

Outcomes of Minimally Invasive Myotomy for the Treatment of Achalasia in the Elderly

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ABSTRACT

Background: An increasing number of elderly patients diagnosed with achalasia are being referred for minimally invasive myotomy. Little data are available about the operative outcomes in this population. The objective of this study was to review our experience with this procedure in an elderly population.

Methods: A retrospective review was performed of 51 consecutive patients, 65 years of age or older, diagnosed with achalasia who underwent a minimally invasive myotomy at our institution. Prior therapies, perioperative outcomes, and postoperative interventions were also analyzed.

Results: Of the 51 patients, 28 (55%) had undergone prior endoscopic therapy, and 2 patients (7%) had a prior myotomy. Mean duration of symptoms was 10.9 years (range, 0.5 to 50). No perioperative mortality occurred, and the median hospital stay was 3 days. Two patients (3.8%) had complications, including a gastric mucosal injury and one atelectasia. Eleven patients (21%) required additional therapy postoperatively. Symptom improvement was described in all patients.

Conclusion: Laparoscopic Heller myotomy can safely be performed in elderly patients, providing significant symptom relief. No evidence suggests that surgery should not be considered a first-line treatment. Advanced age does not appear to adversely affect outcomes of laparoscopic Heller myotomy.

Key Words: Achalasia, Laparoscopic, Myotomy.

INTRODUCTION

Although achalasia is the most common functional disorder of the esophageal body and lower esophageal sphincter (LES), it occurs rarely, with a prevalence of 1/10 000 and an incidence between 0.03 and 1/100 000 per year.¹⁻⁷ Achalasia affects both sexes equally and may occur at any age. However, the incidence peaks in the third and seventh decade of life.^{1,4} Although the cause remains unknown, the disease results from progressive degeneration of the plexus myentericus, resulting in a lack of inhibitory neurons needed for coordination of lower esophageal sphincter relaxation and peristaltic contractions of the esophagus.⁴ While investigators suggest genetic, autoimmune, or infectious origin of the neural damage, the exact cause remains to be determined.^{4,5}

Clinical symptoms including dysphagia, chest pain, and regurgitation are not specific to achalasia, which may result in a 2-year to 3-year delay in diagnosis from the beginning of symptoms.⁴ Severity of the disease has also not been found to be linked to symptoms. Further diagnostic tests, including radiographic and manometric findings are used to confirm the clinical diagnosis.⁶ Esophageal manometry remains the primary diagnostic tool for achalasia. An abnormal pressure measurement pattern is found in patients with achalasia.⁶ Left untreated, most patients will eventually develop a dilated “mega-esophagus” with severe bolus transit impairment. Therefore, the goal in the management of achalasia is early diagnosis and treatment before reaching this end-stage phase when dysphagia may not be amenable to treatment other than esophagectomy.⁷⁻¹⁰

Curing achalasia and reinstating esophageal peristalsis implies restoring the neurons of the myenteric plexi. Until such treatment becomes available, all interventions currently aim at facilitating bolus transit across the LES. Therapies include pharmacotherapy, chemical paralysis through Botox (botulinum toxin A) injection, mechanical dilation, and surgical myotomy. The order in which these therapies are recommended or performed is the subject of debate.¹¹⁻¹² Pharmacotherapy provides short-lived results, incomplete relief, and efficacy that decreases with time. Therefore, it is generally not considered a good treatment option for long-term relief of symptoms.^{11,12} Surgical myotomy produces the most du-

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able long-term results.⁷ Minimally invasive myotomies offer increasingly less morbidity, postoperative pain, and facilitate an expeditious return to daily activities.^{7,11} Prior to the laparoscopic myotomy, operations for achalasia were done either through laparotomy or thoracotomy. The higher risks associated with open surgery dissuaded many from recommending surgical intervention as first-line treatment, especially to the elderly with their associated comorbidities.^{3,13,14} In the relatively short time since the first laparoscopic myotomy, patients undergoing minimally invasive myotomy have demonstrated excellent symptomatic outcomes with low morbidity and mortality.⁷ This has resulted in an increased preference of surgery as the initial treatment strategy.⁷⁻¹⁴ While an increasing number of older patients are being referred for laparoscopic Heller myotomy as the first-line treatment, few studies have followed the impact age has on surgical treatment of achalasia.^{3,13,14} The goal of this investigation was to review the outcomes of minimally invasive myotomies for achalasia in the elderly at our institution.

MATERIALS AND METHODS

After institutional review board consent was obtained, the medical records of 52 consecutive patients aged 65 years or older undergoing minimally invasive Heller myotomy for achalasia were retrospectively reviewed. The diagnosis of achalasia was confirmed by Barium esophagogram, demonstrating the classic appearance of achalasia (proximal esophageal dilation with a distal “bird’s peak”), and esophageal manometry. The most common present symptom was dysphagia (90%). Mean duration of symptoms for the entire patient cohort was 10.9 years (minimum 0.5 years - maximum 50 years). Prior therapies for the treatment of achalasia were documented (pneumatic dilations, Botox, prior myotomy), and the postoperative clinical outcomes were analyzed. Demographic data were obtained. Outcome variables included perioperative morbidity and mortality, symptom improvement, and postoperative interventions.

Operative Technique

The laparoscopic Heller myotomy is performed using a 5-port technique, as previously described.⁷ Direct visualization is used to enter the abdominal cavity 3 inches above the umbilicus. Four additional ports are placed. The gastrohepatic ligament is opened widely using Harmonic shears. The dissection then is carried up and down the right and left crura and into the mediastinum for adequate mobilization of the esophagus into the peritoneal cavity. Care is taken to identify and preserve both the anterior and posterior vagus

nerves throughout the procedure. The short gastric vessels are divided, freeing the fundus, and the gastroesophageal fat pad is removed.

Hook cautery on a low wattage is used to divide the longitudinal and then circular fibers of the esophagus, completing a myotomy approximately 10cm up the esophagus and 4cm down onto the anterior gastric wall. To confirm an adequate myotomy, intraoperative endoscopy is undertaken. An adequate myotomy is confirmed when the endoscope passes easily into the stomach, the gastroesophageal junction opens easily with endoscopic air insufflation, and transillumination of the myotomized segment confirms muscle division well above and below the Z-line. A partial fundoplication was performed in the majority of the patients.

Statistical Analysis

Data were maintained on an Excel spreadsheet (Microsoft, Redmond, WA, USA). Statistical analysis was performed using SPSS software (Version 10; SPSS, Inc, Chicago, IL) and included χ^2 and Student *t* tests. Data are presented as means and percentages for categorical data, means, and standard deviations for continuous data. $P < 0.05$ was used to determine statistical significance.

RESULTS

Fifty-one patients, 29 women and 22 men with a mean age of 73.14 years (range 65 to 89) underwent laparoscopic Heller myotomy at our institution. Twenty-eight patients (55%) had undergone prior therapy ($P = 0.075$). Eight patients (29%) received prior pneumatic dilation, 7 (25%) received prior Botox, and 13 (46%) had both, with a mean period of time between this strategy and the laparoscopic myotomy averaging 12 months (range, 18 to 36). Two (7%) patients had undergone previous myotomies more than 40 years earlier with no improvement, and both patients had been treated with multiple pneumatic dilations and Botox injections (**Table 1**).

All operations were begun laparoscopically with one conversion to open myotomy. The decision for conversion was independent of the myotomy. In addition to an esophageal myotomy, this patient was having a malpositioned Nissen fundoplication taken down. The surgeon’s choice to convert to open was based on the discovery of dense scar tissue that prevented the release of the posterior portion of the wrap from the esophagus. The median hospital stay was 3 days (range, 1 to 26). Complications occurred in 2 (3.8%) patients; 1 patient had an intraoperative gastric perforation, which

Table 1.

Demographic and Clinical of the Study Population

Age (yrs)	73.14 (65 to 89)
Sex (F/M)	29/22
Duration of Symptoms (yrs)	10 (5 to 50)
Preoperative LESP, mm Hg	32 (7 to 28)
Prior Therapy (Y/N)	28/23
Pneumatic dilation	8 (29%)
Botox® Injection	7 (25%)
Both	13 (46%)
Previous myotomy	2 (7%)
Time Between Procedures	12 (18 to 36)

Table 2.

Perioperative Outcomes

Fundoplication	48 (92.3%)
Dor	13 (27%)
Toupet	35 (73%)
Conversion to Open	1 (1.9%)
Complications	
Intraoperative gastric perforation	1 (1.9%)
Atelectasis	1 (1.9%)
Length of Stay (d)	3 (1 to 26)

Table 3.

Postoperative Outcomes

Recurrent Symptoms	11 (22%)
Time of Dysphagia Recurrence (months)	30 (6 to 53)
Required Additional Therapy	
Pneumatic Dilations	5 (50%)
Botox® Injections	1(10%)
Pneumatic Dilations + Botox®	4 (40%)
Esophagectomy	1 (1.9%)
Follow-up (months)	42 (24 to 53)

was recognized intraoperatively and immediately repaired, and 1 patient with postoperative atelectasis that required discharge on supplemental oxygen. There was no perioperative mortality.

Forty-eight patients (92.3%) had a partial fundoplication procedure. Thirteen (27%) received a Dor fundoplication, while 35 (73%) received Toupet fundoplication. The judgment not to complete a fundoplication was based on the finding of dense scarring from a previous fundoplication or compli-

cated anatomy. There was no difference in surgical outcome or patient satisfaction in those patients who had a Dor or Toupet fundoplication (**Table 2**).

Of the 42 patients with documented follow-up (mean time 42 months, range 24 to 53), all claimed overall symptom improvement, although a minority had identifiable foods that they restricted. The most common limitations involved solid foods; meat and hot dogs were specifically noted, which caused significant “sticking.” Despite these notations, each patient claimed overall symptom improvement. Eleven patients (22%) required additional therapy. Five patients (46%) underwent additional pneumatic dilations, 4 (36%) received pneumatic dilation and Botox injections, one (9%) patient received Botox for recurrent dysphagia and at a mean of 30 months (range, 6 to 53) following the surgery. One patient (9%) underwent further surgical intervention, receiving an esophagectomy 4 years later. This patient had an extremely complicated history of achalasia since adolescence with severe progression of his symptoms. Of those 11 patients, 8 (73%) had undergone therapy before the laparoscopic fundoplication as well (P<0.001) (**Table 3**).

DISCUSSION

Achalasia is a chronic disorder of the esophagus that significantly impacts the quality of life of the patients. Because the cause remains elusive, no specific therapy is available for managing the underlying disease process. Several available therapies have been developed to alleviate the symptoms of the disease. However, none of the treatment options re-establish normal muscle activity of the esophageal body and lower esophageal sphincter (LES). Instead, all relieve the functional obstruction caused by the failure of LES to relax upon deglutition. Most treatment options are tailored to the patient’s overall health status and underlying comorbidities.

Occurring in 1 of 100 000 people, achalasia has a bimodal distribution, with a smaller peak in persons between 25 years and 40 years of age, and a larger peak occurring in the seventh decade. Significant differences in the clinical presentation between these 2 populations have been reported.^{1,3–5,7,13,14} Older patients have been shown to experience significantly less frequent dysphagia, regurgitation, and choking episodes premyotomy.^{14–17} Younger patients have more severe symptoms, or less tolerance of their symptoms, regardless of duration.^{15,17} Older patients tend to present with more complaints of heartburn than younger patients do.¹⁶

Lasch¹⁵ and colleagues performed a study with healthy volunteers, which suggested that elderly subjects have a reduced sensitivity to esophageal balloon distention compared with younger subjects. Moreover, acid sensitivity of the inflamed and uninflamed esophageal mucosa has been shown to be largely dependent on the patient's age.¹⁶ Because aging notably decreases the frequency of episodic chest pain, some patients will even lose this symptom over a period of several years.¹⁷ Rakita et al³ examined a cohort of 262 patients (142 men and 120 women), with an average age of 49 years, who had undergone laparoscopic Heller myotomy. Results supported the previous findings that older patients were more likely to have a longer duration and less severe symptoms before myotomy consistent with a more indolent course of disease. Fortunately, postmyotomy results indicated that neither age nor duration of symptoms influenced long-term patient results³ and we could confirm that in our population (Table 4). Whether distinct variants of achalasia exist in the 2 age distributions or whether these differences merely represent a spectrum of the same disease remains to be elucidated.

The increased proficiency of surgeons in minimally invasive techniques over the past 15 years has resulted in the laparoscopic modified Heller myotomy becoming the gold-standard treatment for achalasia in younger individuals (<50 years old).⁷⁻¹⁰ However, some individuals suggest that older patients should have a different approach to treatment, and surgery should not be offered as the first line of therapy. Several series favor botulinum toxin injections or pneumatic balloon dilation (PD), but none have concluded a definitive treatment approach.¹⁸⁻²³ Most suggest that specific treatments work better under certain circumstances such as the early stages of the disease.^{19,21} However, these nonsurgical

options usually have to be repeated to achieve long-term effects. As revealed in our study, most of our patients had undergone nonsurgical treatment without satisfactory long-term results before being referred for surgery.

Pneumatic dilation is recommended by many, because it is associated with an initial success rate of 70%. However, approximately 40% of patients experience symptom recurrence with extended follow-up in some series.¹⁸⁻²⁰ Csendes and colleagues²⁰ found better long-term success in surgical patients compared with those treated by balloon dilatation alone. Farhoomand¹⁸ found a 37% recurrence of symptoms within 3 months in patients treated initially with a 3.0-cm balloon. Moreover Karamanolis et al¹⁹ found that even with a clinical remission for more than 15 years after the initial pneumatic dilation in 51.4% of their patients, the long-term success rate dropped progressively with time, the need for additional esophageal balloon dilation increased, as well as the risk of perforation related to each procedure, and the symptoms were less likely to abate. Our experience indicates that pneumatic dilations offer relief; however, they often require repeat dilations, each with decreasing efficacy.

Botox is usually reserved for physiologically compromised individuals who cannot undergo PD or minimally invasive myotomy (MIM). Vaezi et al,²¹ in a randomized trial comparing Botox and PD, found that pneumatic dilatation resulted in a significantly (P=0.02) higher cumulative remission rate. At 12 months, 14/20 (70%) pneumatic dilatation and 7/22 (32%) Botox-treated patients were in symptomatic remission (P=0.017). PD resulted in significant (P<0.001) reduction in symptom scores, lower esophageal sphincter pressure measurements, esophageal barium column heights, and esophageal diameters. Botox produced a significant reduction in symptom scores (P<0.001), but no reduction in objective parameters. Failure rates were similar initially, but failure over time was significantly (P=0.01) higher after Botox (50%) than after pneumatic dilatation (7%). Zaninotto et al²² published the results of a randomized trial comparing 2 Botox injections 1 month apart (100 units each) with laparoscopic Heller myotomy and fundoplication. There were 40 patients in each group, no mortality in either group, and only 1 minor complication in the surgery group. At 2-year follow-up, nearly 66% of the Botox group was again symptomatic compared with only 13.5% of the surgery group. An initial resistance to Botox, caused by antibody formation, is present in up to 26% of patients and likely contributes to the method's high primary failure rate. Moreover, in patients undergoing Botox injection, intramural fibrosis has been reported that could interfere with subsequent surgical treatment. Neubrand²³ reported a 70% success rate

Table 4.
Patients That Require Additional Therapy

	No Additional Therapy	Additional Therapy	P Value
Patients (n)	40	11	<0.001
Age (yrs)	72	72 (68 to 79)	0.061
Sex (F/M)	24/17	5/5	0.444
Duration of Symptoms	10	11 (0.5 to 40)	0.879
Preoperative LESP, mm Hg	31.4 (-)	36.3 (7 to 82)	.004
Prior Therapy	20	8	<0.001
Postoperative Complications	1	1	0.512

with Botox injections. Unfortunately this result only lasts for 6 months to 9 months and only half of them benefit for more than 1 year. He also found that younger patients (<55 years) usually have a higher LES pressure than older patients, and they did not seem to benefit from botulinum toxin injection.

Few publications of outcomes of MIM specifically in the older population have been published. Kilic et al¹³ performed MIM on 57 patients 70 years of age or older. This group represented 25% of all achalasia patients on their service. Symptom improvement was achieved in the vast majority as assessed by dysphagia score (96.5%) as was freedom from further surgical intervention (93.0%) at a mean follow-up of approximately 2 years. The complication rate of 19.3% was managed without significant morbidity and non-operative mortality. The authors state that one of the best advantages of using MIM for older achalasia patients is the avoidance of repeated procedures, because only 7% of their patient's required further intervention. Similar findings were reported by Kala et al²⁴ in the 8-year follow-up of 115 patients, with a senior subgroup of 26 (average 69.7). Post-operative decrease of LES tone showed good motility results of Heller myotomy, and 24-hour pH-metry revealed good antireflux effects of Toupet fundoplication. In our study, all the patients with a completed follow-up of 32 months claimed overall symptom improvement, and only 11 patients required further interventions.

The influence of prior nonsurgical therapy in the laparoscopic Heller myotomy outcome is still controversial. In an analysis of 200 patients undergoing myotomy, predictors of failure were prior therapy, duration of the symptoms, and sigmoid esophagus.²⁵ In our study, prior therapy and preoperative LESP, mm Hg had statistical significance between patients who required additional therapy and those who did not ($P < 0.01$ and $P = 0.004$, respectively). Smith et al¹² in their study of 209 patients undergoing Heller myotomy for achalasia found that intraoperative complications were more common in patients with previous therapies and postoperative complications like primarily severe dysphagia or pulmonary complications were more common after endoscopic treatment (10.4% versus 5.4%), also myotomy failure was higher in these patients (19.5% versus 10.1%). On the other hand, Ferulano and colleagues² assert that age and previous treatment do not influence the outcome. They did not find evidence that repeated dilations render surgery more difficult, even if mucosal tears had occurred in their patients who had undergone previous treatments. While prior therapy may make the actual surgery more demanding, our experience indicates that the long-term results remain unaffected.

Eleven of our 51 patients had additional therapy after surgical treatment. Eight of those 11 (73%) had also received preoperative therapy. Twenty-three patients underwent a laparoscopic Heller myotomy as the first-line treatment with only 3 (13%) requiring further therapy. Our data suggest that although preoperative therapy does not negatively affect the outcome of the Heller myotomy, it makes a patient more susceptible to additional therapy postoperatively. Schuchert²⁵ concluded in his 200-patient study that prior endoscopic therapy was associated with a higher risk of failure after myotomy as well as reoperation rate. Surgery as a first-line treatment is therefore advantageous in that it may prevent additional procedures, which is also potentially advantageous to the elderly population. In addition, patients receiving pneumatic dilations often seek surgery eventually. In the event of a failed myotomy, re-do myotomy is generally considered a formidable task, because of the adhesions and dense fibrosis that destroy the planes within the LES.⁷ However, with the continually progressing techniques and improvements in advanced laparoscopy, re-do myotomy has also been shown to be safe and effective.²⁵

The majority of our patients had a partial fundoplication in addition to the myotomy. Other authors have demonstrated in randomized trials that the addition of a partial fundoplication decreased the incidence of postoperative gastroesophageal reflux from 46.6% with Heller alone to 9.1% with Heller/Dor, with no significant change in dysphagia.^{26,27} Twenty-seven percent of our patients undergoing fundoplication received a Dor fundoplication, while 73% received a Toupet fundoplication. Our study showed favorable results with the addition of fundoplication, regardless of the technique. Follow-up records report overall improvement in deglutition symptoms, with a handful of patients citing incidences of dysphagia with select foods. No patient complained of reflux at the time of follow-up, suggesting that both Dor and Toupet are effective fundoplication procedures. Ultimately, surgeon experience and preferences dictated procedure choice.

All patients reported an improvement in symptoms at follow-up. A minority of patients noted specific foods or incidences that caused dysphagia. However, relative to initial symptoms, all patients claimed improvement. Our data are consistent with that of other studies that also indicate an overwhelming degree of symptom improvement.^{3,9,11,13,25} Heller myotomy provides high patient satisfaction and significant symptom improvement, both of which play critical roles in determining a treatment.

CONCLUSION

Our data suggest that laparoscopic Heller myotomy should be offered as a first-line treatment for elderly patients with achalasia who are fit for surgery. The procedure has proven to be safe and effective in this population. Prior endoscopic therapy does not appear to adversely effect postoperative symptom improvement, but may help predict those patients who might require further therapy postoperatively.

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