Peroral Endoscopic Myotomy (POEM)

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Case Presentation

A 25 y/o male presents with dysphagia x 1year

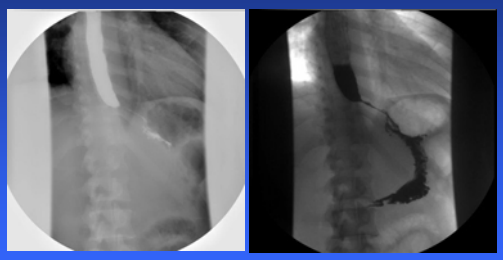
-Initially dysphagia to liquids then solids also

-Chest pain intermittently while eating

-10 lb weight loss

- Failed empiric Savary dilation

Barium Swallow



Eckardt score

Table 1
Eckardt Scoring system for oesophageal achalasia [6]. Higher numbers indicating more pronounced symptoms. Symptom relief (clinical success) was defined for an Eckardt Score ≤3.

Score	Symptom			
	Weight loss (kg)	Dysphagia	Retrosternal pain	Regurgitation
0	None	None	None	None
1	<5	Occasional	Occasional	Occasional
2	5-10	Daily	Daily	Daily
3	>10	Each meal	Each meal	Each meal

Kumagai K, et al. Peroral endoscopic myotomy (POEM) for oesophageal achalasia. Preliminary results in humans. Dig Liver Dis 2012;44:827-32.

Treatment of Achalasia

Medical Therapy with muscle relaxants

- Nitrates/Ca-channel blockers largely ineffective with ≤ 20% partial response
- Continued treatment required

Botox injection

TABLE 1. Results Obtained With Endoscopic Botulinum Toxin Injection in the Treatment of Achalasia

Author (Reference No.)	Year	Design	n	Botulinum Toxin (Units)	Follow-up (mo)	Decrease LESP (%)	Symptom Improvement* (% of Patients) <1 mo	3 mo	6 mo	>12 mo	Received Treatment After EBTI n (%) Repeat EBTI	Dilation	Myotomy
Pasricha[13]	1996	PC	31	80	29	45	90	55	55	—	26 (84)	3 (10)	1 (3)
Fishman[14]	1996	PC	60	100	10	—	70	—	—	36	16 (27)	2 (3)	1 (2)
Cuilliere[48]	1997	PC	55	80	6	31	75	69	53	—	19 (35)	—	—
Gordon[49]	1997	PC	16	80	7	—	75	56	44	—	4 (25)	1 (6)	1 (6)
Wehrmann[50]	1999	PC	20	100	24	—	80	—	—	10	14 (70)	1 (5)	1 (5)
Kolbasnik[51]	1999	PC	30	80	21	—	—	77	57	39	14 (47)	3 (10)	1 (3)
D'Onofrio[52]	2002	PC	37	100	22	30	84	—	—	51	14 (38)	—	—
Neubrand[53]	2002	RC	25	25	30	31	64	—	—	39	14 (56)	1 (4)	1 (4)
Martinek[54]	2003	PC	41	100	26	35	93	83	—	55	10 (24)	1 (2)	4 (10)
							Mean (Range)						
Total			315		18 (6–30)	34.0 (30–45)	78.7 (64–93)	70 (55–83)	53.3 (44–57)	40.6 (10–55)	131 (46.6)	12 (3.8)	10 (3.2)

Campos et al, *Annals of Surgery 2009*

Pneumatic Balloon Dilation and Heller Myotomy

- LHM recommended as primary treatment of achalasia in patients at low surgical risk[1]
- Recent randomized MCT[2] found "Balloon dilation equivalent to laparoscopic Heller" (86% success vs. 90% success at 2 years) BUT dilation:
  - 4% perforation rate
  - Up to 4 endoscopies with dilation allowed in a period of 2 years (2 initially + 2 at 2 years if relapse) without considering this "treatment failure"

1. Vaezi M *Am J Gastroenterol* 1999
2. Boeckxstaens, *NEJM 2011*

Heller Myotomy

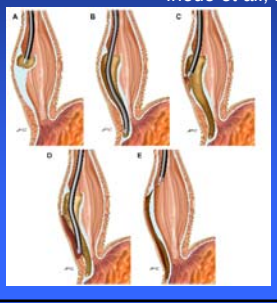
- Problems with Laparoscopic Heller Myotomy
  - Invasive
  - Severe reflux (20-100% of patients) requiring fundoplication with associated problems
  - Suboptimal efficacy in patients with type III achalasia (spastic achalasia)

Background – Submucosal Endoscopy

- Submucosal tunneling was initially described by Sumiyama and colleagues
- POEM was first described by Pasricha et al. in 2007 in swine experiments
- Inoue championed translating this innovative procedure into clinical care

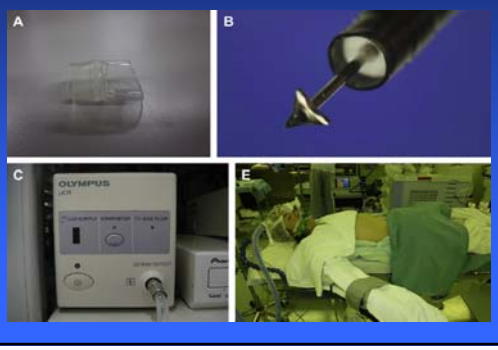
- Seminal initial publication of POEM in 17 patients
  - Mean dysphagia score decrease 10→1.3 (p=0.0003)
  - Mean LES pressure decrease 52.4→19 mm Hg (p=0.0001)
  - 1/17 (5.8 %) required PPIs for GERD symptoms

Inoue et al., Endoscopy 2010



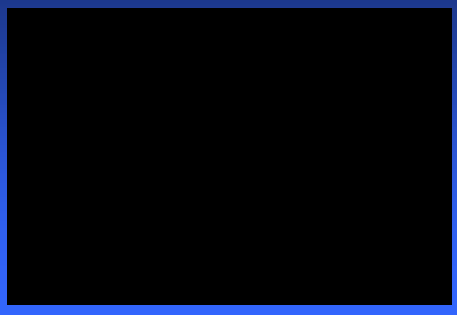
Inoue
Thor Surg Clin 2011

Equipment



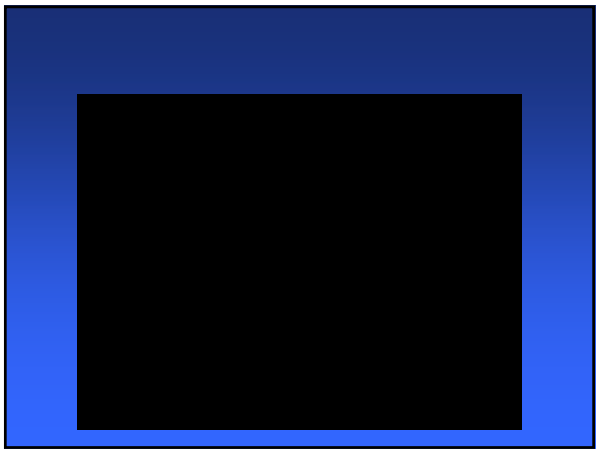
The POEM Procedure
Step 1: Mucosal Entry

- Submucosal injection of saline and indigo carmine in mid esophagus
- A 1.5-2cm longitudinal incision in the 2 o'clock position using dry cut mode
- If chest pain is a major symptom, incision should start more proximal



The POEM Procedure
Step 2: Submucosal Tunneling

- The tunnel is created distally by using a technique similar to ESD.
- The tunnel is passed over the GEJ and the gastric lumen is entered 2-3 cm distally
- Using a TT knife, the submucosal tissue is dissected using spray-coagulation mode at 50 W.

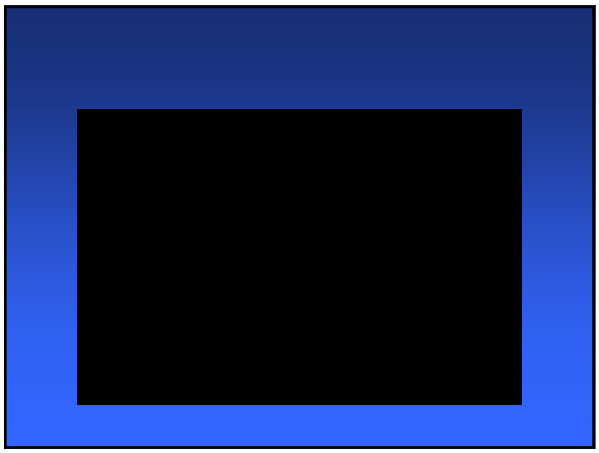


The POEM Procedure
Step 3: Endoscopic Myotomy

- The dissection of the circular muscle bundle is initiated 2 cm distal to the mucosal entry point.
- The circular fibers are divided using a spray-coagulation current at 50W.
- Only circular muscle bundles should be cut

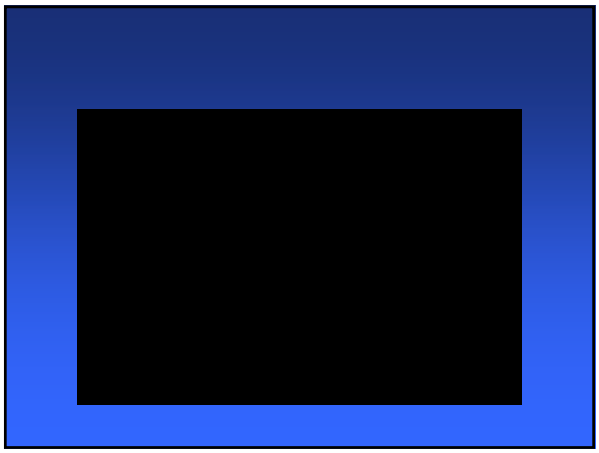
The POEM Procedure
Step 3: Endoscopic Myotomy

- The myotomy is extended for a distance of 2-3 cm on to the stomach
- Easy passage of the endoscope through the GEJ without resistance from within the native lumen provides confirmation of complete myotomy



The POEM Procedure
Step 4: Closure of Mucosal Entry

- The mucosal entry site, usually 2 to 3 cm long, is closed with 3-7 endoscopic clips
- The successful closure of mucosal entry is confirmed by endoscopic appearance
- Esophagram is obtained the following day



How to correctly assess depth of myotomy?

Double Endoscope Transillumination for Extent Confirmation Technique (DETECT)

Intraoperative determination of the adequacy of myotomy length during peroral endoscopic myotomy (POEM): the double-endoscope transillumination for extent confirmation technique (DETECT)

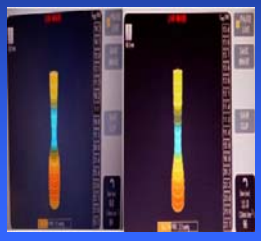
Khashab et al. Endoscopy 2015;47:925-8

Standard methods

- Insertion depth
- Resistance to passage of endoscope
- Vasculature
- Epinephrine injection

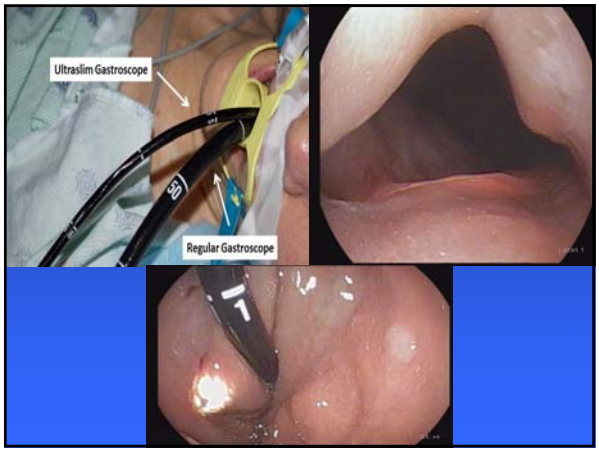
Newer methods

- Endoflip measurements

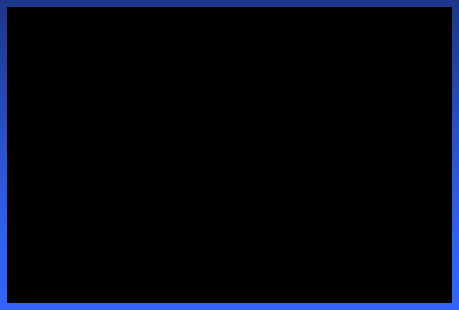


Newer methods

Double Endoscope Transillumination for Extent Confirmation Technique (DETECT)



Endoflip/DETECT



- DETECT helps ensure reliable myotomy length especially with less experienced operators
- It also aids these operators in perfecting use of the standard but less cumbersome techniques

Clinical Experience

Author (yr)	N	Myotomy (cm)	Pre LES pressure	Post LES pressure	Pre Eckhardt score	Post Eckhardt score
Inoue (2010)	17	8.1	52.4	19.9	10	1.3
Swanstrom (2011)	5	7	55.1	NR	NR	0-1
Costamagna (2012)	11	10.2	45.1	16.9	7.1	1.1
Von Renteln (2012)	16	12	27.2	11.8	8.8	1.4
Chiu (2012)	16	10.8	43.6	29.8	5.5	0
Swanstrom (2012)	18	9	45	16.8	6	0
Von Renteln (2013)	70	13	28	9	7	1
Familiari (2014)	100	12	40.2	19	8.1	1.1

Outcomes

- Significant clinical improvement with Eckhardt score ≤ 3 in >90%
- Average LOS 1-2 days
- Limited capnoperitoneum and subcutaneous emphysema occur and are clinically irrelevant (as long as air is not used)
- Visible capnoperitoneum is drained during procedure

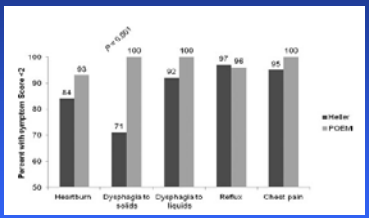
A Comparative Study on Comprehensive, Objective Outcomes of Laparoscopic Heller Myotomy With Per-Oral Endoscopic Myotomy (POEM) for Achalasia

- Swanstrom's group
- Annals of Surgery 2013

Operative details

	Heller n = 64	POEM n = 37	*P*
Operative time, min			
Median	160	120	0.003
Range	100–280	60–215	
Full-thickness injury, n			
Esophagus	8	4	0.1
Stomach	3	0	0.8
Return to the OR, n			
Bleeding	1	1	
Length of stay, mean days (SD)	2.5 (1.9)	1.1 (0.6)	<0.0001

Long-term relief of symptoms



Persistent post-operative symptoms

Early Symptoms*, %	Heller n = 63	POEM n = 37	*P*
Heartburn	3	11	0.2
Dysphagia to solid	10	5	0.4
Dysphagia to liquid	3	0	0.4
Reflux	6	5	0.6
Chest pain	5	5	0.6
Long-term symptoms†, %	n = 38	n = 27	
Heartburn	16	7	0.3
Dysphagia to solid	29	0	0.001
Dysphagia to liquid	8	0	0.2
Reflux	3	4	0.7
Chest pain	5	0	0.3

*Symptom score ≥2, within 2 wk of surgery.
†Symptom score ≥2, more than 6 mo after surgery.

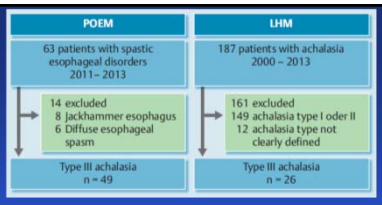
Acid Reflux

- Postoperatively, 39% of POEMs and 32% of HM had abnormal acid exposure (*P = 0.7*).

Peroral endoscopic myotomy (POEM) vs laparoscopic Heller myotomy (LHM) for the treatment of Type III achalasia in 75 patients: a multicenter comparative study

Authors: Vivek Kumbhari[1], Alan H Tieu[1], Manabu Onimaru[2], Mohammad H. El Zein[1], Ezra N. Teitelbaum[1], Michael B. Ujiki[3], Matthew E. Gitelis[4], Rani J. Modayil[4], Eric S. Hungness[3], Stavros N. Stavropoulos[4], Hiro Shiwaku[2], Rastislav Kunda[5], Philip Chiu[6], Payal Saxena[1], Ahmed A. Messallam[1], Haruhiro Inoue[2], Mouen A. Khashab[1]

Endosc Int Open 2015; 03: E195–E201



	POEM n=49	LHM n=26	P value
Median length of myotomy (cm)	16 (7–26)	8 (6–10)	<0.01
Median procedure time (min)	102 (43–345)	264 (189–331)	<0.01
Adverse events, n (%)			
Mild	2 (4)	1 (4)	1
Moderate	1 (2)	6 (23)	<0.01
Total	3 (6)	7 (27)	<0.01
Mean length of stay, days (SD)	3.3 (1.9)	3.2 (2.3)	0.68
PPI therapy, n (%)	19 (38.8)	12 (46.1)	0.7
Eckardt stage II or III, n (%)	1 (2.0)	5 (19.2)	0.01
Need for subsequent therapy, n (%)	0	2 (7.7)	0.11
Clinical response, n (%)	48 (98)	21 (80.8)	0.01

Potential advantages of POEM over HM

1. Less invasive
2. Shorter procedure time
3. Shorter hospital stay
4. Less postoperative pain
5. Eliminates wound complications
6. Eliminates need for antireflux surgery and its associated morbidity
7. Clear advantage in type III achalasia patients

Comprehensive analysis of efficacy and safety of peroral endoscopic myotomy performed by a gastroenterologist in the endoscopy unit: a single-center experience

Mouen A. Khashab, MD, Mohamad El Zein, MD, Vivek Kumbhari, MD, Sepideh Besharati, MD, Saowanee Ngamruengphong, MD, Ahmed Messallam, MD, Ahmed Abdelgalil, MD, Payal Saxena, MD, Alan H. Tieu, MD, Shreya Raja, MD, Ellen Stein, MD, Sameer Dhalla, MD, Patricia Garcia, MD, Vikesh K. Singh, MD, MSc, Pankaj J. Pasricha, MD, Anthony N. Kalloo, MD, John O. Clarke, MD

Baltimore, Maryland, USA

GIE 2016

TABLE 1. Patient and procedural characteristics

	POEM (N = 60)
Preoperative	
Age, y, mean ± SD	48.0 ± 16.5
Female, no. (%)	30 (50)
Disease type, no. (%)	
Achalasia type	
I	3 (5)
II	44 (74)
III	8 (14)
Jackhammer esophagus	5 (7)
Baseline Eckardt score, mean ± SD	8 ± 2
Grade II or III degree of dilation, no. (%)	14 (24)
Duration of symptoms, y, (range)	4.5 (1-15)
Previous therapy, no. (%)	24 (40)
Previous botulinum toxin, no. (%)	13 (22)
Previous pneumatic dilation, no. (%)	19 (32)
Previous Heller myotomy, no. (%)	6 (10)
Operative	
Approach, no. (%)	
Anterior	54 (90)
Posterior	6 (10)
Procedure length, min, mean (range)	99 (36-210)
Length of submucosal tunnel, cm, mean (range)	14 (9-25)
Length of myotomy, cm, mean (range)	11.7 (7-22)
Postoperative	
Length of hospital stay, d, median (range)	1 (1-9)
Clinical response (Eckardt score <3), no. (%)	48 (92.3)

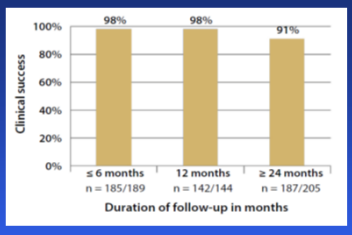
Outcomes

- There was significant decrease in the Eckardt score after POEM (8 vs 1.19, P < .0001).
- The mean LES pressure decreased significantly after POEM (29 mm Hg vs 11 mm Hg, P < .0001).
- Clinical response was observed in 48 patients (92.3%)
- Most (75%) of the patients who attained clinical response had either no or minimal residual symptoms after POEM (Eckardt score, 0 or 1).
- 10 (16.7%) adverse events, none severe

Long-term outcomes of per-oral endoscopic myotomy in patients with achalasia with a minimum follow-up of 2 years: an international multicenter study

Saowanee Ngamruengphong, MD,[1] Haruhiro Inoue, MD, PhD,[2] Philip Wai-Yan Chiu, MD, FRCSEd,[3] Hon Chi Yip, MD,[3] Amol Bapaye, MD,[4] Michael Ujiki, MD,[5] Lava Patel, MD,[5] Pankaj N. Desai, MD,[6] Bu Hayee, MBBS, PhD,[7] Amyn Haji, MD,[7] Vivien Wai-yin Wong, MD,[3] Silvana Perretta, MD,[8] Shivangi Dorwat, MD,[1] Mathieu Pioche, MD, PhD,[9] Sabine Roman, MD, PhD,[10,11] Jérôme Rivory, MD,[9] François Mion, MD,[10,11] Thierry Ponchon, MD, PhD,[9] Aurélien Garros, MD,[10,11] Jun Nakamura, MD, PhD,[2] Yoshitaka Hata, MD,[2] Valerio Balassone, MD,[2] Manabu Onimaru, MD, PhD,[2] Gulara Hajiyeva, MD,[1] Amr Ismail, MD,[1] Yen-I Chen, MD,[1] Majidah Bukhari, MD,[1] Yamile Haito-Chavez, MD,[1] Vivek Kumbhari, MD,[1] Roberta Maselli, MD,[12] Alessandro Repici, MD,[12] Mouen A. Khashab, MD[1]

GIE 2017, in press



Of 185 patients with clinical response at 6 months, 11 (6%) experienced recurrent symptoms at 2 years

- History of PD was associated with long-term treatment failure (OR 3.41; 95% CI .25-9.23).
- AE rate 8.2%, only 1 patient required surgical intervention.
- Abnormal esophageal acid exposure in 37% and reflux esophagitis in 18%

POEM for spastic esophageal disorders

Background

- Spastic esophageal disorders (SEDs):

1. Spastic (type III) achalasia
2. Diffuse esophageal spasm (DES)
3. Jackhammer (hypercontractile) esophagus

- Combined prevalence of 2%

Bredenoord et al. Neurogastroenterol Motil 2012;24 Suppl 1:57-65

Background

- Management of these spastic esophageal disorders is challenging and standard pharmacologic and endoscopic therapy fail in as many as 74% of patients

Patti MG et al. Arch Surg 1995;130:609-15

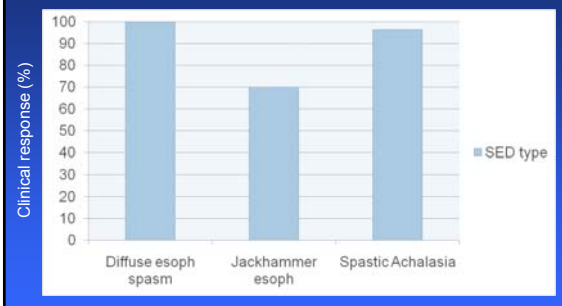
ORIGINAL ARTICLE: Clinical Endoscopy

International multicenter experience with peroral endoscopic myotomy for the treatment of spastic esophageal disorders refractory to medical therapy (with video)

Mouen A. Khashab, MD,[1] Ahmed A. Messallam, MD,[1] Manabu Onimaru, MD, PhD,[2] Ezra N. Teitelbaum, MD,[3] Michael B. Ujiki, MD,[3] Matthew E. Gitelis, BS,[4] Rani J. Modayil, MD,[3] Eric S. Hungness, MD,[3] Stavros N. Stavropoulos, MD,[3] Mohamad H. El Zein, MD,[1] Hironari Shiwaku, MD,[5] Rastislav Kunda, MD,[6] Alessandro Repici, MD,[7] Hitomi Minami, MD, PhD,[8] Philip W. Chiu, MD,[10] Jeffrey Ponsky, MD,[11] Vivek Kumbhari, MD,[1] Payal Saxena, MD,[1] Amit P. Maydeo, MD,[12] Haruhiro Inoue, MD, PhD[2]

Gastrointest Endosc 2015;81:1170-7

POEM in SED (Jackhammer)



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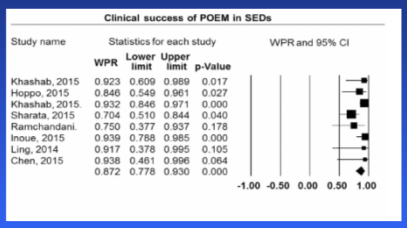
Is POEM the Answer for Management of Spastic Esophageal Disorders? A Systematic Review and Meta-Analysis

Muhammad Ali Khan[1] · Vivek Kumbhari[2] · Saowanee Ngamruengphong[2] · Amr Ismail[2] · Yen-I Chen[2] · Yamile Haito Chavez[2] · Majidah Bukhari[2] · Richard Nollan[2] · Mohammad Kashif Ismail[2] · Manabu Onimaru[3] · Valerio Balassone[3] · Ahmed Sharata[4] · Lee Swanstrom[4] · Haruhiro Inoue[3] · Alessandro Repici[5] · Mouen A. Khashab[2]

Dig Dis Sci (2017) 62:35–44

Weighted pooled rate for clinical success of POEM in SEDs



8 observational Studies, 179 pts

The WPRs for clinical success of POEM for type III achalasia, DES, and JH were 92, 88, and 72%, respectively.

Our patient

- Underwent POEM
- Mild subcutaneous emphysema
- Eating unrestricted diet without chest pain, dysphagia, regurgitation
- Gained 20 lbs after 1 month

Table 1
Eckardt Scoring system for oesophageal achalasia [6]. Higher numbers indicating more pronounced symptoms. Symptom relief (clinical success) was defined for an Eckardt Score ≤3.

Score	Symptom			
	Weight loss (kg)	Dysphagia	Retrosternal pain	Regurgitation
0	None	None	None	None
1	<5	Occasional	Occasional	Occasional
2	5-10	Daily	Daily	Daily
3	>10	Each meal	Each meal	Each meal

Thank you