

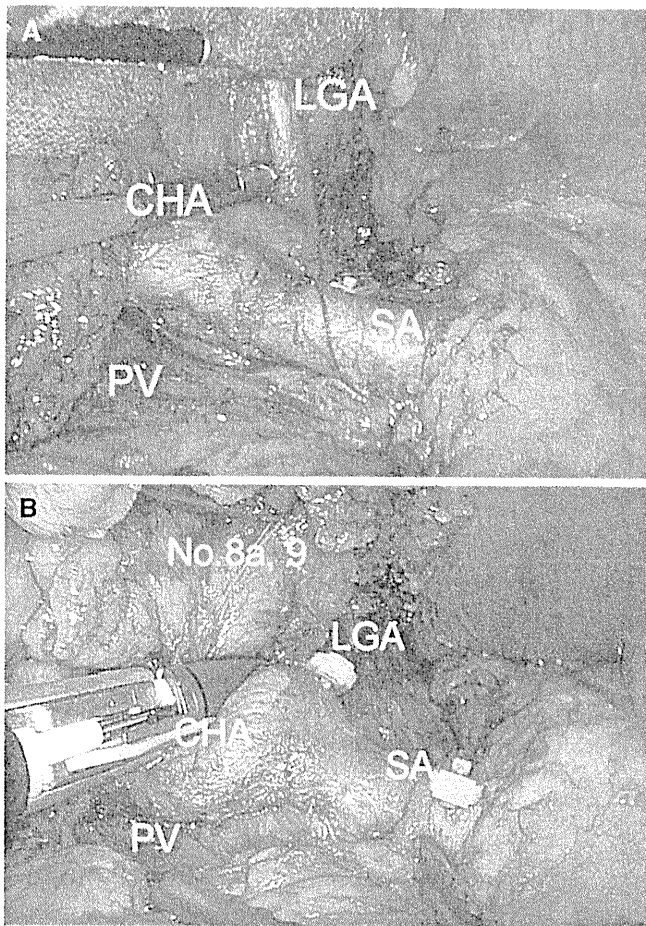
**Fig. 3.** **A** Lifting the left gastropancreatic fold. An assistant lifted the pedicle of the left gastric artery and vein (left gastropancreatic fold) using a right-hand grasper. **B** Procedure for suprapancreatic lymph node dissection; direction is shown from 1 to 4. **C** Dissection of lymph node station 11p. The left

side of the left gastropancreatic fold is held to lift the fold, and the no. 11p lymph node is dissected from the base of the splenic artery (SA) towards the periphery. SV, Splenic vein; LGA, left gastric artery

metastasis; 8 of the 10 patients were converted to open surgery for additional lymph node dissection. Other reasons for conversion included one case of injury to Henle's gastrocolic trunk during dissection of station 6 and one case of severe adhesion of the stomach to the pancreas, possibly due to chemotherapy for malignant lymphoma of the pancreas. The overall incidence of postoperative complications was 4.6%. The postoperative complications included seven cases of pancreatic fistula, five cases of intraabdominal abscess surrounding the stump, two cases of anastomotic leakage, and three cases of surgical site infection. In one case, the patient developed small-intestinal obstruction, and required further surgery for an internal hernia on postoperative day 12. There was no mortality associated with surgery. Time to the beginning of oral intake was  $2 \pm 0$  days. Mean postoperative hospital stay was  $13 \pm 10$  days.

## Discussion

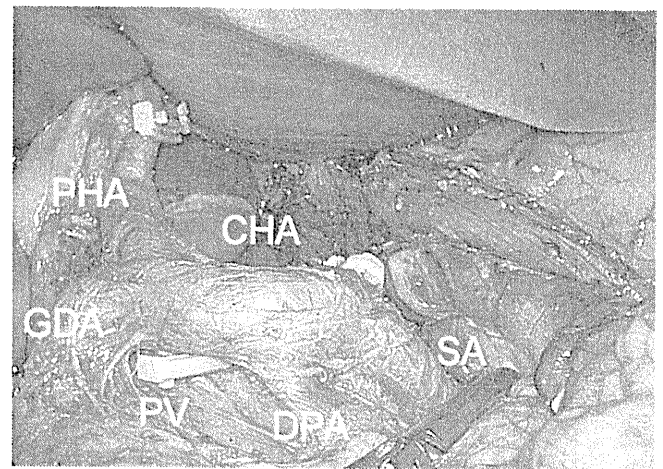
In order to perform extended lymph node dissection safely and accurately during LADG for the treatment of gastric cancer, special techniques are required for dissecting the suprapancreatic lymph nodes, including lymph node stations 8a, 9, and 11p, and 12a, where expanding the visual field is particularly difficult [2, 3, 7]. For the dissection of lymph node station 12a, it is necessary to stretch the hepatoduodenal ligament in the longitudinal and horizontal directions. In open gastrectomy, the entire pancreas head is manually pulled in the caudal direction by an assistant in order to stretch the hepatoduodenal ligament in the longitudinal direction, and the duodenal bulb is dissected to stretch the hepatoduodenal ligament in the horizontal direction. In previously described laparoscopic techniques, similar to



**Fig. 4.** **A** Dissection of the left gastric artery (*LGA*). The left gastric artery is confirmed from the left side of the celiac trunk, and a clip is placed at the base to cut the artery, using LigaSure. **B** Dissection of lymph node station 8a. Lymph node station 8a was dissected after cutting the left gastric artery and vein

the technique in open gastrectomy, the duodenum has been transected to stretch the hepatoduodenal ligament in the horizontal direction, but this dissection eliminates the site for longitudinal pulling [2, 3, 9]. As a result, it is necessary to stretch the hepatoduodenal ligament longitudinally by taping the common hepatic artery. Even with this technique, the hepatoduodenal ligament cannot be fully stretched in the longitudinal direction, and the proper hepatic artery is taped to compensate for the horizontal expansion.

With our technique, instead of transecting the duodenum in the abdominal cavity, the pyloric region is strongly pulled in the left caudal direction in order to pull the hepatoduodenal ligament in the longitudinal direction. With laparoscopy, near horizontal close-up images are obtained, and by observing the hepatoduodenal ligament horizontally from the right side and pulling the right gastric artery to the left, the front



**Fig. 5.** Completion of dissection of lymph node station D2. Clips are placed at the resection stump of the left gastric vein and artery and right gastric artery. *DPA*, dorsal pancreatic artery

surface of the portal vein can easily be accessed, thus making it possible to reliably dissect the lymph node at station 12a. In addition, not transecting the duodenum avoids contaminating the visual field due to bleeding from the cutoff stump, and not taping the vessels simplifies and shortens the surgery time.

In conventional laparoscopic suprapancreatic lymph node dissection, the common hepatic artery and splenic artery are taped, and lymph nodes are generally dissected from right to left, starting with lymph node station 8a, followed by lymph node station 9 and then 11p. However, there are many small vessels and lymphatic vessels around the lymph nodes at station 8a, and if this area is dissected first, the subsequent left gastric artery and vein dissections, and the dissections of lymph node stations 9 and 11p, are sometimes more difficult due to contamination of the visual field by bleeding and lymph leakage. By comparison, with our technique, the left gastropancreatic fold is pulled in the ventral direction through the opened lesser sac, and the suprapancreatic lymph nodes are dissected from left to right. Because the suprapancreatic lymph node dissection is started from this area and the cranial side of the left gastric artery and vein is sufficiently detached before dissection, it becomes easier to stretch the left gastric artery and vein in the ventral direction and to confirm well-stretched suprapancreatic lymph nodes. Furthermore, because the left gastric artery and vein are dissected before lymph node station 8a, vessels can be treated safely in a dry state without the presence of blood and lymph.

In conventional laparoscopy-assisted surgery, when stretching the area between the common hepatic artery and splenic vein and the area between the splenic artery and vein, the artery is taped and pulled in the caudal

**Table 1.** Characteristics of patients who underwent LADG with the new technique of lymph node dissection

Number of patients	391
Sex	
Male / Female	231/160
Age average (years)	62 ± 12
Body mass index (kg/m <sup>2</sup> )	23 ± 3
Duration of operation (min)	239 ± 56
Blood loss (ml)	63 ± 127
No. of dissected lymph nodes	36 ± 11
Degree of lymph node dissection	
D2 / modified D2	41/350
Clinical staging	
IA / IB / II	369/20/2
No. of patients with conversion to open surgery (%)	10 (2.6)
Further lymph node dissection	8
Bleeding	1
Adhesion	1
Postoperative complications (%)	18 (4.6)
Pancreatic fistula	7
Intraabdominal abscess	5
Anastomotic leakage	2
Surgical site infection	3
Ileus	1
Time until starting oral intake (days)	2 ± 0
Postoperative hospital stay (days)	13 ± 10

Data values are presented as means ± SD. Body mass index = body weight/height<sup>2</sup> (kg/m<sup>2</sup>)  
LADG, laparoscopy-assisted distal gastrectomy

direction to ensure a sufficient visual field. The advantage of our technique is that the splenic vein is easy to access by pulling up the left gastropancreatic fold ventrally through the horizontal field of the magnified view provided by laparoscopy, which makes dissection in this area safe and reliable without taping the common hepatic and splenic arteries.

In this manner, by not transecting the duodenum inside the abdominal cavity during laparoscopic lymph node dissection, it becomes possible to securely lift the entire stomach, and because it is not necessary to tape vessels, it becomes easier to stretch the hepatoduodenal ligament and perform the station 12a lymph node dissection. In addition, because laparoscopy provides horizontal and close-up images of deep areas, it is possible to approach the left side of the left gastropancreatic fold, and as a result, suprapancreatic lymph node dissection can be performed in a dry state.

Suprapancreatic lymph node dissection is considered to be more demanding in obese patients. The present study included eight patients with body mass index (BMI) values between 30 and 35.6 kg/m<sup>2</sup>, all of whom were operated on safely without postoperative complications. This may be because our technique is more suitable for obese patients than the conventional procedure, because the operative field is easily obtained by pulling up the left gastropancreatic fold from the sur-

rounding tissues. In the conventional procedure, the left gastropancreatic fold is hard to approach in obese patients due to the surrounding fat. For this reason, it was easier for both surgeons and assistants to acquire proficiency in our left-sided technique than the conventional procedure; requiring only about ten cases to establish this surgical procedure.

Due to recent advances in surgical techniques, as well as advances in optical equipment and dissection devices, it is difficult to compare the present technique to past techniques. However, when compared to the conventional technique, suprapancreatic lymph node dissection in LADG was completed in a shorter time, possibly because the dissection could be developed safely and smoothly in a dry state. In the present study, an optimal number of lymph nodes was dissected, the incidence of postoperative complications associated with dissection, such as pancreatic fluid leakage, was low, and the procedure was completed safely.

Laparoscopic lymph node dissection for gastric cancer, in which suprapancreatic lymph nodes are dissected with a left-sided approach without duodenal transection, is more convenient than conventional methods. This approach can be performed easily, and we believe that the present technique will become more widely adopted and will contribute to the future success of LADG.

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