Peroral Endoscopic Myotomy (POEM) for Achalasia:

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Case Presentation

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

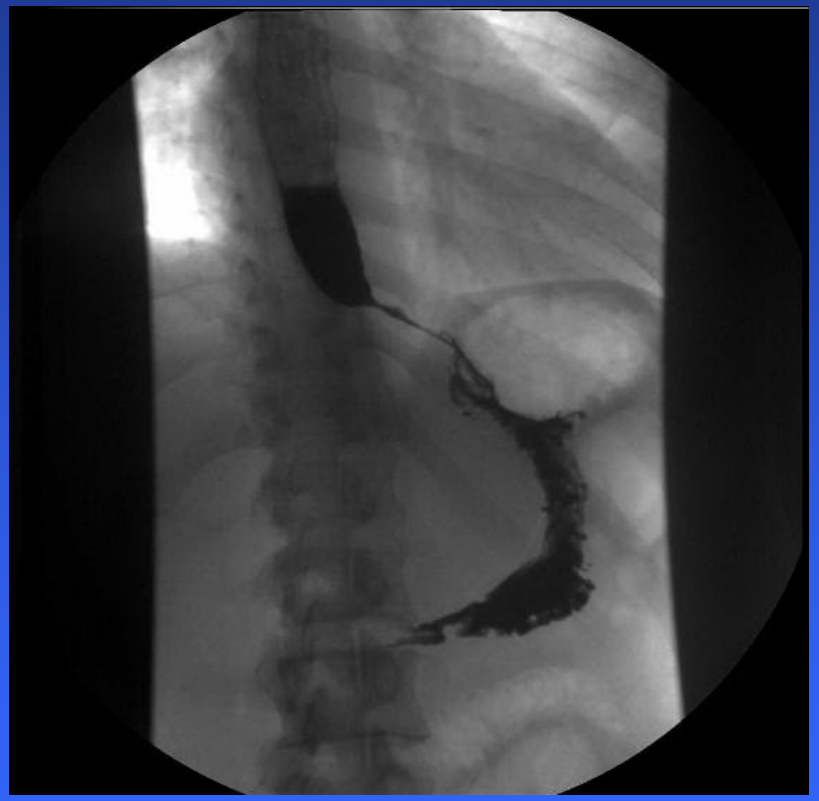
-Initially dysphagia to liquids then solids also

-Chest pain intermittently while eating

-10 lb weight loss

- Failed empiric Savary dilation

Barium Swallow



Subsequent Imaging: EGD

Distal and proximal esophageal biopsies with rare eosinophils, total of 6 biopsies

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

Costamagna G, et al. 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

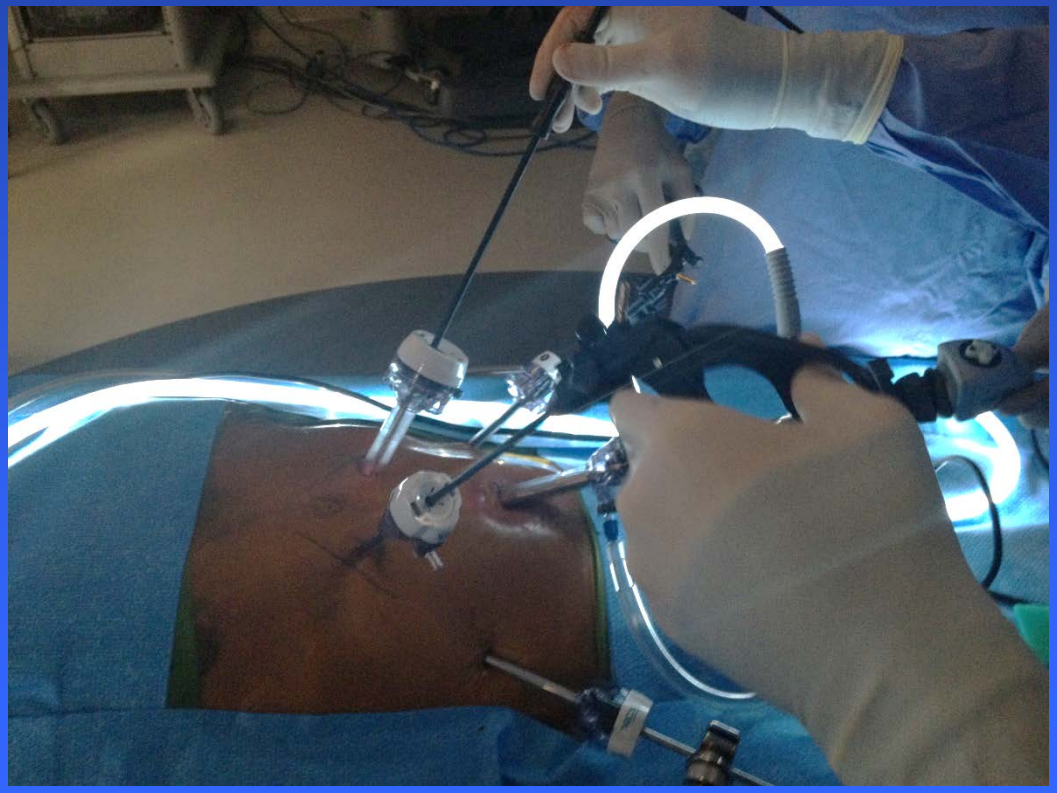
TABLE 1. Results Obtained With Endoscopic Botulinum Toxin Injection in the Treatment of Achalasia

Author (Reference No.)	Year	Design	n	Botulinum Toxin (Units)	Follow-up (mo)	Decrease LESP (%)	Symptom Improvement* (% of Patients)				Received Treatment After EBTI n (%)		
							<1 mo	3 mo	6 mo	>12 mo	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)

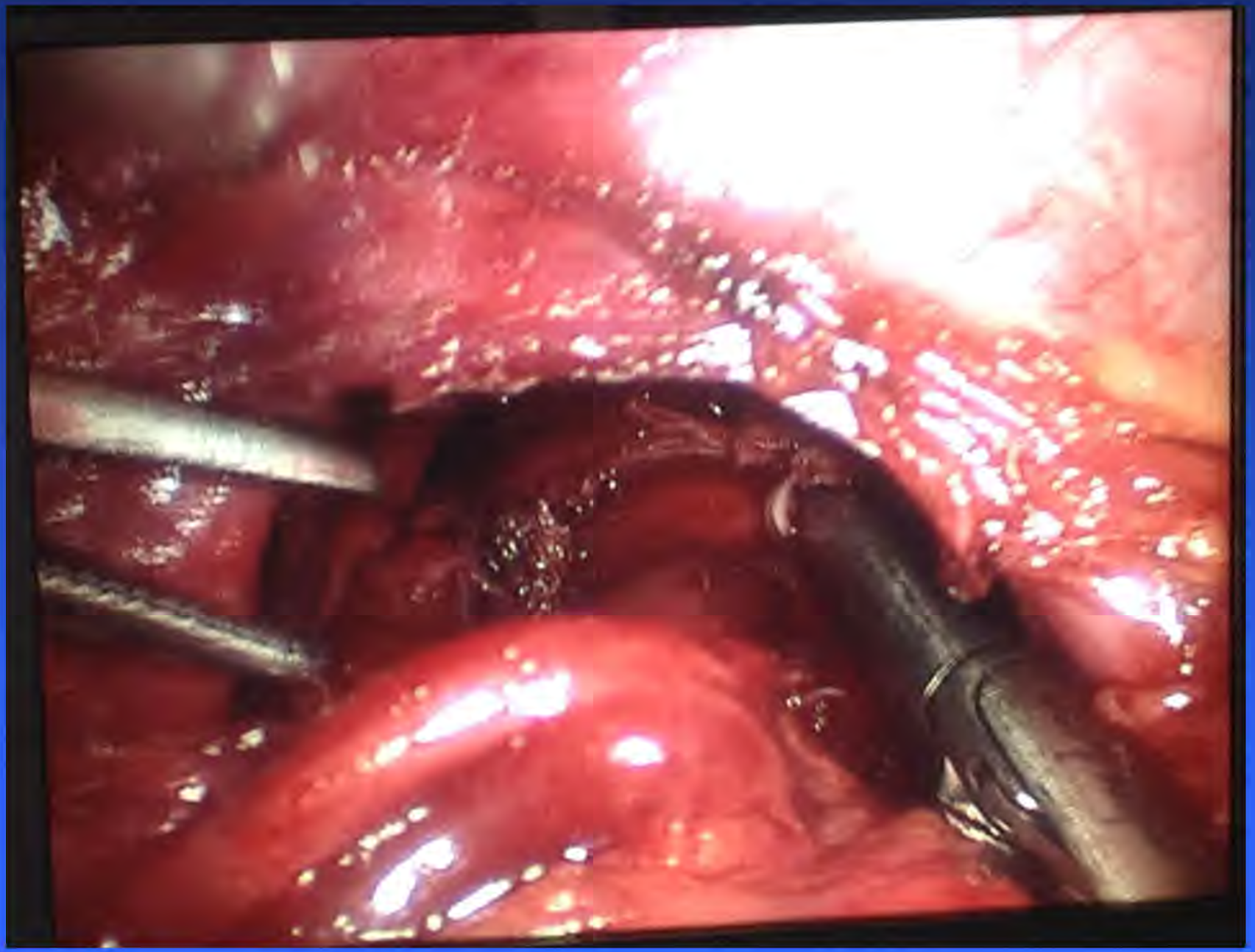
Campos et al, *Annals of Surgery 2009*

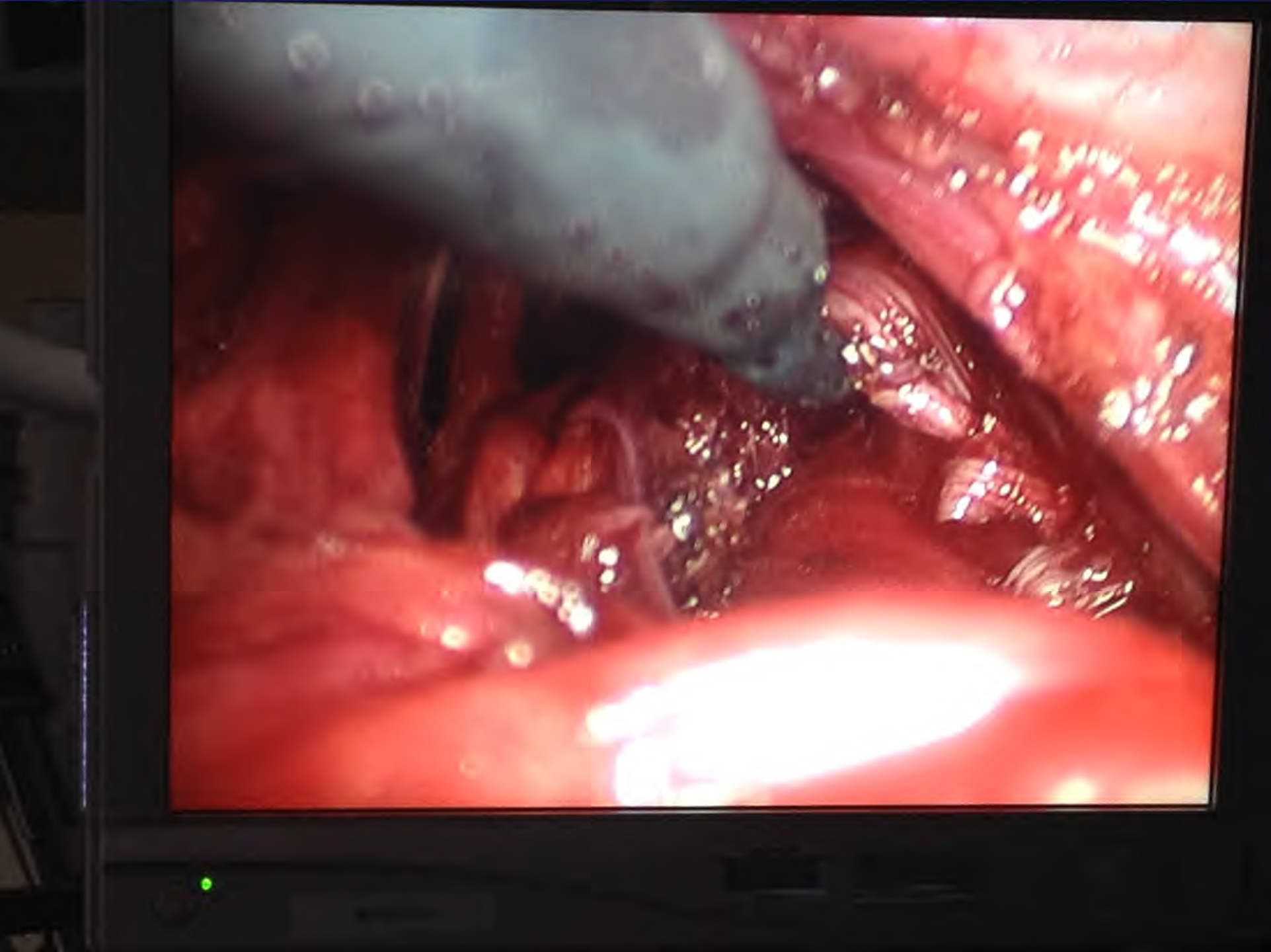
Pneumatic Balloon Dilation and Heller Myotomy

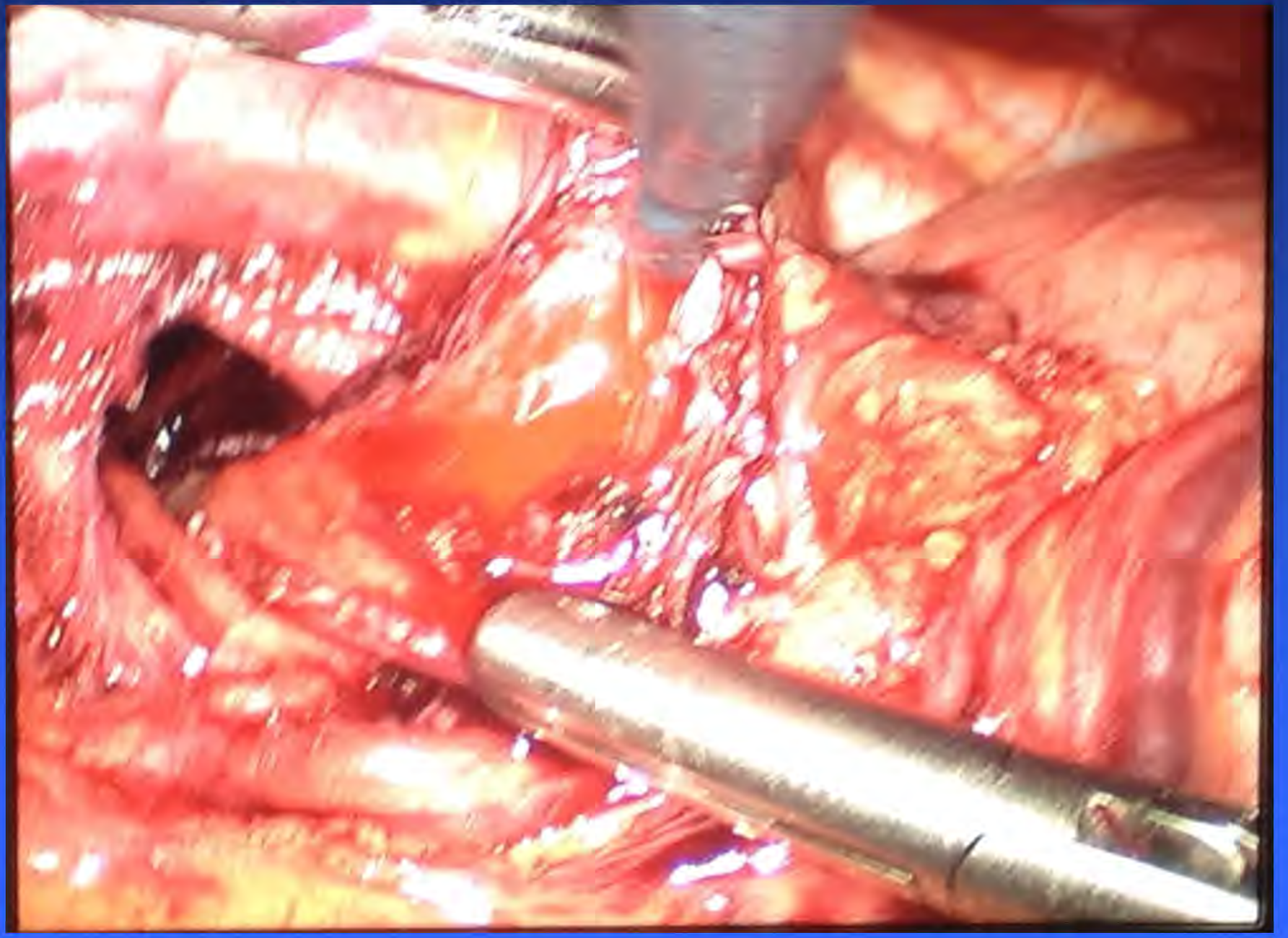
- LHM recommended as primary treatment of achalasia in patients at low surgical risk[1]

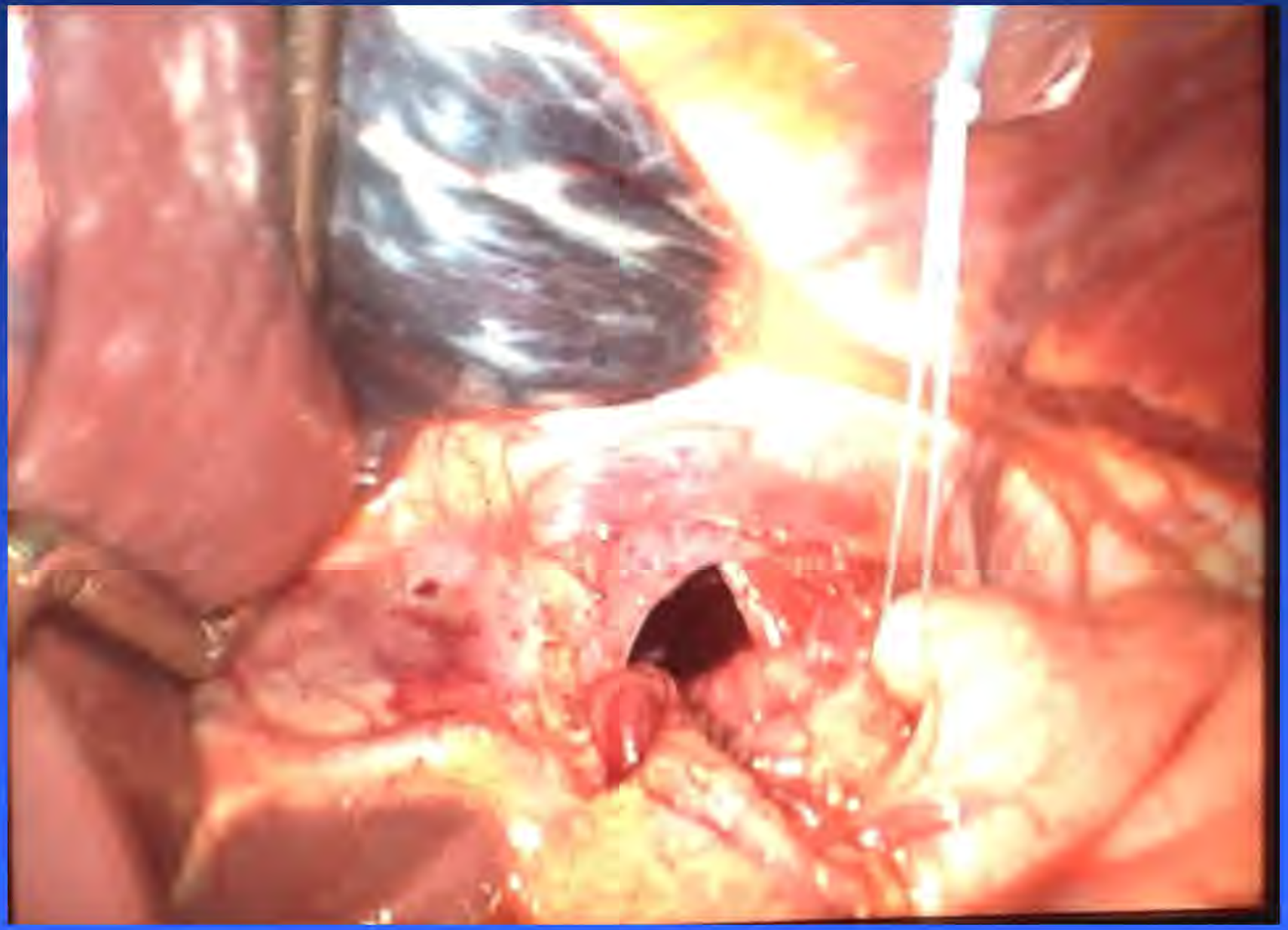


1. Vaezi M *Am J Gastroenterol* 1999









Heller Myotomy

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

Pneumatic Balloon Dilation and Heller Myotomy

- Recent randomized MCT[1] found “Balloon dilation equivalent to lap Heller”
- 86% success vs. 90% success at 2 years
- 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. Boeckxstaens, *NEJM 2011*

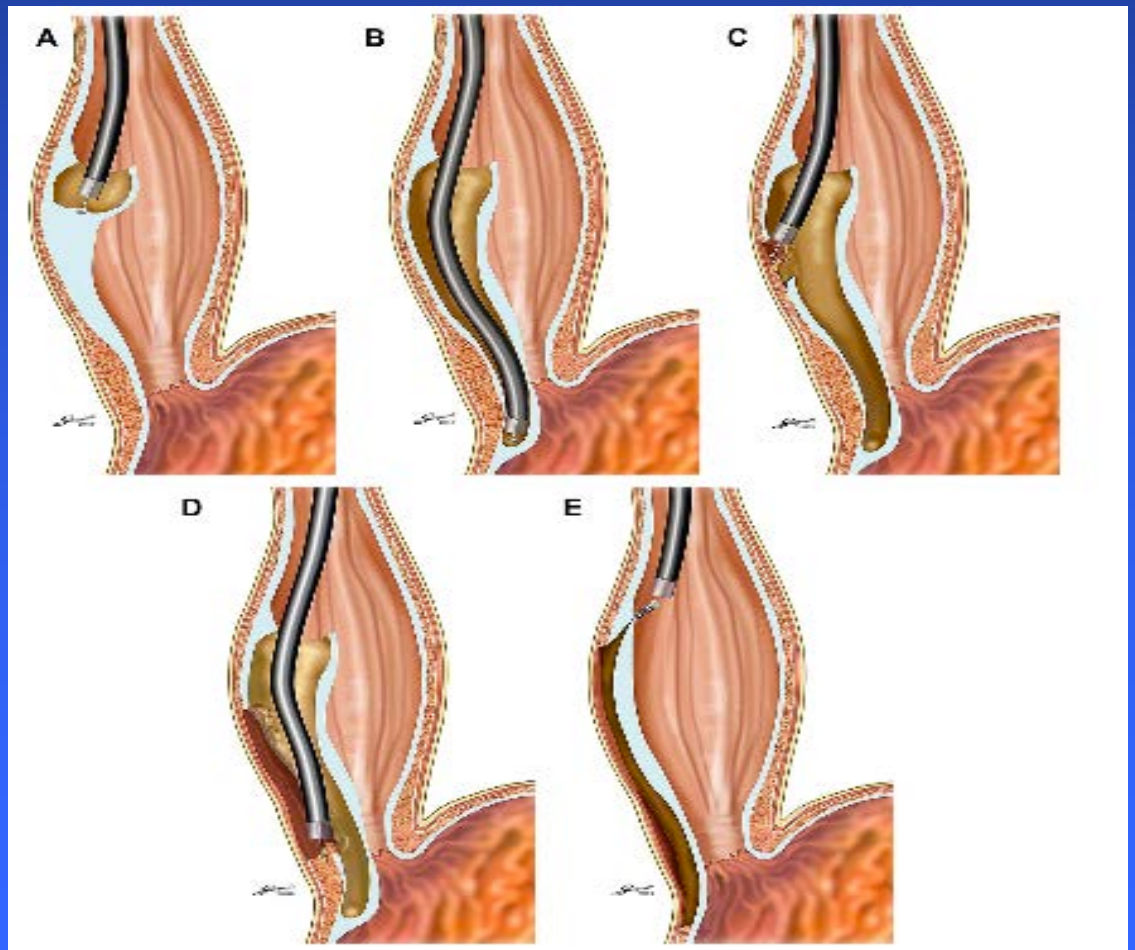
A procedure that effectively relieves dysphagia while avoiding iatrogenic reflux or long term fundoplication-related dysphagia is the holy grail of surgery for achalasia

Background

- 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

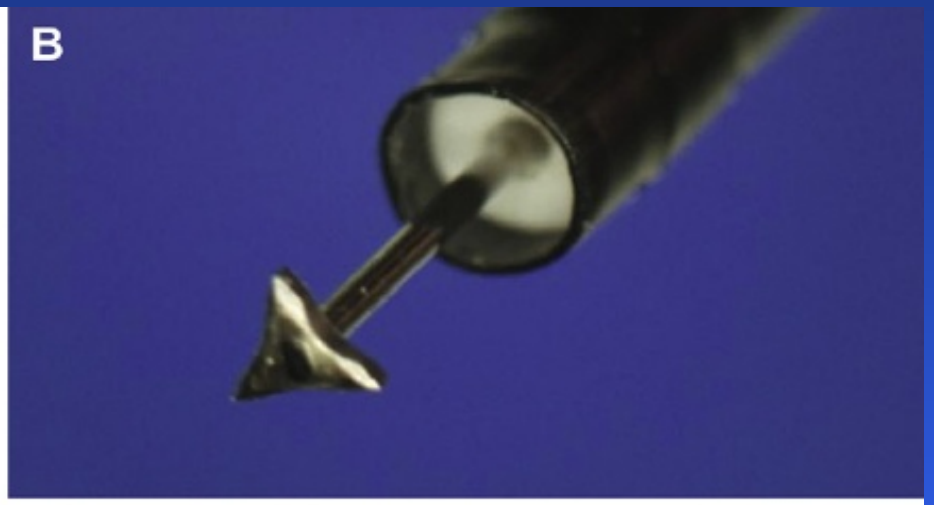
- Seminal initial publication of POEM in 17 patients
  - Mean Eckhardt score decrease 10→1.3 (p=0.0003)
  - Mean LES pressure decrease 52.4→19 mm Hg (p=0.0001)
  - 1/17 (5.8 %) required PPIs for GERD symptoms

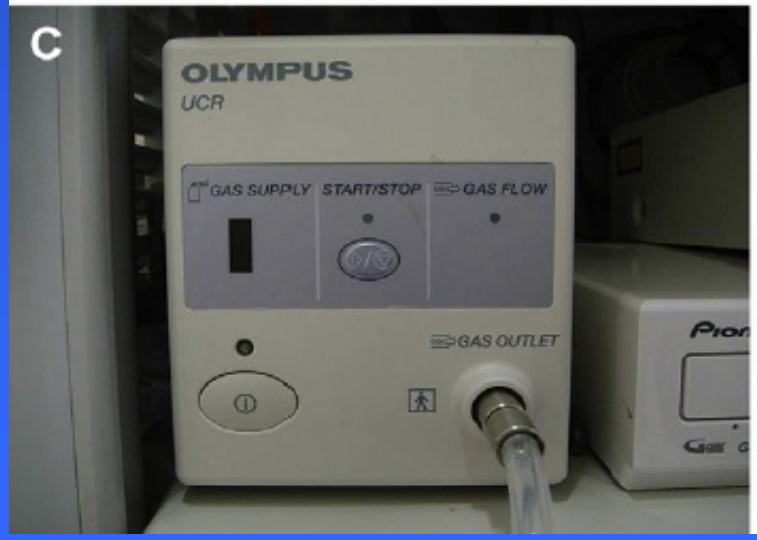
Inoue et al., Endoscopy 2010



Inoue
Thor Surg Clin 2011

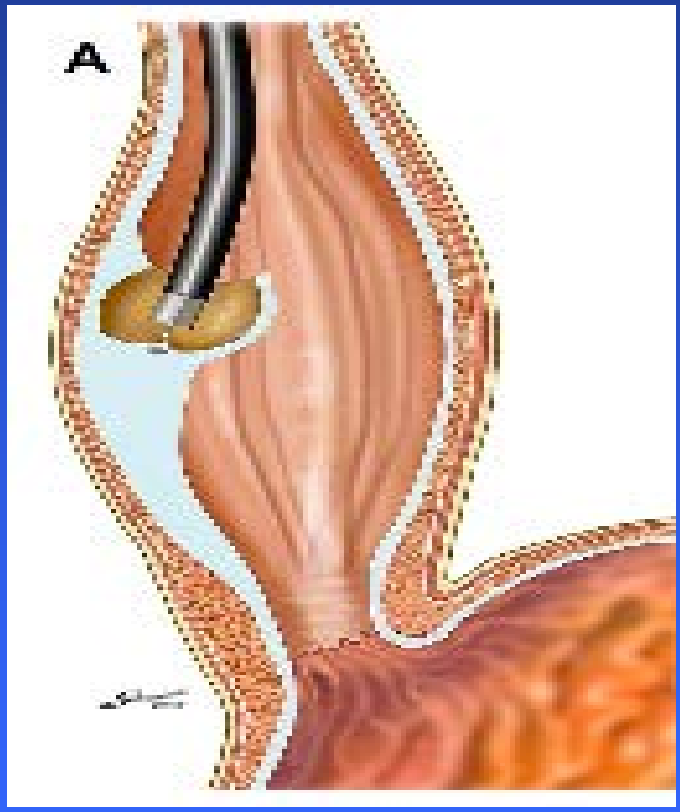
Equipment





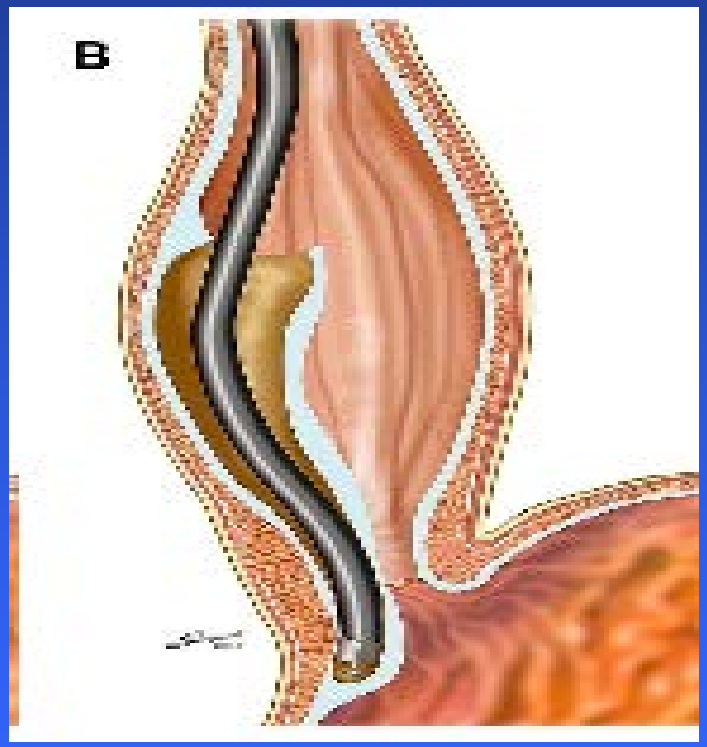
The POEM Procedure
Step 1: Mucosal Entry

- Submucosal injection of saline and indigo carmine in mid esophagus
- A 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



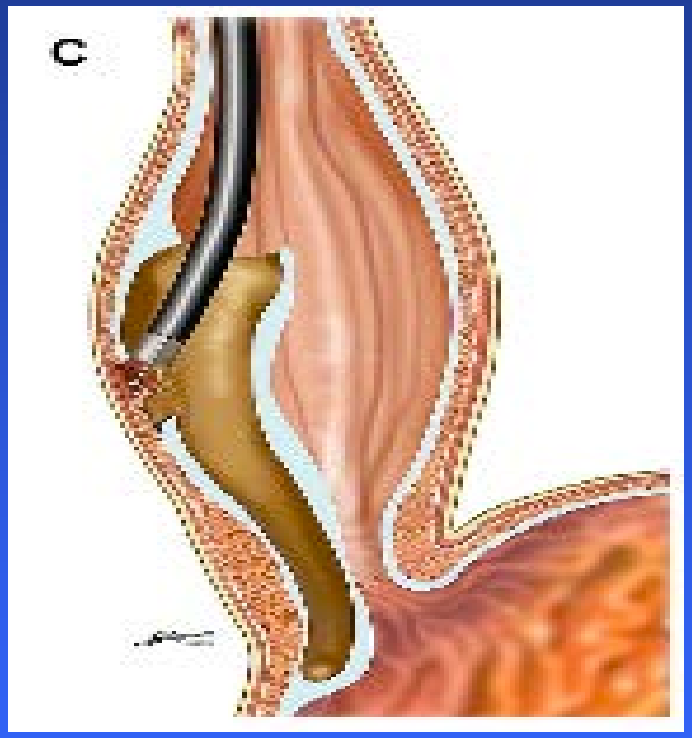
The POEM Procedure
Step 2: Submucosal Tunneling

- 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.



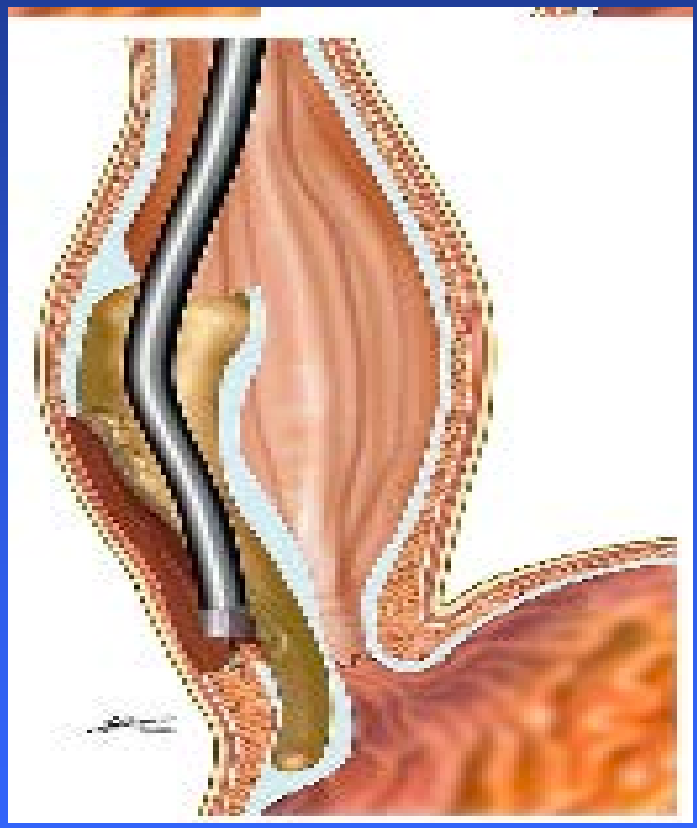
The POEM Procedure
Step 3: Endoscopic Myotomy

- 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.



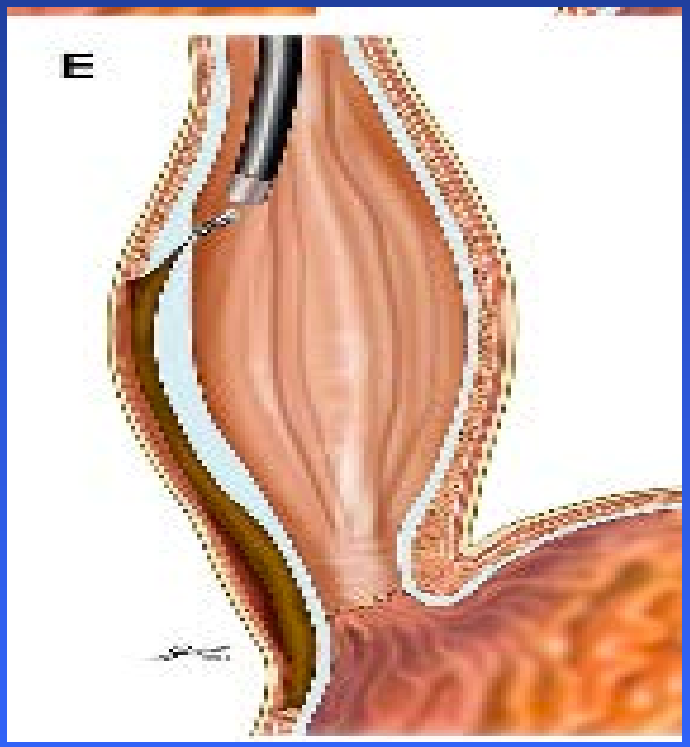
The POEM Procedure
Step 3: Endoscopic Myotomy

- 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

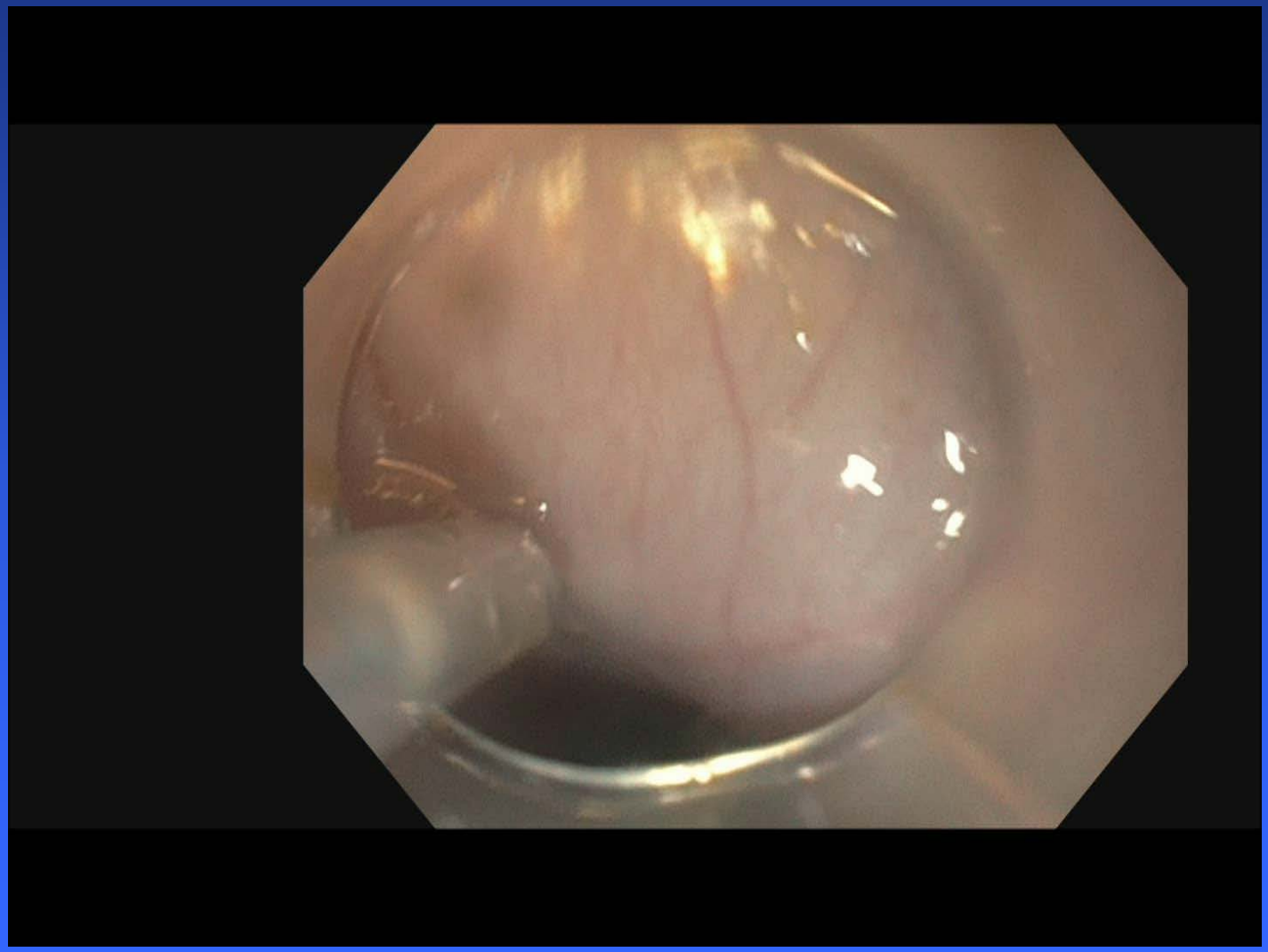


The POEM Procedure
Step 4: Closure of Mucosal Entry

- The mucosal entry site, usually 2 to 3 cm long, is closed with 5 to 10 endoscopic clips
- The successful closure of mucosal entry is confirmed by endoscopic appearance
- Esophagram is obtained the following day



POEM in a live porcine model



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

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

Outcomes

- Full-thickness myotomy is not infrequent
- Mucosal injury at the cardia my occur and can be treated with clips
- Abnormal esophageal acid exposure in 20-40% and GERD in 6%
- No deaths have been reported

Comparison of Perioperative Outcomes Between Peroral Esophageal Myotomy (POEM) and Laparoscopic Heller Myotomy

- Hungness et al. J Gastrointest Surg 2012
- POEM (n=18) vs. LHM (n=55)
- Focuses on perioperative outcomes

	POEM	LHM	*p* value
Median (range) operative time (min)	113 (88–220)	125 (90–195)	<.05
Myotomy length (cm)	9 (6–14)	8.5 (7–10)	.18
EBL (ml)	≤10 in all cases	50 (10–250)	<.001
Clips required to close mucosotomy	9 (7–17)	–	
Veress needle decompression of pneumoperitoneum	7 (39 %)	–	
Major complications (grade IIIb)	1 (6 %) - Esophageal perforation	1 (2 %) - Esophageal perforation	.45
Minor complications (grade I)	3 (17 %) - Subcutaneous emphysema - Atrial fibrillation - Urinary retention	7 (13 %) - Anterior vagus nerve division - Splenic capsule tear - Aspiration - Atrial fibrillation - Urinary retention ×2 - Readmission for chest pain	.71
Length of stay (days)	1 (1–13)	1 (1–19)	.63

Hungness et al. J Gastrointest Surg 2012

Comparison of Perioperative Outcomes Between Peroral Esophageal Myotomy (POEM) and Laparoscopic Heller Myotomy

- POEM and LHM appear to have similar perioperative outcomes.
- Further investigation is needed regarding long-term results after POEM.

Peroral endoscopic myotomy: A short-term comparison with the standard laparoscopic approach

- Ujiki et al.
- Surgery 2013;154:893-900
- POEM (n=18) vs. LHM (n=21)
- Baseline characteristics of both groups were equivalent

	POEM (n = *18*)			*Laparoscopic myotomy* (n = *21*)			
	Pre	*Post*	P	*Pre*	*Post*	P	P
Dysphagia score	3.4 ± 1.4	4.9 ± 0.3	.01	3.1 ± 1.0	4.5 ± 0.6	.001	ns
Eckardt score	6.4 ± 0.5	0.7 ± 0.5	<.0001	5.4±0.4	1.0 ± 0.4	<.0001	ns
Eckardt stage							
Stage 0	0	16		0	15		
Stage 1	1	1		0	2		
Stage 2	9	1		18	2		
Stage 3	8	0		3	2		
Length of stay (days)		3.4 ± 1.3			3.4 ± 0.9		ns
Complications		3			1		ns
Subcutaneous emphysema		2			0		
Perforation		1			1		
Pain medication* (mg)		26.0 ± 13.7			90.0 ± 48.5		.02
Visual analogue scale		3.9 ± 0.6			5.7 ± 0.4		.02
Return to ADL (days)		2.2 ± 0.6			6.4 ± 1.0		.03
Follow-up (days)		115.9 ± 25.1			164.3 ± 41.6		ns

Ujiki et al. Surgery 2013;154:893-900

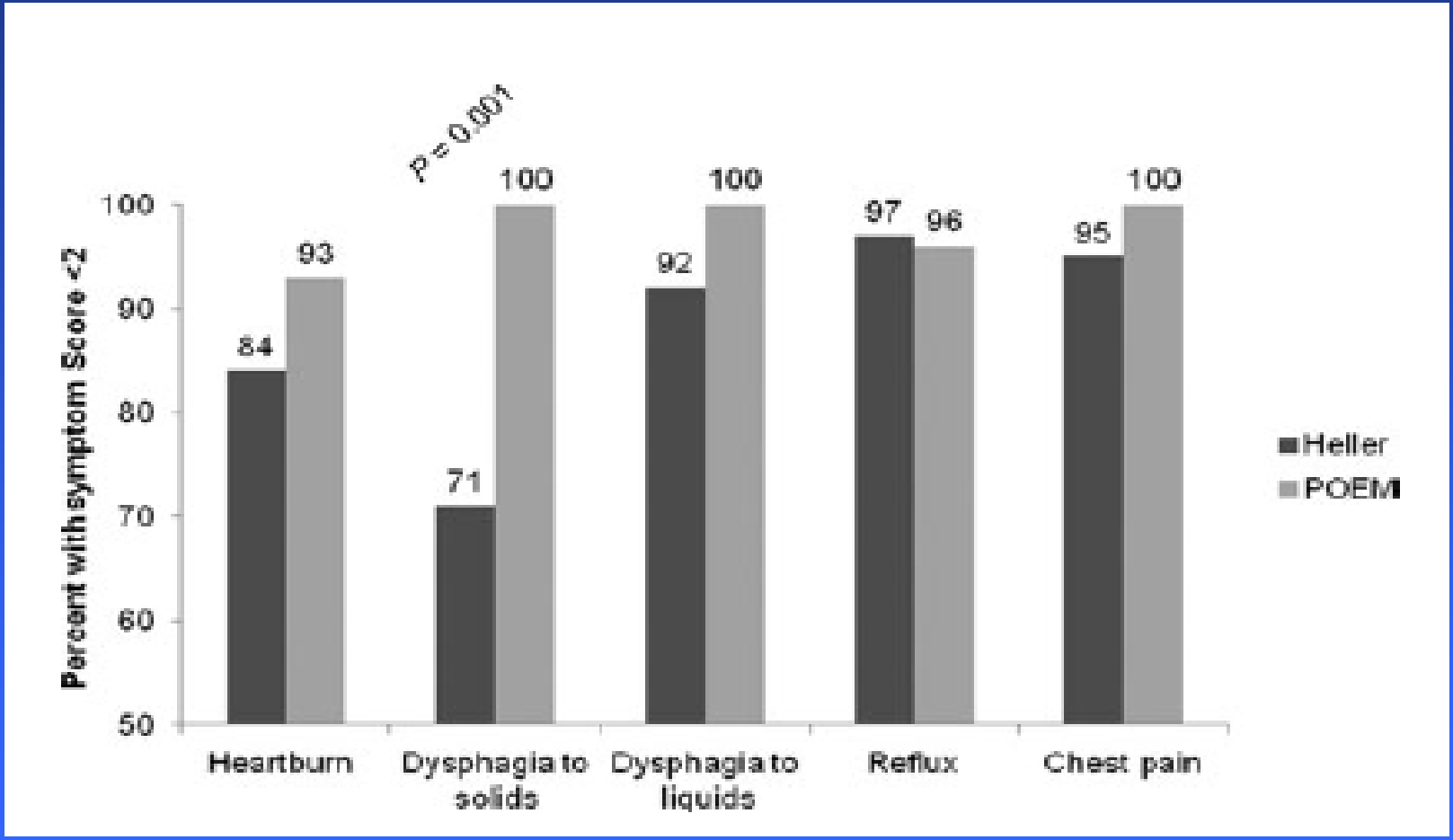
A Comparative Study on Comprehensive, Objective Outcomes of Laparoscopic Heller Myotomy With Per-Oral Endoscopic Myotomy (POEM) for Achalasia

- 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

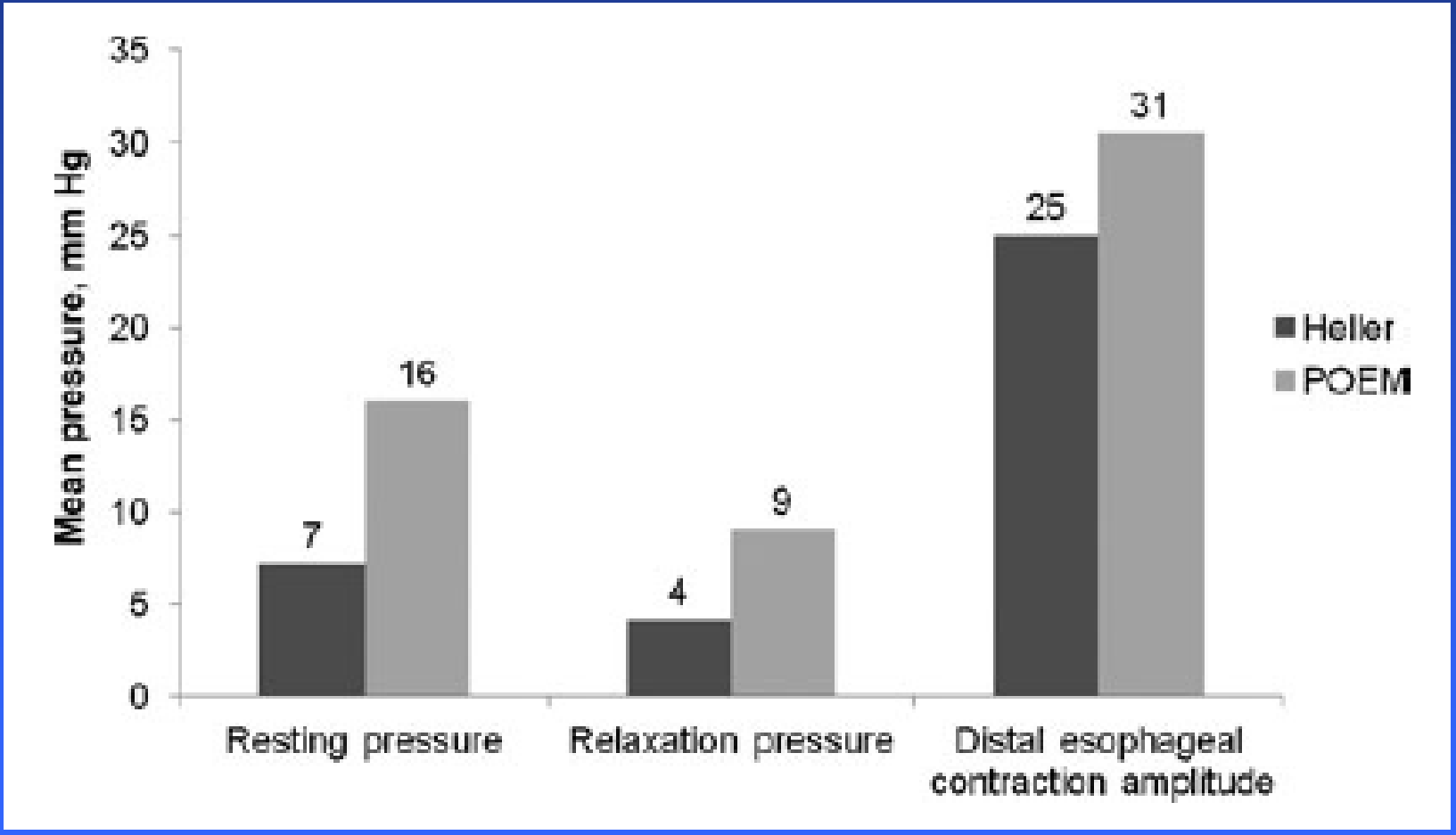


Persistent post-operative symptoms

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.

Long-term manometry



Acid Reflux

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

Authors' conclusions

- "Our data reported here directly compare HM and POEM and show similar rates of technical complications and, in fact, possibly better outcomes for the POEM procedure."

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 (suspensory esophageal ligaments)
7. Possible advantage in type III achalasia patients

Potential advantages of HM over POEM

1. Known long-term outcomes

So its just a matter of time

POEM after failed Heller Myotomy

Peroral endoscopic remyotomy for failed Heller myotomy: a prospective single-center study

Zhou et al. Endoscopy 2013;45:161-166

Peroral Endoscopic Myotomy Is a Viable Option for Failed Surgical Esophagocardiomyotomy Instead of Redo Surgical Heller Myotomy: A Single Center Prospective Study

Onimaru et al. J Am Coll Surg 2013;217:598-605

POEM after failed Heller

	Zhou et al	Onimaru et al.
Number of patients	12	10
Pre Eckhardt score	9.2	6.5
Post Eckhardt score	1.3	1.1
Pre LES pressure	29.4	22.1
Post LES pressure	13.5	10.9
Percent response	11/12 (92%)	10/10 (100%)

Our patient

- Underwent POEM
- Mild subcutaneous emphysema
- Eating unrestricted diet without chest pain, dysphagia, regurgitation 1.5 years after POEM
- 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