# Peptic Ulcer Disease and Thoracoscopic Left Truncal Vagotomy

E. Croce, MD, S. Olmi, MD, R. Russo, MD, M. Azzola, MD, E. Mastropasqua, MD


## ABSTRACT

**Background:** This study illustrates our experience in treating duodenal ulcer by means of thoracoscopy and laparoscopy over a period of six years.

**Materials and Methods:** From October 1991 to October 1998, we submitted 38 patients (31 males and 7 females), average age 51 years (range 22-78 years), with duodenal ulcer to vagotomy with minimally invasive access: 23 Hill-Barkers, 2 Taylors, 9 thoracoscopic truncal vagotomies and 4 laparoscopic truncal vagotomies. The patients submitted to thoracoscopic truncal vagotomy had previous gastric surgery (5 ulcers of the neostoma in patients who had undergone gastric resection, 3 hemorrhagic gastritis of the gastric neostoma and 1 incomplete abdominal vagotomy).

**Results:** The average time required for the thorascopic approach was 30 minutes (range 20-40 minutes) with return to normal feeding in 1 day, without any difficulty, and discharge on day 3 (range 2-5 days). The patients were followed for 3-54 months. Twenty-two patients (91.3%) out of 23 submitted to anterior superselective and posterior truncal vagotomy, and the patients submitted to thoracoscopic vagotomy, were pain free without medical therapy. One patient (4.3%) was lost to the follow-up. There was only one relapse (4.3%) after seven months where the patient underwent left thorascopic truncal vagotomy. We had no mortality and no intraoperative or postoperative complications.

**Conclusions:** In our opinion, minimally invasive treatment of peptic ulcer disease may represent the "gold standard." It is simple, quick, effective and delivers the same excellent results of open surgery but with minimum trauma.


**Key Words:** Peptic disease, Duodenal ulcer, Vagotomy, Thoracoscopy, Thoracoscopic vagotomy, Laparoscopic vagotomy.

1st Department of General and Thoracic Surgery
Center for Laparoscopic and Minimally Invasive Surgery
Fatebenefratelli Hospital, Corso Porta Nuova 23, 20121 Milan, Italy.

Address reprint request to: Stefano Olmi, MD, Via Ippolito Nievo 21, 20145 Milano, Italy. Telephone: + + 39 02 63632430 – 2630, Fax: + + 39 02 63632460, E-mail: stefolmi@tin.it

## INTRODUCTION

From a therapeutic point of view, the introduction of highly effective drugs for the care of peptic ulcer disease has radically changed the situation in just a few years. The discovery of anti-H2 receptors in the mid-1970s,[1] and, subsequently, of proton pump inhibitors, prokinectics and, finally, the advent of combined medical therapies capable of abolishing acidity and, above all, of eradicating Helicobacter Pylori, has meant that classical surgery was set aside in favor of medical treatment. In recent years, only the complications of peptic ulcer disease, perforation, hemorrhage and stenoses have been treated surgically, as it is obvious that the uncomplicated form of the disease can be completely dealt with by medical management.

However, the advent of minimally invasive surgery has somewhat modified this situation. The following are the most commonly performed vagotomy techniques: left thoracoscopic bilateral truncal vagotomy, superselective vagotomy, Hill-Barker's anterior superselective and posterior truncal vagotomy (the technique we prefer),[2,3] Taylor's posterior truncal vagotomy and anterior seromyotomy[4] and Gomez-Ferrer's operation (mechanical section-suture of the anterior gastric wall). Each of these operations has proved to be easy to perform with minimally invasive access and, in various cases, with an almost complete lack of intraoperative complications. Total truncal vagotomy, be it thoracoscopic or laparoscopic, must be prescribed for patients with alvus, which tends to be associated with diarrhea, and bulbar substenosis. On the contrary, thoracoscopic access, in our opinion, is the best choice for cases if ulcer relapse or if jejunal ulcers should appear after surgery. We perform a thoracoscopic truncal vagotomy in those patients who have undergone a previous gastric drainage procedure or an incomplete abdominal vagotomy.[5,6]

A "functional" operation like vagotomy is ideal from a practical and conceptual point of view to be used with minimally invasive thoracoscopic or laparoscopic access. It is also a valid alternative to medical therapy with a lasting and effective therapeutic effect. Recently, in some third world countries, the laparoscopic operation has been replaced by medical therapy, which is certainly

more expensive but can be discontinued when the patient is symptom free. It can reasonably be said that candidates for minimally invasive surgery for duodenal ulcer are as follows:

1) All patients, especially young patients, with duodenal ulcer (including juxtapyloric ulcers) that require regular medical therapy for a prolonged time (over several decades);
2) All patients who have ulcer relapses due to an anomalous intake of medical therapy in relation to method and time;
3) All patients with a low compliance to chronic medical therapy;
4) All patients who, in spite of a correct medical therapy, have ulcer disease complicated by substenosis, bleeding, and who need high doses of drugs.

A final aspect, which is certainly less important but must not be overlooked, is the economic comparison in terms of cost-benefit between protracted medical treatment and minimally invasive surgery, which is decidedly in favor of the latter. With regard to cure of duodenal ulcer, the choice between medical and surgical therapy is, therefore, extremely precise, with a net preference for medical therapy in patients with a short clinical history and prompt therapeutic response.[7]

## MATERIALS AND METHODS

From October 1991 to October 1998, we submitted 38 patients (31 males and 7 females) with an average age of 51 years (range 22-78 years) to vagotomy with minimally invasive access: 23 Hill-Barkers, 2 Taylors, 9 thoracoscopic truncal vagotomies and 4 laparoscopic truncal vagotomies, one of which also underwent a Heinecke-Miculicz's pyloroplasty plus laparoscopic cholecystectomy because of a stenotic duodenal ulcer and cholecystitis.

Of the patients submitted to surgical operations using the thoracoscopic vagotomy, five had ulcers of the neostoma, three had hemorrhagic gastritis of the gastric neostoma, and one had incomplete abdominal vagotomy. Of the patients submitted to the Hill-Barker's technique, eight were resistant to medical therapy, 11 decided not to continue with long-term medical therapy, three took medical therapy on an inconsistent basis, and one with long-lasting ulcer disease requested vagotomy in association with laparoscopic cholecystectomy. In 22 patients, a bleeding complication preceded surgery.

In all patients, the diagnosis was confirmed by esophagogastroduodenoscopy and biopsy with histological confirmation that the lesion was benign. Preoperative gastric acid testing with pentagastrin stimulation (6 mcg/Kg) was performed. When possible, an active ulcer was managed with medical therapy before vagotomy. After surgery, if an active ulcer was present, drug therapy was continued until the ulcer had healed. Endoscopic and clinical reviews were made eight weeks after the operation, after which 15 patients underwent a gastric acid test with insulin stimulation (0.2 U/Kg) to assess the completeness of vagotomy (Hollander's test). The basal and stimulated postoperative values were compared to the preoperative test. Patients were further reviewed 6, 12 and 24 months after the operation and thereafter only if needed. These patients are still interviewed at regular intervals over the telephone.

## THORACOSCOPIC LEFT VAGOTOMY

The operation is carried out under general anaesthesia with selective endotracheal intubation to obtain collapse of the left lung and aided mechanical ventilation. Before the operation, we position a nasogastric probe, which is removed 24 hours later, in order to prevent possible gastric distension and also to make it easier to identify the esophagus during the operation. We avoid positioning a urinary bladder catheter and always administer a short-term antibiotic therapy.

### Position of the Patient and of the Surgical Team

The patient is placed on his or her right side, as in a left thoracotomy, with right arm outstretched to maintain an infusion line. The left arm is suspended and placed cranially to raise the apex of the scapula as much as possible and to help increase the space between the ribs. The operating table is split at a level of the apex of the scapula, putting the lower half of the body in a downward sloping position, thereby increasing both the seperation of the intercostal spaces and lowering of the diaphragm. The operating surgeon is positioned on the left side of the patient together with an assistant, who operates the camera and stands to the right of the operating surgeon. The instrumentalist and instrument table are also on the left-hand side of the patient, near the patient's feet. The videolaparoscopic equipment is placed on the opposite side, in front of the operators **(Figure 1)**.

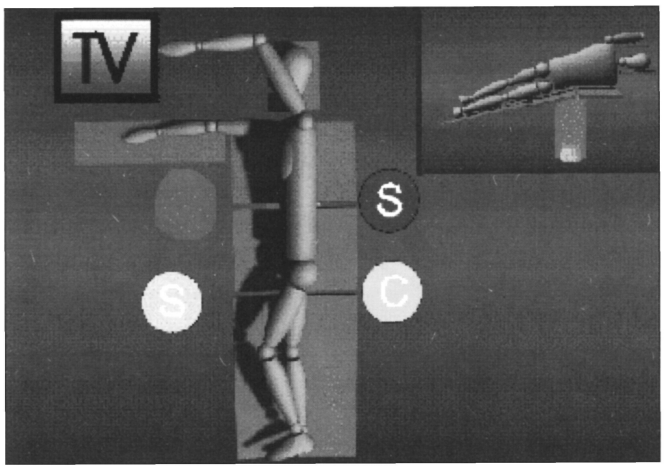


**Figure 1.** Position of the patient and of the surgical equipment for thoracoscopic left truncal vagotomy.

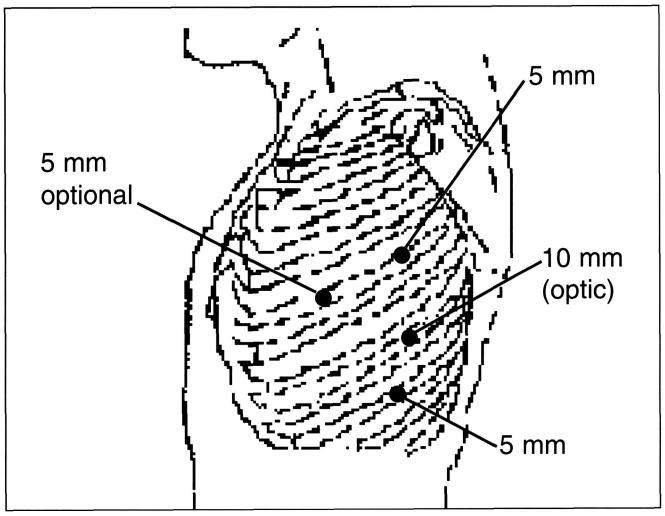


**Figure 2.** Position and size of trocar in left thoracoscopic truncal vagotomy.

### Surgical Technique

Once the left lung has been excluded, a 10 mm thoracic trocar is positioned in correspondence with the sixth intercostal space in the posterior axillary line, through which we insert a laparoscope with a visual angle of 30 degrees operated by the assistant's left hand (the 30 degree scope makes it possible to explore all areas of the thoracic cavity better than with a frontal optic). After exploring the thoracic cavity, again under visual endoscopic control, two 5 mm trocars are inserted in the median axillary line in correspondence with the fourth (right hand of the operator) and of the eighth intercostal space (operator's left hand). Sometimes a fourth 5 mm trocar may be needed in the anterior axillary line, fifth intercostal space, through which a retractor or irrigator-aspirator can be inserted. The irrigator-aspirator, held in the assistant's right hand, can help retract the lower left pulmonary lobe and help keep the operator's field clear of bleeding or smoke **(Figure 2)**.

The operation begins with a longitudinal incision of the mediastinal pleura, after sectioning, if necessary, the lower triangular ligament of the lung. The incision is in correspondence with the third distal of the esophagus in a restricted rear space from the aorta, descending frontally from the left inferior pulmonary lobe, above from the left ventricle of the heart and below from the esophageal hiatus and the left cupula of the diaphragm. The esophagus is isolated by means of blunt dissection with the aid of atraumatic forceps inserted in the trocar in the seventh intercostal space (operator's left hand) and with an ultrasound monopolar hamulus or with a bipolar forceps inserted in the trocar in the fifth intercostal space (operator's right hand). The anterior or left vagus rami are easily identified in the periesophageal tissue, appearing as a whitish trunk the nerve is isolated and loaded on the hamulus; it is coagulated and sectioned above and below, removing a section of about 1 cm, which is sent for a histological analysis **(Figure 3)**.

There are two ways to isolate the posterior or right vagus nerve: either by lifting the esophagus and shifting it to the right after it has been secured in the operator's forceps, and dissecting in this space with the retractor operated with the right hand of the assistant, or by lowering the esophagus and shifting it toward the left in order to gain access to its postero-lateral surface **(Figure 4)**. Once the truncus vagalis posterior has been isolated, we can proceed with its coagulation and sectioning in the same manner as with the left. A search is also made for possible accessory or anomalous distribution rami that need to be sectioned. After securing hemostasis in the dissected space, a 5 mm drain is positioned in the pleural cavity through the trocar in the eighth intercostal space, which is made waterproof while proceeding with the suturing of the other cutaneous incisions. The anaesthetist re-expands the collapsed lung. After making sure there is no air leak, the drain is removed and the last site is sutured. The operation terminates with infiltration of

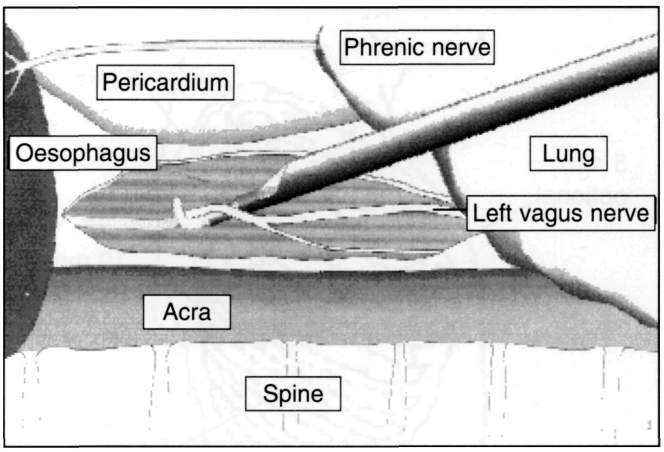


**Figure 3.** Dissection of the anterior (left) vagus nerve.

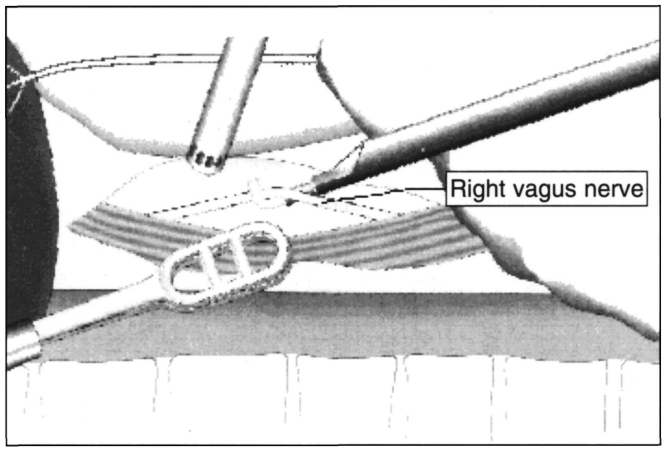


**Figure 4.** Dissection of the posterior (right) vagus nerve.

the intercostal spaces with a long-lasting anaesthetic such as bupivacaine. In our experience, the average duration of the surgery is 30 minutes, and the patient can be discharged on day two since there is no parietal trauma.

## RESULTS

The average duration of the operation by thoracoscopy was 30 minutes (range 20-40 minutes) with return to normal feeding in 1 day, and return home on day 3 (range 2-5 days). The patients were followed for 3-54 months. Twenty-two patients (91.3%) out of the 23 submitted to anterior superselective and posterior truncal vagotomy, and the patients submitted to thoracoscopic vagotomy, were pain and ulcer free without medical therapy. One patient (4.3%) was lost to follow-up. One ulcer recurred seven months after the operation. This was the first patient upon whom the operation was performed and whose acid test showed an incomplete vagotomy. After the recurrence, a thoracoscopic truncal vagotomy was performed with good results, as the patient was symptom free four months after the operation and "Hollander negative." We had no mortality and no intraoperative or postoperative complications.

In the thoracoscopic series, we had one patient who had epigastric fullness and impaired gastric emptying three months after the operation. Satisfaction during follow-up is 100% Visik I-II.

## DISCUSSION

On the basis of what has been published, we can say that truncal vagotomies are associated with a need for pyloric dilation in 10%, 5% result in left phrenic paralysis and 5% have chronic diarrhea. Superselective vagotomies are associated with a pathological gastroesophageal reflux in 12%, 4% experience gastroparesis and 4% have an ulcer relapse. Posterior truncal vagotomy and seromyotomy according to Taylor is associated with 3% diarrhea, 3% bezoar, 1% reflux disease and 4% relapse.[8-12] Another complication with vagotomy is the sensation of postprandial gastric fullness, which at times forces patients to eat small, frequent meals, as is the case with those who have undergone gastric resection; this complication was observed in 47% of the patients after truncal vagotomy and in 30% of the patients after proximal selective vagotomy.[11] Truncal vagotomy also causes a decided increase in gallbladder volume with atonicity, which is unlike the other types of vagotomies in which the vagal hepato-biliar rami are preserved. This stasis leads to an increase in the incidence of cholelithiasis, which is estimated to be between 18 and 23%.[13,14] Finally, the interruption of the celiac vagal ramus, causes loss of muscular tone in the right colon and in the glandular intestine, with paretic dilation and a slowdown of the ileac transit, is the fundamental cause of diarrhea.[15] Just as left thoracoscopic vagotomy represents the most effective treatment for ulcers of the neostoma in patients who have undergone gastric resection (for example, hemorrhagic gastritis of the gastric neostoma), so does Hill-Barker's

superselective anterior and truncal posterior vagotomy performed with laparoscopic access represent, in our opinion, the best choice in other cases of ulcer diseases.[3]

## CONCLUSION

The advent of minimally invasive surgery has made it possible not only to surgically correct peptic disease without major operative trauma and release patients from the need for chronic medical therapy, but also to obtain functional results that are similar to traditional surgical results. In just a few weeks, medical therapy cures over 95% of the patients; however, when the medications are suspended, the rate of relapse varies from 10% after one months' therapy to 65% after 18 months' therapy. Vagotomy performed thoracoscopically is simple, quick, and effective, and the magnification of an excellent laparoscope (even better if equipped with digital image processes capable of increasing the contrasts between the various structures) provides a definite visualization and section of the vagal fibers.

### References:


1. Baker RJ, Nyhus LM. Where have all the ulcers gone? *Curr Surg.* 1983;40:91-92.

2. Hill GL, Barker CJ. Anterior highly selective vagotomy with posterior truncal vagotomy: a simple technique for denervating the parietal cell mass. *Br J Surg.* 1978;65:702-705.

3. Croce E, Olmi S, Russo R, Azzola M, Mastropasqua E, Golia M. Laparoscopic treatment of peptic ulcers. A review after six years experience with Hill-Barker's procedure. *Hepatogastroenterology.* 1999;46(26):924-929.

4. Taylor TV, Lythgoe JP, McFarland JB. Anterior lesser curve seromyotomy and posterior truncal vagotomy versus truncal vagotomy and pyloroplasty in the treatment of chronique duodenal ulcer. *Br J Surg.* 1990;77:1007-1009.

5. Corbelle JL Jr, Corbelle JL. Indication for thoracoscopic truncal vagotomy. *Surg Laparosc Endosc.* 1993;3(5):395-397.

6. Laws LH, Naughton MJ, McKernan JB. Thoracoscopic vagotomy for recurrent peptic ulcer disease. *Surg Laparosc Endosc.* 1992;2(1):24-28.

7. Jordan PH. Surgery for peptic ulcer disease. *Curr Probl Surg.* 1991;28:265-330.

8. Hoffman J, Olsen A, Jensenn HE. Prospective 14-18 year follow-up after parietal cell vagotomy. *Br J Surg.* 1987;74:1056-1059.

9. Johnston D. Operative mortality and postoperative morbidity of highly selective vagotomy. *Br J Surg.* 1975;62:160-164.

10. Ballinger WF. Post-vagotomy changes in the small intestine. *Am J Surg.* 1967;114:382.

11. Johnston D. Vagotomy without a drainage procedure. In Truelove SC and Trodwell J, eds. *Topics in Gastroenterology.* Oxford: Blackwell; 1974.

12. Katkhuda N, Heimbucher J, Mouiel J. Laparoscopic posterior vagotomy and anterior seromyotomy. *Endosc Surg Allied Technol.* 1994;2:95-99.

13. Nobles ER. Vagotomy and gastroenterostomy: 15 years follow-up of 175 patients. *Am J Surg.* 1966;32:177.

14. Clave AR, Gaspar MR. Incidence of gallbladder disease after vagotomy. *Am J Surg.* 1969;118:169.

15. Jordan PH. Surgery for peptic ulcer disease. *Curr Probl Surg.* 1991;28:265-330.