

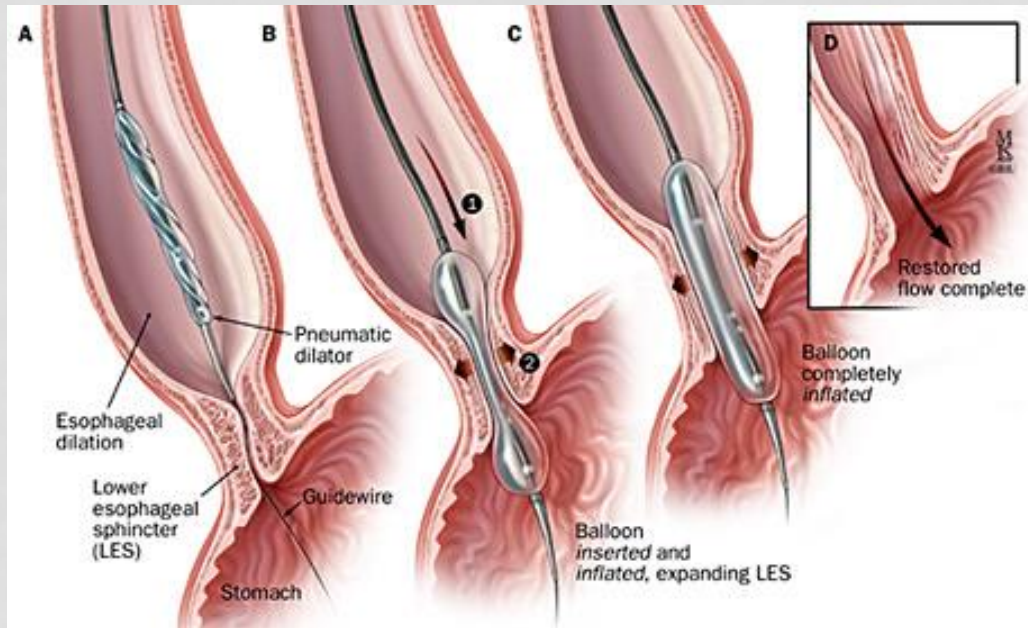
**Efficacy of Peroral Endoscopic Myotomy for Achalasia:
Evaluation of Treatment Effect using
Timed Barium Esophagography according to
the Diameter of Lower Esophageal Sphincter**

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INTRODUCTION

- **Achalasia**
 - Esophageal motility disorder
 - Absent peristalsis & incomplete LES opening
 - Sx: dysphagia, regurgitation
 - 1° achalasia: probably autoimmune disorder & neuronal degeneration of myenteric plexus ganglia
 - 2° achalasia: malignant tumor at EG junction, etc.
- Short-term control: Botulinum toxin injection to LES
- Long-term Tx: Pneumatic dilatation / Heller myotomy



Pneumatic dilatation

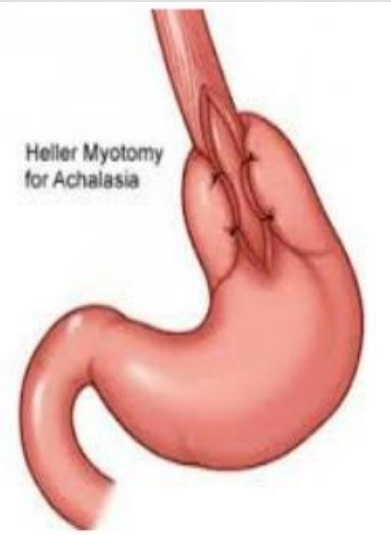
Surgical Treatment

• HELLER MYOTOMY

Cutting muscle of Lower esophagus & cardia.

Complication- GERD

Therefore Partial Anterior Fundoplication (HELLER-DOR's operation) is added.

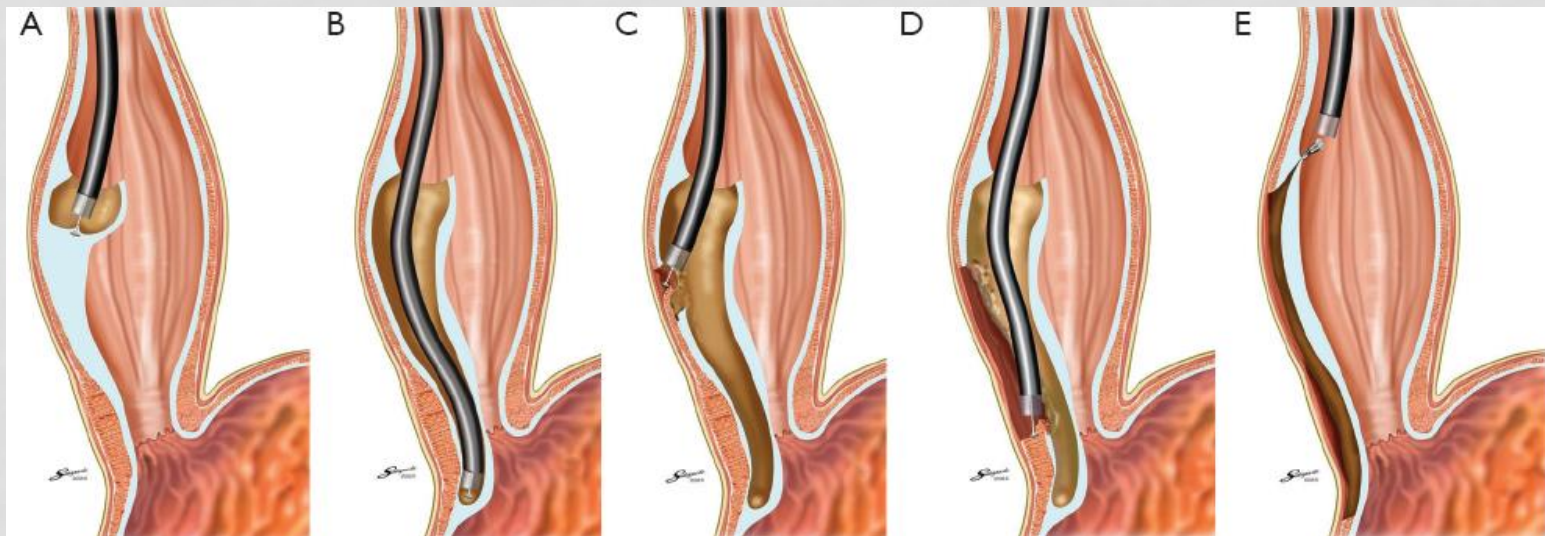


Heller myotomy

Google search

PERORAL ENDOSCOPIC MYOTOMY (POEM)

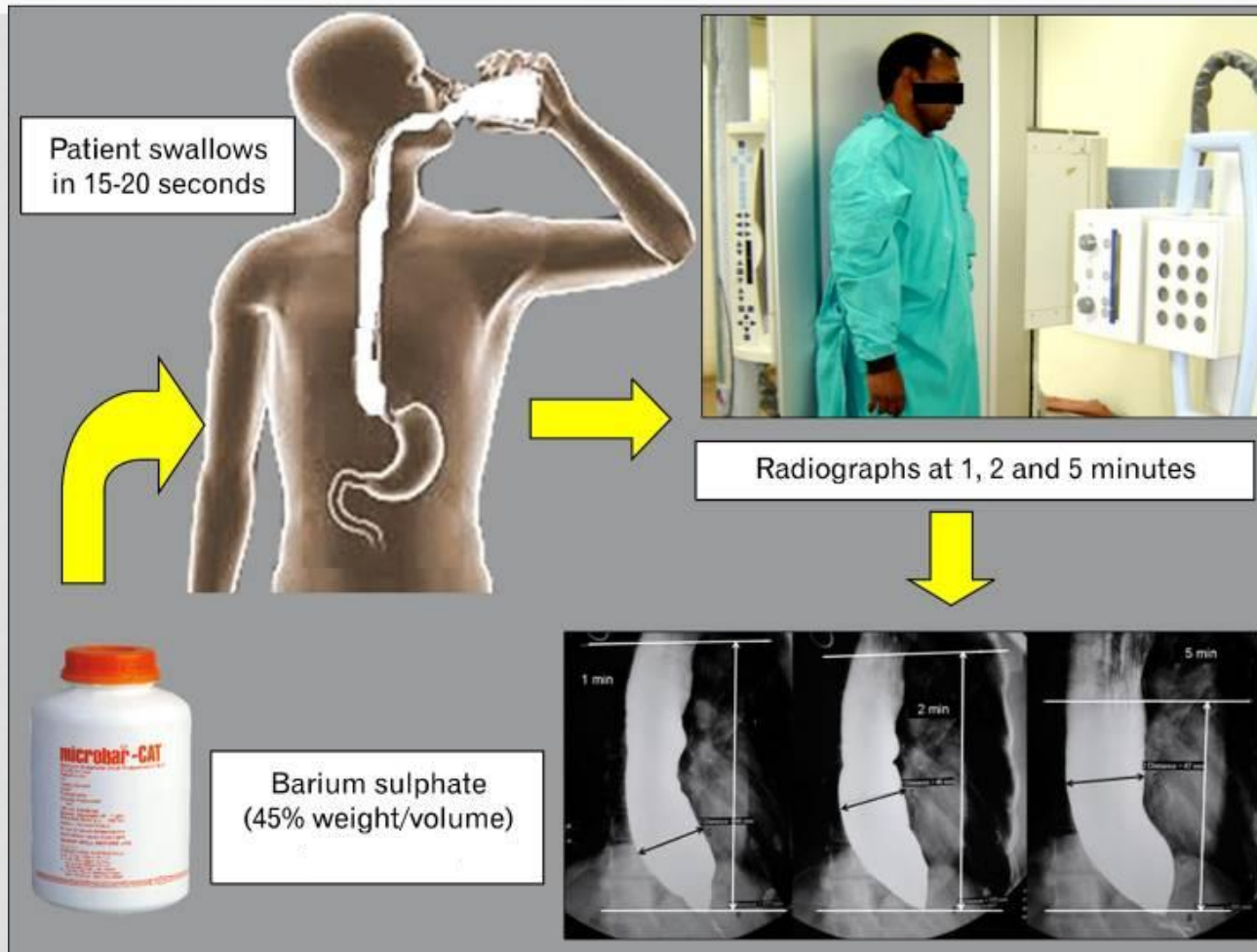
- Less invasive approach for long-term treatment since 2010
- Fewer complications (ex: esophageal perforation)
- Mucosal entry (A): incision at mucosa in the mid-esophagus
- Submucosal tunnel creation (B)
- Myotomy (C, D): transect the circular muscle of LES.
- Closure of mucosal entry with hemostatic clips (E)



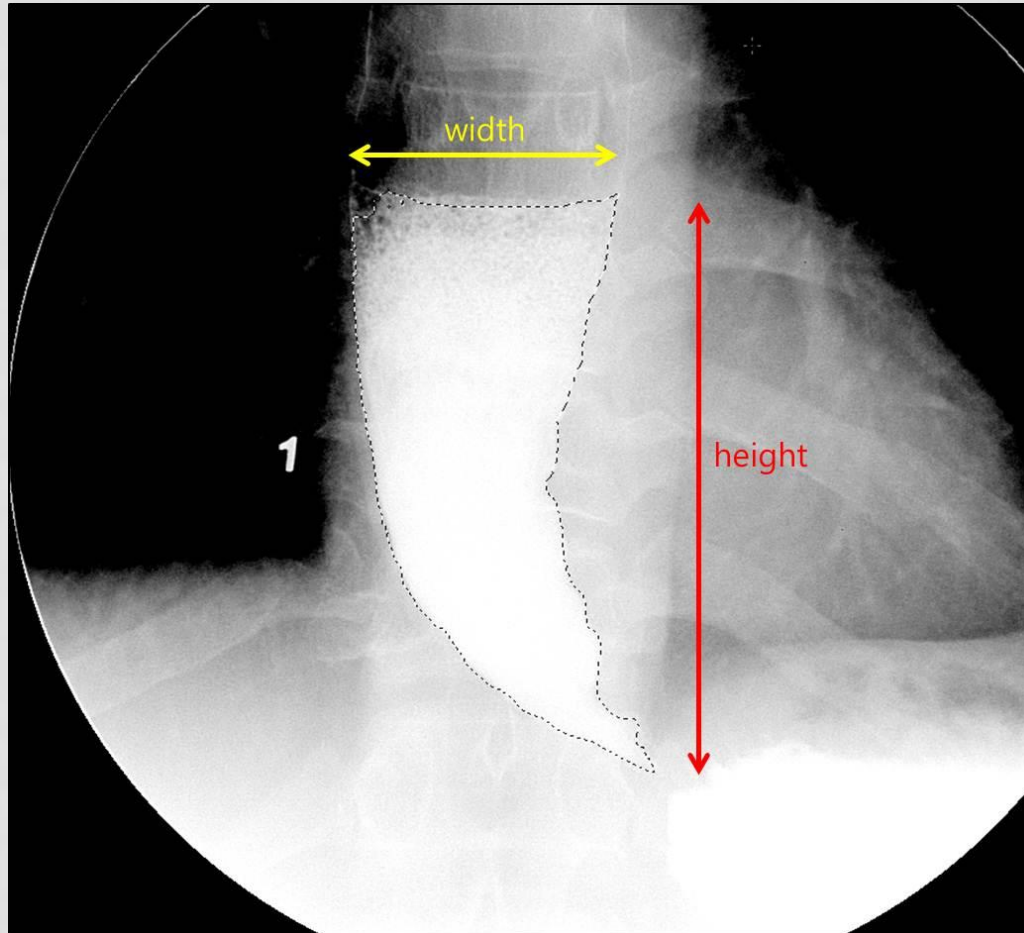
TIMED BARIUM ESOPHAGOGRAPHY (TBE)

- Erect posture under fluoroscopy
- Ingestion of 150~250 mL low-density barium sulphate (45% w/v) within 15-20 sec.
- Images at 1, 2, and 5 min after finishing the barium ingestion in the upright AP, LPO and LAO position.
- The barium column was centered on the monitor so that the height & width of the column were included within the monitor.
- All scanned images were sent to the PACS for interpretation.

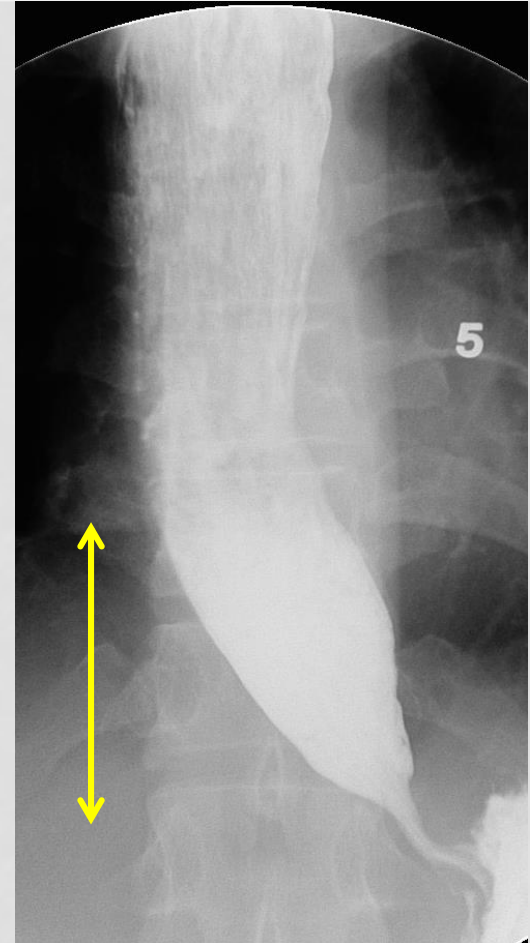
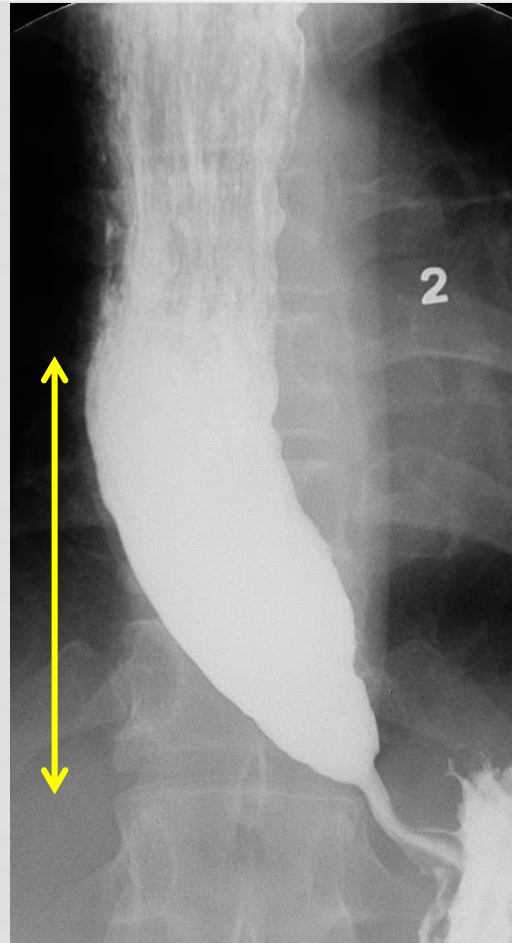
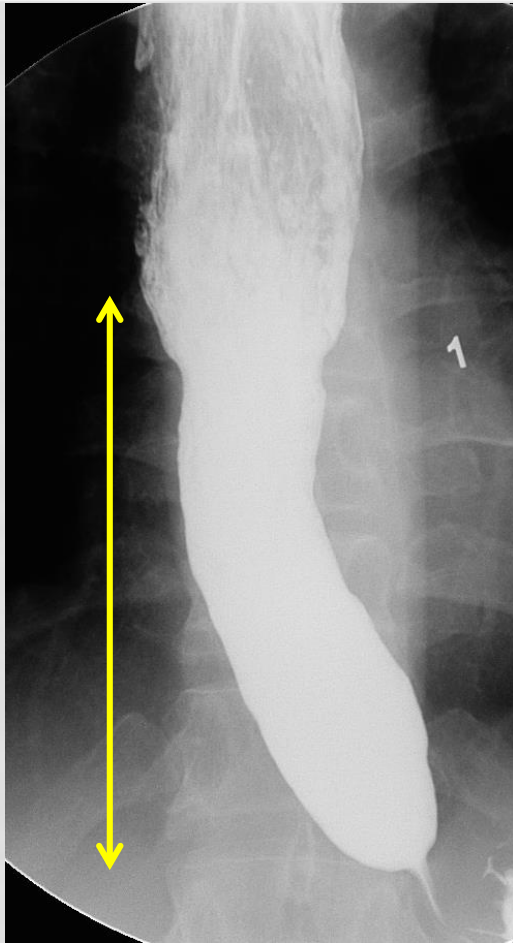
TECHNIQUE OF TBE



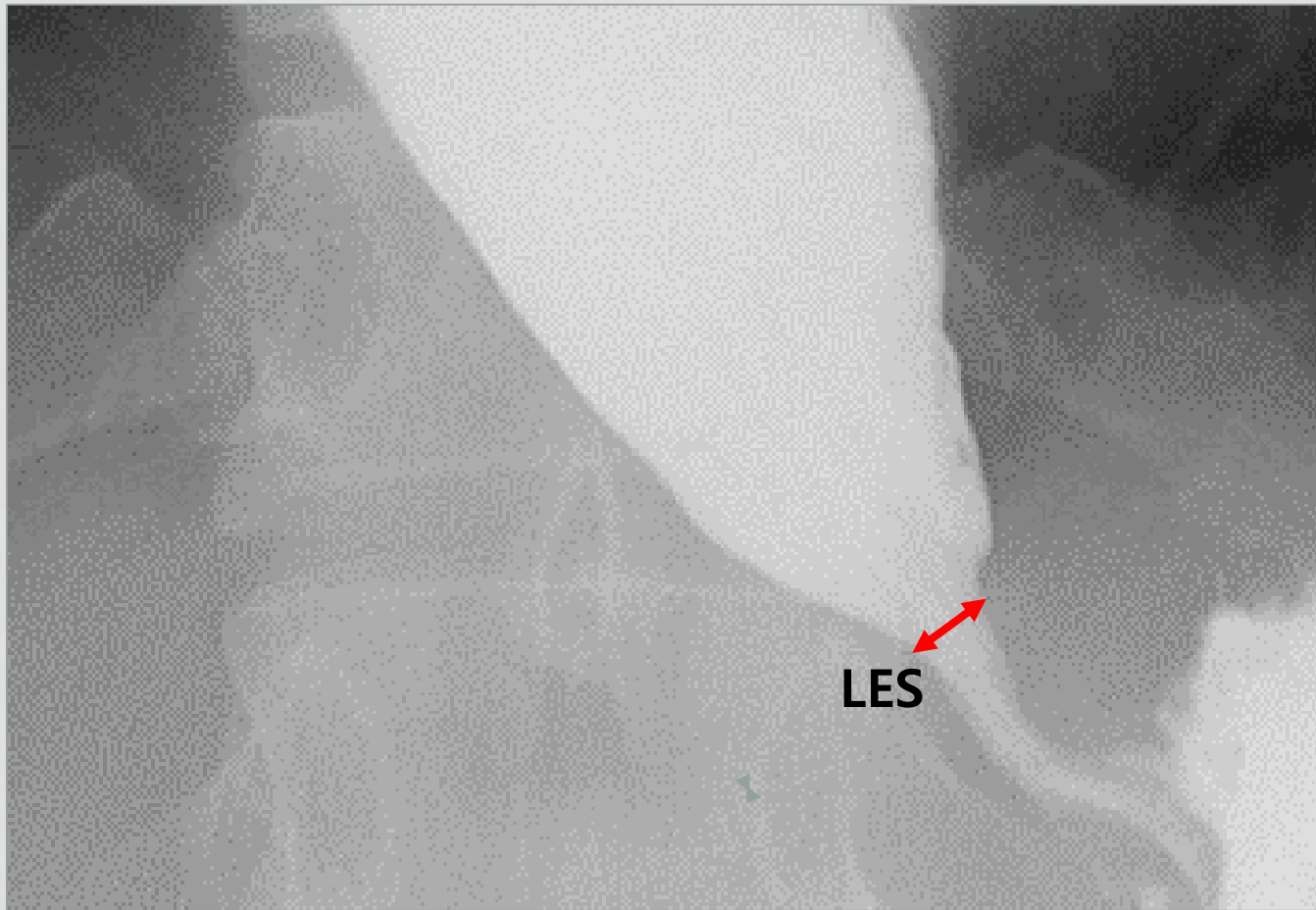
MEASUREMENT OF BARIUM COLUMN



TBE (1', 2', 5'- IMAGES)



MEASUREMENT OF LES



Achalasia Severity: Eckardt Score

Symptom/Sign	Score for each symptom/sign			
	0	1	2	3
Recent weight loss (Kg)	none	< 5	5-10	>10
Dysphagia	none	occasional	daily	each meal
Chest pain	none	occasional	daily	several times/day
Regurgitation	none	occasional	daily	each meal

PURPOSE

- To evaluate the efficacy of peroral endoscopic myotomy (POEM) for achalasia by measurement of the diameter of lower esophageal sphincter (LES) using timed barium esophagography (TBE) before and after POEM

MATERIALS & METHODS

- Thirty-two patients (M:F=20:12, mean age: 43 years-old) with pre- and post-POEM TBE were divided into 3 groups according to LES diameter (A: < 5 mm, B: 5~8 mm, C: > 8 mm). The increased value of LES after POEM were measured in each group for comparison of treatment effect.
- Esophageal shape (bird's beak [n=24], diffuse narrowing [n=4], tortuous [n=2], sigmoid [n=2]) on pre-POEM TBE, Eckardt score, and history of pre-POEM pneumatic dilatation [n=14] were also compared in each group.
- Statistical analysis: Kruskal-Wallis test (esophageal shape), Mann-Whitney U test (LES diameter group, prior pneumatic dilatation), or simple correlation (Eckardt score).

RESULTS

- The mean increased value of LES after POEM was 5.5 mm, 2.9 mm, and 3.3 mm in group A (n=10), B (n=18) and C (n=4), respectively.
- Group A showed statistically significant ($p < 0.01$) treatment effect, compared with group B, but there was no statistically significant difference ($p > 0.01$) between group A and group C, or between group B and group C.
- Bird's beak shape showed statistically significant ($p < 0.01$) treatment effect rather than other shapes.
- The history of pneumatic dilatation and pre-POEM Eckardt score showed no statistical significance ($P > 0.01$).

STATISTICAL ANALYSIS (I)

Kruskal-Wallis Test

Ranks

	e_shape	N	Mean Rank
les_diff	1.00	24	17.75
	2.00	4	14.75
	3.00	2	4.25
	4.00	2	17.25
	Total	32	

Test Statistics^{a,b}

	les_diff
Chi-Square	3.994
df	3
Asymp. Sig.	.262

a. Kruskal Wallis
Test

b. Grouping
Variable:
e_shape

STATISTICAL ANALYSIS (II)

Mann-Whitney Test

Ranks

	p_dil	N	Mean Rank	Sum of Ranks
les_diff	.00	18	16.69	300.50
	1.00	14	16.25	227.50
	Total	32		

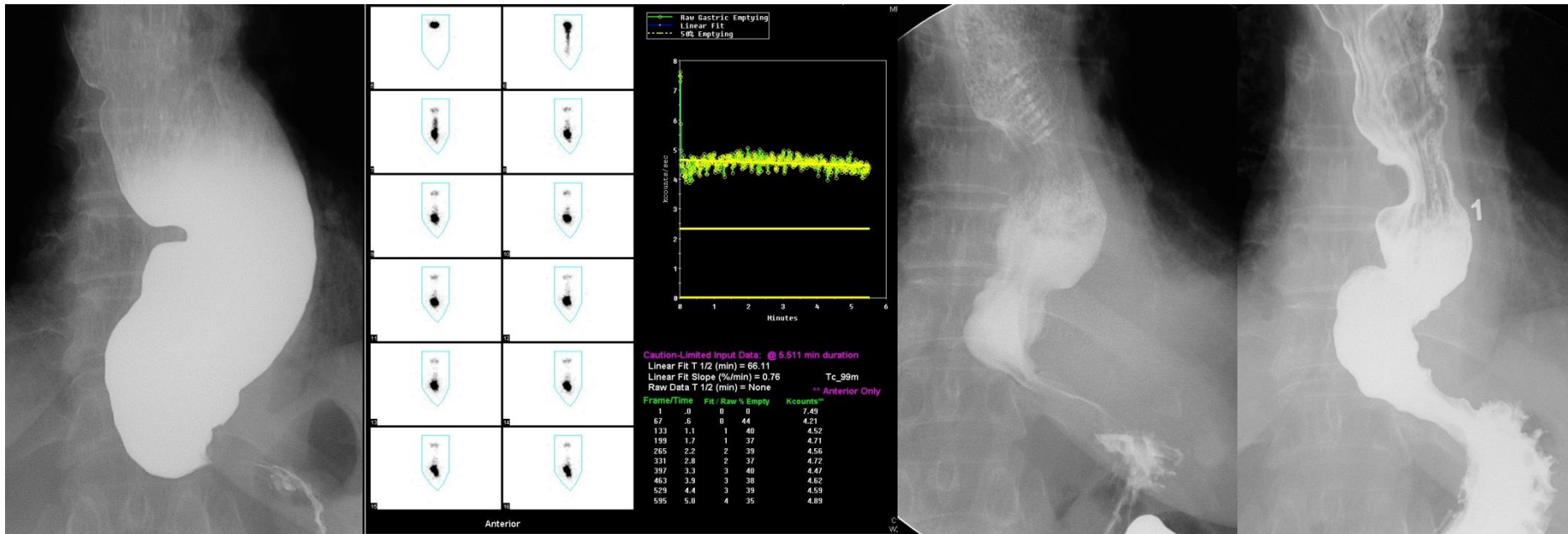
Test Statistics^a

	les_diff
Mann-Whitney U	122.500
Wilcoxon W	227.500
Z	-.133
Asymp. Sig. (2-tailed)	.894
Exact Sig. [2*(1-tailed Sig.)]	.896 ^b

a. Grouping Variable: p_dil

b. Not corrected for ties.

Group A (LES: 4.4 → 12.0 mm)



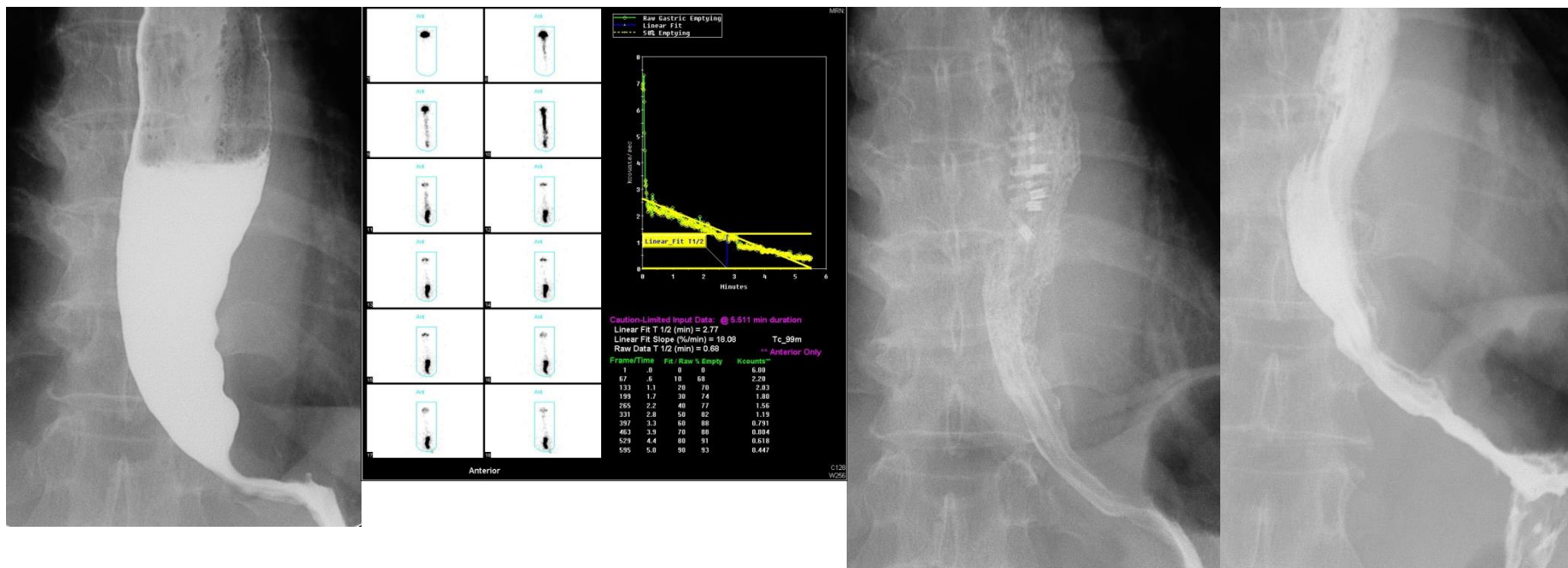
pre-POEM-TBE

pre-RI scan

post-POEM-gastro

post-POEM-TBE

Group B (LES: 5.2 → 9.0 mm)



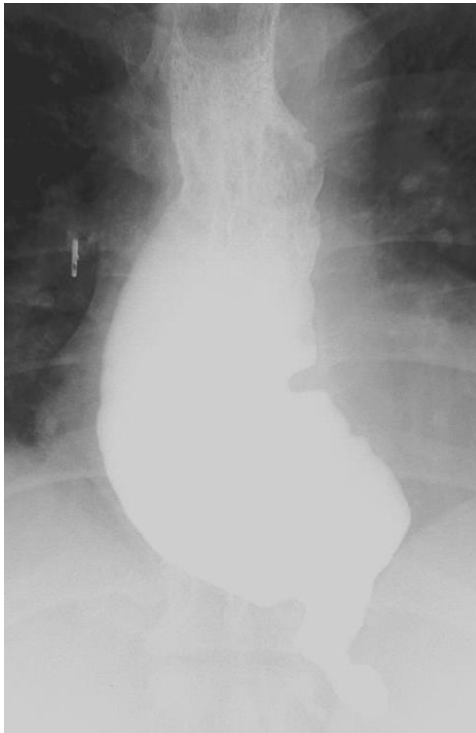
pre-POEM-TBE

pre-Rl scan

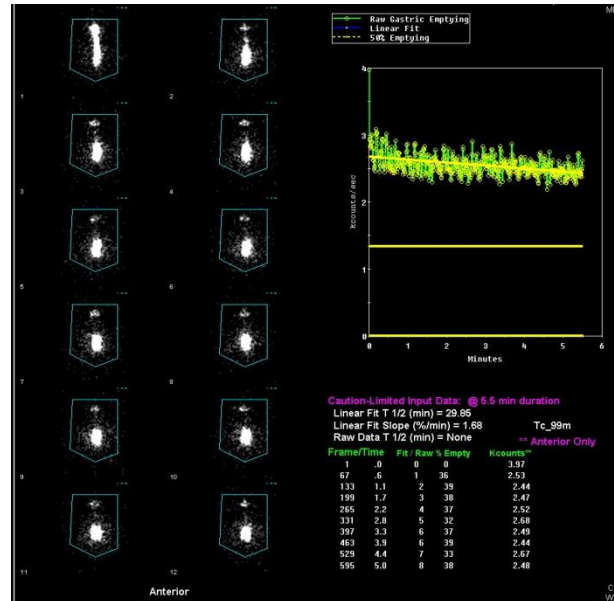
post-POEM-gastro

post-POEM-TBE

Group C (LES: 8.7 → 12.2 mm)



pre-POEM-TBE



pre-R1 scan



post-POEM-TBE

DISCUSSION (I)

- It is important to assess esophageal emptying function after treatment of achalasia, for which esophageal manometry, TBE and esophageal transit scintigraphy have been used as objective tools.
- TBE is a noninvasive and effective method in both diagnosis and evaluation of the response to achalasia treatment because it can assess esophageal morphology as well as function. The treatment success was objectively evaluated by measuring barium column height and width at 5 min during TBE for achalasia.

DISCUSSION (II)

- Surgical myotomy has been the most reliable treatment of choice for treating esophageal achalasia since the first report by Heller in 1913. Other management methods include medication, balloon dilatation and botulinum toxin injection, which are still inconclusive due to the relatively low efficacy and high complication rates.
- Inoue et al. introduced POEM as a non-surgical treatment method for esophageal achalasia in 2010. Since then, POEM has been one of the standard treatments for treating esophageal achalasia and related esophageal motility diseases, such as diffuse esophageal spasm.

DISCUSSION (III)

Table 1. Characteristics of Peroral Endoscopic Myotomy Compared with Laparoscopic Heller Myotomy and Pneumatic Dilation

	POEM	LHM	PD
Scarring	No	Yes	No
Selective circular myotomy	Possible	No	No
Concurrent anti-reflux procedure	No	Fundoplication	No
Dissection and disruption of the diaphragmatic hiatus	No	Yes	No
Postoperative incidence of GERD	(+++) Symptomatic GERD approximately 20-30%	(++) Symptomatic GERD approximately 15%	(+/-)
Myotomy extension to the proximal esophageal body	Possible	Difficult	Impossible
Hospital stay	Intermediate	Relatively long	Very short
Cost	Intermediate (variable according to region)	High	Low
Clinical response for achalasia	Good (excellent)	Good	Fair
Clinical response for spastic esophageal disorders	Good	Fair	Poor

POEM, peroral endoscopic myotomy; LHM, laparoscopic Heller myotomy; PD, pneumatic dilation; GERD, gastroesophageal reflux disease.

CONCLUSION

- **The treatment effect of POEM for achalasia was the most useful in group A with the narrowest LES and in patients with bird's beak shape on TBE.**

REFERENCES

1. Inoue H, Minami H, Kobayashi Y, et al. Peroral endoscopic myotomy (POEM) for esophageal achalasia. *Endoscopy* 2010;42:265-71
2. Minami H, Isomoto H, Yamaguchi N, et al. Peroral endoscopic myotomy (POEM) for diffuse esophageal spasm. *Endoscopy* 2014;46(suppl 1) UCTN:E79-E81
3. Shiwaku H, Inoue H, Beppu R, et al. Successful treatment of diffuse esophageal spasm by peroral endoscopic myotomy. *Gastrointest Endosc* 2013;77:149-50
4. Youn YH, Minami H, Chiu PWY, Park H. Peroral endoscopic myotomy for treating achalasia and esophageal motility disorders. *J Neurogastroenterol Motil* 2016;22:14-24
5. Minami H, Inoue H, Haji A, et al. Per-oral endoscopic myotomy: emerging indications and evolving techniques. *Dig Endosc* 2015;27:175-81
6. Teitelbaum EN, Soper NJ, Santos BF, et al. Symptomatic and physiologic outcomes one year after peroral esophageal myotomy (POEM) for treatment of achalasia. *Surg Endosc* 2014;28:3359-65
7. Phalanusitthepha C, Inoue H, Ikeda H, Sato H, Sato C, Hokieriti C. Peroral endoscopic myotomy for esophageal achalasia. *Ann Transl Med* 2014;2:31-9
8. Park YM, Jeon HH, Park JJ, Kim JH, Youn YH, Park H. Correlation between timed barium esophagogram and esophageal transit scintigraphy results in achalasia. *Dig Dis Sci* 2015; 60:2390-7
9. Chung JJ, Park HJ, Yu JS, Hong YJ, Kim JH, Lee SI. A comparison of esophagography and esophageal transit scintigraphy in the evaluation of usefulness of endoscopic pneumatic dilatation in achalasia. *Acta Radiol* 2008;49:498-505
10. Andersson M, Lundell L, Kostic S, Ruth M, Lonroth H, Kjellin A, et al. Evaluation of the response to treatment in patients with idiopathic achalasia by the timed barium esophagogram: results from a randomized clinical trial. *Dis Esophagus* 2009;22:264-73