Revisional Surgery after Heller Myotomy for Treatment of Achalasia: A Comparative Analysis Focusing on Operative Approach

Biswanath P. Gouda · Thomas Nelson · Sunil Bhoyrul

Received: 14 October 2010 / Accepted: 22 December 2011 / Published online: 21 January 2012
© Association of Surgeons of India 2012

Abstract Surgical myotomy is the gold standard in therapy for achalasia, but treatment failures occur and require revisional surgery. A MEDLINE search of peer-reviewed articles published in English from 1970 to December 2008 was performed using the following terms: esophageal achalasia, Heller myotomy, and revisional surgery. Thirty-three articles satisfied our inclusion criteria. A total of 12,727 patients, with mean age of 43.3 years (males 46% and females 50%), underwent Heller myotomy (open 94.8% and laparoscopic 5.2%). Revisional surgery was performed in 6.19%. Procedures performed included revision of the original myotomy or creation of a new myotomy with or without an antireflux procedure or esophagectomy. Reasons for reoperation were incomplete myotomy (51.8%), onset of reflux (34%), megaesophagus (16.2%), and esophageal carcinoma (3.04%). Systematic review of the literature for revisional surgery following Heller myotomy revealed a 6.19% rate of reoperation with a low mortality rate.

Poster presentation at 2007 SAGES (Society of American Gastrointestinal and Endoscopic Surgeons) Annual Conference at Las Vegas, NV

B. P. Gouda (✉)
Department of General Surgery,
P.D.Hinduja National Hospital and Medical Research Center,
Veer Savarkar Marg, Mahim, Mumbai 400016, India
e-mail: bisu_g@yahoo.com

T. Nelson
Department of Minimally Invasive Surgery,
Naval Hospital Camp Pendleton,
Camp Pendleton, CA, USA

S. Bhoyrul
Department of General and Minimally Invasive Surgery,
Scripps Memorial at La Jolla,
9850 Genessee Ave, Suite 730,
La Jolla, CA 92037, USA

Keywords Achalasia · Heller myotomy · Revisional surgery

Introduction

The complex pathogenesis of achalasia makes its treatment difficult. It was first recognized more than 300 years ago as “cardiospasm” and renamed in 1937 by Lendrum [1] as “achalasia—failure to relax” who described it as a syndrome caused by incomplete relaxation of the lower esophageal sphincter. There has been a continuous evolution in treating achalasia starting with Thomas Willis who in 1672 treated esophageal achalasia using a whale-bone fixed with a round button of sponge at its end, to dilate the esophagus [2]. It was Ernest Heller [3] who first described a surgical approach for performing esophageal myotomy (both anterior and posterior) for its treatment in 1913. In 1923, Zaijer [4] proposed a single extramucosal myotomy through the lower esophageal sphincter. In 1962, Dor published anterior partial fundoplication while a year later; Andrew Toupet reported a posterior fundoplication [5, 6]. With the advent of laparoscopy, in 1991 Shimi et al. [7] reported the first Heller myotomy performed laparoscopically. It took 77 years for evolvement from open toward closed approach for the treatment of achalasia. Early 1990s saw growth of laparoscopic methods in treating achalasia.

As the treatment for achalasia has evolved over several decades, the evidence for the surgical approach, either open (abdominal or thoracic) or laparoscopic, has been well documented in the scientific literature. Published results have proved laparoscopic Heller myotomy to be the standard of care for achalasia when performed by a competent surgeon. Knowing the complex pathogenesis causing achalasia, it is equally important to know the

long-term effects after performing surgical procedures like myotomy in achalasic subjects. This study was undertaken to learn about the long-term effects of achalasia in postoperative patients and the rate of revisional surgery performed in them. Esophageal achalasia has an incidence of 1–6/100,000 persons and affects in the third or fourth decade of life [8, 9]. Upon receiving surgical attention for the symptoms such as dysphagia or heartburn, the anatomy or alignment of structures changes, especially after Heller myotomy with fundoplication. But since the muscular layer and sphincteric fibers are untouched, the pathology remains the same. As a result, there is long-term deterioration of the immediate postoperative resolution of symptoms seen after surgery. This study aims to

understand the reasons behind such long-term failure of Heller myotomy for achalasia and operative morbidity when performed.

Methods

A MEDLINE search was performed to obtain primary data published between 1970 and December 2008. Keywords such as esophageal achalasia, myotomy, Heller myotomy, redo surgery, revision surgery, reoperations, and surgical treatment for achalasia were used to perform the search. Studies conducted in humans and articles published in English were selected. Studies that had less than ten subjects

Table 1 Accumulated data from 33 papers from 38 years (1970–2008)

No	Author	Year	Journal	N	Mean age	Male (n)	Female (n)	F/U (months)
1	Patrick [11]	1971	Archives of Surgery	–	–	–	–	264
2	Barker [10]	1971	British Journal of Surgery	30	41	15	15	156
3	Ellis [12]	1975	American Journal of Surgery	368	–	–	–	–
4	Black [13]	1976	British Journal of Surgery	108	47.5	56	52	48
5	Okike [15]	1979	Annals of Thoracic Surgery	468	51	–	–	–
6	Jara [14]	1979	Archives of Surgery	145	–	–	–	–
7	Fekete [16]	1982	International Surgery	410	–	–	–	120
8	Guarner [17]	1983	Surgery, Gynecology & Obstetrics	–	–	–	–	–
9	Ellis [19]	1984	Journal of Thorac & Cardiovasc Surg	113	45	49	64	81
10	Pai [18]	1984	Annals of Thoracic Surgery	36	43.2	18	18	–
11	Ellis [21]	1986	Journal of Thorac & Cardiovasc. Surg.	1,586	–	–	–	48
12	Mercer [20]	1986	Canadian Soc. Cardiovasc Surg.	49	38.6	–	–	9
13	Andreollo [22]	1987	British Journal of Surgery	5,002	–	–	–	–
14	Gonzalez [23]	1988	International Surgery	1,465	45.2	–	–	–
15	Gayet [24]	1991	Hepatogastroenterology	1,445	–	–	–	–
16	Ellis [25]	1992	European Journal of CT Surg	57	45	28	4	163.2
17	Ellis [26]	1993	British Journal of Surgery	185	42	90	93	108
18	Malthaner [27]	1994	Annals of Thoracic Surgery	22	43	10	12	228
19	DiSimone [28]	1995	Annals of Thoracic Surgery	129	–	–	–	97.4
20	Kiss [29]	1996	Surgery Today	139	46	–	–	–
21	Ellis [30]	1997	Chest: Surgical Clinics of America	–	–	–	–	–
22	Donahue [32]	1999	Disease of Esophagus	48	–	–	–	–
23	Zaninotto [31]	2000	Journal of Gastrointestinal Surgery	113	43	56	44	24
24	Luketich [33]	2001	Annals of Surgery	62	53	27	35	–
25	Raiss [35]	2002	Annals de Chirurgie	123	36	56	67	60
26	Gorecki [34]	2002	Surgical Endoscopy	62	–	–	–	–
27	Fernandez [36]	2002	Surgical Endoscopy	110	42	40	70	55
28	Duffy [37]	2003	Surgical Endoscopy	–	–	–	–	27.5
29	Yutaka [38]	2003	World Journal of Gastroenterology	36	–	18	18	–
30	Codispoti [39]	2003	European Journal of Surgery	25	40.3	13	12	64.8
31	Falkenback [40]	2003	Disease of Esophagus	20	–	–	–	–
32	Lin Jung [41]	2004	World Journal of Gastroenterology	176	32.9	78	98	168
33	Rossetti [42]	2005	Annals of Surgery	195	45.2	91	104	–

were excluded. References were then hand searched to incorporate any relevant articles that had not been included in the primary group. Thirty-three articles fulfilled the selection criteria (see Table 1). Each article was studied to find variables such as postoperative complications, type of approach, reasons for failure of surgery, follow-up period, and different studies that were performed before surgery to establish achalasia or failure of treatment. The results were analyzed for descriptive statistics using excel software. The result based on 38 years of scientific literature is a step toward understanding the long-term effects of Heller myotomy and the challenges that every treating surgeon should be aware of during such extensive phases of follow-up.

Results

Of the 12,727 patients who underwent Heller myotomy, in 94.8% it was performed as open abdominal/thoracic procedure and in 5.2% laparoscopically (see Table 2). Revisional surgery was performed in 6.19% ($n=78$) as observed from the pooled data. Published studies came from various centers across the globe, majority from Europe (30.3%), the USA (42.4%), the and UK (12.1%). From Asia [38, 41] and Canada [20, 27], two reports each were published.

Mean age was provided only in 54.5% of articles. The mean age for primary Heller myotomy was 43.3 years with similar distribution of both sexes (males 46% and females 50%). Similarly, the mean age for the revisional surgery group was 41.8 years (males 53.7% and females 50.5%); data were from 24.3% articles. Interestingly, this study showed that surgeons performing Heller myotomy as a primary procedure have also performed an additional procedure at the same time, the most likely reason being to prevent postoperative reflux. Procedures such as truncal vagotomy [10, 11], pyloroplasty [10, 11, 16], cardioplasty [10], antrectomy [11, 12, 21, 27], Belsey repair [14, 26, 27, 32], and roux-en-Y gastrojejunostomy [12, 21, 23, 27, 30] have been documented.

Postoperative complications such as pneumothorax [19, 32, 33], pulmonary atelectasis [19, 32, 33], esophageal fistula [10], esophageal perforation [31, 33], gastric

perforation [33], deep venous thrombosis [10], paraesophageal hernia [19], splenic injury [31], and adhesions [31] were reported after primary Heller myotomy procedure. Complications were comparatively less after revisional surgeries and the overall mortality rate was 0.63%. Higher mortality rates of 3–5% were reported [11, 16, 24], but 91% studies reported zero mortality rates after revisional surgeries.

We could demonstrate the changing trends in approach while performing Heller myotomy. It was not till 1991, when Shimi et al. published their report of performing laparoscopic cardiomyotomy for achalasia; this procedure was performed as an open surgical procedure. In fact, in eight studies that include 1,181 patients, this procedure was done via thoracic approach and was considered a standard approach till late 1980s. The advent of laparoscopic surgery has been pivotal in treating achalasia. Since 1995, out of 13 studies identified, 52.5% procedures were done laparoscopically from eight different centers, whereas 47.4% were performed as open procedures published from five surgical centers. Although the overall cases reported for laparoscopic Heller myotomy (5.2%) are low, the trend has increased since the past 10 years. Similar variation was seen in revisional cases where majority of the cases (97.7%) were completed as an open procedure, while only 2.3% of cases were laparoscopically treated.

The primary aim of this article was to study the reasons for revisional surgery in a previous Heller myotomy. Conditions that merit a revisional surgery included: incomplete myotomy, onset of reflux, esophageal carcinoma, megaesophagus or sigmoid esophagus, and the wrong diagnosis during the primary surgery (Table 3). A lower reoperative rate of 6.19% may be encouraging, but the average age of achalasia diagnosis is around the second or third decade of life, thus stressing importance of longer follow-ups in such patients.

Incomplete myotomy or scar tissue formation at the site of original myotomy is the main reason for surgical failure. In our analysis, the most common reason for revisional surgery, in 409 patients extracted from 25 reports, was categorized as a myotomy defect. Reason for revisional surgery in 79.4% ($n=325$) from the above group was incomplete myotomy (92%) or scar formation (8%). Redo myotomy

Table 2 Comparative data between primary myotomy and revisional surgery

	Initial Heller's myotomy		Revisional surgery	
	Open	Laparoscopic	Open	Laparoscopic
N	12076	626	769	18
%	95.07	4.9	97.7	2.28

Table 3 Reasons for revisional surgery

Causes of revisional surgery	N	%
Failure of myotomy	409	51.8
Onset of reflux	269	34.0
Esophageal carcinoma	24	3.04
Wrong diagnosis of achalasia	8	0.9
Mega esophagus	128	16.2

at the same site was performed in majority of these patients (65.2%). A fresh myotomy was performed in 34.8% of patients [12, 23, 32]. In our review new onset of reflux disorder after undergoing Heller myotomy was seen in 32% cases that required a revisional surgery. Esophageal cancer was seen in 3.04%, while megaesophagus was the reason for revisional surgery in 16.2% patients. Symptoms due to achalasia improved after successful cardiomyotomy as reported by many case series from across the globe, but the basic disease process remains unchanged in spite of such a surgical procedure. Due to this, we feel that follow-up plays a vital role in assessing long-term outcomes after Heller myotomy. In our study, 51% of case series provided follow-up information whereas 16 articles had no follow-up data. Our overall mean follow-up was 101.3 months, with a higher mean duration of follow-up (105.8 months) among open cases than among laparoscopic cases (25.7 months).

Discussion

Our systematic review of the literature for revisional surgery following Heller myotomy revealed a 6.19% rate of reoperation with a low mortality rate. A few patients underwent concomitant antireflux procedures during the primary operation. Most of the long-term follow-up has been in patients who underwent an open approach. Our study shows a higher rate (6.19%) of revisional surgeries than the previous studies. We have good follow-up data from only 51% of the patients in reviewed studies. Assuming the rate of reoperation is higher than 6.19%, it becomes clear to stress the importance of longer follow up to at least 10 or more years. Extending the duration of follow-up would document the natural history of individuals who receive Heller myotomy for achalasia.

Our study showed that after 1995, 52.3% of patients had their surgeries completed laparoscopically. Only 2.3% of reoperations during this time period were done laparoscopically. As laparoscopic techniques have evolved, it is apparent that primary Heller myotomy is well suited for minimally invasive techniques due to the resolution of image, clarity of deeper tissues, and tissue handling. Usually revisional or reoperations pose more challenges to the surgeon due to fibrosis and altered tissue planes as a result of past surgery.

Incomplete myotomy was the major reason for revisional surgery. Our study showed that 79.4% of patients who underwent revisional surgery had an incomplete myotomy. This rate we assume will be reduced with the use of laparoscopes that would provide better visibility and higher tissue resolution. Esophageal cancer was seen in 3.04% which again stresses the need for having a long-term follow-up of at least 10 years after primary Heller myotomy to detect esophageal cancers at an early stage.

References

1. Lendrum FC (1937) Anatomic features of the cardiac orifice of the stomach with special reference to cardiospasm. *Arch Intern Med* 59:474–511
2. Willis T (1674) *Pharmaceutice Rationalis Sive Diatribe de Medicamentorum Operationibus in Human Corpore*. Hagae Comitibus, London
3. Heller E (1913) Extramukose Kardioplastik beim chronischen Kardiospasmus mit dilatation des oesophagus. *Mitt Grenzgeb Med Chir* 27:141–149
4. Zaijer JH (1923) Cardiospasm in the aged. *Ann Surg* 77:615–617
5. Earlam RJ, Ellis FH, Nobrega FT (1969) Achalasia of the esophagus in a small urban community. *Mayo Clin Proc* 44:478–483
6. Spiess AE, Kahrilas PJ (1998) Treating achalasia. From whalebone to laparoscope. *JAMA* 280:638–642
7. Shimi S, Nathanson LK, Cuschieri A (1991) Laparoscopic cardiomyotomy for achalasia. *J R Coll Surg Edinb* 36:152–154
8. Finlayson SG, Laycock WS, Birkmeyer JD (2003) National trends in utilization and outcomes of antireflux surgery. *Surg Endosc* 17:864–867
9. Howard PJ, Maher L, Pryde A (1992) Five-year prospective study of the incidence, clinical features, and diagnosis of achalasia in Edinburgh. *Gut* 33:1011–1015
10. Barker JR, Franklin RH (1971) Heller's operation for achalasia of the cardia. *Br J Surg* 58:466–468
11. Patrick DL, Payne WS, Olsen AM (1971) Reoperation for achalasia of the esophagus. *Arch Surg* 103:122–128
12. Ellis FH, Gibb SP (1975) Reoperation after esophagomyotomy for achalasia of the esophagus. *Am J Surg* 129:407–412
13. Black J, Vorbach AN, Collis JL (1976) Results of Heller's operation for achalasia of the oesophagus. The importance of hiatal repair. *Br J Surg* 63:949–953
14. Jara FM, Toledo-Pereyra LH, Lewis JW (1979) Long-term results of esophagomyotomy for achalasia of esophagus. *Arch Surg* 114:935–936
15. Okike N, Payne WS, Neufeld DM (1979) Esophagomyotomy versus forceful dilation for achalasia of the esophagus: results in 899 patients. *Ann Thorac Surg* 28:119–125
16. Fekete F, Breil P, Tossen JC (1982) Reoperation after Heller's operation for achalasia and other motility disorders of the esophagus: a study of eighty-one reoperations. *Int Surg* 67:103–110
17. Guarnier V, Gavino J (1983) The Heyrowsky operation associated with fundoplication for the treatment of patients with achalasia of the esophagus after failure of the cardiomyotomy. *Surg Gynecol Obstet* 157:450–454
18. Pai GP, Ellison RG, Rubin JW (1984) Two decades of experience with modified Heller's myotomy for achalasia. *Ann Thorac Surg* 38:201–206
19. Ellis FH, Crozier RE, Watkins E (1984) Operation for esophageal achalasia. Results of esophagomyotomy without an antireflux operation. *J Thorac Cardiovasc Surg* 88:344–351
20. Mercer CD, Hill LD (1986) Reoperation after failed esophagomyotomy for achalasia. *Can J Surg* 29:177–180
21. Ellis FH, Crozier RE, Gibb SP (1986) Reoperative achalasia surgery. *J Thorac Cardiovasc Surg* 92:859–865
22. Andreollo NA, Earlam RJ (1987) Heller's myotomy for achalasia: is an added anti-reflux procedure necessary? *Br J Surg* 74:765–769
23. Gonzalez EM, Alvarez AG, Garcia IL (1988) Results of surgical treatment of esophageal achalasia. Multicenter retrospective study of 1,856 cases. *Int Surg* 73:69–77
24. Gayet B, Fekete F (1991) Surgical management of failed esophagomyotomy (Heller's operation). *Hepatogastroenterol* 38:488–492

25. Ellis FH (1992) Ten to 20-year clinical results after short esophagomyotomy without an antireflux procedure (modified Heller's operation) for esophageal achalasia. *Eur J Cardio Thorac Surg* 6:86–90
26. Ellis FH (1993) Oesophagomyotomy for achalasia: a 22-year experience. *Br J Surg* 80:882–885
27. Malthaner RA, Todd TR, Miller L (1994) Long-term results in surgically managed esophageal achalasia. *Ann Thorac Surg* 58:1343–1347
28. DiSimone MP, Felice V, D'Errico A (1996) Onset timing of delayed complications and criteria of follow-up after operation for esophageal achalasia. *Ann Thorac Surg* 61:1106–1111
29. Kiss J, Voros A, Sziranyi E (1996) Management of failed Heller's operations. *Surg Today* 26:541–545
30. Ellis FH (1997) Failure after esophagomyotomy for esophageal motor disorders. Causes, prevention and management. *Chest Surg Clin N Am* 7:477–488
31. Zaninotto G, Costantini M, Molena D (2000) Treatment of esophageal achalasia with laparoscopic Heller myotomy and Dor partial anterior fundoplication: prospective evaluation of 100 consecutive patients. *J Gastrointest Surg* 4:282–289
32. Donahue PE, Teresi M, Patel S (1999) Laparoscopic myotomy in achalasia: intraoperative evidence for myotomy of the gastric cardia. *Dis Esophagus* 12:30–36
33. Luketich JD, Fernando HC, Christie NA (2001) Outcomes after minimally invasive esophagomyotomy. *Ann Thorac Surg* 72:1909–1913
34. Gorecki PJ, Hinder RA, Libbey JS (2002) Redo laparoscopic surgery for achalasia. *Surg Endosc* 16:772–776
35. Raiss M, Hrorra A, Menfaa M (2002) Heller's myotomy without fundoplication: a series of 123 patients. *Ann Chir* 127:771–775
36. Fernandez AF, Martinez MA, Ruiz J (2003) Six years of experience in laparoscopic surgery of esophageal achalasia. *Surg Endosc* 17:153–156
37. Duffy PE, Awad ZT, Filipi CJ (2003) The laparoscopic reoperation of failed Heller myotomy. *Surg Endosc* 17:1046–1049
38. Shiino Y, Awad ZT, Haynatzki GR (2003) Postmyotomy dysphagia after laparoscopic surgery for achalasia. *World J Gastroenterol* 9:1129–1131
39. Codispoti M, Soon SY, Pugh G (2003) Clinical results of thoracoscopic Heller's myotomy in the treatment of achalasia. *Eur J Cardiothorac Surg* 24:620–624
40. Falkenback D, Johansson J, Oberg S (2003) Heller's esophagomyotomy with or without a 360–0 floppy Nissen fundoplication for achalasia. Long-term results from a prospective randomized study. *Dis Esophagus* 16:284–290
41. Liu JF, Zhang J, Tian ZQ (2004) Long-term outcome of esophageal myotomy for achalasia. *World J Gastroenterol* 10:287–291
42. Rossetti G, Bruscianno L, Amato G (2005) A total fundoplication is not an obstacle to esophageal emptying after Heller myotomy for achalasia. *Ann Surg* 241:614–621