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Laparoscopic Heller Myotomy and Dor Fundoplication: Prospective Evaluation of 30 Consecutive Patients

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Abstract

Background: Prospective studies evaluating outcome of laparoscopic Heller myotomy and Dor fundoplication for esophageal achalasia are less in Asian people.
Objectives: This study conducted to evaluate the results of laparoscopic cardiomyotomy and partial fundoplication for achalasia.
Patients and Methods: Thirty patients who underwent Heller myotomy for achalasia via laparoscopy in Alzahra hospital Isfahan, Iran were recorded prospectively (2009 - 2013). Median follow-up was 18 months. Symptoms including dysphagia, regurgitation, chest pain and weight loss were recorded before and after operation. Also, previous treatment for achalasia such as endoscopic pneumatic dilatations and intrasphincteric injection of botulinum toxin or other component, duration of symptoms and duration and complication of operation was recorded.
Results: Among 30 patients, there were 13 (43.3%) females and 17 (56.7%) males, and mean age was 40.8 years (range, 20 - 68 years). The operations were finished laparoscopically in all patients. Mean operative time was 137 $\pm$ 36.2 minutes. The patients were symptomatic for at least 30 months before referring for surgery. There are some difficulties in dissection in cases who received Ethanolamine or Botholinum Toxin injection as non-surgical treatment before that. Mean hospital stay was 2.45 days. Regurgitation, chest pain and heartburn relieved significantly in median follow up of 18 months, in 100%, 66.6% and 70%, respectively ($P < 0.001$, $P < 0.01$ and $P < 0.01$, respectively). At that time, except for two (6.6%) patients, all other patients had improvement in dysphagia ($P < 0.001$) .The mucosa in two (6.6%) of patients was perforated on the gastric end of the xylotomy. The perforations were repaired laparoscopically with single suture without postoperative leak.
Conclusions: Our study showed that laparascopic Helermyotomy with Dor fundoplication result in significant relief of dysphagia. Overall clinical symptoms indicate improvement in patient functional status during 18-month follow-up.

Keywords: Esophageal Achalasia, Laparoscopic Myotomy, Dor Fundoplication, Dysphagia

1. Background

Achalasiais aprimaryesophagealmotor disorder is characterized and diagnosed by lack of proper relaxation of the lower esophageal sphincter (LES) and absence of peristalsisin the esophagus. Disease presented with progressive dysphagiaanda have various degrees of weight loss, chest pain, aspiration and regurgitation (1-4). Although the disease has been known for more than 300 years ago, but its cause remains unknown. In histological evaluation of damaged esophagus, inflammation in myenteric network with the loss of cells and fibers of myenteric network is evident (4, 5).

The hallmark symptom of achalasia is progressive dysphagia. Because the progress of this symptom is very slow, patient has a severe dysphagia at diagnosis (5-8). Esophagogram with contrast is the first diagnostic test which is recommended in patients with progressive dysphagia.

This easily available and inexpensive test often helps us to detect the classic esophageal feature in achalasia such as impaired peristalsis, dilated esophagus, and smooth tapering at the gastroesophageal junction (GEJ) which has been named “bird’s beak” esophagus, the pathognomonic finding in achalasia.

In patients who present the classic finding of achalasia, aperistalsis of the esophagus and incomplete LES relaxation manometry is important for confirmation of diagnosis. Endoscopy is used to exclude other achalasia mimicking diseases and diagnosis of some anatomical disorders

such as traction or epiphrenic diverticula, but PH metery is not a routine evaluation (8-10).

Various treatments are available. Certain medications or injections of botulinum toxin into the lower sphincter (LES) may be used in some cases as a palliative treatment, but more permanent relief is brought by an esophageal pneumatic dilatation and a surgical cleaving of the muscle (Heller myotomy) (10). In 1941 for the first time, one anterior and one posterior GEJ along cardiomyotomy technique described by Ernst Heller. Nowadays, only the anterior technique in a modified form is performing (8-12). In the past years, there were two transthoracic and transabdominal approach for the achalasia surgical treatment, that both of them had a great morbidity as a major open surgery, with an about 7-10 days of hospital stays. So, 10-15 years ago, patients preferred the non-surgical treatment such as pneumatic dilatation although the long term outcomes were better with surgery. The surgery became satisfactory when the minimally invasive techniques were developed in the early 1990s. The hospital stay and postoperative pain were less in minimally invasive approach with symptomsas relief as amount as open surgery (13-17). Nowadays, there are several methods for surgical treatment of achalasia, such partial fundoplication, Toupet method (180 degree posterior fundoplication), myotomy without fundoplication et cetera.

2. Objectives

The aim of this study was evaluation of the results of laparoscopic cardiomyotomy and partial fundoplication for achalasia for first time in Iran.

3. Patients and Methods

Thirty patients with a diagnosis of primary achalasia, underwent laparoscopic Heller myotomy of the distal esophagus and cardia between August 2009 and November 2013 by one surgeon in Alzahra hospital Isfahan, Iran; in all patients, an anterior partial fundoplication (Dor) was added to prevent gastroesophageal reflux.

Symptoms including dysphagia, regurgitation, - chest pain, and weight loss were recorded before and after operation. Also, previous treatment for achalasia such as endoscopic pneumatic dilatations and intrasphincteric injection of botulinum toxin or other component, duration of symptoms and duration and complication of operation was recorded. Esophageal manometry and endoscopy were performed in all patients preoperatively. PH monitoring and manometery was not performed postoperatively in patient, because of our limitations and poor cooperation of our patients.

3.1. Surgical Technique

The patient was placed supine, and general anesthesia was induced. Then, the legs were spread apart on leg boards (the “French” position) using a fracture table. Both arms were tucked at the patient’s sides. A urinary catheter and orogastric tube were placed. A video monitor was placed at 12 o’clock position over the patient’s head. All remaining laparoscopic instrumentation was on a cart located at 10 o’clock position. All tubes and lines were brought onto the field in the right upper quadrant to minimize tangling. After all trocars were placed, the surgeon stood between the patient’s legs, facing the monitors and maintaining coaxial alignment with the gastroesophageal junction, the laparoscope, and the monitor. The camera operator stood on the right side of the patient while the first assistant and scrub nurse stood on the left side of the patient. Pneumoperitoneum was established with the Veress needle through the umbilical puncture using carbon dioxide to achieve an intra-abdominal pressure of 12-14 mmHg. The first 10-mm optical trocar for the telescope was placed through umbilical incision. Four working 5 mm ports are then placed (epigastria, RUQ , LUQ and costal margin in the left anterior axillary line) under direct visualization.

The patient should be positioned in a steep reverse Trendelenburg after port placement.

After exploration of abdomen, only the anterior portion of the esophagus was dissected, the anterior vagus nerve was identified, and a myotomy 6 to 8 cm long above the gastroesophageal junction (in the left side of vagus nerve) with Harmonic or Ligasure and extension 1 to 1.5 cm of gastric side of the cardia (by means of hook) was performed. After the esophageal myotomy, the air leak test was done. Thus, a facilitating identification of the probable perforation was done. Then, an anterior partial (180-degree) Dor fundoplication completed the operation, with three stitches (with silk string) being placed on each side to suture the gastric wall (without dissection of short gastric vessels) to the edges of the myotomy and crus.

3.2. Follow-Up

These patients recommended starting liquid diet the day after surgery, which could be turned in to soft food sand discharged without esophagogram in the next day. Nausea must be muffled by appropriate medication. Patients were asked to come to the outpatient clinic 1 and 4 weeks after surgery.

Patients were asked to come 3-4 times a year after the first year. Patients who failed to report to the outpatient clinic, were interviewed by phone.

3.3. Statistical Analysis

Data are expressed as medians and range. Nonparametric tests were used to compare groups (Mann-Whitney and Wilcoxon, as appropriate). The Fisher exact test was used to compare categorical data. A probability of less than 5% was assumed to be statistically significant ($P < 0.05$).

4. Results

Among 30 patients, there were 13 (43.3%) females and 17 (56.7%) males, and mean age was 40.8 years (range, 20 - 68 years). The operation was completed laparoscopically in all patients, with a median operative duration of 135 minutes, and a continuous steady reduction in the operating time from the first patients to the last. In the last ten patients, the operating time ranged from 105 to 145 minutes. Mean operative duration was 137 $\pm$ 36.2 minutes. Synchronous to our major operation, hiatal hernia was repaired laparoscopically in 2 patients, and in one case ovarian cyst was resected. Fourteen (46.6%) patients were previously treated with multiple pneumatic dilatations (mean 2 per patient), two patients by intrasphincteric injection of botulinum toxin and 1 patient by intrasphincteric injection of ethanolamine (4 times). The median duration of symptoms was 30 months before being referred for surgery.

Mean hospital stay was 2.45 days. At a median follow-up of 18 months, dysphagia was alleviated in all patients except two ones (93.4%), and regurgitation in all patients ($P < 0.001$).

Chest pain and heartburn improved significantly in 66.6% and 70%, respectively ($P < 0.01$) as well. Two (6.6%) patients had residual dysphagia but not as severe as before surgery. The esophageal mucosa in two (6.6%) of patients was perforated on the gastric end of the myotomyduring to clear the mucosa of all external tissue. The perforations were repaired laparoscopically. Simple repair was sufficient in all patients. Also difficulties in dissection were encountered in one patient who had history of ethanolamine injection. The mucosa in two (6.6%) of patients was perforated on the gastric end of the xylotomy. The perforations were repaired laparoscopically without postoperative leak. And fallowed like the other patients post operatively.

In one patient, fever on 7th postoperative day was investigated with Chest X ray and thoracentesis, that he had empyema. There was esophageal leak in chest CT scan with oral contrast. In the thoracotomy, there was 4 cm rupture in mucosa (delayed necrosis of mucosa) which was repaired primary with single suture and a pleural flap and drained with chest tube and the patient took one month ICU care, anti-biotic, TPN and patient were discharged after 35 days. Intraoperative capnothorax occurred in one patient. It was identified and evacuated out from a trocar site with an angiocath in anterior of chest. In further evaluation, epipherenic diverticulae at the site of myotomy was diagnosed in these 2 patients 1 year and 4 years after myotomy. Laparoscopic diveticulectomy was done and dysphagia was improved. For first ten patients, we used Ligasure for myotomy but after delayed esophageal fistula in that patient, we used Harmonic for esophageal portion.

5. Discussion

This was the first study in Iran which studied and fallowed partial fundoplication because of less acceptance of this way in Iran. Heller performed first esophagomyotomy in 1913. He described both anterior and posterior myotomy. In 1923, Zaaiger modified it by doing single anterior myotomy and proposed the same results. Laparoscopic era started with Pellegrini who performed the first minimal access surgery of cardiomyotomy by thoracoscopic approach in 1991. Since then, various studies were performed at various institutions to compare or to prove the efficacy of the minimal access surgery. Minimal access cardiomyotomy (laparoscopic cardiomyotomy) has got lots of attention around the world. Several controlled trials have been conducted, some are in favor of laparoscopy and others are not. This evaluation was unbiased by the operative changeability, since all the patients were operated on by the same senior surgeon who used the modified Heller myotomy. The present series confirm the short-term benefits of laparoscopic surgery, including reduced scar, shorter hospital stay, earlier oral feeding resumption, and quicker recovery, as reported by Ancona et al. (18). We also observed a longer median operative time (135 minutes) for laparoscopic myotomy, which is similar to the 114 to 216 minutes of operative time previously reported in most Heller-Dor laparoscopy series (6, 18, 19).

The reported rate of esophageal mucosal tears during laparoscopic Heller myotomy ranges from 4% to 15%, a rate like to ours (6.6%). We agree with the most authors that laparoscopic suture of mucosal tears is a safe procedure and particularly adequate for abdominal esophagus tears.

Vela and colleagues compared with the long term efficacy of Pneumatic Dilatation (PD) with that of laparoscopic cardiomyotomy. They defined success in the long term as freedom from further interventions. At 6 years freedom from intervention, it was 28% in the single pneumatic dilatation group versus 57% in the laparoscopic cardiomyotomy patients. Indeed, many patients from the PD group with more severe diseases crossed over to cardiomyotomy,

otherwise the difference may have been even greater. Cardiomyotomy, also, has been shown to be superior to PD in the long term, previously (20). Results of Anselmino et al. (21) study showed that surgical myotomy provides a better long- term outcome. The early disease stage is associated with perforation after pneumatic dilatation. Surgical myotomy should be considered in patients with early achalasia rather than balloon dilatation. In our study, difficulties in dissection were encountered in 14 patients who had history of pneumatic dilatation and among these patients, gastric mucosa in two (14%) was perforated. In 2004, Zaninotto (22) study on 80 patients concluded BoTx, should be reserved for patients who are unfit for surgery or as a bridge to more effective therapies, such as surgery or endoscopic dilation.

In another study by Niknam et al. in 2011 (23), it was indicated that ethanolamine (EO) is well endured and potentially effective in high risk patients for surgery with idiopathic achalasia that (IA) might be explained by the local inflammatory properties of EO. As presented data are too preliminary to support the routine uses of EO in the treatment of all patients with IA. In our study, there was one patient previously treated by intrasphincteric injection of EO (4 times). More difficulties in dissection were encountered in patient who had history of ethanolamine injection. Jeansonne (24) reported outcomes of LHM for achalasia in patients who underwent surgery more than 10 years prior. Most patients who underwent LHM with partial fundoplication, reported satisfaction 10 years after the operation. A small number of patients required additional intervention. Dysphagia scores at 10 years were not different from those together at short-term follow-up. Their data suggest that the efficacy of LHM is sustained at 10-year follow-up.

The advent and the success of minimal access surgery have changed the treatment algorithm of the esophageal achalasia.

Minimal access cardiomyotomy for achalasia is becoming more and more popular over conventional open cardiomyotomy in view of its equal safety and efficacy with added advantage of less morbidity, mortality and better quality of life.

Whether an antireflux procedure should be linked with laparoscopic Heller myotomy, is still arguable with some authors advocating minimal esophagus dissection without division of the anatomic antireflux mechanisms. The value of the anterior partial fundoplication technique as an antireflux procedure, may be all more questioned because it is outside the scope of the latest laparoscopic antireflux studies that have been focused exclusively on the results after a total and posterior partial fundoplication (25). However, the most authors advise the relationship between an anterior partial fundoplication with Heller myotomy to prevent both fibrous retraction and gastroesophageal reflux (18, 19).

There is good evidence from a well- formed RCT that the addition of a Dor fundoplication reduces the risk of pathological gastro-oesophageal reflux without compromising relief of dysphagia. Douard and colleagues (25) found that without a fundoplication, the incidence of pathological reflux (pH $<$ 4 for more than 4.2% of a 24 hour period) was 47%. The addition of an anterior 180 degree Dor fundoplication reduced this to 9% without any effect on post-operative dysphagia or LOS pressure reduction. Treatment failures following laparoscopic cardiomyotomy are most commonly related to inadequate myotomy, and occur more frequently on the “learning curve” phase of a surgeons training. After this, rates of failure and complication are remarkably similar between surgeons and hospitals. Rates of recurrent dysphagia within one year are commonly 8% - 10%. Similar to Douard study, our only observed major complication was a delayed esophageal fistula potentially related to an electrosurgery induced thermal damage to the mucosa. This complication may be avoided by using laparoscopic scissors rather than ligasure, even if it is protected on its convex part to divide the muscularis.

We have some limitations in this study; for example less cooperative patients forced us so that we couldn’t make PH monitoring and manometery postoperatively in all patient.

We recommend to researchers to design randomized controlled trials for easy comparison and judgeship.

More than 90 percent of patients experience improving dysphagia in minimally invasive approach and this method greatly reduced morbidity. Laparoscopic esophageal myotomy and fundoplication should be considered the primary treatment for achalasia for most patients. Also, we had complications in patients.

Is seems that, the laparoscopic myotomy with Dor fundoplication could be recommended as the first treatment choice in patients with achalasia.

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Footnote

Authors’ Contribution: Study concept and design: Gholamreza Mohajeri; acquisition of data: Masoud Sayadi

Shahraki; analysis and interpretation of data: Shahab Shahabi Shahmiri; drafting of the manuscript: Shahab Shahabi Shahmiri, Elyas Mostafapour; critical revision of the manuscript for important intellectual content: Behrouz Keleidari, Mohsen Mahmoudieh; statistical analysis: Shahab Shahabi Shahmiri; administrative, technical, and material support: Faranak Bahrami; study supervision: Gholamreza Mohajeri.

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