LAPAROSCOPIC HELLER MYOTOMY WITH FUNDOPICATION FOR ACHALASIA

I-Rue Lai, Wei-Jei Lee, and Ming-Te Huang

Achalasia is a rare esophageal motor disorder that manifests mainly as dysphagia, chest pain, and regurgitation. It is characterized by incomplete relaxation of the lower esophageal sphincter (LES) with swallowing and impaired esophageal peristalsis. Pathologic study in patients showed selective loss of inhibitory neurons in the myenteric plexus of the LES [1].

The goal of achalasia treatment is to relax the LES. Treatment modalities in use include pneumatic dilation with balloons, intra-sphincteric injection of botulinum toxin [2, 3], and surgical cardiomyotomy. Although the long-term results of surgical cardiomyotomy were good compared to those of pneumatic dilatation [4, 5], physicians and patients are often concerned about the morbidity and longer hospitalization associated with thoracotomy or laparotomy. With the advent of minimally invasive surgery, surgical cardiomyotomy can be performed safely using either thoracoscopic or laparoscopic approaches. The laparoscopic approach has been shown to be superior to the thoracoscopic approach in that patients are more comfortable and have shorter operations and hospital stays [6, 7]. In addition, the results of the laparoscopic approach (relief of dysphagia and prevention of heartburn) are similar or even superior to those of the thoracoscopic approach. Our team is experienced in the performance of laparoscopic fundoplication [8], and we started to perform laparoscopic Heller myotomy and anterior fundoplication for patients with achalasia in January 1998. The purpose of this study was to review the results obtained using this new therapeutic approach in Taiwanese patients. The results indi-

Background and Purpose: Laparoscopic Heller cardiomyotomy for the treatment of achalasia can be performed safely. The application of this minimally invasive approach has not been reported in Taiwan. This study assessed the results obtained using this new method in Taiwanese patients.

Methods: From January 1998 to December 2000, we recruited 10 patients (3 men, 7 women; average age 37.3 yr) with achalasia who underwent laparoscopic cardiomyotomy and fundoplication. Before and after surgery, the severity of three symptoms (dysphagia, regurgitation, chest pain) was evaluated by symptom scores (0 = symptom absent; 1 = occasional; 2 = every day, 3 = every meal). Barium swallow study and panendoscopy were performed in all patients. Esophageal manometry was performed before surgery in seven patients. Laparoscopic Heller myotomy and anterior (Dor) fundoplication was performed through five abdominal trocar sites. The myotomy extended 7 cm, 6 cm above and 1 cm below the gastroesophageal junction.

Results: Barium swallow study showed that one patient had a normal or mildly dilated esophagus (<3 cm) and nine patients had moderate esophageal dilatation (3–7 cm). Mean operative time was 162.5 ± 29.7 minutes. Mean hospital stay was 5.1 ± 1.6 days (range, 3–9 d). The mean follow-up time was 21.3 ± 9.4 months, longer than 19 months in eight patients. Dysphagia was alleviated in all but one patient (90%). Regurgitation and chest pain also improved in all patients. No intraoperative complication occurred. Postoperative weight gain (>4 kg) was noted in all patients.

Conclusions: Laparoscopic Heller myotomy and anterior fundoplication result in significant symptomatic relief for patients with achalasia.
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cated that laparoscopic Heller myotomy and anterior
dfundoplication is a safe and efficacious treatment to
relieve dysphagia in patients with achalasia.

**Materials and Methods**

Ten patients, three men and seven women with a mean age of 37.3 ± 17.5 years (range, 18–75 yr), treated for achalasia at the Department of Surgery of the En Chu Kong Hospital, were recruited into this study between January 1998 and December 2000. The diagnosis was made on the basis of clinical symptoms and the results of barium swallows, panendoscopy, and esophageal manometry. Three symptoms were analyzed: dysphagia, regurgitation, and chest pain. Symptom scores (0 = no symptoms; 1 = occasional symptoms; 2 = symptoms every day; 3 = symptoms every meal) were obtained before and after surgery. Barium swallows and panendoscopy were performed in all patients. All patients had a dilated esophagus with a bird-beak taper on esophagograms. Esophageal manometry was performed before surgery in seven patients, and all seven were classified as having classic achalasia by manometry criteria. Three patients underwent pneumatic dilation before surgery.

**Surgical procedure**

Laparoscopic Heller myotomy and anterior fundoplication was performed through five abdominal trocar sites as previously described [8]. Briefly, the procedure was performed with the patient in the lithotomy position. Pneumoperitoneum was established via the supraumbilical port. The other four working ports were placed at the subxiphoid, bilateral subcostal in the midclavicular line, and left lower quadrant of the abdomen along the anterior axillary line. The phrenoesophageal membrane was incised, and the anterior aspect of esophagus was exposed. A 7-cm myotomy incision extended 6 cm above and 1 cm below the gastroesophageal junction (Fig. 1A). Simultaneous intraoperative endoscopy was used to adjust the adequacy of myotomy and detect any mucosal perforation (Fig. 1C and D). Anterior (Dor) fundoplication was performed. The mobilized anterior fundic wall of the stomach was sutured to the left then to the right muscular edge of the myotomy (Fig. 1B). A nasogastric

![Fig. 1. Intraoperative pictures of A) a 7-cm myotomy and B) the accomplishment of anterior fundoplication. C) Preoperative and D) postoperative views of the esophagogastric junction.](image-url)
tube was left in place. All patients underwent gasrograffin studies on the first postoperative day, and started a liquid diet if no extravasation of contrast media was found (Fig. 2). Follow-up took place during clinic visits and by telephone interviews.

Results

The clinical characteristics of the patients are listed in the Table. Barium swallow study showed that one patient had a normal or mildly dilated esophagus (<3 cm) and nine patients had moderate esophageal dilatation (3–7 cm). In four patients, the maximal diameter of the esophagus decreased by more than 2 cm after the operation. No sigmoid esophagus was found in our patients. Mean operative time was 162.5 ± 29.7 minutes (range, 125–235 min). Mean hospital stay was 5.1 ± 1.6 days (range, 3–9 d). The mean follow-up time was 21.8 ± 9.4 months, and for eight patients was longer than 19 months. Dysphagia was alleviated in all but one patient (90%). This 46-year-old man had initial relief of dysphagia, but soon the symptom recurred. He underwent balloon dilation 2 months later and his dysphagia was relieved. Review of the video recording of the patient’s operation suggested that inadequate myotomy of the gastric side was the cause of failure.

Obvious regurgitation in two patients was alleviated after the operation, and in the others, no difference was noted. No obvious relief of chest pain was noted because most patients did not have severe chest pain symptoms before surgery. No intraoperative complication occurred. Postoperative weight gain (mean, 6.1 ± 2.2 kg) occurred in all patients.

Discussion

Pneumatic dilatation was once the most common treatment and the treatment of choice for patients with achalasia. However, forceful dilation of the LES carries the risk of perforation, and the symptom relief rate is only 51% after 5 years, compared with 95% symptom resolution in the surgical group in a controlled study [4]. Intersphincteric injection of botulinum toxin has become an attractive non-operative alternative in the management of achalasia. However, a multicenter trial of botulinum injection showed that the symptom relief rate was 60% at 6 months, and 34% of patients needed a second treatment in 2 months [3]. Another report showed that previous botulinum toxin injection made subsequent laparoscopic myotomy more difficult and risky [9]. None of our patients had ever received botulinum injection before the operation. Both pneu-
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Table. Clinical characteristics of patients with achalasia

<table>
<thead>
<tr>
<th>Case</th>
<th>Age/sex</th>
<th>Pneumatic dilatation</th>
<th>LES pressure, mmHg (preop/postop)</th>
<th>Esophageal diameter, cm (preop/postop)</th>
<th>Body wt, kg (preop/postop)</th>
<th>Operation time, min</th>
<th>Hospital stay, d</th>
<th>Follow-up, mo</th>
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<td>2</td>
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<td>No</td>
<td>45/10</td>
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<td>5</td>
<td>33</td>
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<tr>
<td>3</td>
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<td>Failed</td>
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<td>61/65</td>
<td>170</td>
<td>9</td>
<td>28</td>
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<tr>
<td>4</td>
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<td>38/12</td>
<td>5.7/3.0*</td>
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<td>180</td>
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<td>125</td>
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<td>19</td>
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<td>2</td>
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</table>

LES pressure = basal lower esophageal sphincter pressure; preop = preoperative data; postop = postoperative data; esophageal diameter = maximal diameter measured on esophagogram; wt = weight. *Decrease in maximal esophageal diameter by more than 2 cm on esophagogram.

Heller cardiomyotomy was first described in 1913, and remains the most common procedure for the surgical treatment of achalasia. Dysphagia is relieved by the procedure in 89 to 93% of cases [10–12]. However, using either the transthoracic [10] or transabdominal [11] method, open Heller myotomy carries the risks of major surgery, greater wound pain, and long convalescence. Minimally invasive laparoscopic Heller myotomy for the treatment of achalasia was first reported in 1991 [13], and was found to be as effective as the open method [14, 15]. We used the laparoscopic rather than the thoracoscopic approach in this study for several reasons. First, having considerable experience in performing laparoscopic antireflux procedures [16], we were quite familiar with the gastroesophageal junction via the transabdominal approach. Second, via the abdominal approach, the direction of dissection during myotomy is parallel to the axis of the esophagus rather than perpendicular to it, as is the case in the thoracic approach. The former is much easier [14, 17, 18]. Third, the esophagus could be pulled downward into the abdomen sufficiently to allow adequate myotomy. Fourth, anterior fundoplication could be performed easily via the abdomen to prevent postoperative reflux. In a prospective, non-randomized study, Stewart et al showed that laparoscopic Heller myotomy was superior to thoracoscopic Heller myotomy in preventing heartburn, relieving dysphagia, shortening the operation time and learning curve, and shortening the hospital stay [7]. Debates continue about the indications for fundoplication. Although symptomatic reflux has rarely been noted, postoperative pH studies revealed that abnormal gastroesophageal reflux was present in seven of 40 patients who underwent Heller myotomy [19]. No patients in our study had symptomatic gastroesophageal reflux disease in the postoperative follow-up, but the true incidence of this condition was not known because none of our patients would undergo postoperative pH studies. We routinely used intraoperative gastroscopy to help identify the gastroesophageal junction and adjust the extent of myotomy. This procedure has been shown to be of great assistance in improving surgical outcome [17, 20].

Nine achalasia patients had symptomatic relief after laparoscopic Heller myotomy and anterior fundoplication. The only patient who did not obtain symptomatic relief subsequently improved in response to an additional balloon dilation procedure. No major complications developed, and no symptomatic reflux was evident in the follow-up period. Our results indicate that laparoscopic Heller myotomy with anterior fundoplication is a safe and effective procedure for patients with uncomplicated achalasia.

References