and February 1996. All patients were diagnosed as early gastric carcinoma without lymph node metastases preoperatively by upper gastrointestinal barium study(UGI), esophagogastroduodenoscopy(EGD) with biopsy and computed tomography scan(CT-scan). Postoperative pathologic reports revealed that we could obtain the resection margin and regional lymph nodes sufficient enough by laparoscopy-assisted radical subtotal gastrectomy. All patients had a good postoperative course. Flatus was present on the 2nd in a patient and 3rd postoperative day in five patients respectively. Nasogastric tube was removed and oral feeding was started on the day after flatus was present. Minor bile leak was noted in one patient postoperatively and managed conservatively. The postoperative scar was in excellent condition and measured about 2~3 inches in length. And postoperative courses were uneventful in all except a patient with bile leakage. Further technical experience and development could shorten the operation time. Popular acceptance of this procedure in the management of early gastric carcinoma(EGC) may give great help to the patients.

Key Words: Laparoscopy, radical subtotal gastrectomy, early gastric carcinoma

Gastric carcinoma is, still, one of the major health problems in the world, and ranks second in incidence(Sawyer, 1995). However, early diagnosis can improve the survival outcome. Early gastric carcinoma was defined in 1962 by the Japanese Society of Gasroenterological Endoscopy as a cancer confined to the gastric mucosa or submucosa regardless of its size or the presence of lymph node metastases. Its clinical importance is that a 5-year cure rate

of 90% can be obtained by operative intervention. Currently, the curative treatment for early gastric carcinoma is gastrectomy with D2 lymph node dissection. Salmon (Salmon, 1992) reported the endoscopic resection of early gastric carcinoma when the tumor was a well-differentiated adenocarcinoma with a diameter of 2 cm or less and tumor infiltration limited to the mucosa. This approach has limitations in application at present because endosonographic diagnosis of lymph node involvement is not entirely accurate and the policy of D2 lymph node dissection cannot be achieved. The success of therapeutic laparoscopy in general surgery, especially in colon surgery, has encouraged us to perform minimal invasive gastrectomy without compromising curability.

Our initial goal of this protocol for laparoscopy-assisted radical subtotal gastrectomy was to establish a minimally invasive treat-

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ment, which has the advantages of laparoscopic surgery.

To date, we have performed six radical subtotal gastrectomies using such a minimally invasive technique. The present study describes the operative techniques and the early results with this new approach.

MATERIALS AND METHODS

Patient

Among the twenty four patients diagnosed as early gastric cancer between September 1995 and February 1996, we analyzed six, who underwent laparoscopy-assisted radical subtotal gastrectomy after an informed consent was obtained from each patient. All six patients were diagnosed as early gastric carcinoma by UGI, EGD with biopsy and CT-scan. In one patient, endoscopic ultrasonography was performed. We did laparoscopy-assisted radical subtotal gastrectomy in cases that the lesion was measured less than 2 cm with confined to the submucosa or less than 3 cm with confined to the mucosa. Preoperative characteristics of the six patients are listed in Table 1.

Surgical procedure

Under general anesthesia, the patient was placed in a supine position with their legs spread on leg borders. The pneumoperitoneum was maintained at pressure below 14 mmHg. Three 10 mm trocars were placed on

supraumbilicus area, 2 cm below the right and left costal margin on the midclavicular line (Fig. 1). A forward-view (zero-degree) and a strabo-view (30-degree) scope were used alternatively through the umbilical port. Whole abdominal organs were carefully examined and we confirmed that there was neither serosal invasion nor metastatic lesion.

The omentectomy and the division of the left gastroepiploic artery and vein, which are impossible with a 2~3 inches-long incision window, were carried out with laparoscopic surgery. Omentectomy was started at the mid-portion of the transverse colon, the operator grasps the omentum with Endo-Grasper (US Surgical Corp., Norwalk, Connecticut, USA) on his left hand to lift them on the ventral side



Fig. 1. Three 10mm trocar insertion state (U: umbilicus, Arrow: oral side).

Table 1. Preoperative diagnostic findings in patients with early gastric cancer treated

54	M	Angle, LC	1.5×1.0	IIC	Signet ring cell Ca.
62	M	Antrum, LC	1.0×2.0	IIC+III	Well-diff. adeno Ca.
54	M	Angle, LC	0.5×0.5	IIC	Signet ring cell Ca.
55	M	Antrum, AW	1.0×0.5	IIC	Signet ring cell Ca.
41	M	Low body, LC	3.0×2.5	IIB	Well-diff. adeno Ca.
23	M	Angle, LC	2.0×3.0	III+IIC	Well-diff. adeno Ca.

LC: Lesser curvature

AW: Anterior wall

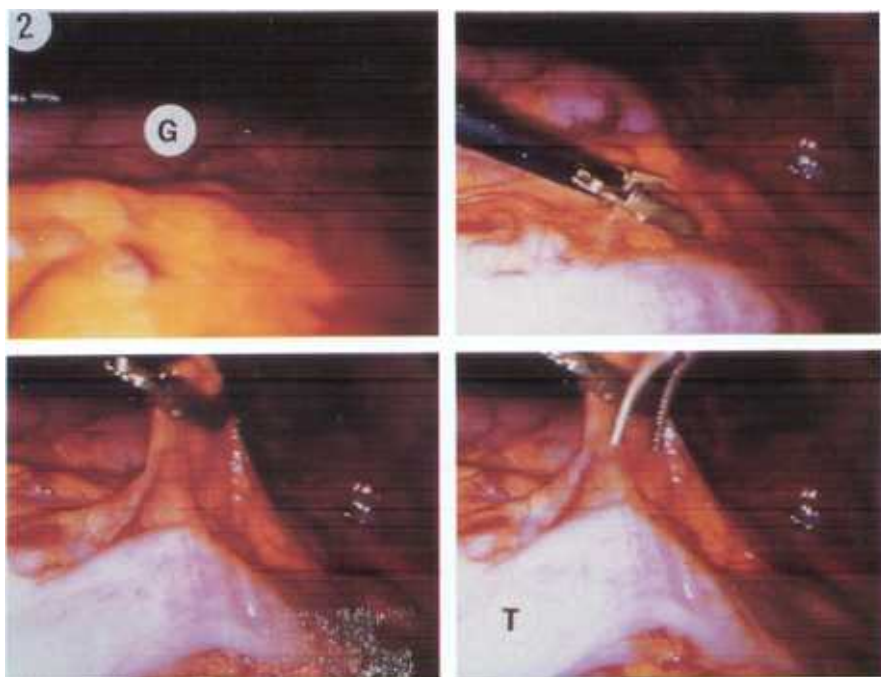


Fig. 2. Omentectomy (G: stomach, T: Trnasverse colon).

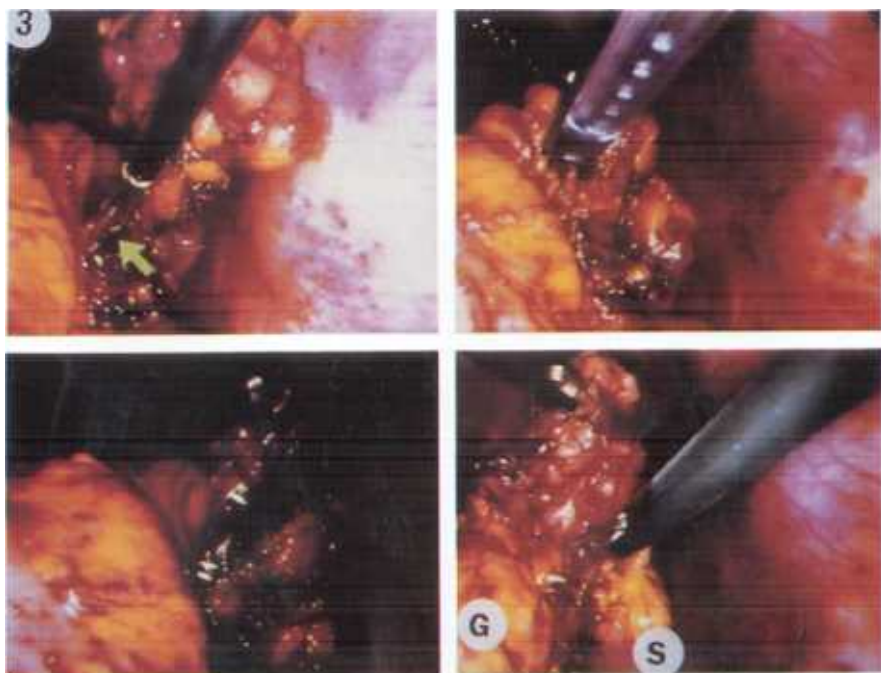


Fig. 3. Short gastric vessel ligation (S: spleen, G: stomach, Arrow: short gastric vessel).

(Fig. 2). In addition, an incision in the greater omentum was made and advanced toward the right side to the hepatic flexure and right gastroepiploic artery and vein were identified and lymph node bearing areolar tissues at the root of right gastroepiploic vessels were dissected. In the same procedure, the incision on the greater omentum was advanced toward the left side, and the left gastroepiploic artery and vein and two or three short gastric arteries and veins were divided after double clipping (Fig. 3).

Posterior wall of the stomach was dissected from the anterior surface of the pancreas and then celiac trunk was identified. During this procedure, we used Endo-scissor or Harmonic scalpel (Ultrasonic dissector, UltraCision Corp., 25 Thurbeer Blvd., Smithfield, RI 02917, USA).

Two or three inches-long skin incision was made on the upper abdomen transversely or vertically. Right gastric and right gastroepiploic artery and vein were ligated and divided through this incision (Fig. 4, 5). During this procedure, lymph node bearing areolar tissues were dissected and removed. Duodenum was divided at 2 cm below the pylorus (Fig. 6) and then left gastric artery and vein were divided and ligated (Fig. 7). During this procedure, lymph node bearing areolar tissues along the left gastric and common hepatic arteries and around the celiac trunk were dissected and removed. Also lesser curvature of the stomach was skeletonized. Proximal portion of the stomach was resected and gastroduodenostomy was done as the same manners as an open surgery (Fig. 8).

The upper and lower resection margin was sent to the pathologic department for a frozen diagnosis. The whole procedure under exploration took approximated 60 to 90 minutes.

Two silastic drains were placed in the Morison's pouch via the right trocar site. The operation was completed by closing the abdominal wounds.

RESULTS

Table 2 shows the operation time, postoper-

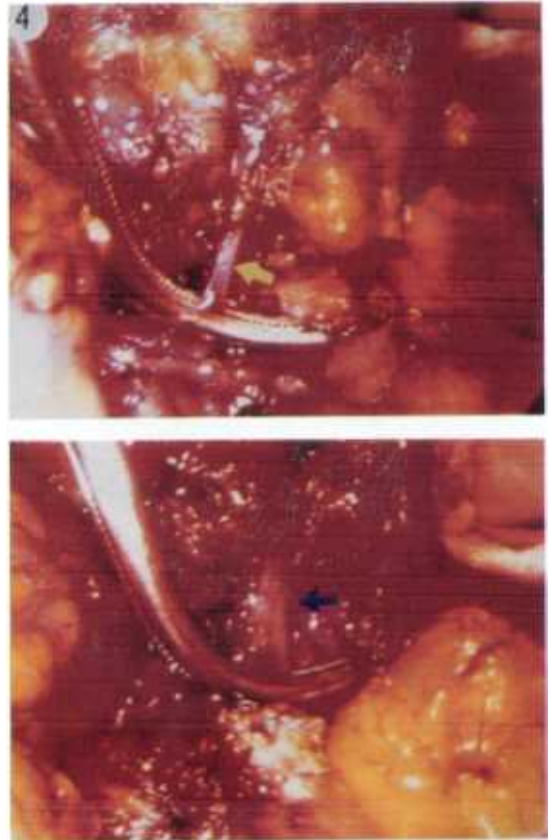
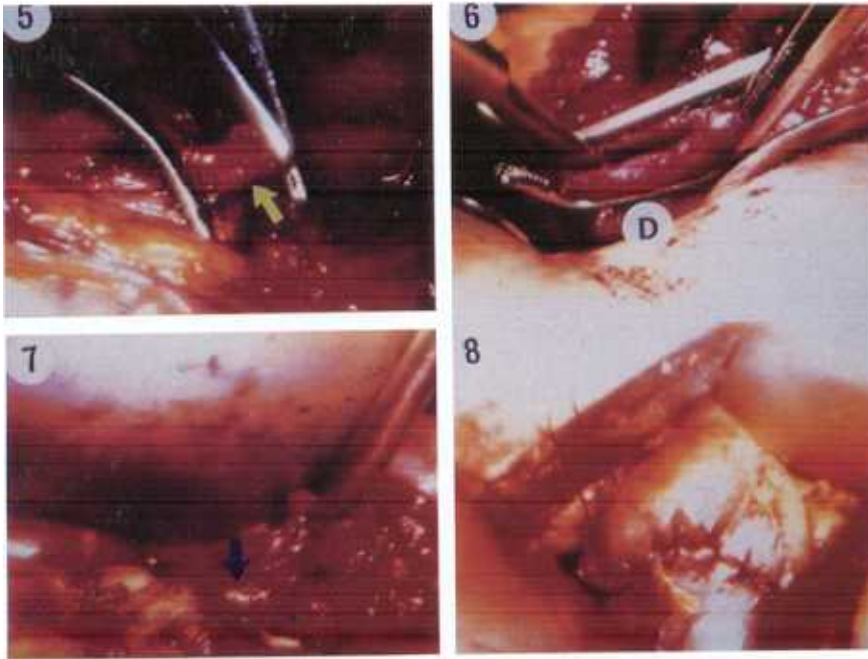


Fig. 4. Right gastroepiploic vessel ligation (Upper arrow: right gastroepiploic vein, Lower arrow: right gastroepiploic artery).

ative course and postoperative pathologic diagnosis in the six patients. All patients had confirmed as early gastric carcinoma without lymph node metastases.

All patients had a good postoperative course. Intraoperative transfusion was needed in one patient, who took one pint of fresh pack cell. Flatus was present on the 2nd postoperative day in one patient and on the 3rd day in five patients respectively. Nasogastric tube was removed and oral feeding was started the day after flatus was present. Postoperative complication of minor bile leak was noted in one patient, who was managed conservatively and discharged at postoperative 25 days. The patients were discharged between 10 and 16 days after operation except one



*Fig. 5. Right gastric artery ligation (Arrow: right gastric artery).
Fig. 6. Division of duodenum at 2 cm below pylorus (D: duodenum).
Fig. 7. Left gastric artery ligation (Arrow: left gastric artery).
Fig. 8. Gastroduodenostomy state (Arrow: gastroduodenostomy site).*

Table 2. Operative & postoperative course and postoperative histologic diagnosis

Op. time (min)	Transfusion (pint)	Gas out (day)	Soft diet start (day)	Histologic Diagnosis	
				Depth of invasion	LN* status
450	0	POD #3	POD #5	mucosa	
400		POD #3	POD #5	submucosa	
350	0	POD #3	POD #5	mucosa	
360		POD #4	POD #7	submucosa	
270	0	POD #2	POD #4	mucosa	
215	0	POD #2	POD #4	mucosa	

POD: Postoperative day

LN status: lymph node status (No. of dissected node)

complicated case. The postoperative scar was very excellent and it was measured about 2~3 inches in length (Fig. 9).

This procedure took relatively long time as between 215 and 450 minutes, but 270 and 215 minutes for the last two cases respectively.

DISCUSSION

Stomach cancer is still, one of the major health problems in the world, and has the



Fig. 9. Postoperative scar (U: umbilical port site, Arrow: 2~3 inches incision scar).

second highest incidence (Sawyer, 1995). As the diagnostic skill using endoscopy is refined and people take more interest in their own health, the proportion of early gastric cancer tends to be increasing. The significance of this trend is that surgical cure rate exceeds 90% if strict adherence to the basic rules of cancer surgery is followed. A conventional radical surgery greatly contributed to the increased survival rate, and increasing number of patients with early stomach cancer has survived long after the operations. However, in cases of early gastric cancer, a need for new surgical method that could offer a better quality of life after surgery without affecting the cure rate, has been proposed. A recent development of laparoscopy which is being used in most of the surgical fields since the first laparoscopy-assisted cholecystectomy by Mouret in 1987, has been suggested as one of the solutions.

Laparoscopy-assisted operations have been reported to cause less release of stress hormones and to offer a faster recovery than the conventional open method (Glaser *et al.* 1995; Glerup *et al.*, 1995). For the laparoscopy-assisted gastric resections of benign gastric tumors, Billroth type II has been reported by Goh *et al.* (Goh *et al.* 1992; Goh and Kum, 1993). He reported that the laparoscopic Billroth II gastrectomy offered less postoperative pain, faster return to social activity, lower infection rate, superior surgical wound healing and

shorter hospitalization than the conventional open method. However, the application of this method to cancer surgery has been controversial. Recently various alternatives to conventional open surgery, such as laparoscopic mucosal resection, laparoscopic intraluminal surgery, laparoscopic full-thickness resection have been reported for the selected cases of early gastric cancer (Misumi *et al.* 1992; Ohgami *et al.* 1993; Ohashi, 1995).

However, lymph node dissection could not be done using these methods and access might be difficult depending on the location of the lesion. As for the laparoscopic surgery which applies the conventional curative resection concept in malignant cases, Kitano *et al.* (Kitano *et al.* 1994) in 1994 first reported laparoscopy-assisted Billroth I gastric resection without D2 lymph node dissection. Similar procedure reported by Nagai *et al.* (Nagai *et al.* 1995) and Barlechner *et al.* (Barlechner *et al.* 1994) offered the advantages of doing most of the procedure in a closed state, but it could be applied for the limited cases without lymph node metastasis and the lesions limited to mucosa. The procedure also require expensive surgical instruments. Billroth II distal subtotal gastrectomy with D1 lymph node dissection suggested by Lopez *et al.* (Lopez *et al.*, 1996), even aside from the extent of node dissection, might not be physiological as compared to the Billroth I procedure. But, since the preoperative estimation of the size & the shape of the lesion in most cases do not coincides with the postoperative findings, and the degree of differentiation may be difficult to be judged by the biopsy, the authors feel that the principle of gastrectomy with D2 lymph node dissection in early gastric cancer should be maintained with an exception of some minute cancer cases.

We started our laparoscopic surgery program in the late 1991, expanding the applications to cholelithiasis, appendicitis, gastroesophageal reflux disease and gastric preparation for the substitute after esophageal resections. Based on these experiences, the present authors felt that radical subtotal gastrectomy can be done with 2 inches-long incisions instead of 20 cm with a help of a laparoscope,

without affecting the extent of the surgery (sufficient gastric resection, D2 lymph node dissection). The procedure, which utilizes laparoscopy for the gastric mobilization & omentectomy followed by D2 lymph node dissection & the gastroduodenostomy with 2~3 inches of incision, was carried out on 6 patients with early gastric cancer. This method with all the advantages of laparoscopic surgery, allows the same extent of the surgery as conventional exploration while, at the same time, overcoming the preoperative diagnostic problems in the lymph node metastasis.

It is also relatively easy to learn for surgeons specializing in stomach cancer with some experiences in laparoscopy. The shortcoming includes a long operation time, which can be overcome as operators gain more experiences and refinements in surgical instruments are made.

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