

V-shaped Liver Retraction during a Laparoscopic Gastrectomy for Gastric Cancer

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Purpose: The aim of this study was to evaluate the effectiveness of our retraction method for achieving a good operative field for the adequate lymph node dissection during laparoscopic gastrectomy in view of short term surgical outcome.

Materials and Methods: This study prospectively enrolled 19 patients who underwent laparoscopic gastrectomy for early gastric cancer. The procedure was simply performed by putting the laparoscopic suture in the phrenoesophageal ligament, and then the string was pulling and tying over the sternum. Surgical outcomes of these patients were evaluated.

Results: Under V-shaped liver retraction, the mean operating time and mean number of retrieved lymph nodes was 166.3 minute and 31.37, respectively. And the results were satisfactory compared to open or conventional laparoscopic gastric surgery.

Conclusions: V-shaped liver retraction requires no extra port or assistant's hands, and prevents additional injury to any intra-abdominal organ. And this method can easily, efficiently and safely enable to achieve a good operative field for the lymph node dissection near the lesser curvature of the stomach.

Key Words: Gastric cancer, Laparoscopic surgery, Liver retraction, Phrenoesophageal ligament

Introduction

Radical gastrectomy with lymph node dissection has been the treatment of choice for gastric cancer including early stage disease.(1,2) For these patients diagnosed with early gastric cancer, a laparoscopic surgery is the one of minimally invasive treatments and remains a popular surgical practice.(3-5)

Since noticeable portion of early gastric cancer tends to metastasize beyond the perigastric lymph nodes, dissection for the lymph nodes of a certain range is essential in gastric cancer surgery.(6) Therefore, it is necessary to devise an advanced laparoscopic technique for performing adequate lymph node dissection. In this technique, whether a patient is obese or not, liver

retraction is critical for a secure and safe lymph node dissection. (7) Even in obese patients, the falciform ligament and the left lateral liver cover the lesser sac of abdominal cavity and the lesser curvature of the stomach, this make the operative field narrow and obscure.

Recently our institute brought a new method for the liver retraction method. This method not only enables full visualization of the operative field, but also removes the efforts of assistant for retraction. Also it doesn't need another trocar insertion that leaves abdominal wound.

The aim of this study was to evaluate the effectiveness of our retraction method for achieving a good operative field for the adequate lymph node dissection during laparoscopic gastrectomy in view of short term surgical outcome.

Materials and Methods

From November 2009 through December 2009, 19 patients who underwent laparoscopy assisted gastrectomy at department of surgery, Ajou University Hospital were enrolled. The data

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Received July 13, 2010
Accepted September 2, 2010

were collected retrospectively after reviewing medical records and clinicopathologic results.

All patients were pathologically diagnosed with adenocarcinoma through endoscopic biopsy. The enrolled patients were classified as an early gastric cancer by esophagogastroduodenoscopy (EGD) and/or endoscopic ultrasonography (EUS). The cancers were staged according to 6th edition of the American Joint Committee of Cancer (AJCC) classification.(8)

For identifying the location of tumors intraoperatively, metal clips were applied endoscopically 1 or 2 cm above the lesion 1 or 2 days preoperatively for every patient. The metal clips can be identified by simple supine X-ray during operation to determine a safe resection line.(9)

One surgeon (Dr. Han S.U.) performed all laparoscopic gastrectomy. Before operation, we obtained informed consent from all patients.

1. Operative technique

Laparoscopic-assisted distal gastrectomy (LADG) and laparoscopic-assisted total gastrectomy (LATG) were performed under general anesthesia. With a patient lying supine on the table, 10-mm sized skin incision was made in the supraumbilical or infraumbilical region. Using Verres needle, CO₂ pneumoperitoneum was obtained and then a 10-mm sized troca was inserted for a camera port. Laparoscopic inspection of the peritoneum, diaphragm, liver capsule, and pelvis was done. Four other trocars were inserted through the abdominal wall, one in the right upper quadrant (5-mm sized trocar; operator's working port), one in

the right lower quadrant (12-mm sized trocar; operator's working port). One in the left upper quadrant (5-mm sized trocar; as an assistant's working port), and one in the left lower quadrant (12-mm sized trocar; as an assistant's working port) were inserted.

A 2.6-cm curved needle with a 90-cm long, 2-0 sized monofilament thread was inserted through the right lower operator's working port, and the needle was grasped from inside. Then the assistant lift the liver slightly upward to expose the lesser curvature of the stomach and esophagogastric junction. The operator put a suture at the superior margin of the phrenoesophageal ligament. The needle was then cut by assistant's endo scissors. And then from the outside of the abdomen, endo closure needle was punctured at the inferior of the subcostal margin, just 2 to 3cm lateral to the xiphoid process bilaterally. The cut thread was pulled out of the abdomen and tied (Fig. 1).

Then we could lift the liver and get a clear operative filed for the secure and safe lymph node dissection without making any other scar and injury to the liver (Fig. 2).

Before drains were inserted, we could easily remove the thread for the liver retraction by simple cut of the exterior thread.

Results

Nineteen patients with early gastric cancer underwent the V-shaped liver retraction method during laparoscopic assisted gastrectomy. The patients' characteristics are shown in Table 1. Mean patient age was 59.3 years (range 28~71 years); 16 were male and 3 were female. Mean body mass index of patients was 23.89

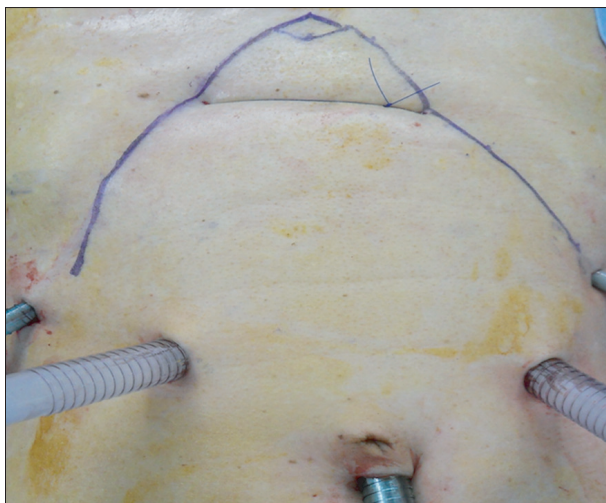


Fig. 1. Strings and port placement for V shaped liver retraction.



Fig. 2. The operative field after putting V shaped liver retraction. Gastrohepatic ligament, hepatoduodenal ligament, and esophageal hiatus were fully visualized after liver retraction.

Table 1. Patient characteristics

Variable	N
Gender	
Male (%)	16 (84.2)
Female (%)	3 (15.7)
Age (year)	
≤ 60 (%)	11 (57.9)
> 60 (%)	8 (42.1)
BMI, kg/m ² (range)	23.89 (16.89~29.07)
Type of operation	
LADG c B-I (%)	9 (47.4)
LADG c B-II (%)	6 (31.6)
LADG c RY (%)	1 (5.3)
LATG c RY (%)	3 (15.7)
Mean operation time, min (range)	166.3 (110~260)
Stage	
T1 (%)	18 (95)
T2 (%)	1 (5)
N0 (%)	16 (84)
N1 (%)	3 (16)
Mean number of retrieved lymph nodes (range)	31.37 (12~62)

BMI = body mass index; LADG = laparoscopic-assisted distal gastrectomy; B-I = Billroth I anastomosis; B-II = Billroth II anastomosis; RY = Rouenx en Y anastomosis.

kg/m² (range 16.96~29.07).

Livers were adequately retracted using the described V-shaped liver retraction method and the area around the lesser curvature of the stomach including hepatoduodenal and gastrohepatic ligaments were fully visualized in all cases. No patient needed an additional trocar insertion for liver retraction.

Two V-shaped retractions were required in 1 patient with a BMI of 29.07; one for liver retraction and the other for falciform ligament retraction at the upper and lower margin of phrenoesophageal ligament.

The mean number of retrieved lymph nodes was 31.37 (range 12~62), and lymph node station 1, 3, or 5 were not missed. The mean operating time was 166.3 min (range 110~260 min). The average time for getting V-shaped liver retraction was 7 minute (range 5~10 min).

Discussion

V-shaped liver retraction can be performed safely and simply in laparoscopic gastric cancer surgery without injury to the liver. In addition, it could be an effective method for exposing the hepatoduodenal ligament, gastrohepatic ligament, and esophageal hiatus for lymph node dissection in laparoscopic gastrectomy.

The laparoscopic gastric cancer surgery should gain the same oncologic outcomes as good as the open surgery. Recent consensus described that the present indication of laparoscopic surgery for gastric cancer is limited to early stage, because the laparoscopic extended lymphadenectomy for advanced gastric cancer is not generally acceptable procedure for all gastric cancer surgeons.(10) However, surgical principles for early gastric cancer also require the dissection of lymph nodes around celiac axis, lesser curvature, paraesophageal area. To achieve a curative resection in laparoscopic gastrectomy for early gastric cancer, it is necessary to maintain clear exposure of the area around lesser curvature of the stomach.(7) However, it is difficult to dissect the lymph node around these areas due to redundancy of the left liver and the falciform ligament. Therefore, obvious exposure of these regions could be critical issue for laparoscopic surgeon. Our method could be one of the easiest methods which can obtain the excellent view for lymph node dissection.

For the retraction of the liver in laparoscopic gastrectomy for gastric cancer, many surgeons have used a specific retractor.(7) However, this procedure requires an additional incision for the trocar, and the assistant is able to manipulate only one pair of forceps, thereby decreasing the efficiency of the surgical procedure. Although there was another option using the sling retractor to lift the only falciform ligament,(7) it would be not enough to achieve a good operative field for the adequate lymph node dissection. By V-shaped liver retraction, we could reduce one trocar insertion for the liver retraction and enhance assistant's performance compared to laparoscopic gastric surgery with the liver retractor. It would be expect to be more useful in the totally laparoscopic surgery, performing intracorporeal anastomosis, than in the laparoscopy-assisted surgery. Reduced trocar site in the upper abdomen lead the patients to complain less pain and will give the satisfaction with less wounds in a cosmetic view.

Recently, Lee et al.(11) introduced a liver retraction method using a straight needle. They punctured the liver around the falciform ligament to pull up the liver for traction. But by doing so, the liver could be injured by blind needle puncture and

delayed bleeding through puncture site would be occurred. The manipulation of the long needle in the intra-abdominal cavity can also cause an unexpected injury to the other organs. However, this V-shaped liver retraction method has minimal possibility of an inevitable organ injury including the liver that could result in hemorrhage, because intracorporeal one stitch in the phrenoesophageal ligament with a small round needle is enough in this simple procedure.

Our method had several limitations. The phrenoesophageal ligament is histologically composed of abundant elastic and collagen fibers which were arranged in an alternative interwoven manner.⁽¹²⁾ However, some patients have fully under-developed fiber tissue of the phrenoesophageal ligament. Maintaining of liver retraction would not be easy during operation in these cases, although we did not have such cases in our series. In several cases of our cases, the string was snapped by endoscopic ultrasound shear during gastrectomy, and then the longer operation time was required due to re-suture of phrenoesophageal ligament. In the case with the hypertrophy of the left liver, this procedure could be insufficient for exposure the operation field. We applied this method on a 59-year old man with body mass index of 29.07 who have the too redundant left later lobe of the liver to pull up with one V-shaped retraction. In order to achieve more effective retraction for this patient, we furnished one additional retraction simply using the same method.

V-shaped liver retraction requires no extra port or assistant's hands, and prevents additional injury to any intra-abdominal organ. And this method can easily, efficiently and safely enable to achieve a good operative field for the lymph node dissection near the lesser curvature of the stomach. Moreover, this method can be applied to any laparoscopic surgery that needs retraction of the liver. Thus, this technique in laparoscopic surgery for gastric cancer would easily, efficiently and safely achieve a good operative field for the lymph node dissection around the lesser sac of abdominal cavity and the lesser curvature of the stomach.

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