

A Comparative Prospective Randomized Study between Laparoendoscopic Single Site Heller Myotomy with Dor Fundoplication and Multiple Port Laparoscopic Myotomy with Toupet Fundoplication for Treatment of Achalasia

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ABSTRACT

One of the newest minimally invasive surgical techniques, is single-port laparoscopic Heller myotomy, for the treatment of achalasia, which has the potential to provide better cosmetic outcomes, in addition to less wound pain and decreased recovery time. The objective of this study was to compare single port laparoscopic myotomy with the traditional multiple port myotomy for achalasia. patients were randomly prospectively divided into two groups. Group (A) with 8 patients, had a single site laparoendoscopic myotomy with anterior Dor fundoplication, and group (B) 8 patients undergone traditional laparoscopy with posterior toupet fundoplication. Laparoscopic surgery was performed in all cases with no need for conversion. The study included 11 females (68.7%) and 5 males (31.3%), ages of the patients ranged from 38-67 years. The operative time for the patients in group (A) was 152 minutes range(125-166 min), while in group (B) was 98 minutes range(88-122 min). We had a single perforation of the oesophagus in group A which was detected intraoperatively and primarily closed with no postoperative leakage, also we had a single case of wound infection in group B patients which resolved conservatively. Laparoscopic Heller myotomy safely relieves symptoms of dysphagia. Confinement is short and satisfaction is very high with the single port myotomy. Relief of esophageal obstruction is paramount whether single or traditional multiple port myotomy.

Key words: Laparoendoscopic single site myotomy, Heller's myotomy, achalasia.

INTRODUCTION

Achalasia is an uncommon oesophageal motility disorder, with an incidence of around one case per 100 000 inhabitants/ year. It is characterised by the loss of peristalsis in the body of the oesophagus, and the inability of the lower oesophageal sphincter (LOS) to relax. The most common symptom is dysphagia and, to a lesser extent, regurgitation and chest pain.⁽¹⁾

Achalasia is an oesophageal motor disorder, whose aetiology is unknown.⁽²⁾ Several hypotheses have been ventured from a physiopathological standpoint, degeneration of inhibitory neurons within the oesophageal myenteric plexus being currently accepted as the origin of the disorder.⁽³⁾

In 1995, studies started using a laparoscopic approach for Heller myotomy and Dor fundoplication in adults with achalasia, and favorable therapeutic outcomes have been

obtained with relief of dysphagia and regurgitation.⁽⁴⁾

Over the last decade, advancements in minimally invasive surgical techniques, (laparoscopy or thoracoscopy) have resulted in the application of these techniques to a wide range of diseases. One of the newest minimally invasive surgical techniques is single-port laparoscopic surgery, which has the potential to provide better cosmetic outcomes in addition to less wound pain and decreased recovery time.⁽⁵⁾

Treatment is based on trying to alleviate dysphagia by reducing the pressure of the lower oesophageal sphincter. There are several ways to do this, including pneumatic dilatation, botulinum toxin injections, or surgery using the chest conventional or abdominal approaches. In the last decade, the laparoscopic approach has been developed and popularised. It has shown the same effectiveness as the conventional surgery mentioned above.⁽⁶⁾ With the added benefits of being a minimally invasive technique, with a

reasonably low rate of complications, and a good long-term outcome.⁽⁷⁾

PATIENTS & METHODS

Between July 2010 and March 2014, 16 patients with achalasia, were prospectively randomized into two groups (A) and (B) by sealed envelopes by the ward nurse, and after the patients consent. Group (A) included 8 patients who underwent laparoscopic single site Heller myotomy with anterior Dor fundoplication. While in group (B) 8 patients were operated upon by a multiple five port laparoscopic myotomy with a posterior 270 Toupet fundoplication. 11 patients were women, and five were men. The mean age was 43.5 ± 5.6 years (range: 38-63). All patients underwent upper endoscopy, a barium swallow study, and oesophageal manometry prior to the surgery.

We used modified lithotomy position with reverse Trendelenburg and the legs abducted. Pneumoperitoneum was established using a left subcostal closed technique in both groups.

In group (A) patients a small 15 mm umbilical incision was made, and a single multitrocar port was used, through which passed a deflectable tip 5mm laparoscope, a 5mm liver retractor, and an energy source 5mm ultrasonic dissector. Adjunctive sutures were placed across the abdominal wall to facilitate exposure. Such a suture was placed through the left lower abdominal wall, through the cardia of the stomach, and back out the abdominal wall to place stretch across the gastroesophageal junction to facilitate myotomy. Intraoperative esophagogastrosopy was routinely used to ensure the myotomy was sufficiently cephalad and caudal to the squamocolumnar junction (z-line).

Furthermore, after myotomy, the gastroesophageal junction should open promptly with gentle air insufflation through the endoscope and there should be no bubbling of air noted, which would document violation of the mucosa/submucosa oesophagotomy. After exposing the anterior face of the oesophagus, we dissected the oesophagogastric junction along 6–8 cm in preparation for the myotomy, identifying and respecting the anterior vagal trunk so as to avoid gastroparesis which could lead to postoperative gastro-oesophageal reflux disease (fig1).

The myotomy was performed using the ultrasonic harmonic scalpel where the active blade was superficial and extended 2–3 cm toward the stomach and at least 5–7 cm toward the oesophagus. Accidental perforation of the mucosa occurred, it was sutured with 3/0 two layers interrupted ethibond sutures. Once the myotomy was completed, we always performed a partial anterior Dor fundoplication. The short gastric vessels were divided to relieve any tension on the wrap. Dor fundoplication was accomplished with interrupted sutures tied intracorporeally.

Two rows of sutures were inserted, each consisting of 3 stitches. The first row joined the gastric fundus and the left side of the divided oesophageal muscle. The stomach then was folded over the esophagus, and a second row of sutures was placed between the fundus and the right side of the divided esophageal muscle. The uppermost stitch was placed between the fundic wrap and the crural pillar to remove tension from the wrap and to remove tension potentially twisting the oesophagus.

The patients in group (B) were performed with five incisions. The supraumbilical incision was 5 cm above and slightly to the left of the umbilicus to avoid the falciform ligament, for the camera port, right and left midclavicular working ports, left anterior axillary assistant port, and finally the epigastric liver retractor port.

After the myotomy the oesophagus was circumferentially dissected, and the short vessels were divided, for the posterior 270 Toupet fundoplication wrap. Statistical analysis included Wilcoxon matched-pairs test, and Fisher exact test.

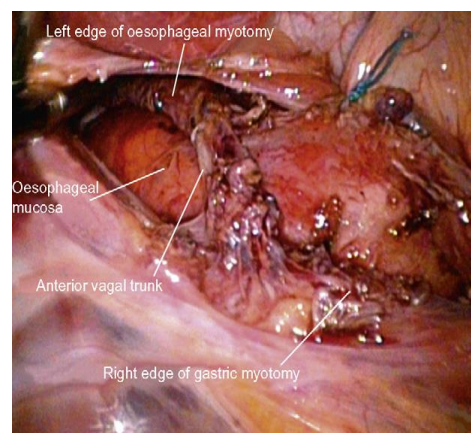


Fig. 1 Image showing the completed myotomy, preserving the anterior vagal trunk.

RESULTS

Laparoscopic surgery was performed in all cases with no need for conversion. The study included 11 females (68.7%) and 5 males (31.3%), ages of the patients ranged from 38-67 years (table 1). Symptoms before myotomy had existed for a mean of 5 years, where 2 patients had a trial of endoscopic dilatation and 1 patient had botox therapy before surgery with no improvement of the symptoms. At the time of the myotomy, all patients complained of dysphagia to solids and/or liquids, especially very hot and/or very cold liquids, with consequential accommodation of their eating habits.

Also, because of the poor esophageal emptying, sleeping habits were modified before the myotomy, symptoms were severe and frequent difficulty in swallowing (ie, dysphagia), sensations of food stuck in the chest (ie, choking), and regurgitation were particularly severe and frequent.

The operative time for the patients in group A was 152 minutes range (125-166 min), while in group B was 98 minutes range (88-122 min). We had a single perforation of the oesophagus in group A which was detected intraoperatively and primarily closed with no postoperative leakage.

The mean hospital stay in group A patients was 3.11 ± 2.13 days (2-12), and in group B patients 2.51 ± 2.11 days (2-4). There were no wound complications at the umbilicus with laparoendoscopic single site myotomy in the patients in group A whom also needed less analgesics than the patients in group B. One patient in group B had mild infection in the port wound for the liver retractor below the xiphoid which resolved conservatively by medication.

A barium oesophagogram was performed on the second postoperative day in both groups which indicated an improvement in transit from the esophagus to the stomach, and no postoperative gastroesophageal reflux was observed, up to two months postoperatively (Fig 5).

With mean follow-up at 15 months, the severity and frequency of all symptoms (eg, dysphagia, heartburn, regurgitation, vomiting, etc.) improved significantly (Table 3).

Reductions in difficulty in swallowing, food stuck in chest, regurgitation, vomiting, chest pain,

and heartburn were significant and meaningful. Eating and sleeping habits improved as well. Myotomy reduced symptoms of achalasia whether the myotomy was performed with Dor or Toupet fundoplication or by conventional laparoscopy in group B or laparoscoendoscopic single site myotomy in group A. Symptoms of achalasia relief after myotomy were to some extent similar whether myotomy was accomplished with anterior or posterior fundoplication, by conventional laparoscopy (fig 3) or laparoendoscopic single site laparoscopy (fig 4). Postoperative complaints of heartburn were reduced similarly by the application of an anterior fundoplication in group A patients, and a posterior fundoplication in group B patients, but we realized that symptom improvement was more evident in the patients of group A.

Patients wound associated with laparoendoscopic single site surgery, was done without apparent scarring.

Table (1). Demographics of the patients in group A and B

Demographic	Data
Patients, n	16
Age, y	45.5(48±16.7)
Body mass index, kg/m ²	23(24±4.7)
Gender, %	
Male	68.7
Female	31.3
Duration of symptoms, y	5(6.2±3.7)
Preoperative therapy, %	
Yes	25
No	75
Botox only: dilation only	1:2
Both dilation and Botox	0
Difficulty swallowing liquids, %	
Yes	75
No	25
Difficulty swallowing solids, %	
Yes	82
No	18
Difficulty swallowing saliva, %	
Yes	12
No	88

Unless otherwise indicated, data are given as median (mean ± SD).

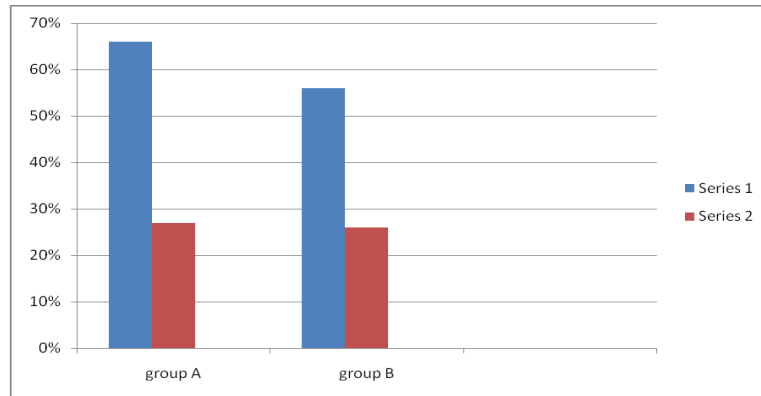


Figure (2). Patients reported reduced restrictions in sleeping habits after undergoing laparoscopic multiple port myotomy, and laparo-endoscopic single site myotomy ($p < 0.0001$, Fisher exact test).

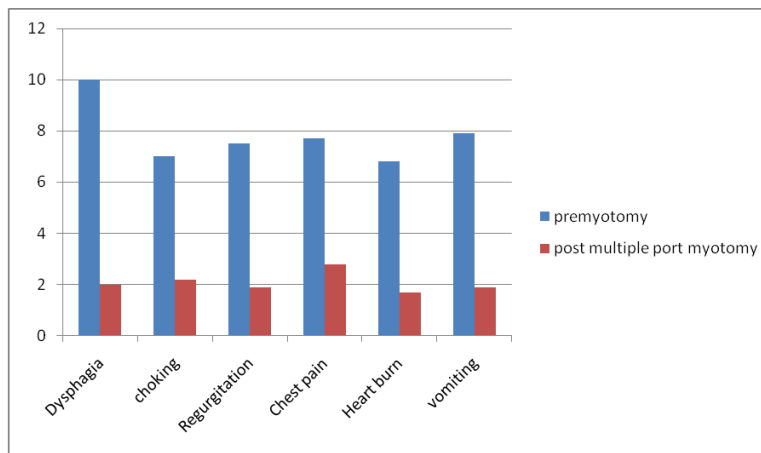


Figure (3). Patients in group B undergoing multiple port laparoscopic myotomy experienced palliation of symptoms frequency, $p < 0.05$, Wilcoxon matched-pairs test

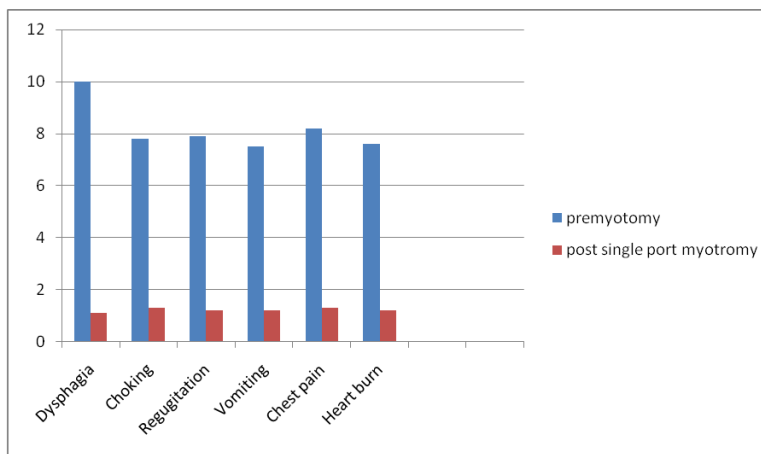


Figure (4). Patients undergoing laparoendoscopic single site myotomy in group A, experienced dramatic palliation of frequency symptoms, $p < 0.05$, Wilcoxon matched-pairs test.

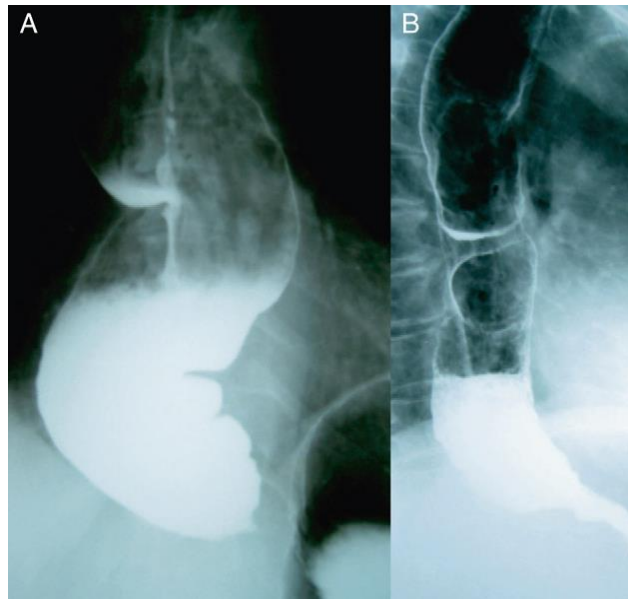


Fig 5. (A) Sigmoid oesophagus with tapering stenosis of the gastro-oesophageal junction and food retention in the oesophageal lumen. (B) Two months after the surgical intervention, dilation and tortuosity have decreased and the clinical result was good.

Table(2).Velanovich scale for achalasia

0	No symptoms
1	Sporadic mild symptoms
2	Unpleasant symptoms but not daily
3	Daily unpleasant symptoms
4	Symptoms affect everyday activities
5	Symptoms are disabling and prevent the patient from doing everyday activities

Table(3). Results obtained by applying the Velanovich scale pre and postoperatively in both groups

	Pre-op	Post-op	
Dysphagia	4.15(0.38)	0.31(0.63)	$P<.001$
Regurgitation	1.92(1.12)	0.46(0.88)	$P<.001$
Heartburn	1.62(0.96)	0.85 (0.9)	$P=.045$
Chest pain	2.46(0.88)	0.77(0.93)	$P<.001$

DISCUSSION

Since Shimi et al⁸ reported the first laparoscopic Heller myotomy in 1991, many minimally invasive procedures have been performed for achalasia⁹. Recently, a metaanalysis in adults demonstrated that laparoscopic Heller myotomy was superior to nonsurgical therapies and should be the surgical therapy of choice¹⁰.

Single-port laparoscopy has gained popularity as the method to perform appendectomy and cholecystectomy¹¹

Symptoms due to achalasia can dramatically affect quality of life. This study documents that patients with achalasia, whether failing medical and even endoscopic therapy, can acquire dramatic relief with laparoscopic Heller myotomy, which also can be done safely, with short length of stay, and limited confinement.

The patients in group A underwent their myotomy, performed with Dor anterior

fundoplication, by laparoendoscopic single site port, while the patients in group B by the conventional laparoscopy with posterior Toupet fundoplication.

Intraoperative oesophagotomy was infrequent, occurring in one patient in group A. Thankfully, with intraoperative recognition and closure buttressed by anterior fundoplication, consequences of esophagotomy were unapparent. Our rate of esophagotomy is clearly better than some, and consistent or better than rates in most other large reports¹².

The operative time was longer in the patients in group A, than those in group B, for the less evident field, and crowding of the instruments. Which we think could improve with more experience, and which could have added to the oesophagotomy we had, and longer hospital stay in group A patients.

The attributes of the laparoscopic single site approach are difficult to quantify, and the lack of a scar, with a complex operation like a Heller myotomy and anterior fundoplication is quite remarkable, and is embraced by patients.

The application of anterior and posterior fundoplication, has possibly added to the safety of the myotomy, because long-term consequences, and symptoms of gastroesophageal reflux, may be abated by fundoplication. A randomized trial has documented this, but questions remain, as previously noted¹³.

Now, use of laparoendoscopic single site surgery techniques promotes application of laparoscopic Heller myotomy and anterior fundoplication, and increases the attractiveness of operative intervention, for patients very concerned about the negative potential cosmetic impact of conventional laparoscopic intervention. Whether or not laparoendoscopic single site myotomy, and anterior fundoplication with less dissection of the oesophagus, causes less pain, and a quicker return to normal activities, than conventional laparoscopy does is still debatable.

The range of motion and crowding of the laparoscope and instruments also makes surgical dissection through a single port more difficult than it is in conventional multiport laparoscopic surgery, the narrow field and more difficult control of the endostitches. However, we believe that this approach for esophageal achalasia might be one of the next frontiers of laparoscopic surgery.

Based on our experience with this study, we believe that laparoendoscopic single site myotomy is a safe and feasible procedure for symptomatic achalasia when performed by a surgeon experienced in laparoscopic and esophageal surgery.

The single port myotomy is useful in improving the postoperative quality of life. It offers the advantage of patient satisfaction concerning cosmesis because the procedure leaves a small wound and because the number of incisions is reduced, thereby avoiding the discomfort associated with multiple incisions. More experience using this technique is required to confirm our initial impressions.

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