JOURNAL OF LAPAROENDOSCOPIC SURGERY
Volume 3, Number 4, 1993
Mary Ann Liebert, Inc., Publishers

Laparoscopic Nissen Fundoplication: Report of First 15 Cases

MICHAEL J. O'REILLY, M.D. and SPENCER G. MULLINS, M.D.

ABSTRACT

Performance of a Nissen fundoplication laparoscopically for gastroesophageal reflux disease offers significant advantages such as reduction in hospital stay, postoperative recovery time, and return to work time. Early experience with laparoscopic Nissen fundoplication is presented.

INTRODUCTION

WITH THE ADVENT OF IMPROVED PHARMACOTHERAPY, the trend over the last 15 years has been more toward medical management and less toward surgical correction of gastroesophageal reflux disease (GERD). As such, many patients are managed on chronic medication which is expensive, of variable effectiveness, and of unknown long-term effect on the individual patient.[1,2] Presented is the experience with the Nissen fundoplication, a well-established procedure for GERD with proven long-term results, performed through a laparoscopic approach. The markedly decreased postoperative morbidity makes the laparoscopic Nissen fundoplication ideal surgical treatment for patients with chronic GERD.

MATERIALS AND METHODS

The same operative patient selection criteria is used for open and laparoscopic Nissen fundoplication. Esophagogastroduodenoscopy (EGD) with biopsy and UGI series are performed in all patients. Esophageal manometry is strongly recommended in all patients. If the diagnosis of GERD is in doubt after the above studies, 24 h pH monitoring is performed. No patient was excluded due to size or previous surgery.

The patient, under general anesthesia, is placed in the low lithotomy position. An 18 Fr nasogastric tube and Foley catheter are placed. A sterile prep is performed from the nipple line to the pubic symphysis anteriorly, to the mid-axillary line bilaterally. A 10 mm Hasson cannula is placed at the umbilicus by the open technique.[3] Pneumoperitoneum is achieved with CO_2 and the peritoneal cavity is explored in the usual fashion. Port placement is performed under direct vision. Initially, four 10 mm ports are placed, two on each side of the midline in a 'V' configuration with the umbilicus at the vertex (Fig. 1).

Advanced Laparoscopic Training Center, Kennestone Hospital, Marietta, GA.

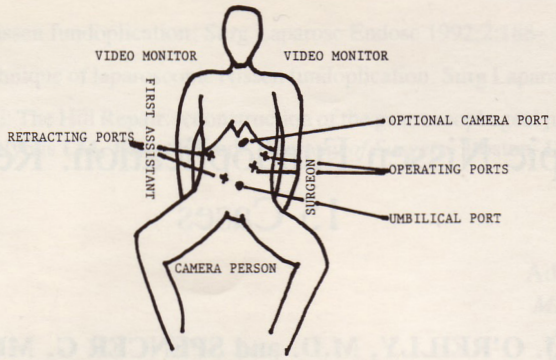

FIG. 1. Arrangement of ports and personnel in operating room.

The ports placed on the patient's right side are for exposure, the operating ports are on the left side. The first port is placed in the right subcostal region at the anterior axillary line. This port allows for retraction of the left lobe of the liver anteriorly and cephalad with an Endo Retract (U.S. Surgical, Norwalk, CT.) Next, a 10 mm port is placed on the right, several centimeters above the level of the umbilicus at the mid-clavicular line. This port allows for downward traction on the stomach with an Endo Babcock (U.S. Surgical, Norwalk, CT.) Next, two 10 mm operating ports are placed in the left upper quadrant. It is important to maintain a 6–8 cm distance between these two ports, thus avoiding 'sword fighting' while performing the dissection. The first port is placed immediately below the left costal margin at the mid-clavicular line. The second operating port is placed midway between the first operating port and the umbilicus. It is critical that the second operating port be placed in a position that avoids the 'advancing' laparoscope placed through the Hansson umbilical port.

A fifth 10 mm port is frequently placed in the immediate subxyphoid position. This 'camera' port allows for direct visualization of the esophageal gastric (EG) junction. Through this port, excellent visualization of the EG junction can be achieved with a 0° laparoscope. Of note, all the ports are placed under direct visualization of the videolaparoscope at the umbilical port. A 30° laparoscope is occasionally used during the dissection of the EG junction.

The patient is placed in the reverse Trendelenburg position, tilted or airplaned to the patient's left. The surgeon stands on the left side of the patient with videomonitors placed at the head of the table.

Initially, the peritoneum overlying the EG junction is sharply transsected in a horizontal fashion. No energy source is used when performing the dissection around the EG junction. If needed, hemostasis is achieved with clips (Fig. 2). Downward traction on the stomach is of critical importance to maintain exposure of the EG junction and to lengthen the intraabdominal esophagus. Laparoscopic tissue scissors and a Roticulator Endo Grasp (U.S. Surgical, Norwalk, CT.) are utilized for dissection of the EG junction. The anterior and posterior nerve trunks are identified and spared of injury unless a parietal cell vagotomy is to be performed concurrently. The vagal nerve trunks are included in the wrap, if in doing so there is no tension created.

It is very important to enter and remain in the correct tissue plane around the esophagus. The vagal nerve trunks are the landmarks for the correct plane of dissection (Fig. 3). The crura of the diaphragm can be mistaken for the esophagus, thereby complicating and prolonging the dissection. Placement of an endoscope intra-operatively by an assistant allows for easy clarification of the pertinent anatomy and is most helpful during a surgeon's early experience with laparoscopic dissection of the EG junction. It is also very important never to grab the esophagus to achieve exposure.

The distal 5 cm of esophagus is freed by dissecting both the right and left sides of the esophagus with blunt-tipped graspers (Fig. 4). At this point, the Roticulator Endo Grasp is angled to 80°. From the patients right side of the esophagus, under direct visualization and utilizing the 30° laparoscope if necessary, the roticulating grasper is placed around the distal esophagus. A ½" Penrose drain can be placed at this time to aid in obtaining exposure (Fig. 5).

Next, the esophagus is retracted gently toward the anterior abdominal wall exposing the posterior aspect of the EG junction. In addition, slight traction on the Penrose drain to the patient's left allows the surgeon to free

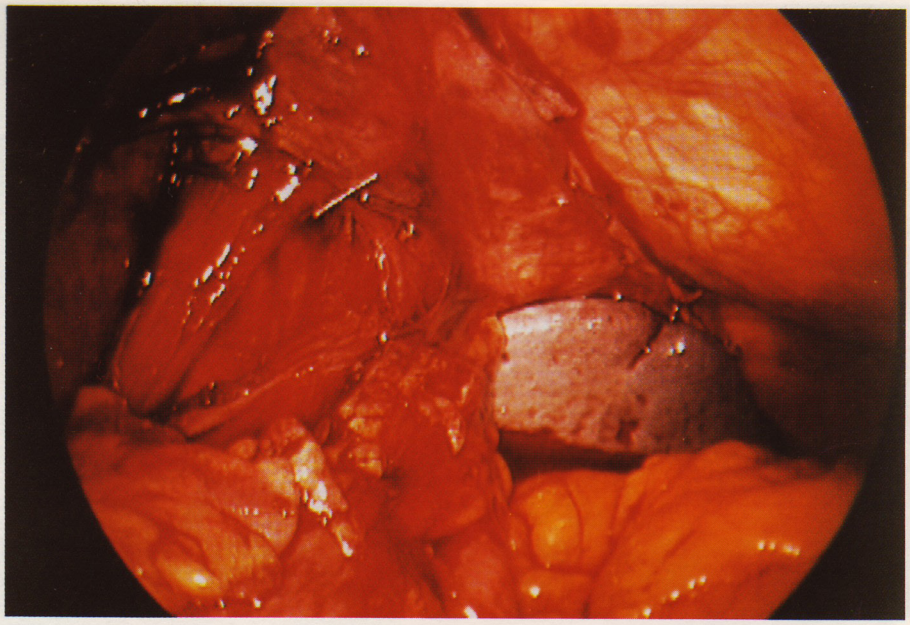

FIG. 2. Initial dissection exposing right and left crura. Spleen is in the background.

the tissue behind the distal esophagus and EG junction. Care is taken to avoid injuring the hepatic branch of the anterior vagal nerve trunk. The posterior vagal nerve trunk usually separates easily from the esophagus. On the left side of the esophagus the posterior dissection is carried out past the left crura down to the angle of His. The dissection posterior to the esophagus and EG junction should free a length of 5–7 centimeters. The crura can be approximated at this time by closing a large hiatal defect with simple stitches of non-absorbable suture (Fig. 6).

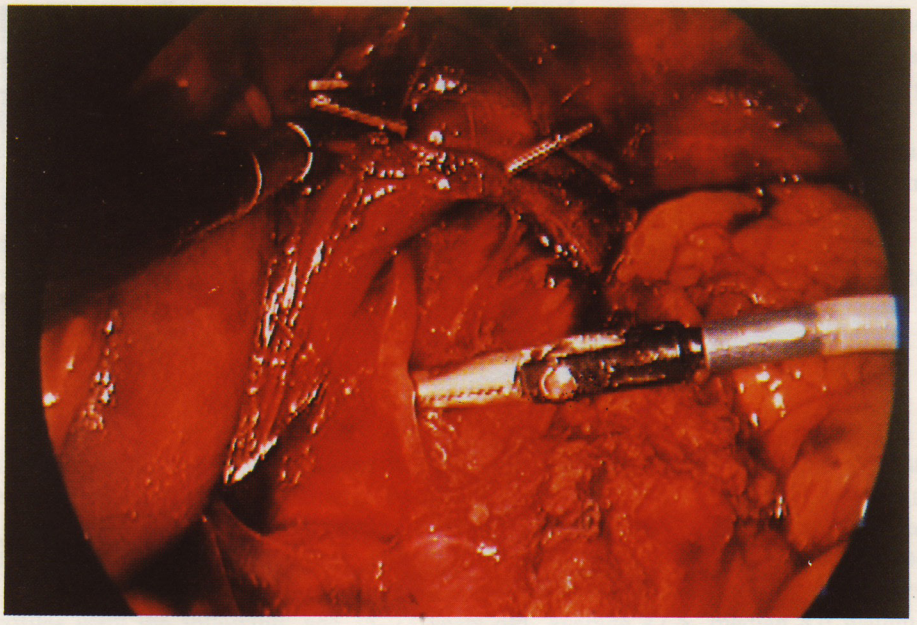

FIG. 3. Exposure of anterior vagus nerve, verifying the correct plane of dissection.

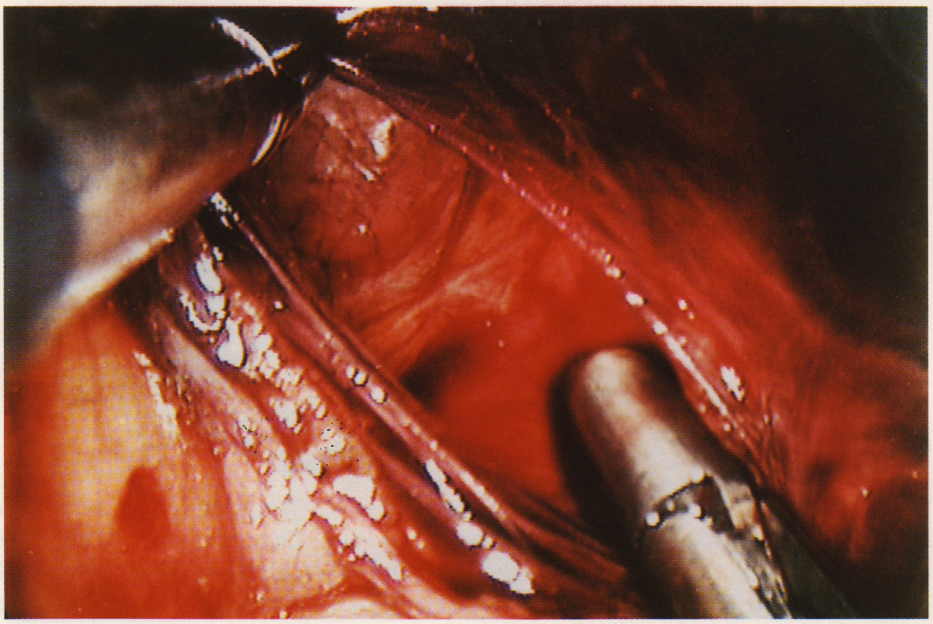

FIG. 4. Blunt dissection revealing areolar tissue plane around distal esophagus.

Transsecting the short gastric vessels is unnecessary in most instances when the previous dissection is done correctly. If it is necessary to transsect the short gastrics because of tension, exposure is the key. When the spleen is attached posteriorly, a seventh 10 mm port may be helpful. This 'splenic' port is placed at the anterior axillary line at the level of the umbilicus on the patient's left side. Gentle caudad traction on the spleen and surrounding fat is obtained utilizing a fan retractor. An experienced laparoscopic assistant who has developed a "feel" with laparoscopic instrumentation should be given this task. The patient is rotated to his right side.

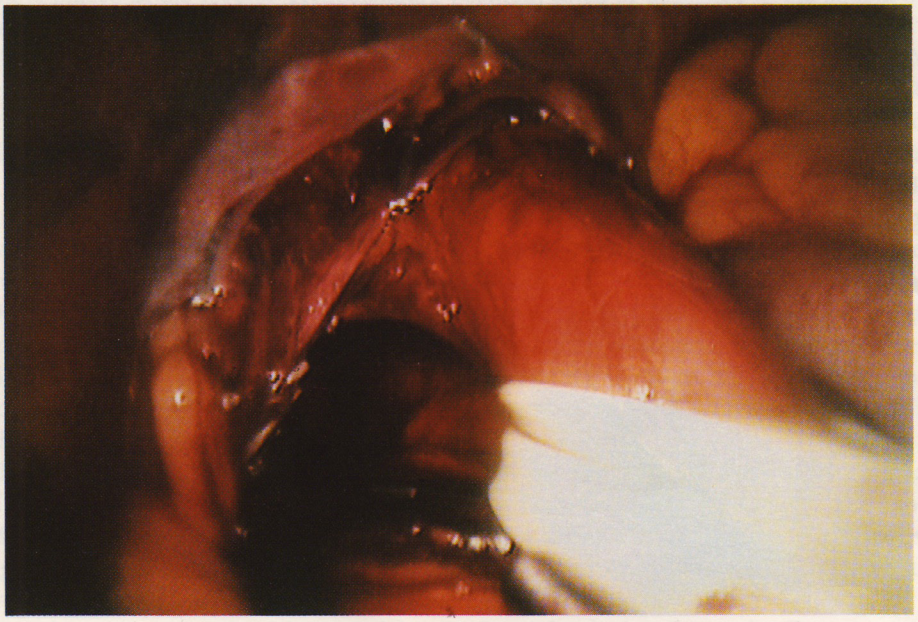

FIG. 5. Retraction of esophagus using Penrose drain.

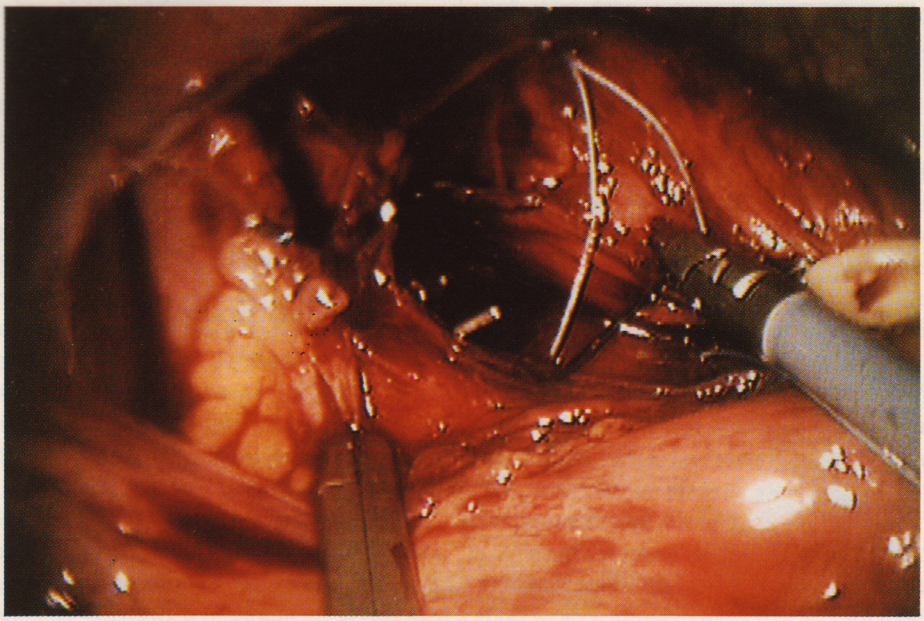

FIG. 6. Closure of esophageal hiatus viewed from patient's right side. Esophagus retracted to patient's left with a Penrose drain.

The fundus is gently pulled to the right with a Babcock clamp. The uppermost short gastrics can now be taken with careful dissection using double hemostatic clips. Alternatively, the short gastrics can be exposed by transsecting the gastrocolic ligament and lifting the posterior wall of the stomach anteriorly with a fan retractor. The videolaparoscope placed through the Hasson port reveals the short gastric vessels nicely. A 50 Fr esophageal dilator or something comparable (18 Fr nasogastric tube and a 40 Fr esophageal dilator) is placed by the anesthesiologist. Correct position is confirmed by visualization on the video monitor and palpation with laparoscopic blunt-tipped graspers. With the roticulating grasper placed around the EG junction from the right side, the anterior wall of the fundus is grasped near the greater curvature and pulled around the distal esophagus. The Babcock clamp releases the downward traction of the stomach and grasps the wrapped portion of the fundus on the right side of the esophagus.

Three sutures are placed laparoscopically approximating the wrapped fundus anterior to the esophagus. The first two stitches incorporate the anterior wall of the esophagus with care to avoid the anterior vagal trunk (Fig. 7). The suture is secured extracorporeally.

At the completion of the procedure the nasogastric tube and the esophageal dilator are removed. The ports are removed under video inspection to assure hemostasis. Fascial defects at all port sites are closed with absorbable suture.

RESULTS

Fifteen laparoscopic Nissen fundoplications were performed from Nov '91–Nov '92. All patients had chronic GERD on maximal medical treatment. Two patients had chronic aspiration secondary to reflux and one patient had a failed Belsey–Mark VI performed overseas. Three patients with duodenal ulcer disease underwent concurrent parietal cell vagotomy. Two patients had a concurrent cholecystectomy. One patient was opened when he developed extensive subcutaneous emphysema and a left pneumothorax.

Patient profiles were the following: age 35–73 years old, average 47.5, median 47; weight 140–220 pounds, average 175, and a median of 177. The length of operation time ranged from 113–330 min, average

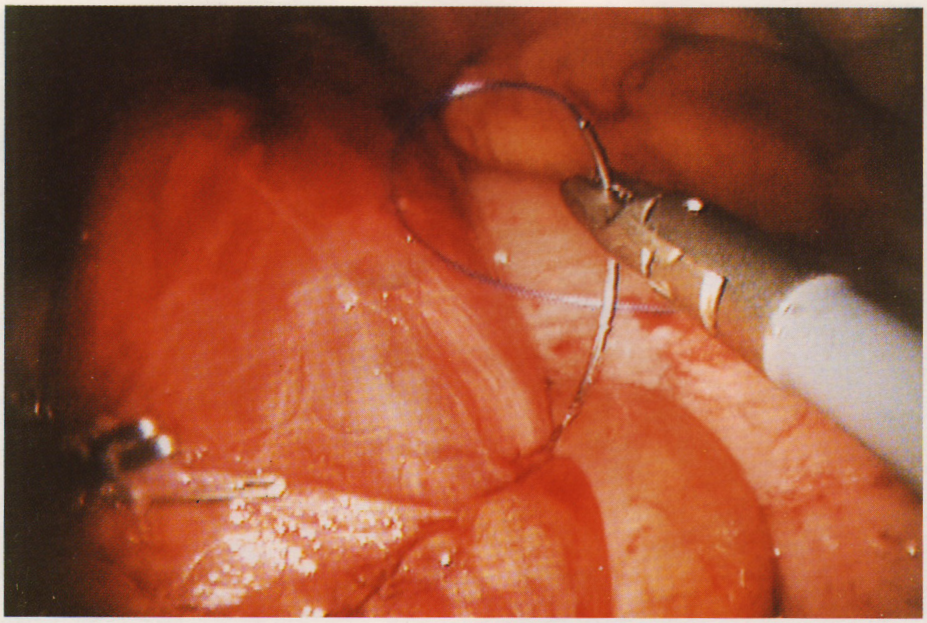

FIG. 7. Placing suture into esophageal anterior wall near esophagogastric junction.

of 190, and median of 155. The average operative time from a laparoscopic Nissen fundoplication without a vagotomy was 150 min, with a median of 160. The length of hospital stay ranged from 1–5 days. Five of fourteen patients went home on postoperative day 1 (36%), 4 of 14 went home on day 2 (29%), 3 of 14 patients went home on day 3 (21%), and 2 of 14 patients went home on day 4 (14%). The patient who went home on postoperative day 5 had a prolonged stay for a workup to rule out a myocardial infarction. The patient who had a laparotomy went home on day 6. Return to work time for the 7 employed patients ranged from 7–14 days, average of 8.5 days, and a median of 7 days.

To date all patients have had complete relief of their reflux symptoms. Follow-up studies include EGD's in 9 patients and barium swallows in 3 patients. All studies have verified an intact fundic wrap and the EGD's, in addition, have confirmed resolution of esophagitis in all patients scoped.

Two complications occurred in this series. A left pneumothorax that required a chest tube occurred in the patient that was opened. One patient experienced dysphagia 4 weeks postoperatively and required esophageal dilation.

DISCUSSION

The Nissen fundoplication is a well-accepted surgical procedure for the treatment of gastroesophageal reflux disease.[4] The procedure has undergone several modifications over the years.[5–7] Recently, surgeons have been performing the Nissen fundoplication laparoscopically. The techniques described are basically that of the open or traditional Nissen fundoplication performed in a minimal access fashion. To date, the series are notable for decreased postoperative morbidity compared to the open procedure.[8–10]

The technique for laparoscopic Nissen fundoplication that we perform is advantageous in several respects. The camera port placed in the subxyphoid position and the operating ports relatively high in the left upper quadrant give both excellent visualization and instrument access of the EG junction. The ability to avoid ligating the short gastric vessels routinely is attributed to the technique of dissection. It is believed that it is critically important to the success of the procedure to carry out a complete dissection of the posterior distal

esophageal and EG junction area. The dissection on the left side of the esophagus onto the left crura and angle of His area frees the fundus in most patients such that short gastric ligation is unnecessary. The time spent to complete the dissection as described is well spent. The exposure afforded and absence of tension on the wrap determines the excellent results.

Laparoscopic performance of the Nissen fundoplication in no way compromises the procedure. In fact, with less tissue trauma and greater visualization of the esophagogastric junction, the procedure may be more efficiently performed laparoscopically. A large portion of patients with GERD are obese. The laparoscopic technique offers good visualization, especially in situations where exposure is difficult to achieve in an open case. One of these cases was in a patient with previous surgery around the EG junction, a failed Belsey-Mark VI. Excellent visualization was achieved with the described technique allowing for completion of the procedure laparoscopically in this difficult setting. Intraoperative esophageal manometry was utilized in this case to gauge the length and tightness of the wrap.[11]

In another case, a laparoscopic Nissen fundoplication and parietal cell vagotomy were performed in a patient with medically refractory severe errosive esophagitis. The procedure was performed urgently because of persistence of bleeding. The esophageal dissection was difficult secondary to severe inflammatory changes. Maintaining good exposure and dissecting in the proper tissue plane made the procedure a success. The patient was discharged on postoperative day 2, asymptomatic and tolerating a soft diet.

One patient was opened early in the surgeons' experience because of the development of extensive subcutaneous emphysema of the neck, and a left pneumothorax on chext x-ray. Examination of the laparoscopically-performed fundoplication revealed a good wrap without evidence of an esophageal injury. A left chest tube was placed. The patient went on to make an uneventful recovery. The decision to convert or open a patient can be very difficult to make. If the procedure is not progressing along smoothly for whatever reason, i.e. poor exposure, bleeding, or inability to achieve or maintain dissection in the correct tissue plane, the authors strongly believe that the patient should be opened.

CONCLUSION

The great majority of patients with GERD are managed with medical treatment. However, there is a significant number of patients with chronic severe GERD that will benefit from a properly performed laparoscopic Nissen fundoplication. The markedly decreased postoperative morbidity makes the laparoscopic Nissen fundoplication the procedure of choice for chronic GERD.

REFERENCES

1. Klinkenberg-Knol EC, Jansen JM, Getsen HP, et al: Double-blind multicentre comparison of omeprezole & ranitidine in the treatment of reflux oesphagitis. Lancet 1987;1:349–351.
2. Hetzel DJ, Dent J, Reed WD, et al: Healing & relapse of severe peptic esophagitis after treatment with omeprazole. Gastroenterology 1988;96:903–912.
3. Hasson HM: Modified instrument and method for laparoscopy. Am J Obstet Gynecol 1971;110:886–887.
4. Nissen R: Gastropexy and 'fundoplication' in surgical treatment of hiatus hernia. Am J Dig Dis 1961;6:954–961.
5. Demeester TR: Gastroesophageal reflux disease. In: Moody FG, Carey LC, Jones RS, Kelly KA, Skinner DB. *Surgical Treatment of Digestive Disease*. Chicago: Year Book, 1986, pp 132–158.
6. Polk HC, Martin RW, Richardson JD: Gastroesophageal reflux. In: Nyhus LM, Baker RJ, eds. *Mastery of Surgery*. Boston: Little, Brown and Company, 1992, pp 954–961.
7. Rossetti ME, Liebermann-Meffert D: Nissen antireflux operation. In: Nyhus LM, Baker RJ, eds. *Mastery of Surgery*. Boston: Little, Brown and Company, 1992, pp 504–511.
8. Dallemagne B, Weerts JM, Jahaes C, Markiewicz, Lombard R: Laparoscopic Nissen fundoplication: preliminary report. Surg Laparosc Endosc 1991;3:138–143.

9. Bagnato VJ: Laparoscopic Nissen fundoplication. Surg Laparosc Endosc 1992;2:188–190.

10. Hinder RA, Filipi CJ: The technique of laparoscopic Nissen fundoplication. Surg Laparosc Endosc 1992;2:265–272.

11. Kraemer SJ, Hill LD, Low DE: The Hill Repair: reconstruction of the gastroesophageal junction and the flap valve for gastroesophageal reflux. In: Nyhus LM, Baker RJ, eds. *Mastery of Surgery*. Boston: Little, Brown and Company, 1992, pp. 534–540.

Address reprint requests to:
Michael J. O'Reilly, M.D.
805 Campbell Hill Street
Suite 100
Marietta, Georgia 30090