

Laparoscopic Intra-gastric Surgery for Early Gastric Cancer: A New Technique in Laparoscopic Surgery

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A new laparoscopic operation for the treatment of mucosal or submucosal gastric lesions has been designed and performed on 12 patients. In this procedure, all three trocars are placed in the gastric cavity, penetrating both the abdominal and gastric walls in order to perform a laparoscopic removal of gastric lesions. The operation is then carried out in the gastric cavity using currently available laparoscopic instruments and laparoscopic monitoring. The procedure is easy, safe and feasible for mucosal or submucosal lesion of the stomach that cannot be treated by gastrofiberscopic technique. In this series, we treated a total of 12 patients: 10 patients with early gastric cancer, 1 with a submucosal leiomyoma and 1 with giant polyps of the stomach—all of which were treated uneventfully. Since this technique is based on a new concept in laparoscopic surgery, the author has named this operation "Laparoscopic Intra-gastric Surgery" (L.I.G.S.).

INTRODUCTION

Recently, laparoscopic surgery has been widely applied not only to cholecystectomy but also to gastro-intestinal operations. However, most of those procedures approach the target organ with surgical instruments inserted in

the abdominal cavity.

The purpose of this article is to introduce our new operative technique,¹ in which all trocars and surgical instruments are inserted directly into the gastric cavity to perform the resection of mucosal or submucosal lesions of the stomach.

Indications of Laparoscopic intra-gastric surgery

- | | |
|-------------------------|--------------------|
| 1) Early gastric cancer | 4) Acute bleeding |
| 2) Submucosal tumor | 5) Foreign body |
| 3) Giant polyp | 6) Pancreatic cyst |

Table 1.

Patients and treatments

<u>patient</u>	<u>n</u>	<u>treatment</u>
Early gastric cancer	10	Mucosal resection + Laser treatment
Giant polyp	1	Polypectomy
Submucosal tumor	1	Enucleation

Table 2.

INDICATIONS

Early gastric cancer (carcinoma in situ), especially in elderly patients, is one of the most adequate indication for the use of L.I.G.S., since the carcinoma in situ statistically shows no lymphatic metastasis while the tumor is limited in the mucosal layer. The mucosal or submucosal benign tumor of the stomach, such as leiomyoma, which cannot be treated by conventional gastrofiberscopic technique because of its size or location, is also a good indication for the use of L.I.G.S. (For the operative indications of L.I.G.S., see Table 1.) The procedure is able to remove lesions located in any part of the stomach except, because of the technical difficulty, the limited area of the anterior gastric wall.

PATIENTS AND METHODS

Between February 1993 and June 1994, L.I.G.S. was performed on twelve patients: ten with early gastric cancer, one with giant polyps and another with submucosal tumor (leiomyoma) of the stomach (Table 2).

Under general anesthesia, a gastrofiberscope is inserted perorally into the stomach in order to see the gastric lesion (Figure 1). At this time, a naso-gastric tube with balloon is generally placed in the duodenum, and the balloon is inflated to prevent air flowing from the stomach to the intestine. While observing the gastrofiberscope image on the monitor, the abdominal wall is compressed with a forefinger to select three ade-



Figure 1. Peroral insertion of the gastrofiberscope.

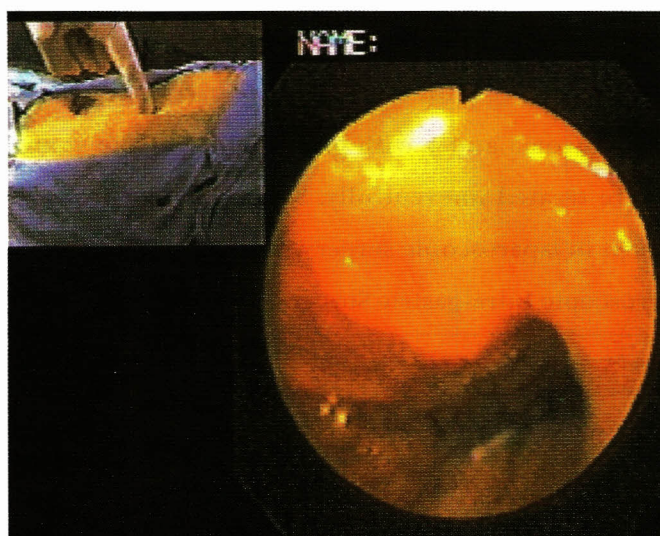


Figure 2. Abdominal wall is compressed with forefinger to select adequate trocar ports.

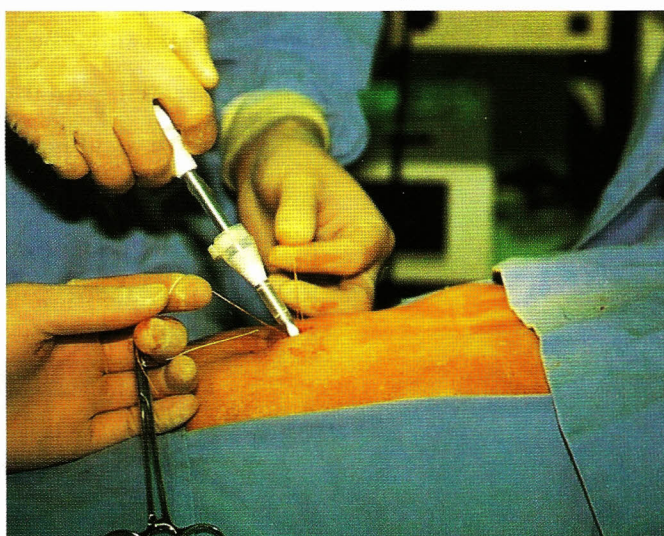


Figure 3. Hasson cannula is inserted into the stomach between two holding stitches on the anterior gastric wall.

quate points for trocar ports (Figure 2). It is important to select those points in which the abdominal wall directly touches the anterior wall of the stomach when compressed with a forefinger. The three trocar points should be about 3 cm or more apart from each other. To fix the gastric wall to the abdominal wall, it is also important to select those trocars with a balloon on the tip such as Hasson cannula. Upon the selection of three trocar points, a skin incision of 1 to 2 cm each is made on the abdominal wall. After putting two holding stitches on the anterior wall of the stomach through the abdominal incision, Hasson cannulas, three in a row, are inserted between two stitches directly into the gastric cavity with a gastrofiberscopic monitoring (Figures 3,4). The balloon of the Hasson cannula is then inflated separately to fix the gastric wall to the abdominal wall (Figure 5). As to the technique of trocar placement, there are several other modified methods, for example, a direct puncture of the gastric wall through the abdominal incision or a separate puncture of the stomach with laparoscopic monitoring. Among the various methods of trocar placement, our technique is a simple and safe way to insert and to close trocar ports of the stomach.

After insertion and fixation of all three trocars in the stomach, the laparoscope is inserted through the central trocar to observe the gastric lesion, and two surgical instruments are also inserted through the other

two trocars (Figure 6). After determination of an adequate removal margin around the lesion (Figure 7), the mucosal resection is started by dissecting the mucosal margin with forceps, electrocautery and/or laser (Figure 8). The resected specimen is then extracted by a gastrofiberscope through the esophagus or by special bag through the trocar. Electro- and laser cauterization are used to confirm hemostasis on the remaining mucosal margin and the muscular layer of the resected area (Figure 9). After deflating the balloon of each trocar, all instruments and trocars are pulled out of the gastric cavity and each trocar port of the stomach is finally closed

between the two holding stitches, followed by closure of the abdomen (Figure 10). The schema of the operation is shown in Figure 11.

CASE REPORTS

Case 1 (Giant polyp)

A 75-year-old woman was admitted with two giant polyps in the posterior wall of the stomach. Preoperative gastrofiberscopic examination revealed that these two polyps were relatively large in size, both about 2 cm in diameter. One of these two polyps was located close to the esophagus and seemed to be technically difficult for gastrofiberscopic removal. Therefore, as a

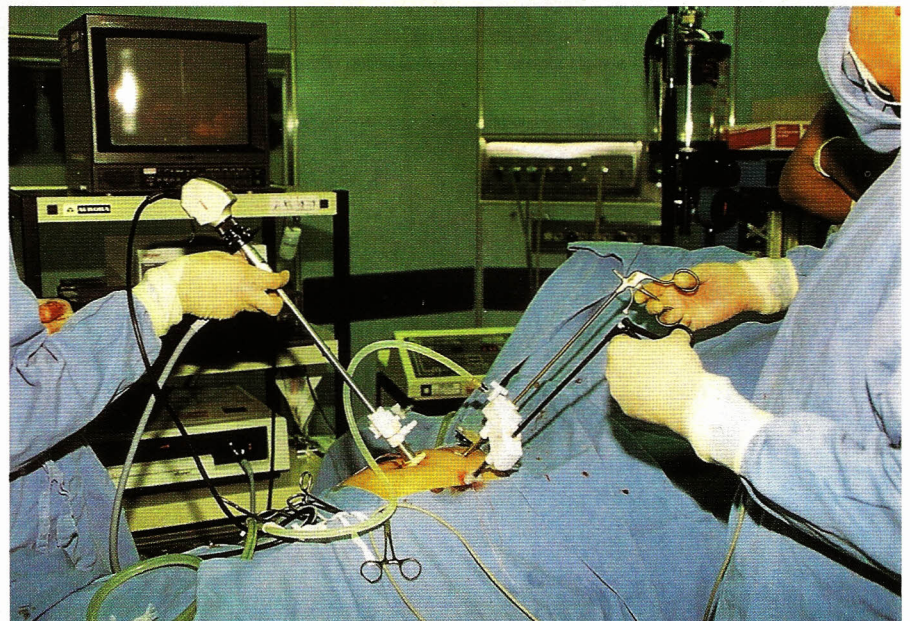


Figure 6. Laparoscope and two surgical instruments are placed in the stomach to perform operation.

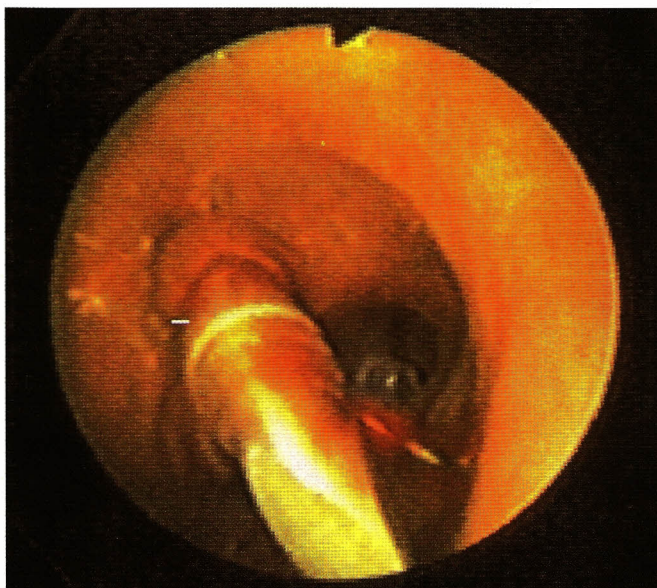


Figure 4. Gastrofiberscopic view of the trocar insertion.

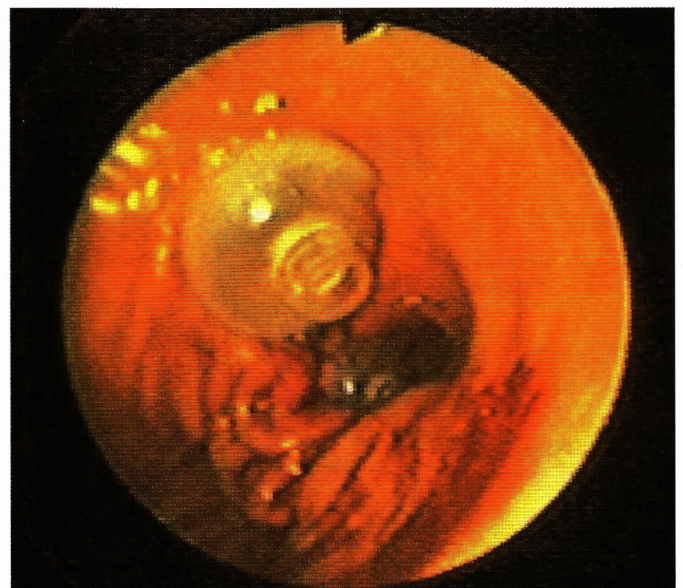


Figure 5. Balloon inflation to fix stomach to the abdominal wall.

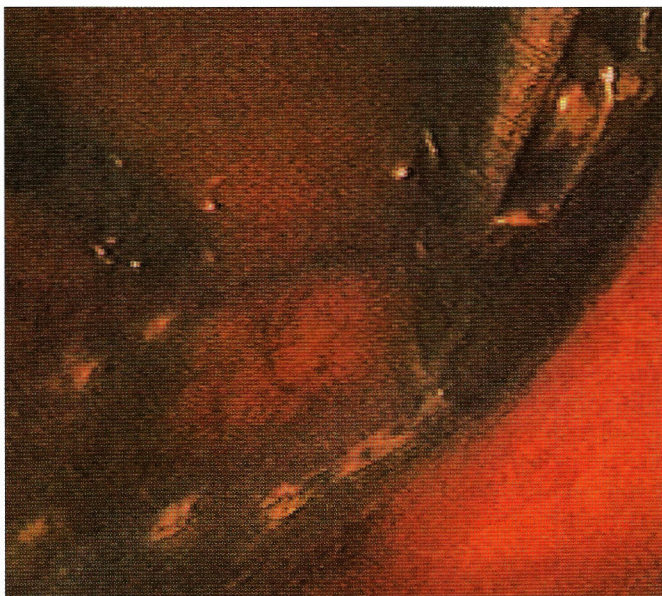


Figure 7. Marking the adequate margin around the mucosal lesion with electrocautery (early gastric cancer).

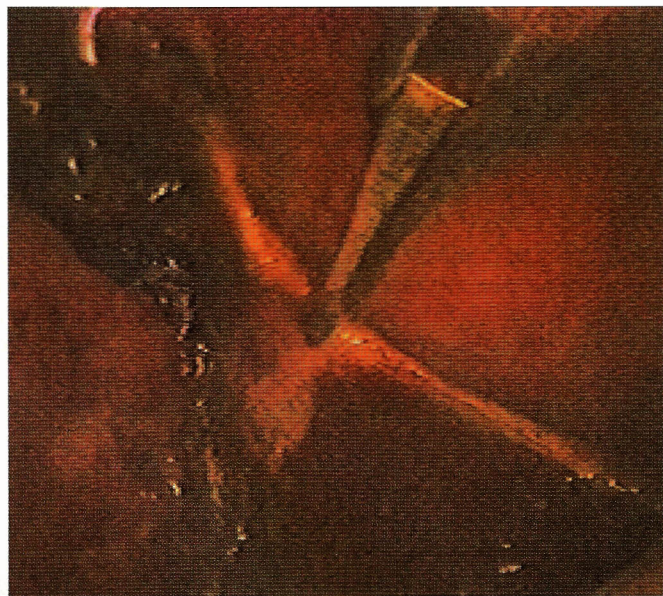


Figure 8. Dissection of the mucosal lesion (early gastric cancer).

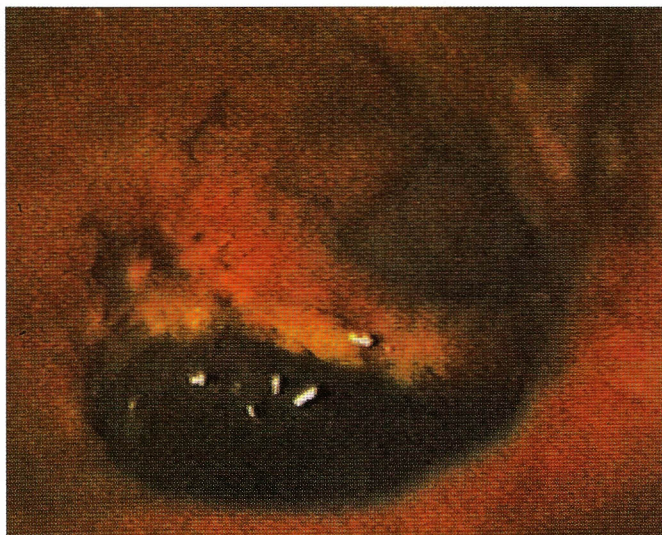


Figure 9. Mucosal defect after removal of the gastric lesion.



Figure 10. Abdominal wound at the end of operation.

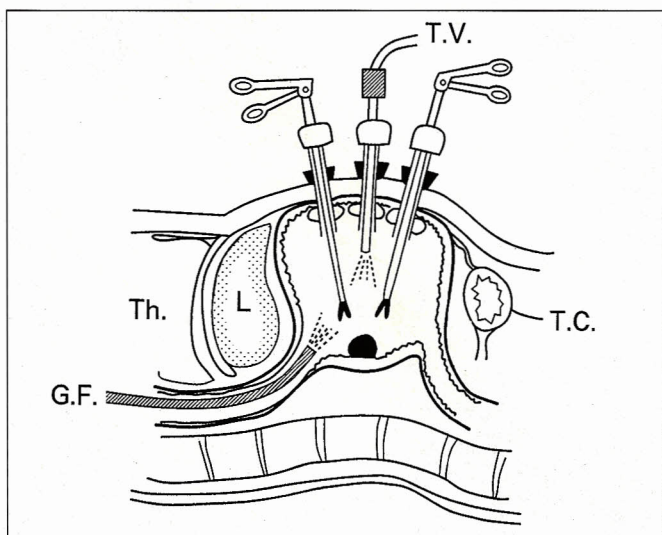


Figure 11. Schema of "Laparoscopic Intra-gastric Surgery" (L.I.G.S.).



Figure 12. Giant polyp of the stomach.

minimally invasive surgery, L.I.G.S. was performed for the resection of these polyps (Figures 12,13,14). Intra-operative pathological examination revealed no malignancy in both polyps.

Case 2 (Submucosal tumor)

A 68-year-old woman presented with a submucosal tumor in the fornix of the stomach. Since it was very difficult to remove it by gastrofiberscopic technique, she had undergone L.I.G.S. for the enucleation of the tumor (Figures 15,16). Intra-operative pathology indicated that the submucosal tumor was a leiomyoma of the stomach.

Case 3 (Early gastric cancer)

An 81-year-old man with early gastric cancer was admitted to undergo L.I.G.S. Preoperative endoscopy and

ultrasound demonstrated that the tumor was located in the posterior wall of the gastric body, remaining in the mucosal layer itself, with a width of 2 cm in diameter. Under general anesthesia, all instruments were placed in the stomach, and the mucosal lesion with adequate margin was marked and resected completely with electrocautery. A laser treatment was finally added on the remaining mucosal margin, and the resected portion was left as a mucosal defect (Figures 7,8,9).

RESULTS

In this series of 12 cases, the postoperative course was uneventful and the mean hospital stay was 5 days. The gastrofiberscopic examination was performed 1 to 2 weeks after the operation

on all patients, indicating that the defect of the gastric mucosa after removal of the lesion was completely healed in all cases. To date, the mean follow-up in patients with early gastric cancer is 6 months (maximum 12 months) and none of the patients have a recurrence of the gastric cancer.

DISCUSSION

Historically, there have been many works written about the endoscopic approach to gastric lesions. Noninvasive treatments such as strip biopsy using a gastrofiberscope have been increasingly applied and developed in the field of internal medicine.² Less invasive gastrotomy using a gastrofiberscope has also been conducted by Ponsky et al.³ The intra-operative observation of the gastric cavity has been conducted by inserting

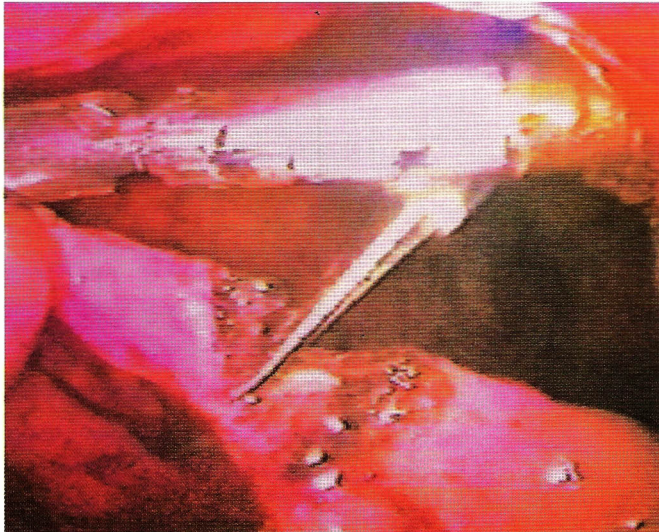


Figure 13. Polypectomy with electrocautery.

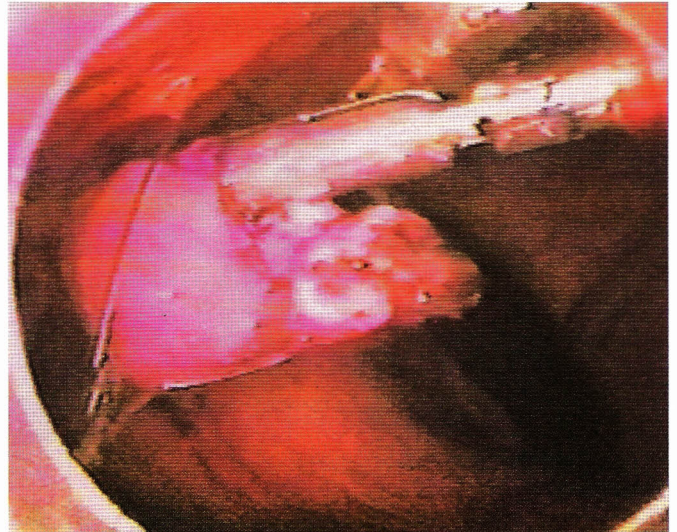


Figure 14. Removal of the polyp by basket catheter.

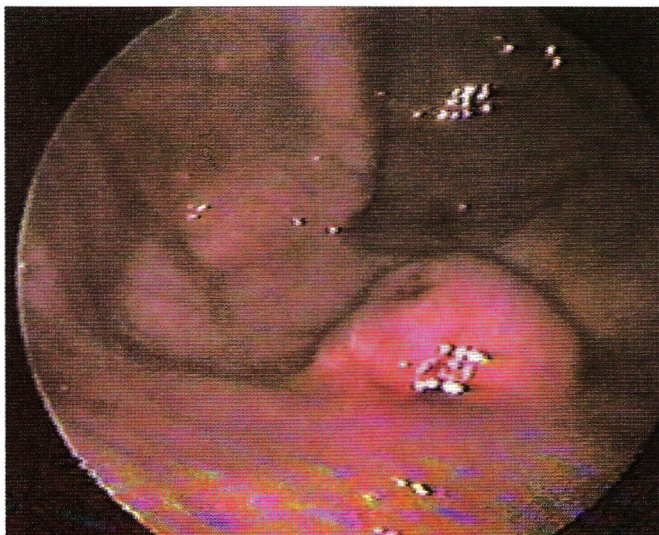


Figure 15. Submucosal tumor in the fornix of the stomach.

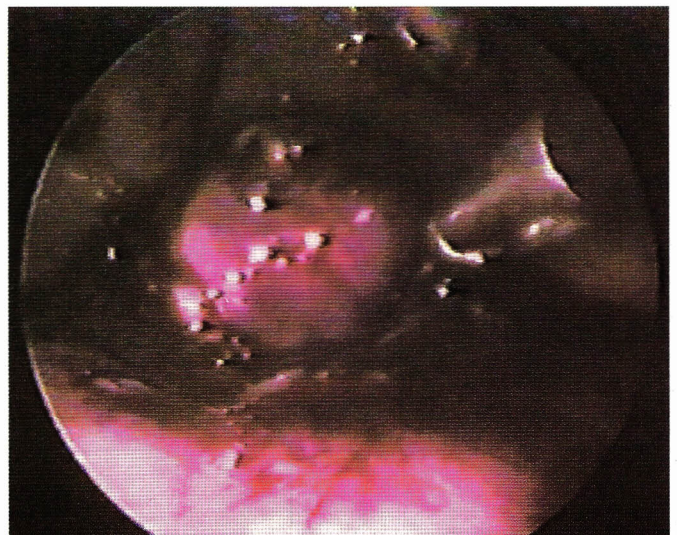


Figure 16. Enucleation of the submucosal tumor (leiomyoma).

an endoscope through gastrotomy in open surgery.⁴ However, the aim of the intra-operative endoscopy was merely to observe the inside of the stomach during open surgery. Laparoscopic surgery, which has gained popularity in recent years, has been applied to various types of gastric diseases.⁵ However, all of those procedures are performed in the abdominal space.

The concept of L.I.G.S. is quite different from any other methods of current laparoscopic procedures. This technique is a type of endo-organ surgery of the stomach. There is a similar type of endo-organ surgery described by Way et al.,⁶ in which the pancreatic cystgastrostomy is performed through

the anterior wall of the stomach. However, it seems that his operation is a type of trans-gastric procedure, targeting the pancreatic cyst. On the other hand, the target of L.I.G.S. is the lesions of the stomach itself. Therefore, L.I.G.S. is applicable to a wide range of gastric lesions such as early gastric cancer, mucosal and submucosal tumors. In addition, L.I.G.S. will be able to extend the indications, which are currently limited by the usual method of gastrofiberscopic treatment. **STI**

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