

Laparoscopic vagotomy in three patients with chronic duodenal ulcer

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Introduction

The management of recurrent duodenal ulcer patients is a problem for both gastroenterologist and surgeon. The immediate and long term results of vagotomy in patients with intractable or complicated ulcer disease are known to be quite satisfactory with few incidence of postoperative complication.¹⁾ We have considered vagotomy to be a procedure of choice for patients with intractable ulcer and individuals with ulcer diathese resistant to medical treatment to be candidate for elective surgical therapy.

Experience in laparoscopic cholecystectomy has made possible the use of this operative technique to treat acute and chronic duodenal ulcer.^{2,3)} At present individuals are considered indicated for elective laparoscopic surgery if they continue to complain of recurrent ulcer symptoms despite full compliance with medical management for at least two or three years. Laparoscopic vagotomy is also on

occasion recommended in patients who cannot be followed regularly because of socioeconomic reasons. The operative procedure is similar in many ways to the traditional open operation, but the advantage is in an undisturbed operative field, which makes to returned to normal activity more likely to be achieved than by a conventional abdominal approach.^{3,4)}

A report on three patients with duodenal ulcer who underwent selective vagotomy using an endoscopic technique is presented (Table 1).

Patients and methods

Case 1: A 25-year-old man was referred to Inoue Hospital in January 1992 after repeated episode of epigastric pain and hematemesis despite H₂-receptor antagonist therapy since August 1988 (Table 1).

Table 1. Clinical variables of three patients who underwent laparoscopic vagotomy

Patient (Age• sex)	Duration of disease (years)	Causes of operation	Preoperative drug therapy	Operative procedures & operative time (minutes)	Postoperative complication	Postoperative hospital stay (days)	Acid secretion
Case 1 C. H. (25• ♂)	4 yrs.	intractable ulcer abdominal pain bleeding (hematoemesis)	'88 7. 3-7. 25 '91 3. 7-4. 10 anti-H ₂ (famotidine) → omeprazole	'92. 1. 29 highly selective vagotomy (185 min.)	none	7 days	MAO 15.2→11.3 mEq/h Total acidity 50→19 mEq/L pH1.6→4.6
Case 2 Y. K. (18• ♂)	2 yrs.	intractable ulcer abdominal pain nausea	'90 6-8 (adm.) '91 1-3 (") '91 9-11 (") anti-H ₂ (cimetidine) → omeprazole	'92. 6.01 post. T. V. & ant. S. V. with pyloroplasty (150 min.)	slight stasis	14 days	BAO 9.9 mEq/h MAO 20.8 Total acidity 73 mEq/L
Case 3 S. S. (71• ♀)	4 yrs.	intractable ulcer bleeding (melena) anemia	anti-H ₂ (cimetidine) → omeprazole → cimetidine	'92. 6. 15 post. T. V. & ant. highly S. V. (170 min.)	none	10 days	MAO 20.2 mEq/h Total acidity 153 mEq/L pH 1.4

S. V.: selective vagotomy T. V.: truncal vagotomy adm.: admission

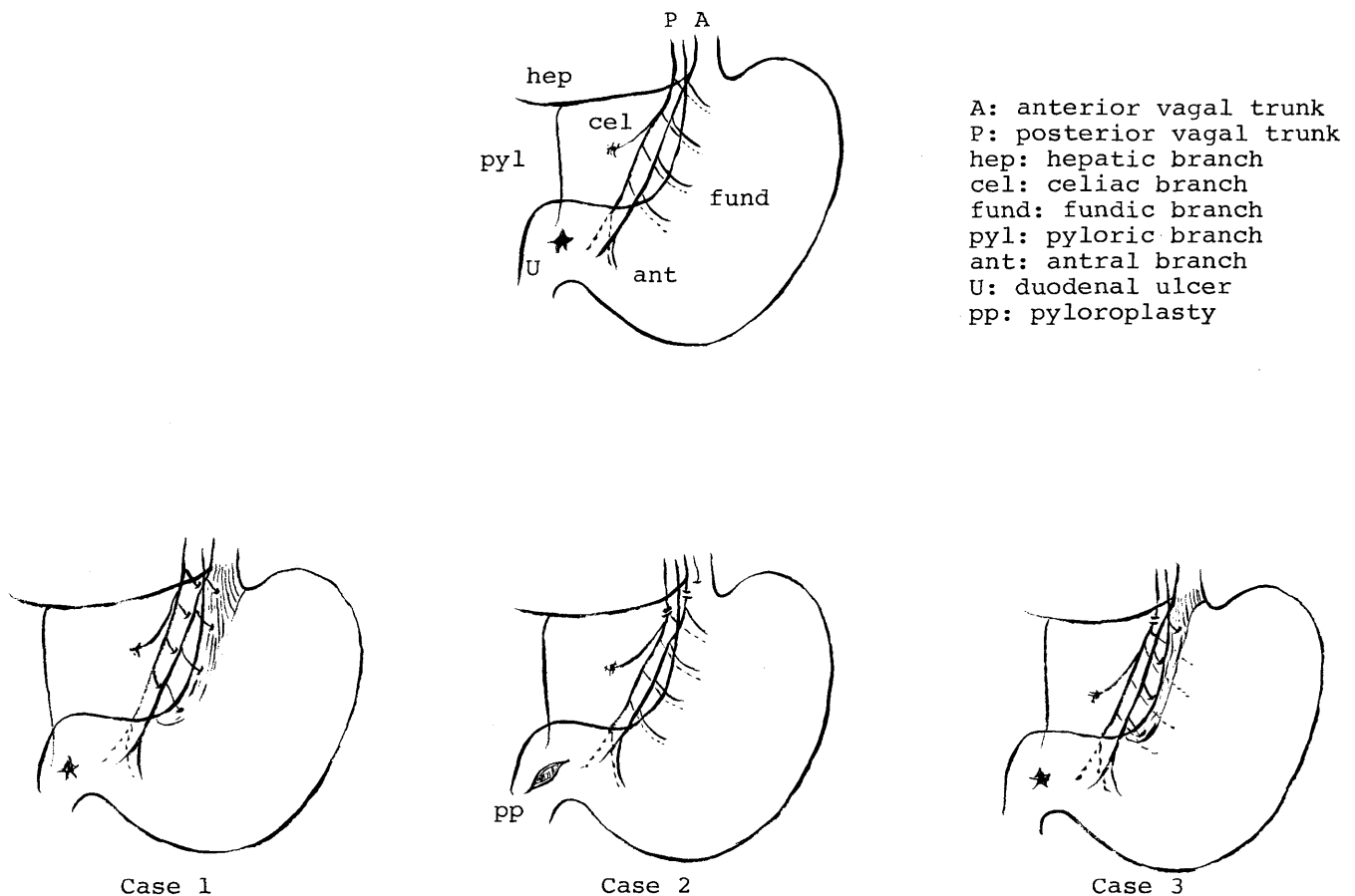


Fig. 1. Scheme of operative procedures

He was treated with omeprazole after further endoscopy demonstrated a duodenal ulcer and erosive gastritis. His symptoms disappeared a few days later, but the ulcer remained open after six weeks (Fig. 3).

In view of the repeated complication a surgical treatment was possibly indicated.

Preoperative gastric acid secretion was measured after stimulation with intravenous tetragastrin. Maximal acid output was 15.2 mEq/h and pH of the gastric juice was 1.6.

His age and cosmetic aspect suggested as an appropriate approach highly selective vagotomy with laparoscopic technique.

On January 29, 1992, the patient was placed in the prone position under general anesthesia. The pneumoperitoneum was established using carbon dioxide by puncture of the umbilicus, the intra-abdominal pressure of 12 mmHg being controlled with electronic insufflator. After the abdomen was fully distended, five punctures were made, two being 10 mm in diameter and three 5 mm (Fig. 2). The first trocar (10 mm:#1) was inserted about 5 cm right of the umbilicus to introduce the forward-viewing laparoscope and video camera.

Then, under direct vision, the remaining trocars were inserted through the abdominal wall. A 5 mm trocar was

inserted just below and to the right of the xiphoid process for introducing retractors or an irrigator-aspirator cannula (#4). Another 5 mm trocar (#5) was inserted in the midclavicular line 2 cm beneath the right costal margin. The same introduction was made beneath the left costal margin for the insertion of atraumatic grasping forceps (#3). The last 10 mm trocar (#2) was placed 6 cm left of the umbilicus as an operating channel for dissecting scissors, a hook coagulator, and hemostatic clip applicator. Holding the left lobe of the liver laterally with a retractor, the dissection proceeded upward from the crow's foot. The anterior leaf was divided close to the lesser curvature, the main vessels was doubly clipped and divided while the smaller ones coagulated with the hook dissector (Fig. 4). The separation of the posterior leaf was done using the same manner, and the dissection extended to cardia incision, the lower part of the esophagus was bared (Fig. 1). To make this maneuver easier a tape was placed around the esophagus. The area was irrigated with a normal saline and checked on complete hemostasis. Intraabdominal drain was inserted via a porthole. After the extrachion of the trocars, simple skin stitches were used to close the each introduction site. Operation lasted 185 minutes.

Postoperative course was uneventful. Oral food intake

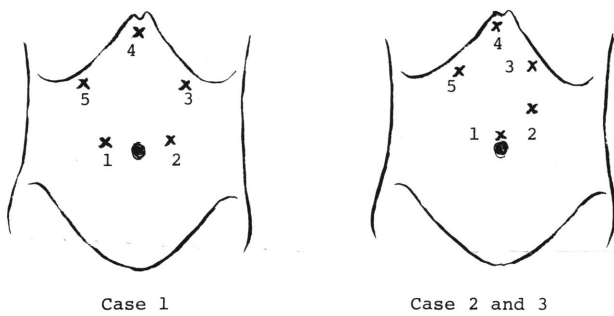
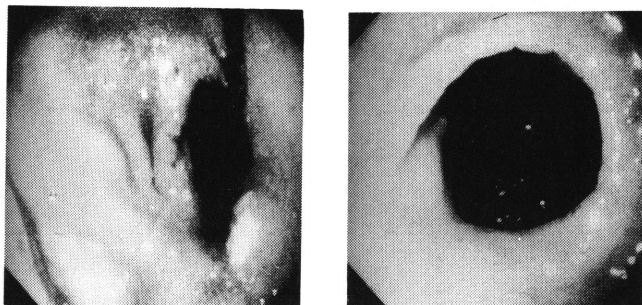


Fig. 2. Schematic representation of the position of the trocar (No. 1 and 2: 10 mm, the rest: 5 mm)



(a) Before operation: deformity of pyloric ring, and bleeding was noted (b) One month after operation: deformity disappeared and ulcer healed

Fig. 3. Endoscopic pictures of duodenal ulcer (Case 1)

was started on the second postoperative day, and only one intramuscular injection of analgesic was enough. The abdominal drain was removed on day 2. He was discharged on the 7th postoperative day, being able to return to normal work on the 14th postoperative day. At the first follow up on the 30th day after surgery, the skin incision was almost invisible. Gastroscopy 2 months after the procedure showed the healed ulcer (Fig. 3). Upper GI series revealed an akalasia-like tapering of the abdominal esophagus, and tantalum clips in the lesser curvature of the upper part of the stomach (Fig. 5). Postoperatively, maximal acid output was 11.3 mEq/h with a decrease of 69.1% and pH of gastric juice was 4.6.

Case 2 : A 18-year-old man was referred to Sasebo Municipal Hospital in May 1992 due to repeated bleeding and epigastric pain despite H₂-receptor antagonist therapy (Table 1). He was treated with omeprazole after upper GI series demonstrated a marked deformity of the duodenal bulb, and the ulcer showed signs of healing at 6 weeks but remained open (Fig. 6).

Preoperative basal acid output was 9.9 mEq/h and maximal acid output 20.8 mEq/h after stimulation with intravenous tetragastrin.

In view repeated bleeding a surgical treatment was possibly indicated. Highly selective vagotomy with laparoscopic technique was recommended as an appropriate

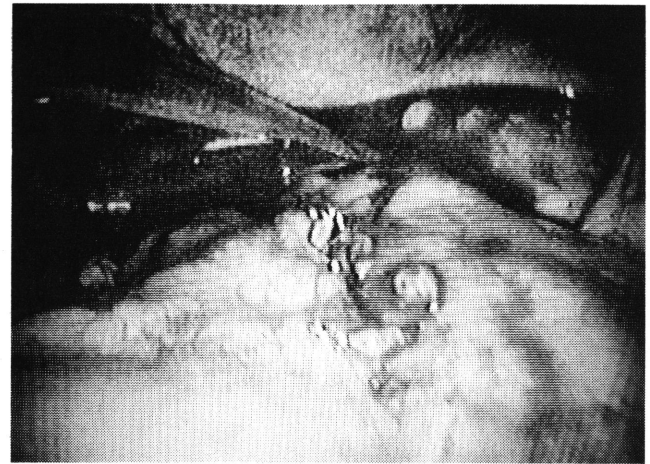


Fig. 4. Laparoscopic view of the lesser curvature of the stomach during highly selective vagotomy

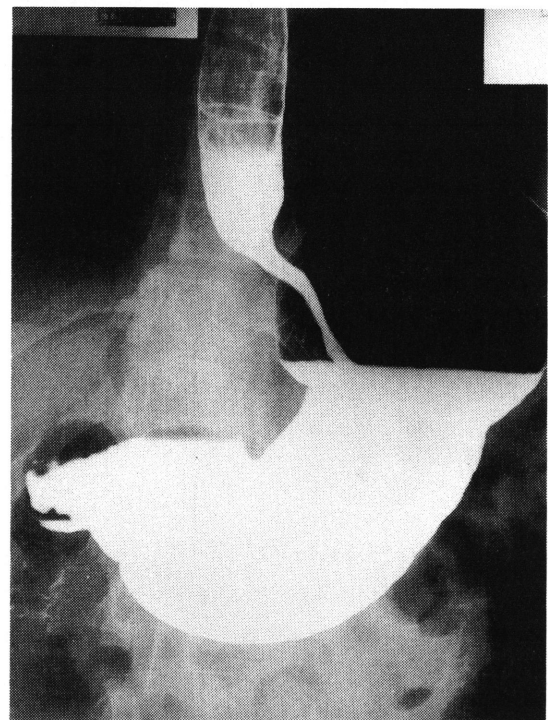


Fig. 5. Upper GI series after operation revealed an akalasia-like tapering of abdominal esophagus, and tantalum clips in the lesser curvature of the upper part of the stomach

approach.

On June 1, 1992, the pneumoperitoneum was set by umbilical puncture under general anesthesia. Five cannulae was inserted, two being 10 mm in diameter and three 5 mm (Fig. 2). The laparoscope was inserted through a 10 mm cannulae (#1) at the upper limit of the umbilicus. A 5 mm trocar (#4) was introduced to the right of the xiphoid. Two other 5 mm trocars were placed beneath each costal margin (#3, 5). The last 10 mm trocar (#2) was inserted 6 cm to the left upward of the umbilicus as an operating channel.

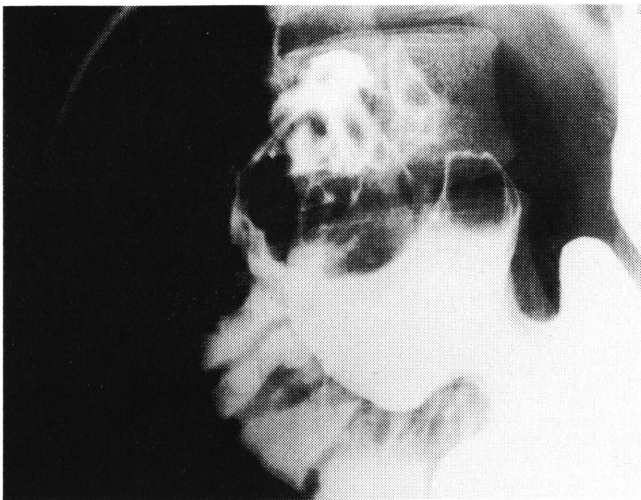


Fig. 6. Radiogram of the duodenum (Case 2)

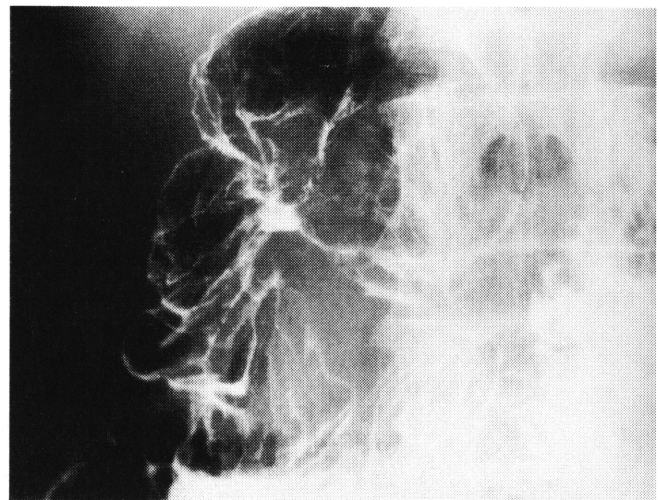


Fig. 7. Radiogram of the duodenum (Case 3)

The operation began by dissecting the avascular portion of the lesser omentum. The overlying peritoneum on the abdominal esophagus was incised, and a careful dissection with the electrical hook cannula made free the left side of the right crus. With the two grasping forceps separating the esophagus and the right crus, it was possible easily to identify the posterior vagus nerve. Posterior truncal nerve was then divided between two metallic clips and a specimen was sent for histologic examination.

The dissection of the anterior leaf was begun upward from crow's foot which was not identified clearly. At the cardia, though hepatic branch was visible, a fine fiber of vagus was cut accidentally. Therefore we considered that anterior Latarjet of the vagus were divided. After the lower part of the esophagus were bared, small skin incision (about 3 cm) just above the pylorus were placed. Under direct vision, the Heinecke-Miculitz's type pyloroplasty was added to selective vagotomy (Fig. 1). Operation lasted 150 minutes.

Postoperative course was uneventful. Oral food intake was started on the fifth postoperative day. His complaint disappeared except slight stasis after meals. He was discharged on the 14th postoperative day.

Case 3: A 71-year-old female was admitted to Inoue Hospital in June 1992, with complaint of recurrent ulcer of the duodenum despite anti- H_2 therapy for four years (Table 1). She was treated with omeprazole for six weeks after further endoscopy and the ulcer had once healed. A maintenance therapy with cimetidine was again begun and soon thereafter a ulcer of the duodenal bulb recurred and a melena was noticed without symptoms (Fig. 7). Gastric acid secretion was measured after stimulation with intravenous tetragastrin. Maximal acid output was 20.2 mEq/h and pH of the gastric juice was 1.4. In view of repeated bleeding surgical procedure was possibly indicated. Her

general condition suggested laparoscopic vagotomy as an appropriate approach.

On June 15, 1992, the pneumoperitoneum was made by umbilical puncture under general anesthesia. Five cannulae were inserted at the same points as in Case 2 (Fig. 2). After the lesser omentum was opened under vision, the hiatus was recognized by retracting the left lobe of the liver and the right crus of the diaphragm. The right vagal trunk was freed with the hook, and cut between two clips. The dissection began upward from crow's foot with clip applicator and hookcoagulator, and extended to cardia incision (Fig. 1). Intraabdominal drain was inserted via a porthole. The procedure was completed without any trouble. The operation lasted 170 minutes.

The patient was able to eat normally at 24 hours after operation, and did not require any injection of analgesic. The abdominal drain was removed on day 2 and she was discharged on the 7th day after operation.

Discussion

As the surgical therapeutic methods of the chronic duodenal ulcer, extensive gastrectomy has been more often performed conventionally in our country, while in European and American countries, vagotomy has become the basic operative mode, and combined use of the selective vagotomy or truncal vagotomy and pyloroplasty has been generally carried out.

In 1967, Holle and Hart⁵ reported selective proximal vagotomy as a functional surgery, and selective vagotomy of the parietal mass preserved functionally pyloric ring which was created by Amdrup and Jensen et al⁶ has extended as an elective surgery.

Since operative cases using selective proximal vagotomy were first reported by Takita et al⁷ in our country in 1971,

favorable results of this method has been reported in many institutes, but unique defect with high recurrence rate has been indicated by follow-up results.

Since H₂-blocker antagonist was developed in 1987, treatment of the ulcer has been largely changed by high therapeutic effect of this agent, and indication of the surgical operation has been restricted to the emergency surgeries such as perforation and massive bleeding, etc. However, ulcer resisting to this agent, so-called H₂-resistant ulcer has been more often observed, and theme of it has been remained in many researchers in the digestive organ disease institutes.

The laparoscopic cholecystectomy which was attempted by Dubois²⁾ in 1986 produced a revolution in the field of surgical operation in digestive organ diseases, and it has been also remarkably extended in our country.⁸⁾

With regard to the laparoscopic vagotomy, Katkhouda⁴⁾ reported first preservation method of the pyloric antrum branch by using truncal vagotomy of the posterior branch and seromuscular incision of the lesser curvature of the anterior wall in 10 cases with chronic duodenal ulcer in 1991. From the results, data such as operative time for mean 60 minutes, no complication during 5 days of the admission period, 83% of the reduced-acid rate of gastric juice (maximal acid output; MAO), disappearance of abdominal symptoms in all cases and endoscopical healing of the ulcer were identified. Moreover, Bailey³⁾ also reported the results of combined use of the laparoscopic cholecystectomy and selective vagotomy. Kashiwagi et al⁹⁾ and Sakuramachi et al¹⁰⁾ in our country also attempted selective vagotomy in each one case, respectively, but many technical problem of this procedure have remained to be solved.

Based on our experiment of the laparoscopic cholecystectomy, laparoscopic selective vagotomy was carried out in 3 cases with duodenal ulcer. The highly selective vagotomy by preserving antral branches of the anterior and posterior vagal nerves was performed in Case 1, while its procedure was difficult beyond our expectations and took a long time. Therefore, truncal vagotomy of the posterior branch and highly selective vagotomy (Taylor's operation)¹¹⁾ preserving anterior antral branch were carried out in the remaining 2 cases, but these procedures were exchanged to the selective vagotomy of the anterior branch because distribution of the nerve was unclear in one case, and operation was converted by addition of the pyloroplasty due to small-incision laparotomy.

As problematical points of this procedure, insertion position of the trocar for procedure (10 mm) was too low in the umbilical fossa, and difficulty of the procedure of abdominal esophagus and upper region of the stomach even though large constitution of Case 1 is a cause. Therefore, inserting position of the trocar for procedure (operating channel) in Cases 2 and 3 was selected about 5-6 cm to left upper-external side from umbilical fossa according

to Mouiel and Katkhouda,⁴⁾ and Baily et al.³⁾

With regard to the identification of the vagal nerve branches, procedure was exchanged to the complete incision of the gastric branch and selective vagotomy preserving hepatic branch, and a small direct incision of the upper pylorus was done, and pyloroplasty was added as an inductive operation, because anatomically thin and multiple branches of the anterior branch were incised by mistake, even though constitution of Case 2 (juvenile) was small.

In Case 3 highly selective anterior vagotomy with posterior truncal vagotomy was completed because of clear differentiation of Latarjet's branch of the anterior branch.

In these 3 cases, technical difficulty in this procedure enabled surgeons to await accumulated experience as compared with that in the conventional vagotomy by laparotomy, although while slight invasion as the minimum invasive surgery such as slight degree of the post-operative pain, short period of the admission and possibility of the early recovery for normal life activity was identified by this highly selective vagotomy. Moreover, bleeding was small, and hemostasis was easily carried out by coagulation or clipping.

The postoperative ulcer symptoms have disappeared in 3 cases, and healing was observed postoperative endoscopy, and no sign of recurrence of the ulcer is observed at the present time.

The laparoscopic vagotomy was considered to be very useful as a therapeutic method of the intractable ulcer against drug-therapy, even though this procedure was performed in only 3 cases.

Conclusion

The laparoscopic selective vagotomy was carried out in 3 cases with intractable and recurrent duodenal ulcers. In one of them, pyloroplasty was added by small-incision laparotomy. Ulcer symptoms in all cases disappeared and ulcers were healed.

The laparoscopic selective vagotomy was considered to be very useful as a therapeutic method (minimum invasive surgery) of the chronic duodenal ulcer resistant to drug therapy, even though there are many technical problem such as length request of the operative time compared with that in the laparotomy, etc.

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