Clinical results of thorascoposcopic Heller’s myotomy in the treatment of achalasia

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Abstract

Objectives: Ideal treatment for achalasia permanently eliminates the dysfunctional lower oesophageal sphincter, relieving dysphagia and regurgitation. The aim of this study was to review the results in a series of patients undergoing video-imaged thoracoscopic Heller’s myotomy (THM).

Methods: Records of all patients undergoing THM by a single surgeon at one institution were analysed. Follow-up was conducted using a structured questionnaire together with oesophageal manometry and/or 24 h pH monitoring when clinically indicated.

Results: Twenty-five consecutive patients (13 males, 12 females, mean age 40.3 ± 19.9 years) suffering from grade 4 dysphagia underwent THM between 1993 and 2001. Preoperative mean lower oesophageal sphincter (LOS) pressure was 42.6 ± 6.3 mmHg. Seven patients (28%) had undergone previous pneumatic dilatations. There were no hospital deaths and no oesophageal perforations. Length of hospital stay was 4.3 ± 1.8 days. One patient died 3 years after surgery from unrelated causes. At follow-up of 5.4 ± 2.1 years, freedom from any reintervention was 95.8% (23/24). Eleven patients (45.8%) were asymptomatic. In patients with residual or recurrent symptoms (n = 13), their severity was significantly reduced from the preoperative period (dysphagia score 1.7 ± 0.8 versus 4 ± 0; P ≤ 0.05). Four patients (16%) with troublesome residual or recurrent grade 3–4 dysphagia underwent repeat oesophageal manometric study, showing a mean reduction in LOS pressure from their baseline values of 46.8 ± 6.1 to 30 ± 5.4 mmHg (P ≤ 0.01). One of these patients (4.2%) required repeat Heller’s myotomy 1.5 years after THM. Six patients complained of troublesome postoperative heartburn; distal oesophageal acid exposure was shown to be abnormal in 3 (12.5%) of these patients and all enjoyed symptomatic relief with medical therapy.

Conclusions: THM is a safe and effective procedure in the treatment of achalasia. Some patients do experience recurrence of symptoms; however, these are significantly less severe. The incidence of postoperative heartburn is acceptably low and can be controlled with oral medications, making the addition of an anti-reflux procedure not necessary. Longer-term follow up and randomised studies comparing THM to other therapeutic modalities are needed to ascertain respectively the durability of this approach and its relative advantages.

Keywords: Achalasia; Video-assisted; Minimally invasive; Thoracoscopic; Heller’s myotomy

1. Introduction

Achalasia is a motility disorder of the oesophagus of unknown aetiology, characterised by lack of peristalsis of its body and failure of relaxation with a lower oesophageal sphincter (LOS) that fails to relax. Several medical and surgical therapeutic modalities have been adopted since Sir Thomas Willis first described a successful dilatation of the LOS using a whale bone in 1672 [1], although all treatments should be considered palliative [2]. Oesophageal myotomy was introduced by Heller in 1913 [3] and it has remained the essential component of surgical treatment for achalasia. During the last decade, minimal access surgery has enabled this procedure to be performed from a thoracoscopic approach in a safe and efficacious manner [4–7]. However, to date, there is paucity of long-term results after thoracoscopic Heller’s myotomy (THM).

The aim of this study was to review our experience with THM over an 8-year period.

2. Methods

The records of all patients undergoing THM by a single surgeon at one institution between January 1993 and July
2001 were analysed. Our technique can be summarised as follows: after general anaesthesia has been induced with double-lumen tracheal intubation, the patient is positioned in right lateral decubitus. Four ports are created: a 10-mm port is introduced in the posterior axillary line at the seventh intercostal space and used for camera visualisation (0° thoracoscope). Once the feasibility of a thoracoscopic approach is ascertained, a 3-cm submammary utility port is fashioned. Two additional 5-mm incisions are then placed 5 cm inferiorly in the anterior and posterior axillary lines and used for instrumentation. The inferior pulmonary ligament is divided and the lung retracted superiorly and anteriorly. The mediastinal pleura is divided longitudinally over the oesophagus from the left inferior pulmonary vein to the diaphragm. The myotomy is commenced by holding the longitudinal muscle fibres of the oesophageal wall with dissecting forceps and gently tearing them apart. The circular muscular layer is therefore exposed, grasped with forceps and disrupted until the submucosal layer bulges out from the separated portion. The muscle fibres are separated for at least half of the oesophageal circumference. Bleeding from the submucosal layer is either left to settle or controlled by applying gentle pressure and diathermy is used. The myotomy is carried out proximally to the level of the left inferior pulmonary vein and distally for approximately 1.5 cm on the anterolateral portion of the gastric cardia. A distinct difference in the orientation of muscular fibres and vascular supply to the mucosa helps in recognising the junction between the oesophageal and gastric linings. Great care is taken to avoid injury to the junction between the oesophagus and gastric cardia. A distinct difference in the orientation of muscular fibres and vascular supply to the mucosa helps in recognising the junction between the oesophageal and gastric linings. Great care is taken to avoid injury to the more distal oblique muscular sling fibres, whose integrity is important in preserving competency of the anti-reflux mechanism [8]. Warm saline solution is poured into the pleural cavity to submerge the dissected portion of the oesophagus and a flexible endoscope is advanced to the stomach under continuous insufflation to check for any mucosal tears. A basal intercostal drain is inserted through one of the inferior ports. Patients are discharged from hospital on oral ranitidine and metoclopramide.

Follow up was conducted using a structured questionnaire, and symptoms of dysphagia, regurgitation and heartburn were graded as described in Table 1. Patients who reported recurrent or residual symptoms of sufficient severity to warrant further investigations underwent oesophageal manometry, 24 h pH study and/or barium swallow as indicated by the presence of dysphagia, heartburn and/or regurgitation.

Demographic, pre-, intra- and post-operative data were entered into an electronic spreadsheet and analysed using a commercially available statistical software (Statistical Package for Social Sciences, SPSS Inc., Chicago, IL) running on a personal computer. The statistical analyses presented use standard descriptive statistics and conventional tests of significance for comparisons, principally Student’s t, χ-square and Mann–Whitney. Statistical significance was set at the 5% level. Unless otherwise stated, data are presented as mean ± standard deviation.

### 3. Results

Twenty-five consecutive patients (13 males, 12 females), mean age 40.3 ± 19.9 years, (range 17–74 years) underwent THM. This represents the totality of patients referred for the first time to our service for treatment of achalasia during the period of interest. All patients were suffering from grade 4 dysphagia at the time of referral. Seven patients (28%) had undergone a mean of 2.2 ± 1 previous pneumatic dilatations, whereas no patients received botulinum toxin injection before being referred. There were no hospital deaths, no oesophageal perforations and no conversions to open thoracotomy or laparotomy. One female patient suffered from persistent vomiting in the early postoperative period; despite maximal anti-emetic treatment, she developed a hiatus hernia, which prompted surgical re-exploration. Via a left thoracotomy, the herniated stomach was reduced into the abdominal cavity and the oesophageal hiatus repaired with interrupted sutures. Her further recovery was uncomplicated. The mean duration of surgery was 105 ± 12 min (138 ± 15 for the first 15 patients and 97 ± 8 for the last ten patients). All patients resumed oral intake and had their intercostal drain removed on the first postoperative day. Length of hospital stay was 4.3 ± 1.8 days. No patients suffered from post-thoracoscopy pain syndromes, dysphagia-related chest pain or regurgitation during the follow up period. One patient died 3 years after surgery from unrelated causes.

Follow up at 5.4 ± 2.1 years (range 1–8.4 years; 124 patient-years) was 100% complete (24/24). One patient required redo HM for recurrence of symptoms 1.5 years after the initial procedure, giving a freedom from any reintervention of 95.8%. A repeat Heller’s myotomy through a muscle-sparing thoracotomy approach was used in this patient, with excellent result to date. Eleven patients

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1</td>
<td>No symptom</td>
</tr>
<tr>
<td>Mild</td>
<td>2</td>
<td>Noticeable symptom but no interference eating meals or other activities</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
<td>Noticeable symptom with some interference eating meals and other activities, including sleep</td>
</tr>
<tr>
<td>Severe</td>
<td>4</td>
<td>Troublesome symptom interfering considerably with eating meals and other daily activities, including sleep</td>
</tr>
</tbody>
</table>

Modified from Johnson et al. [9].
reduction in LOS pressure from their baseline values of postoperative oesophageal manometric study; this showed a dysphagia, but no chest pain or regurgitation (three patients). The appearance of postoperative heartburn after THM, indicating new gastroesophageal reflux disease, is reported in the literature at 18–60% [4–7]. In our patients, we observed a new incidence of heartburn in 25% of cases, and all improved on recommencing or increasing anti-acid and pro-kinetic medical treatment, thereby not requiring an anti-reflux procedure. Like Mattioli and colleagues [8], we believe that utmost care in deciding the extent of distal myotomy on the gastric cardia and the minimal disruption of the phrenoesophageal ligament are the most important factors in determining preservation of continence of the LOS, whilst relieving any obstruction to the passage of food [20].

6.1 to 30 mmHg (P = 0.8, #P = 0.01). Six patients complained of grade 3–4 heartburn following the procedure and underwent 24 h pH study. In three (12.5%) of these six patients oesophageal acid exposure was abnormal; all patients were re-started on proton pump-inhibitors, which resulted in complete symptom relief.

(45.8%) reported absence of symptoms. In the remainder of patients who reported recurrence or persistence of symptoms (n = 13), their severity was significantly reduced (Fig. 1). Four patients (16%) who complained of grade 3–4 dysphagia, but no chest pain or regurgitation (three patients with grade 3 and one patient with grade 4) underwent postoperative oesophageal manometric study; this showed a reduction in LOS pressure from their baseline values of 46.8 ± 6.1 to 30 ± 5.4 mmHg (P = 0.01). Six patients complained of grade 3–4 heartburn following the procedure and underwent 24 h pH study. In three (12.5%) of these six patients oesophageal acid exposure was abnormal; all patients were re-started on proton pump-inhibitors, which resulted in complete symptom relief.

4. Discussion

Oesophageal achalasia remains a disorder of unknown aetiology and with no definitive cure. Several therapeutic options have been adopted during the last century, with variable patterns of safety and efficacy [10]. Surgical myotomy of the distal oesophagus has been shown to yield the best results in relieving the symptoms of achalasia, when compared to other non-surgical techniques [11–13]. During the last decade, minimally invasive video-assisted techniques have enabled this procedure to be carried out successfully from both a laparoscopic and thoracoscopic approach [14,15]. The relative advantages and disadvantages of these procedures have been described [16–18]. However, there remains a paucity of data on the long-term results of Heller’s myotomy via either of these minimally invasive approaches.

This study confirms the excellent safety and efficacy profile of the thoroscopic surgical oesophagomyotomy and, more importantly, demonstrates that THM confers long-term relief from symptoms of achalasia, without the morbidity associated with the open approach.

Although a comparison of different surgical techniques and approaches for Heller’s myotomy is not the aim of this study, we wish to outline the principles that underpin our strategy:

- the thoracoscopic approach provides excellent exposure of the distal oesophagus without disrupting the phrenoesophageal ligament;
- this particular technical aspect is highly desirable and may account for the reported low incidence of gastroesophageal reflux in patients operated by this approach [5,14];
- as a result, the addition of an anti-reflux procedure, with its attendant morbidity, is not necessary;
- the ability to perform a myotomy on the most proximal part of the gastric cardia (an essential part of the Heller’s procedure) is preserved.

Surgical division of the lower oesophageal muscle fibres is very effective in treating achalasia, but significant dysphagia or chest pain is reported to persist or recur in 10–40% of patients treated by THM and followed up for a mean of 0.8 years (range 0.1–4 years) [4–7,15]. In this study with a significantly longer follow up of 5.4 ± 2.1 (range 1–8.4 years), the incidence of persistent or recurrent dysphagia compared favourably to those reported in the literature, at 16%. The only patient who required reintervention in this series was a 24-year old soldier who had previously undergone three pneumatic dilations and had a sigmoid appearance of the oesophagus at the time of the first procedure. As a redo THM was not deemed feasible, a repeat Heller’s myotomy via a thoracotomy approach was performed. At reoperation, the edges of the myotomy were found to be bridged by a thick fibrous layer; this was incised to expose the submucosal layer and an additional myotomy was performed on the opposite side of the oesophageal wall. This patient continues to enjoy symptomatic relief 2 years from last surgery. In the other three patients who had postoperative dysphagia and underwent oesophageal manometry, residual or recurrent obstruction was found at the level of the gastric portion of the cardia. This finding reflects evidence in the literature showing that the gastric side of the myotomy poses the biggest challenge [17]. Although no patient in this series has required balloon dilation post THM, there is evidence in the literature to support its safety and efficacy in relieving residual or recurrent obstructions post surgical myotomy [20–22].

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Pneumatic dilations of the oesophagus, often used as a first-line treatment for achalasia, can lead to the development of fibrosis in the oesophageal wall and of adhesions between the oesophagus and surrounding structures, particularly in cases of post-dilation perforation treated conservatively. These undesirable effects of forcible dilation have been reported to create difficulties in identifying and dissecting the oesophageal layers, thereby increasing the risk of perforation or incomplete myotomy [7,19]. In our series, however, this was not observed, though we acknowledge that no patients had sustained a post-dilation oesophageal perforation before undergoing THM.

Some Authors use intraoperative flexible oesophagoscopy throughout the procedure and describe how this helps at several stages during the operation, facilitating initial identification of the oesophagus, monitoring the depth of penetration of the dissecting instruments, enhancing separation of the edges of the myotomy and accurate gauging of the gastric extent of the myotomy [7]. Whilst we see no reasons to object to this practice, we have found that a post-myotomy upper gastrointestinal endoscopy performed on the operating table is all that is required to check mucosal integrity and appropriate relaxation of the LOS. The insertion of a nasogastric tube at induction of anaesthesia can be used to remove any residual food debris from within the oesophagus, to minimise the risk of aspiration or contamination of the pleural cavity in case of intraoperative oesophageal perforation.

As mentioned previously, this study does not aim to compare different approaches to the treatment of achalasia. However, it is important to acknowledge the excellent results obtained with the laparoscopic approach, mainly due to the ability to add an anti-reflux procedure. Published series of laparoscopic HM, albeit with mean follow up of 1 year (range 0.3–1.3 years), report a good to excellent clinical response between 83 and 100%, with an incidence of gastroesophageal reflux between 6 and 27% [10]. In the absence of conclusive evidence arising from prospective randomised studies with adequate follow up, we believe that thoracic surgical units with adequate expertise and favourable results can continue to offer THM for the treatment of achalasia.

The main limitation of this study is its retrospective nature. For this reason, we elected to use a simple classification of symptoms’ severity based on their frequency and impact on daily activities, rather than more complex quality of life or health-related questionnaires which would have lost most of their significance and value in the absence of baseline scores. In patients who experienced persistence or recurrence of dysphagia, these symptoms are significantly less severe. A minority of patients who require further treatment (only one patient in this series) may be successfully treated by pneumatic dilation, repeat myotomy or oesophagectomy in case of severely dilated, ‘sink-trap’ oesophagus. Another small proportion of patients (12.5% in this series) develop gastroesophageal reflux associated with abnormal distal oesophageal acid exposure, which can be controlled by medical treatment.

Larger studies looking at long-term clinical and functional results, as well as randomised studies comparing THM to other therapeutic modalities (particularly with laparoscopic HM associated with an anti-reflux procedure) are strongly needed to ascertain respectively the durability of this approach and its relative advantages.

Based on the encouraging data of this retrospective series, we have been conducting a prospective randomised trial comparing THM and pneumatic balloon dilatation, whose results will become available in the near future.

5. Summary

The results presented in this study demonstrate that THM can be performed safely and effectively both as first-line treatment and after pneumatic dilatation of the oesophagus in the treatment of achalasia. Although some patients experience persistence or recurrence of dysphagia, these symptoms are significantly less severe. A minority of patients who require further treatment (only one patient in this series) may be successfully treated by pneumatic dilation, repeat myotomy or oesophagectomy in case of severely dilated, ‘sink-trap’ oesophagus. Another small proportion of patients (12.5% in this series) develop gastroesophageal reflux associated with abnormal distal oesophageal acid exposure, which can be controlled by medical treatment.

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