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Laparoscopic Heller's cardiomyotomy: a viable treatment option for sigmoid oesophagus

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Abstract

OBJECTIVES: It is generally believed that Heller's cardiomyotomy (HCM) cannot improve dysphagia in patients with marked dilatation and axis deviation or sigmoid oesophagus. Conventional management for sigmoid oesophagus has been oesophagectomy. We report our surgical experience in the management of 8 patients with sigmoid oesophagus with laparoscopic HCM.

METHODS: Eight patients with sigmoid oesophagus were retrospectively identified and their records were reviewed for symptomatic outcome evaluation following laparoscopic HCM with an antireflux procedure. Preoperative and postoperative, oesophageal and respiratory symptoms and quality of life scoring of achalasia were recorded.

RESULTS: The mean age was 35.5 (range 25–57) years. Males and females were equally distributed. All patients had dysphagia as their chief presenting complaint. The median duration of dysphagia was 55 (range 18–180) months. All the patients had a poor quality of life. Four patients also had chronic cough. All 8 patients underwent laparoscopic HCM with an antireflux procedure. The mean duration of operation was 203.7 min. There were no mortalities and no major postoperative complications. At a median follow-up of 19.5 (range 6–45) months, there was a significant improvement of dysphagia and regurgitation scores with *P*-values of 0.014 and 0.008, respectively. Quality of life also significantly ($P = 0.005$) improved post-surgery. Chronic cough resolved in all the 4 patients (100%) following cardiomyotomy.

CONCLUSIONS: Laparoscopic HCM with an antireflux procedure provides significant symptom relief in patients with sigmoid oesophagus and may be considered as the first-line treatment option in such patients. Oesophagectomy should be reserved for patients with a failed cardiomyotomy.

Keywords: Achalasia • Sigmoid oesophagus • Laparoscopic cardiomyotomy • Dysphagia

INTRODUCTION

Achalasia cardia is a non-curable primary motor disorder of the oesophagus, but symptomatic relief can be provided by means of surgery. It is characterized by incomplete and uncoordinated relaxation of lower oesophageal sphincter (LES) associated with aperistalsis of the oesophagus [1]. Typical symptoms include dysphagia, regurgitation, heartburn, retrosternal pain, aspiration and weight loss. At times, progression of the disease can lead to a massively dilated and tortuous oesophagus commonly referred to as megaoesophagus or sigmoid oesophagus. Conventional management for the sigmoid oesophagus has been oesophagectomy and it has been long believed that Heller's cardiomyotomy (HCM) cannot improve dysphagia in patients with marked dilatation or sigmoid oesophagus [2, 3]. We report our surgical experience in the management of 8 patients with sigmoid oesophagus with laparoscopic HCM.

PATIENTS AND METHODS

From January 2002 to May 2012, 122 patients with achalasia underwent laparoscopic cardiomyotomy (LCM) in a single surgical unit of the Department of Surgical Disciplines, All India Institute of Medical Sciences, New Delhi, India. Of 122 patients, 8 with sigmoid oesophagus were identified and their records were reviewed for symptomatic outcome following LCM. A diagnosis of achalasia was made on the basis of clinical symptoms, barium swallow studies, oesophago-gastroscopy and manometry. In those patients on whom manometry was not performed, the

diagnosis was made on the basis of three other parameters. Barium findings considered to be suggestive of achalasia were a smooth tapering of the lower end of the oesophagus, contrast hold up with delayed emptying and dilated oesophagus. Diagnosis of sigmoid oesophagus was made with the findings of oesophageal axis deviation and massive dilatation of the oesophagus on barium swallow study by an experienced radiologist. Endoscopy was done primarily to rule out other obstructive organic lesions and malignancy, and the findings considered as suggestive of achalasia were a dilated oesophagus with resistance to the passage of the endoscope through the gastro-oesophageal junction (GEJ) and incomplete relaxation of the LES with air insufflations. Preoperative manometry was possible in 4 patients. Manometric findings of simultaneous oesophageal body contractions along with high basal LES pressure and inadequate relaxation of LES to wet swallow were considered diagnostic of achalasia cardia. An oesophagus was considered to be a sigmoid oesophagus when it was markedly dilated and tortuous. A diameter of >6 cm and axis deviation were considered to represent a sigmoid oesophagus [4, 5]. Computed tomography (CT) of the chest was done in 4 patients as a protocol to objectively evaluate respiratory symptoms. Figure 1 shows preoperative barium-swallow films with a sigmoid-shaped oesophagus. Figure 2a and b shows preoperative CT of images of a sigmoid-shaped oesophagus.

Symptomatic evaluation

Preoperative and postoperative oesophageal symptoms of achalasia were graded according to the following scorings systems: dysphagia was graded on a 5-point symptom-scoring scale from 0 to 4 of a modified Mellow-Pinkas scale, and regurgitation and heartburn were graded on a 4-point symptom scoring system of DeMeester, as described in our previous article [6]. Disease-specific health-related quality of life (QOL) was assessed for achalasia [7]. It was scored on a 0–100 scale, with higher values indicating greater disease severity. Preoperative and postoperative respiratory symptoms such as chronic cough, nocturnal cough, dyspnoea and acute respiratory symptoms like choking spells and asphyxia were recorded.

Operative technique and hospital course

A single surgeon assisted by surgical trainees performed all the operations. Patients were put on a liquid diet 48 h before

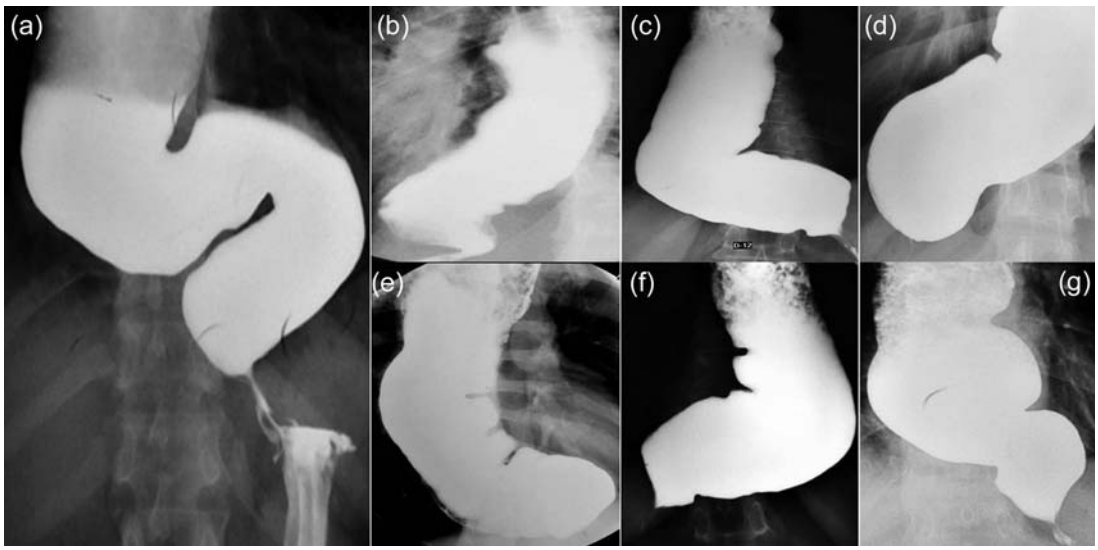

Figure 1: Preoperative barium swallow films (**a**–**g**) show sigmoid-shaped oesophagus.

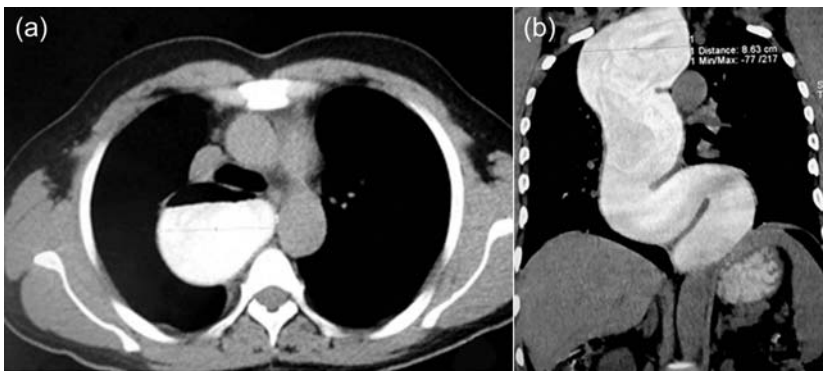

Figure 2: CT of chest showing (**a**) grossly dilated fluid-filled oesophagus compressing on the trachea and (**b**) sigmoid oesophagus, with a maximum diameter of 8.63 cm.

surgery. A nasogastric tube was inserted 24 h before surgery for oesophageal washes, and intravenous fluid supplementation was given during this period. Perioperative antibiotics were given. Rapid-sequence anaesthesia was used to minimize the risks of aspiration; thereafter a five-port access was established and the patient was placed in a low lithotomy and reverse Trendelenburg position. Our standard technique of LCM as described earlier includes a five-port approach with limited mobilization of the oesophagus to expose its anterior surface without disturbing the posterior attachments, identification and preservation of the anterior vagus, clearance of fat pad at the GEJ, and the cardiomyotomy extended 4–6 cm on the oesophagus and approximately 2 cm on the stomach across the GEJ [6]. We do not routinely mobilize short gastric vessels unless a Dor fundoplication is planned. A drain is routinely kept near the hiatus and removed after 24–48 h. The operative procedure was modified in our patients with a sigmoid oesophagus to correct the oesophageal axis deviation. This entailed circumferential mobilization of the oesophagus with extensive dissection into the mediastinum in order to straighten the lower end of oesophagus as far as possible. The widened hiatus was repaired when necessary. An antireflux procedure was routinely added to the standard cardiomyotomy. Figure 3a–h depicts the operative steps.

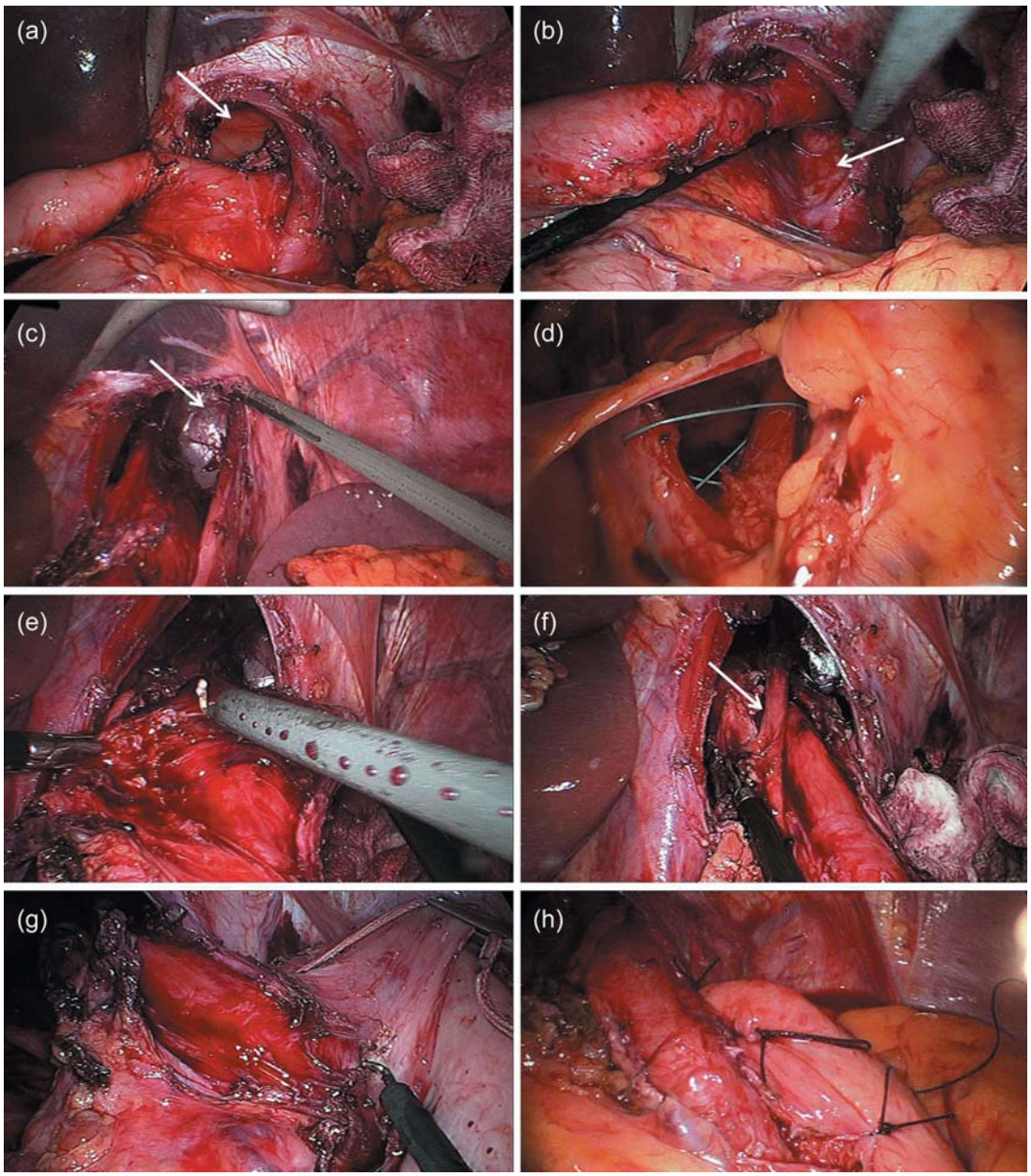

Figure 3: Operative steps of laparoscopic Heller's cardiomyotomy and its modification for sigmoid oesophagus with some anatomical details. (**a**) Widened hiatus with oesophageal axis deviation; arrow shows the dilated part of oesophagus in the mediastinum. (**b**) Circumferential mobilization of the oesophagus exposing the aorta posteriorly (arrow). (**c**) Extensive mediastinal dissection of the oesophagus exposing the pleura (arrow). (**d**) Crural repair using a 2-0 non-absorbable suture for the widened hiatus. (**e**) Cardiomyotomy in progress on oesophageal side. (**f**) Cardiomyotomy completed on the oesophageal side with its mucosa pouting; arrow shows the preserved anterior vagus nerve, it also shows relatively straightened oesophageal axis. (**g**) Cardiomyotomy in progress on the gastric side. (**h**) Completed cardiomyotomy with the angle of His accentuation done as an antireflux procedure.

On the postoperative Day 1, all patients had a gastrographin swallow study to rule out any mucosal leak. If no mucosal leak was identified, a liquid diet was allowed, followed by a semisolid diet on postoperative Day 2. Patients were discharged with the advice to gradually resume a normal diet.

Symptomatic evaluation and follow-up

All patients were followed up with symptomatic scoring and satisfaction grading in the immediate postoperative period (1 week), then every 3 months and till the last follow-up. The data obtained from follow-up records were entered into a computerized data sheet and analysed using the SPSS software. As our data were not normally distributed, a statistical analysis was done using the McNemar test for pre–post-treatment comparison. A *P*-value <0.05 was considered significant.

RESULTS

The mean age of the patients was 35.5 (range 25–57) years. Males and females were equally distributed. Five patients (62.5%) had previous endoscopic oesophageal dilatation (1–5 times). The median preoperative duration of symptoms was 55 (range 18–180) months. The demographic profile of the patients is given in Table 1. Table 2 shows preoperative symptom scoring and QOL of the 8 patients with sigmoid oesophagus. All patients had dysphagia as their chief presenting complaint. Two patients had absolute dysphagia and required nasogastric tube insertion for feeding preoperatively. The mean preoperative dysphagia score was 2.4 and median score was 2. Regurgitation was also present in all patients with a median score of 2. Heartburn was present only in 2 patients (25%) with a mean score of 0.25. All the patients had a poor QOL with a mean score of 62.2.

Four patients had chronic cough as one of the presenting complaints. Among these 4 patients, 2 also had breathlessness on presentation. These symptoms did not respond to routine treatment for lower respiratory tract infection. These 4 patients had CT chest to evaluate their respiratory symptoms; in 2 patients who had breathlessness as one of the presenting complaints, CT chest showed tracheobronchial tree compression by dilated oesophagus and lung changes like consolidation, fibrotic patch, ground glass and nodular opacities. The remaining 2 patients had no CT chest abnormality in the lungs. The mean oesophageal diameter of the 4 patients who had a preoperative CT scan was 7.15 cm. The mean LES pressure of the 4 patients who had manometry was 41.25 mmHg.

All the procedures were completed laparoscopically with no conversions. In 1 patient, there was iatrogenic duodenal perforation during port insertion, which was laparoscopically repaired. Four patients also had crural repair for the widened hiatus. Table 3 shows the operative details. On postoperative Day 1, a gastrographin swallow study demonstrated no leakage in all patients. The intra-abdominal drain was removed on postoperative Day 1 or 2 when the drain output was minimal and serous in nature. There were no postoperative major complications and mortalities. The average length of hospital stay was 4.25 (range 3–6) days.

At a median follow-up of 19.5 (range 6–45) months, there was a significant improvement of dysphagia ($P = 0.014$) and regurgitation scores ($P = 0.008$). Heartburn, which was present in 2 patients resolved following LCM. QOL also significantly ($P = 0.005$) improved following cardiomyotomy with a mean score of 13.5. Patient satisfaction post-surgery was excellent in 4 and good in the remaining 4 patients. Respiratory symptoms resolved in all 4 patients. CT chest was repeated in 2 patients. One patient who had active lung changes in the form of consolidation, ground glass and nodular opacities had resolution of these changes in the repeat CT scan. This patient also complained of chest pain at 36 months of follow-up but had no residual dysphagia, and she had a repeat barium swallow and upper gastrointestinal endoscopy that were unremarkable. Patient who had chronic lung changes like fibrosis had no resolution in the repeat CT chest. Table 4 shows comparisons of preoperative and postoperative symptom scores at the last follow-up.

Table 1: Demographic profile and preoperative dilatation

Characteristics	
Age in years, mean (range)	35.5 (25–57)
Sex	
Male (*n*)	4
Female (*n*)	4
Duration of symptoms, median (range)	55 (18–180)
Previous endoscopic dilatation (number of patients)	5
Mean oesophageal diameter (cm)	7.15 ± 1.5
Mean LES pressure (mmHg)	41.25 ± 11

LES: lower oesophageal sphincter.

Table 2: Preoperative symptom scoring and quality of life

Patient	Dysphagia	Regurgitation	Heartburn	QOL
1	3	1	0	69
2	1	3	1	62
3	2	1	0	59
4	4	2	0	65
5	2	2	0	65
6	4	2	1	62
7	1	2	0	57
8	2	2	0	59

Table 3: Operative details

Variables	Whole group (*n* = 8)
Mean duration	203.7 ± 45.6 min (140–260 min)
Conversion	Nil
Antireflux procedures	
Toupet fundoplication	3
Dor fundoplication	3
Angle of His accentuation	2
Intraoperative complication	1 (iatrogenic duodenal perforation)
Postoperative complication	Nil

DISCUSSION

Laparoscopic Heller's myotomy is being increasingly used in the management of achalasia cardia [8, 9]. Its role in the treatment of sigmoid oesophagus is yet not clearly defined. Traditionally, the sigmoid oesophagus has been considered to be the end-stage achalasia, unlikely to respond to cardiomyotomy. It has therefore been treated with oesophagectomy [2, 3, 10]. Other surgical options that have been used in the management of massively dilated oesophagus include distal oesophagectomy with antrectomy and Roux-en-Y diversion, oesophagectomy with gastric, colon or jejunal interposition [11, 12]. These procedures, however, are major surgical undertakings associated with significant morbidity and even mortality [11, 12]. The mortality rate of oesophagectomy for treating sigmoid oesophagus has been reported to be about 3% even when performed by an experienced surgeon [10, 13]. Oesophagectomy is also associated with complications such as anastomotic leakage, laryngeal nerve injury, bleeding and chylothorax, pleural effusion and cervical fistula [10, 13]. Anastomotic dilatation for the relief of dysphagia post-surgery may be required in 38.5 to nearly 50% of patients, and dumping symptoms have been reported in 4–19% of patients [2, 13].

Table 4: Symptomatic outcome

Variables	Preoperative	Postoperative	*P*-value
Dysphagia			
Mean	2.4	0.0	0.014
Median	2.0	0.0	
Regurgitation			
Mean	1.9	0.1	0.008
Median	2.0	0.0	
Heartburn			
Mean	0.2	0.0	0.50
Median	0.0	0.0	
QOL	62.2	13.5	0.005

With the advent of laparoscopic techniques, there is a resurgence of interest in exploring the role of laparoscopic HCM in the management of patients with sigmoid oesophagus. Our study shows that laparoscopic HCM is a safe and effective option in the management of patients with sigmoid oesophagus. We were able to perform laparoscopic HCM in all our patients without any perioperative mortality. There were no major intraoperative or postoperative complications except one small trocar injury to the duodenum that was successfully repaired laparoscopically. A few other studies (Table 5) reporting on the outcome of LCM in a massively dilated oesophagus also suggest that it is a safe and effective procedure [4, 14–16]. Transthoracic oesophagomyotomy in sigmoid oesophagus has also been reported to give results similar to that in patients with non-sigmoid oesophagus [17].

The procedure took about 203.7 min, which is longer than the reported mean operative time of 85–125.8 min in patients with achalasia without sigmoid oesophagus [6, 8, 18]. Our own mean operative time in patients without sigmoid oesophagus is approximately 125 min. Extra time spent on the circumferential mobilization of the oesophagus and extensive mediastinal dissection to straighten the horizontal lower end of oesophagus contribute to the additional time. Further, we have noticed that these patients usually have significant perioesophageal inflammation, and the dissection is more difficult. This may be secondary to prior interventions such as dilatations in our patients or prior botulinum toxin injections [19]. Further, long-standing retention of food with resultant oesophagitis also may be a factor responsible for perioesophageal inflammation. It may be noted that the median duration of dysphagia in our patients with sigmoid oesophagus was 55 months, which is much longer than the median duration of 36 months observed in our patients with achalasia without sigmoid oesophagus [6]. Eldaif *et al.* [15] reported that patients with a severely dilated oesophagus had a significantly longer duration of symptoms (120 months) when compared with patients with a non-severely dilated oesophagus. Routine addition of an antireflux procedure and repair of the widened hiatus when necessary also contributed to the increased operating time. The average length of hospital stay in

Table 5: Experience of various authors with laparoscopic cardiomyotomy for sigmoid/megaoesophagus

Author (year)	Period of study	Number/types of oesophagus	Procedures	Outcomes	Follow-up, median (months)
Sweet *et al.* (2008) [4]	1993–2006	12 sigmoid oesophagus	LCM + DF	Excellent or good results: 91%	45
Mineo and Pompeo (2004) [16]	1985–2000	14 sigmoid oesophagus	CM + DF Laparoscopic: 6 Open: 8	Excellent to satisfactory symptom relief in 12 of 14 patients with achalasic sigmoid oesophagus	85
Scott *et al.* (2009) [14]	2002–2007	4 extreme megaoesophagus	LCM + TF: 3 LCM: 1	All patients reported relief of their preoperative symptom	-
Eldaif *et al.* (2009) [15]	1996–2006	36 severe dilated oesophagus	LCM + TF: 19 LCM + DF: 6 LCM: 4 LCM + TF: 3	89% of the patients were satisfied and had relief of dysphagia	37
Our series	2002–2012	8 sigmoid oesophagus	LCM + DF: 3 LCM + AHA: 2	Symptom relief excellent: 50%, good: 50%	19.5

LCM: laparoscopic cardiomyotomy; DF: Dor fundoplication; CM: cardiomyotomy; TF: Toupet fundoplication; AHA: angle of His accentuation.

our series was 4 days, which is consistent with a postoperative hospital stay of 2–6 days reported in the literature [20–22].

Relief of dysphagia is the most important goal in the management of patients with achalasia. The mean dysphagia and regurgitation scores significantly improved after LCM in our patients. Two patients, who had absolute dysphagia preoperatively and were on nasogastric feeding, responded to cardiomyotomy and were able to have a normal diet. Patti *et al*. [5] and Sweet *et al*. [4] have previously reported a similar successful outcome following LCM for the treatment of achalasia with megaoesophagus. Two patients who had heartburn also reported resolution of their symptoms. The mean QOL score significantly improved in our patients following LCM. Similar improvements in QOL after cardiomyotomy have also been shown by Decker *et al*. [23]. Youssef *et al*. [24] attributed significant improvement in QOL to relief of dysphagia in patients with achalasia. Mineo *et al*. also have shown that general health, social function and mental health domains improved significantly post-cardiomyotomy with a Dor fundoplication in achalasia patients with sigmoid oesophagus.

Four patients (50%) had respiratory symptoms in the form of chronic cough and breathlessness. The respiratory symptoms can be attributed to chronic microaspiration of the retained food residue in the lower end of the oesophagus and compression of the tracheobronchial tree with the dilated oesophagus [25]. CT chest in 2 of our patients showed lung parenchymal changes in addition to tracheobronchial tree compression by the dilated oesophagus. Respiratory symptoms resolved in all 4 patients. Mineo *et al*. [16] also reported the resolution of respiratory symptoms following laparoscopic HCM in patients with megaoesophagus.

At a median follow-up of 19.5 months, no patient required an oesophagectomy and the majority graded their satisfaction with the outcome of surgery as good to excellent. Achalasia-specific QOL significantly improved in all patients. One patient complained of chest pain though her dysphagia and other symptoms had resolved. Our median follow-up is relatively short and a further follow-up will reflect the durability of the procedure in this particular group of patients. Three patients had more than a 3-year follow-up with a maximum follow-up of 45 months. In the initial part of our experience, we did not offer laparoscopic HCM to patients with sigmoid oesophagus. But with increasing experience, we started offering laparoscopic HCM to even this group of patients. Persistent relief of symptoms has been reported at a median of 85 and 45 months by Mineo *et al*. [16] and Sweet *et al*. [4]. Further, none of the patients in the Mineo *et al*. study needed oesophagectomy, nor did any patients develop carcinoma at a median follow-up of 85 months.

Thus, our study shows the effectiveness of laparoscopic HCM in patients with sigmoid oesophagus at mid-term follow-up. We feel that laparoscopic HCM should be offered as a first choice to patients presenting with massively dilated oesophagus and axis deviation, with oesophagectomy reserved for patients with failed laparoscopic HCM. However, it is important for the surgeon to have gained reasonable experience with laparoscopic HCM in achalasia patients with non-sigmoid oesophagus before accepting such patients for surgery. Our study has the limitation of short follow-up, and a longer follow-up in a larger number of patients is warranted to clearly define the durability of the procedure and need for follow-up oesophagectomy.

Conflict of interest: none declared.

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