

Laparoscopic repair of paraesophageal hernia

New access, old technique

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Abstract. Large paraesophageal hernias are generally repaired by reduction of the stomach into the abdomen, sac excision, crural closure, and gastropexy or fundoplication. After gaining experience performing laparoscopic repair of sliding hiatal hernias and Nissen fundoplication we combined laparoscopic access with traditional surgical technique in treating patients with complex paraesophageal hernias.

Ten adults, six males and four females, with type III paraesophageal hernias underwent laparoscopic repair between February 1993 and April 1994. The average age of the patients was 60.4 years (range 38–81). Using five ports (three 10 mm and two 5 mm), the stomach was reduced into the abdomen, the hernia sac was resected, and the defect was closed with pledgeted horizontal mattress sutures. In addition, nine patients had a Nissen fundoplication performed and one patient had a diaphragmatic gastropexy.

The procedure was completed laparoscopically in all ten cases and the median operating time was 282 min (range 165–430). Two complications occurred, an intraoperative gastric laceration, and a postoperative mediastinal seroma. All patients were discharged on the 2nd or 3rd postoperative day. Eight of nine patients were asymptomatic at last follow-up (mean 8.9 months postop). One patient has mild dysphagia and heartburn from partial migration of the fundoplication into the chest. One patient died 3 months postoperatively of unrelated causes. Paraesophageal hernia can be reduced and repaired safely with laparoscopic access using standard surgical techniques.

Key words: Paraesophageal hernia — Nissen fundoplication — Sliding hiatal hernia

The paraesophageal hernia is a rare type of hiatal hernia, accounting for only 3–10% of hiatal hernias [7, 11, 12, 14]. Hiatal hernias fall into three categories [12]. Type I, the sliding hiatal hernia, is the most common type, in which the gastroesophageal junction is displaced into the mediastinum. Type II is the pure paraesophageal hernia in which the gastroesophageal junction is below the diaphragm, but the fundus and successively greater portions of the greater curvature of the stomach roll into the mediastinum alongside the esophagus. More commonly, paraesophageal hernia presents as a combined hernia (type III) in which the paraesophageal junction *and* a large portion of the stomach reside in the mediastinum. Thus, a paraesophageal hernia may vary from a small portion of the gastric fundus protruding through a mildly enlarged hiatus to a giant hiatal hernia containing the entire stomach, omentum, and transverse colon [12, 13].

Postprandial discomfort with substernal fullness and belching are the most common symptoms of paraesophageal hernia [10, 12, 13, 15]. Thirty percent of patients with a paraesophageal hernia present with a complication such as bleeding, obstruction, gastric volvulus, strangulation, or perforation [1, 7, 14]. Therefore, once diagnosed, paraesophageal hernias are repaired promptly.

Laparoscopic management of gastroesophageal reflux disease is becoming well established. Adhering to standard techniques of managing paraesophageal hernias, we have successfully performed laparoscopic repair of paraesophageal hernias in ten patients.

Table 1. Preoperative history: 10 patients

Dysphagia	7
Chest pain	3
Postprandial fullness	4
Reflux symptoms	6
Nausea/vomiting	5
Chronic anemia	3
Acute obstruction	3
Bleeding gastric ulcer	1

Patients and methods

From February 1993 through April 1994, ten patients with paraesophageal hernias were repaired using a laparoscopic approach. There were six males and four females. The mean age of the patients was 60.4 years (range 38–81). Presenting symptoms were postprandial substernal pain and chest fullness, nausea, vomiting, dysphagia, belching, and anemia (Table 1). Six patients had symptoms of gastroesophageal reflux disease. Four patients were previously admitted to other hospitals for hernia-related emergencies. Three of these patients presented with foregut obstruction (substernal pain, nausea, and vomiting) that resolved with conservative management. One patient was admitted for bleeding from a gastric ulcer in the incarcerated stomach. All patients enjoyed reasonable health, except for one man who was confined to a nursing home because of senile dementia and cardiopulmonary disease. On his second visit to the emergency room for nausea and vomiting he was found to have a giant paraesophageal hernia with foregut obstruction. All patients had a preoperative esophageal evaluation that included esophago-gastroduodenoscopy and barium swallow. Four patients had 24-h ambulatory esophageal pH monitoring and an esophageal motility study. Five patients were scored as ASA II and five as ASA III. All operations were performed on an elective basis, but soon after the patient was referred to us.

Operative approach

The patients were in the supine position with their legs spread on leg boards. The surgeon stood between the patient's legs, the first assistant at the patient's left side and the camera person to the patient's right side. Under general, endotracheal anaesthesia, the abdomen was insufflated with CO₂ to 15 mmHg with a Veress needle in the umbilicus. Five trocars were used, three 10 mm and two 5 mm. The trocar positions were the same as those used for antireflux procedures (Fig. 1). A forward oblique telescope (30 or 45°) was used in all cases.

The liver was elevated from the right subcostal port with an expandable retractor which was then mounted to a mechanical arm. The herniated stomach and greater omentum were reduced with atraumatic graspers. Complete reduction was not possible in most cases until the hernia sac had been detached from the mediastinum. In eight patients the peritoneal component of the hernia sac was completely or nearly completely removed. During sac excision, both vagal nerves were identified. In three cases the anterior vagus nerve ran across the hernia defect and required division to obtain tension-free reduction of the stomach into the abdomen. The pleural reflection was, in all cases, quite close to the sac and was identified and not entered in any case. In our first patient no attempt was made to resect or disconnect the hernia sac. In one patient the sac was detached from the diaphragmatic edge circumferentially, but not removed. The hernia defect was closed in all ten patients using non-absorbable, pledged horizontal mattress sutures. In nine patients, the distal esophagus and the gastroesophageal junction were dissected circumferentially, and the hiatal defect was closed both anteriorly and posteriorly to return the gastroesophageal junction to the abdomen. One patient had the defect closed anteriorly only, followed by gastropexy (Table 2). A loose, 2-cm Nissen fundoplication was performed over a 60 French Bougie. The last five patients had the short gastric vessel mobilized to assure that the fundus was used for fundoplication. The last six patients had the wrap tacked to the diaphragm in three places circumferentially to anchor it in the abdomen. The 10th patient, from the nursing home, had a lesser

procedure—hernia reduction, crural repair, and gastropexy—to expedite the procedure. Postoperatively, all patients had a nasogastric tube left for 24 h. A Gastrografin swallow was performed the 1st day postoperatively. The NG tube was removed and a liquid diet was started. On postop day 2, solid foods were instituted and, if well tolerated, the patient was discharged.

Results

All ten patients had successful laparoscopic reduction and repair of their paraesophageal hernias. They were all extubated in the operating room and no one required an intensive-care-unit admission. The operative time varied from 165 to 430 min, with a median of 282 min. Nasogastric tubes were removed in the operating room in eight patients, later that same day in one patient, and on the 1st postoperative day in another patient (Table 3). Two patients were given clear liquids 8 h after the operation, seven patients were given liquids the following day, and one patient with the gastric laceration was not given liquids until the 2nd postoperative day. Once the patients tolerated a regular soft diet, they were discharged. Two patients went home the day after the procedure, five on the 2nd postoperative day, and three on the 3rd postoperative day. One patient was readmitted 2 weeks after the procedure because of the lower back pain, requiring bed rest and analgesics. Another patient was readmitted 3 weeks after the procedure with low-grade fever and viral-type symptoms that resolved spontaneously.

One intraoperative complication occurred. A grasper tore a hole in the anterior wall of the gastric fundus (Table 4). The hole was repaired with a 35-mm linear stapler. The patient had his nasogastric tube removed the day after surgery and went home on postoperative day 3 eating a soft diet. There were two postoperative complications (Table 5). One patient presented with dysphagia 1 week after the procedure. A CT scan showed a mediastinal fluid collection in the area of the hernia sac. He was afebrile and the dysphagia resolved spontaneously over the ensuing 2 weeks. He was the first patient in this series and we did not remove the hernia sac. All patients have been evaluated postoperatively with a barium-swallow. One patient has been found on the barium-swallow to have a partially herniated wrap, and this patient has occasional mild dysphagia, and heartburn.

One patient expired 3 months after the procedure from cardiopulmonary arrest. This patient resided in a nursing home because of senile dementia but had also significant heart and lung disease. Prior to the operation, he had presented on three occasions to an emergency department with acute obstruction. According to his family he had been free of pain and eating difficulty following his operation. This patient had a type II paraesophageal hernia repaired with crural repair and anchoring of the fundus to the inferior part of the diaphragm.

Postoperative complaints were few (Table 5) and satisfaction with the operation was universal. Two patients had early dysphagia that resolved within 6 weeks. One patient complained of early satiety that

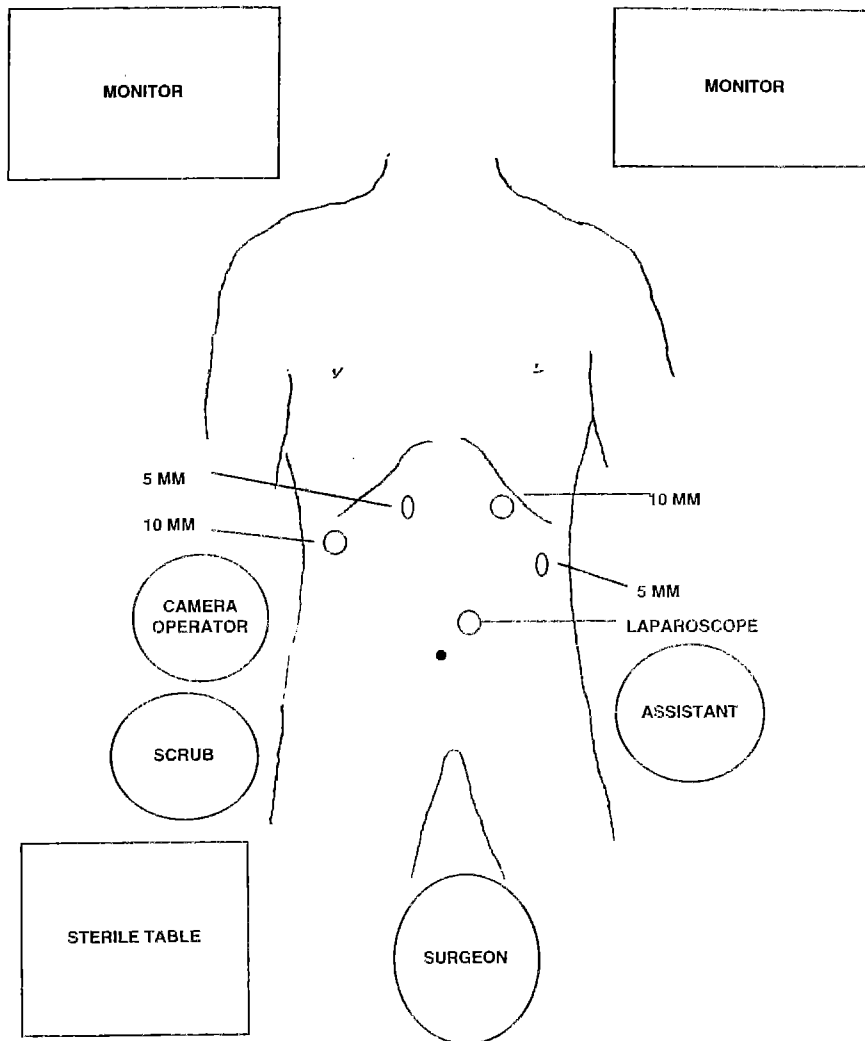


Fig. 1. Trocar placement. Three 10-mm trocars and two 5-mm trocars are placed. The first 10-mm trocar is placed through the left rectus sheath, 15 cm distal to the xiphoid. This trocar is for the telescope. The next 10-mm trocar is placed along the left costal margin, 10 cm from the xiphoid, and is for the surgeon's right hand. The third 10-mm trocar, placed along the right costal margin, 15 cm from the xiphoid, is for the liver retractor. The 5-mm trocar in the epigastrium is placed at the level of the falciform, and as high as the liver edge allows it to be. This trocar is for the surgeon's left-hand grasper. Finally, a 5-mm trocar is placed in the left flank for retraction of the stomach.

Table 2. Surgical procedures performed: 10 patients

Sac excision, crural repair, fundoplication	8
Crural repair, fundoplication	1
Crural repair, gastropexy	1

lasted for almost 2 months and two patients have had dyspepsia. One of these two is the elderly gentleman in a nursing home mentioned above. The other one was found to have gastritis and *H. pylori*, for which she has been treated. This latter patient also has occasional heartburn and was found to have mild reflux using the 24° pH probe.

Discussion

The transabdominal repair of paraesophageal hernias may be accomplished with laparoscopic access and conventional techniques. Large surgical series of this rare entity are hard to find, but certain principles have emerged. Symptomatic or asymptomatic paraesophageal hernias should be repaired soon after diagnosis to avoid the frequent development of a complication

(e.g., obstruction, bleeding, strangulation, and perforation). When 21 patients with minimal symptoms were treated medically, six (27%) presented later with a serious complication of their paraesophageal hernia, which was associated with 100% mortality [14]. Others reports have similar findings [1, 7, 11]. Before referral, four of our ten patients developed a serious complication of their hernia (bleeding one, acute obstruction three) but were treated without operation because of concerns about operative morbidity and mortality.

Most discussions of the surgical technique for transabdominal repair of paraesophageal hernia emphasize the need to excise the hernia sac and close the hernia defect with pledgeted, nonabsorbable sutures [6, 11, 12, 16]. Whether to perform an antireflux procedure in the absence of reflux symptoms is still debated. The strongest argument for omitting an antireflux procedure has been made in patients with type II paraesophageal hernias without reflux symptoms. Reflux is frequently present in type III hernias despite the absence of symptoms. In one report, 60% of patients with type III hernias had hypotensive lower esophageal sphincter and an abnormal 24-h pH test [16]. When an antireflux procedure is not performed, one-fifth of patients will have reflux symptoms, postoper-

Table 3. Postoperative course: 10 patients

	Operating room	Same day	Postop day #1	Postop day #2	Postop day #3
Nasogastric tube removed	8	1	1		
Clear liquids		2	7	1	
Soft diet			4	5	1
Discharged			2	5	3

Table 4. Complications of surgery: 10 patients

Intraoperative	
Gastric perforation	1
Postoperative	
Mediastinal collection	1
Herniation of fundoplication	1

Table 5. Postoperative symptoms: 10 patients

	One month	Three months
Dysphagia	2	
Bloating/flatulence	2	1
Early satiety	1	
Difficulty burping	1	
Weight loss	1	
Dyspepsia	2	1
Nausea	2	1

actively [17]. These findings support routine performance of an antireflux procedure with paraesophageal hernia repair. Nine of the ten repairs presented in this study included a loose, short, Nissen fundoplication. In one case, an expeditious repair that consisted of reduction of the hernia, crural repair, and gastropexy was performed in a nursing-home patient with senile dementia and foregut obstruction. He did well perioperatively, but died 3 months later of unrelated causes.

Elective repair of paraesophageal hernias is associated with low morbidity and mortality [6, 7, 11, 13–16]. The most common complications reported for an open repair are pneumonia, postoperative gastric stasis, wound infection, incisional hernia, gastroesophageal reflux, and hernia recurrence [6, 7, 10, 12, 17]. The only intraoperative complication in this study occurred when a grasper tore a small rent in the anterior stomach wall. An atraumatic grasper was being used, but the friability of the chronically incarcerated stomach was not appreciated by the surgeon. This laceration was repaired with a 35-mm linear stapler but hand-sutured repair is equally acceptable. Our first patient presented 1 week after his operation with dysphagia. A barium-swallow, the first test performed for evaluation of dysphagia, was normal. A CT-scan of the chest demonstrated a fluid collection in the posterior mediastinum, in the area of the hernia sac. His symptoms resolved without intervention but demonstrated to us the importance of removing or detaching the hernia sac from the diaphragm. In addition to the development of fluid collections, residual hernia sac is asso-

ciated with hernia recurrence. The third complication, in which the fundoplication has migrated into the chest, may result from one or all of three problems—a short esophagus, incomplete or disrupted crural closure, or inadequate tacking of the fundoplication to the undersurface of the diaphragm.

There are a few reports recently of new laparoscopic techniques designed to repair paraesophageal hernias [3, 4, 8, 9]. Two of these reports describe the use of prosthetic material to close the hernia. No attempt is made to remove the sac or perform a fundoplication [3, 9]. One report describes reduction of the herniated stomach followed only by the placement of three gastrostomy tubes [8]. Two cases have been reported describing sac excision, crural closure, gastropexy, and Stamm gastrostomy [4]. The use of prosthetic material to close a paraesophageal hernia defect is a new approach using open or laparoscopic access and needs careful evaluation before endorsement for widespread use. Based on previous experience of foreign-body implantation at the gastroesophageal junction (e.g., vertical banding gastroplasty and the Angelchik prosthesis), the use of prosthetic material may be ill advised [2, 5]. Additionally, effective closure of a large hernia can be performed with pledgeted sutures with a low risk of recurrence.

Patients with paraesophageal hernias are generally older than patients with sliding hiatal hernias, and commonly have other medical problems [16]. A laparoscopic approach offers these patients an opportunity for a fast recovery with reduced postoperative discomfort, and a reduced likelihood of cardiopulmonary complication. Because laparoscopic repair can be performed with acceptable morbidity and good results using the standard surgical technique, there seems little need to invent new laparoscopic techniques to repair complex paraesophageal hernias.

References

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Discussion

Dr. Dent: (Moderator) I gather you had no incidence of pneumothorax?

Dr. Oddsdottir: No, not on these patients. We have had occasional pneumothorax in the fundoplication patients, but not with these.

Dr. Edelman: (Miami) I want to congratulate you on a very nice paper. Since Type II and Type III paraesophageal hernias many times present with gastric volvulus, do you feel it's necessary to either add a laparoscopic gastrostomy or some type of gastric fixation to your repair?

Dr. Oddsdottir: The fundoplication is a gastric fixation procedure. Once you wrap the fundus around the

stomach and tie on the fundus stitches, you should include a bit of the esophagus, and tack it to the diaphragm. That is a good fixation of the stomach.

Dr. Edelman: You still have two other points of the stomach, the duodenum and the whole body that can still migrate and volvulize.

Dr. Oddsdottir: Once you have detached the sac and closed the crural defect and then attached the wrap circumferentially around that area, there shouldn't be much place for migration.

Dr. Burbano: (Quito) I enjoyed your paper very much. Some of us have done a number of open procedures for paraesophageal hernias and you commented on one with a laparoscope. The hardest part of the operation seems to be to remove the sac. In some cases that I did open and only one that I did laparoscopically, I left the sac in and closed the two crura. Why is it so important to get the sac out if you tighten the crura?

Dr. Oddsdottir: I don't think that you have to remove the sac completely, but you do have to detach and remove part of it at least. In our first patient, we didn't remove much of the sac at all, and he is the one that presented with a fluid collection. In an open procedure, we usually remove most of the sac, and I think as that is well established, we should do that in the laparoscopic approach as well.

Dr. Glise: (Sweden) Congratulations on a very nice study. We have had some problems when trying to dissect out those big sacs. Because you're in a narrow space, and it's hard to identify the different structures. Have you developed any special methods to do that?

Dr. Oddsdottir: First of all, it's imperative to use an angled scope. With an angled scope, you can actually advance the scope into the hiatal opening and look around. True, the most difficult part of the repair is the resection of the sac; however, it can be accomplished if you go slowly. It's also important that you identify both the vagi and the pleurae, but sometimes it gets stained with blood that absorbs the light. Then bringing in a rolled up sponge helps absorb the blood and actually keeps the field clear.