

Esophageal Motility Disorders

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Relevant Disclosures

- Consultant: Medtronic

Selected Abstracts

1. FLIP Panometry in Achalasia: Useful?

Rooney, KP et al. Distension-induced contractility is frequently present, but consistently abnormal in achalasia: a study utilizing FLIP panometry. DDW session #1145.

2. To POEM or not to POEM? That is the question.

DeWitt JM et al. Prospective evaluation of risk factors for gastroesophageal reflux disease by ambulatory wireless pH monitoring after per-oral endoscopy myotomy. DDW #1147.

Study #1

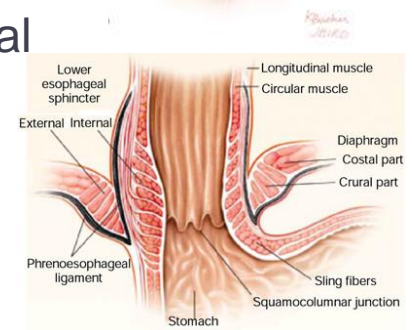
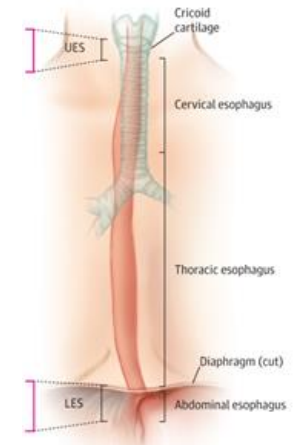
Rooney KP et al.

Distension-induced contractility is frequently present, but consistently abnormal in achalasia: a study utilizing FLIP panometry.

DDW #1145.

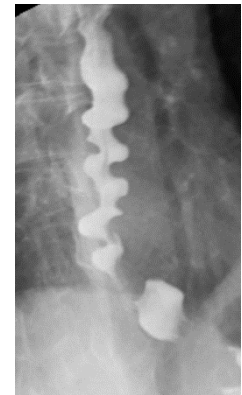
Background: Esophageal Function

- Esophageal peristalsis
 - A propagated wave of contraction sweeping down the esophagus at a standard rate of cm/second
 - Coordinated
 - Central nervous system in striated muscle portion
 - Central and enteric nervous systems in smooth muscle portion
 - *Secondary* peristalsis to clear refluxed stomach contents
- Upper esophageal sphincter (UES) and lower esophageal sphincter (LES)
 - Tonic contraction
 - Timed opening with swallow reflex

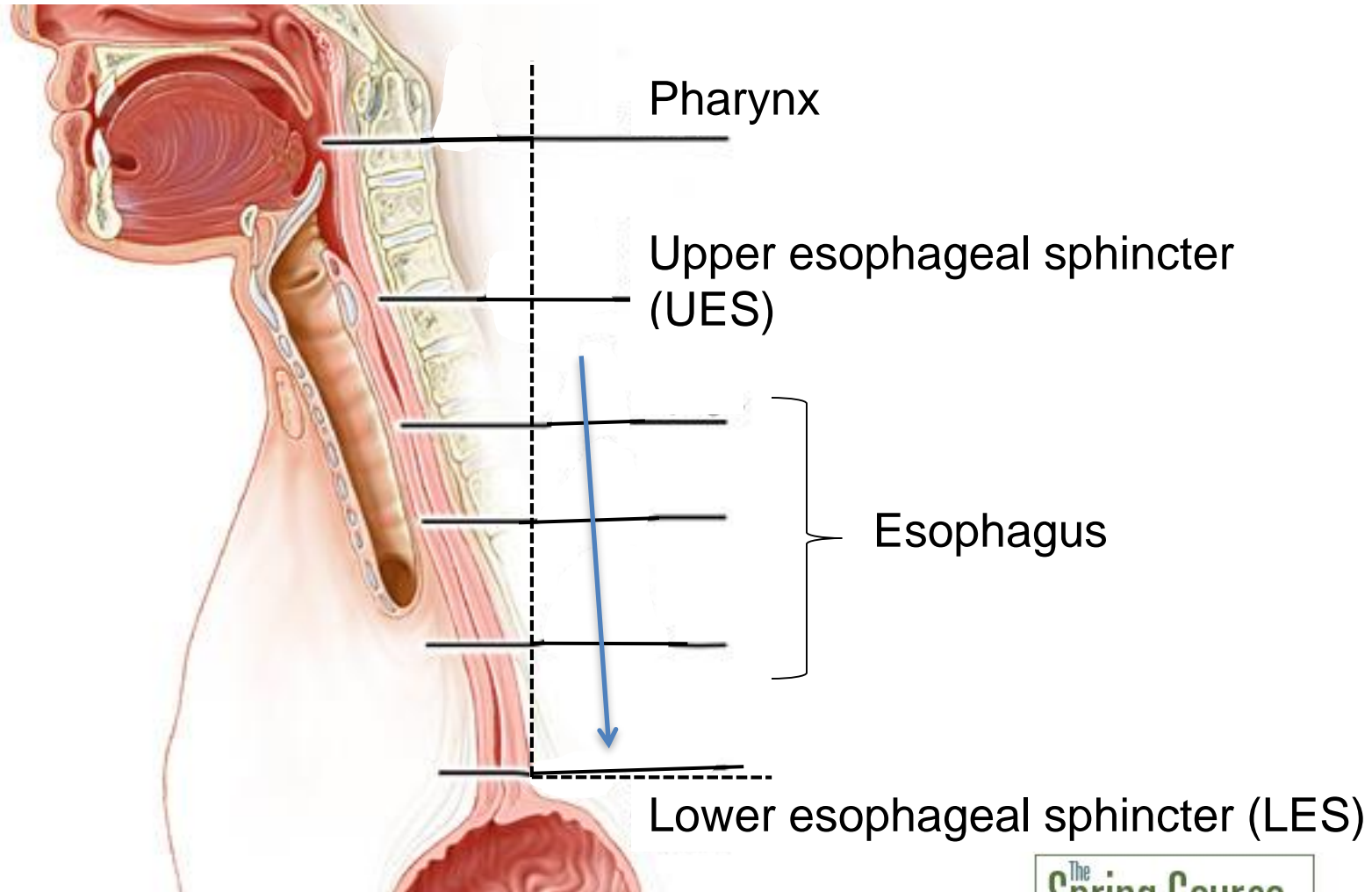


Traditional Tools: Esophageal Peristalsis

- Barium esophagram study
 - Non-invasive evaluation
 - Primary wave of peristaltic contraction can be examined
 - Can apply official emptying metrics
 - Generally not considered accurate enough to make confident diagnosis of primary motility disorder
- Upper endoscopy
 - Can subjectively comment on appearance of peristaltic waves or spastic contractions
 - There are standardized methods of examining the esophagogastric junction (EGJ)
- Esophageal manometry
 - For decades has been accepted as most accurate examination of esophageal motility

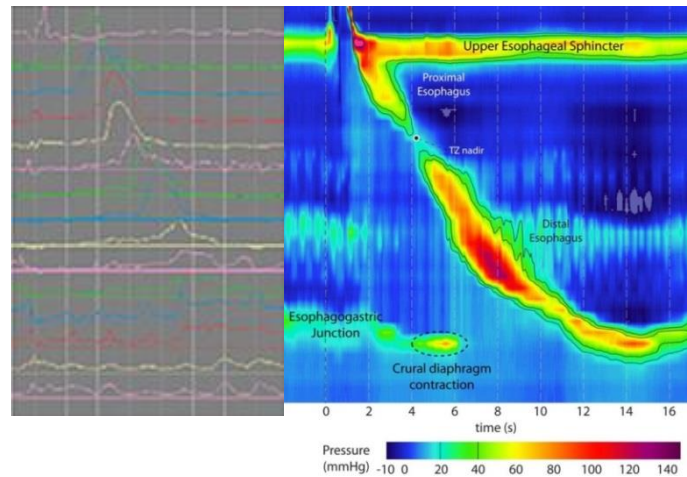


Esophageal Manometry: Line Tracings



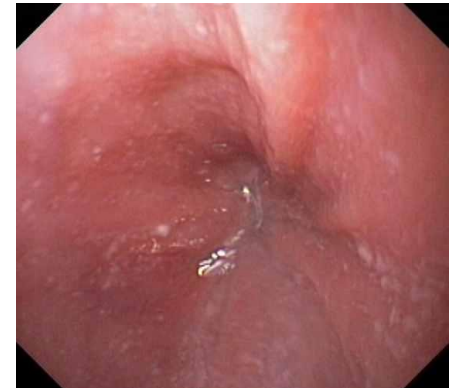
Esophageal High Resolution Manometry (HRM)

- Chicago Classification
 - Accepted system for defining esophageal motility
 - Currently based on ten 5 mL swallows
 - Performed in supine position
 - Version 3.0 is a refinement of prior versions



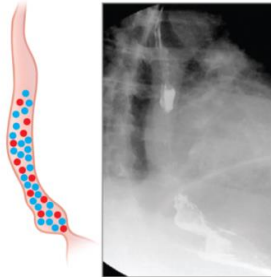
Background: Achalasia

- Esophageal motility disorder
 - Most well-described primary disorder
- Etiology
 - Current prevailing theory: neural degeneration as a progressive autoimmune process initiated by an indolent viral infection in a genetically susceptible patient
- Defining characteristics
 - Complete loss of normal peristalsis
 - Failure of adequate LES relaxation

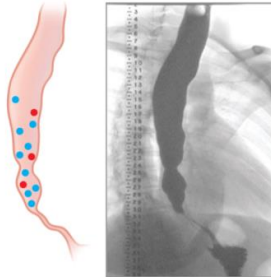


Subtypes of Achalasia

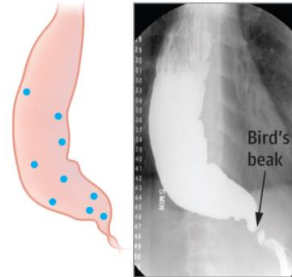
A EGJ outflow obstruction
Impaired LES relaxation
Normal or impaired peristalsis



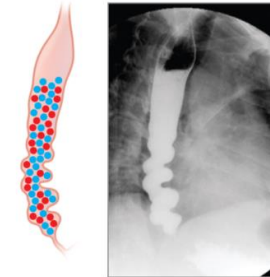
B Type II achalasia
Impaired LES relaxation
Absent peristalsis
Increased pan-esophageal pressure



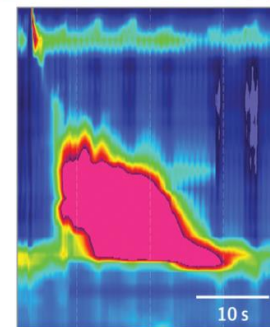
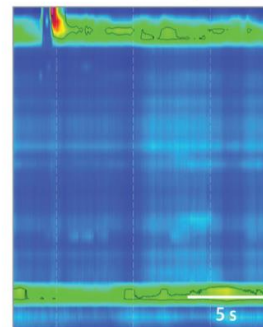
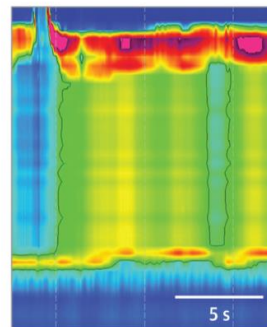
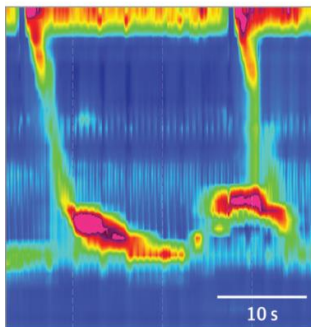
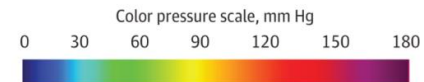
C Type I achalasia
Impaired LES relaxation
Absent peristalsis
Normal esophageal pressure



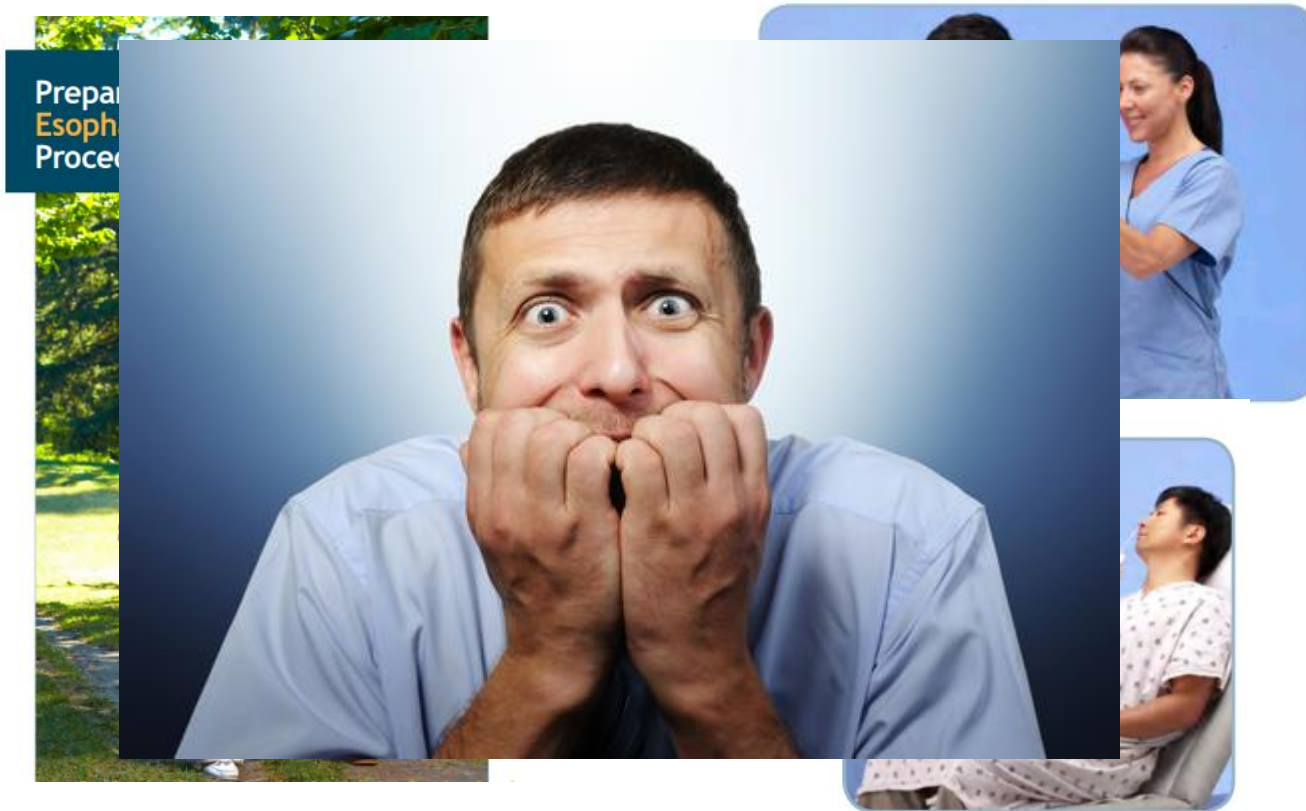
D Type III achalasia
Impaired LES relaxation
Absent peristalsis
Distal esophageal spastic contractions



Smooth muscle innervation
 • Postganglionic excitatory neuron
 • Postganglionic inhibitory neuron

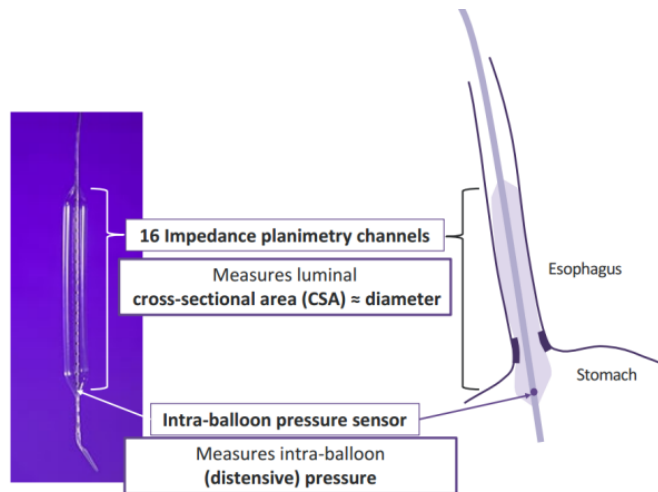


Alternative to Manometry?



Beyond HRM: Esophageal Motility

- Functional lumen imaging probe (FLIP)
 - Balloon-tipped catheter that can be placed on endoscopy
 - Uses *impedance planimetry* sensors mounted on the catheter
 - Balloon filled with conductive fluid, voltage measured across paired impedance sensors to ultimately provide measurement of cross sectional area and thus diameter in the lumen
 - Simultaneously pressure is measured and thus distensibility can be measured
 - Original proposed utilities
 - Included evaluating EGJ distensibility in esophageal motility disorders and GERD

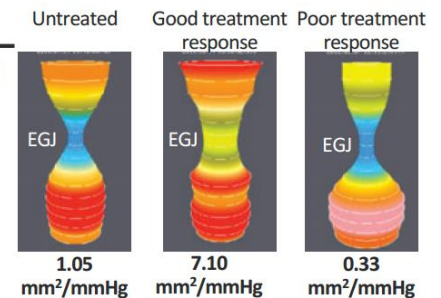


Analysis
 • **EGJ-DI =**

$$\frac{\text{(Narrowest CSA}_{\text{EGJ}})}{\text{(intra-balloon pressure)}}$$

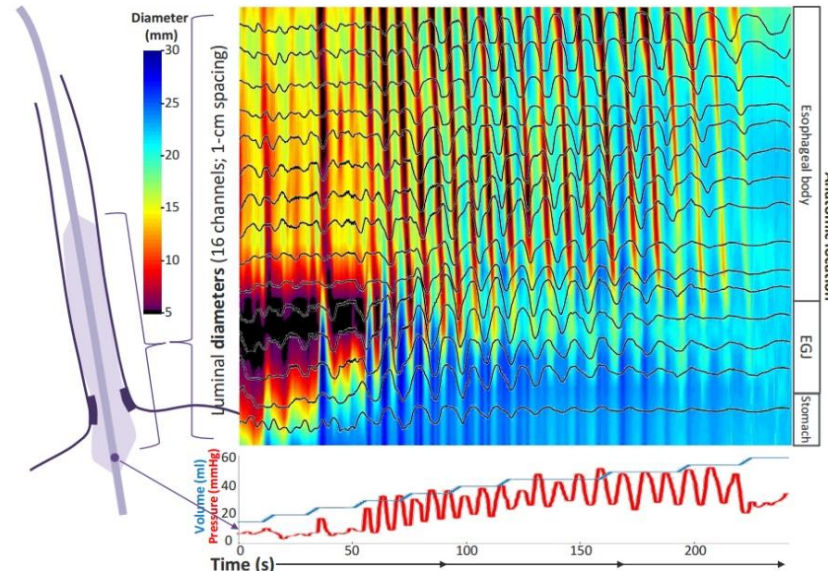
Achalasia

- Reduced EGJ-DI^{1,2}

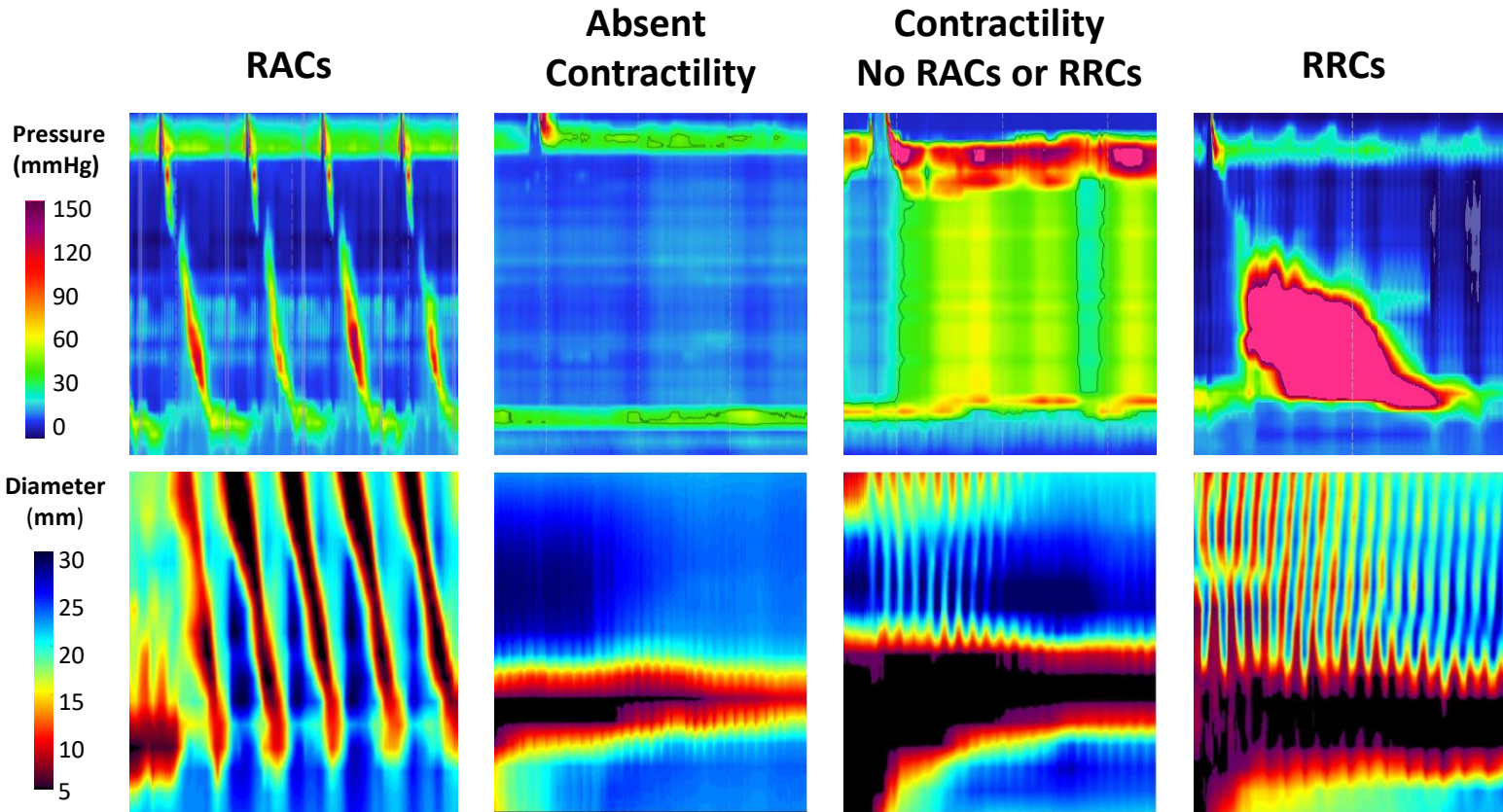


FLIP for Esophageal Motility

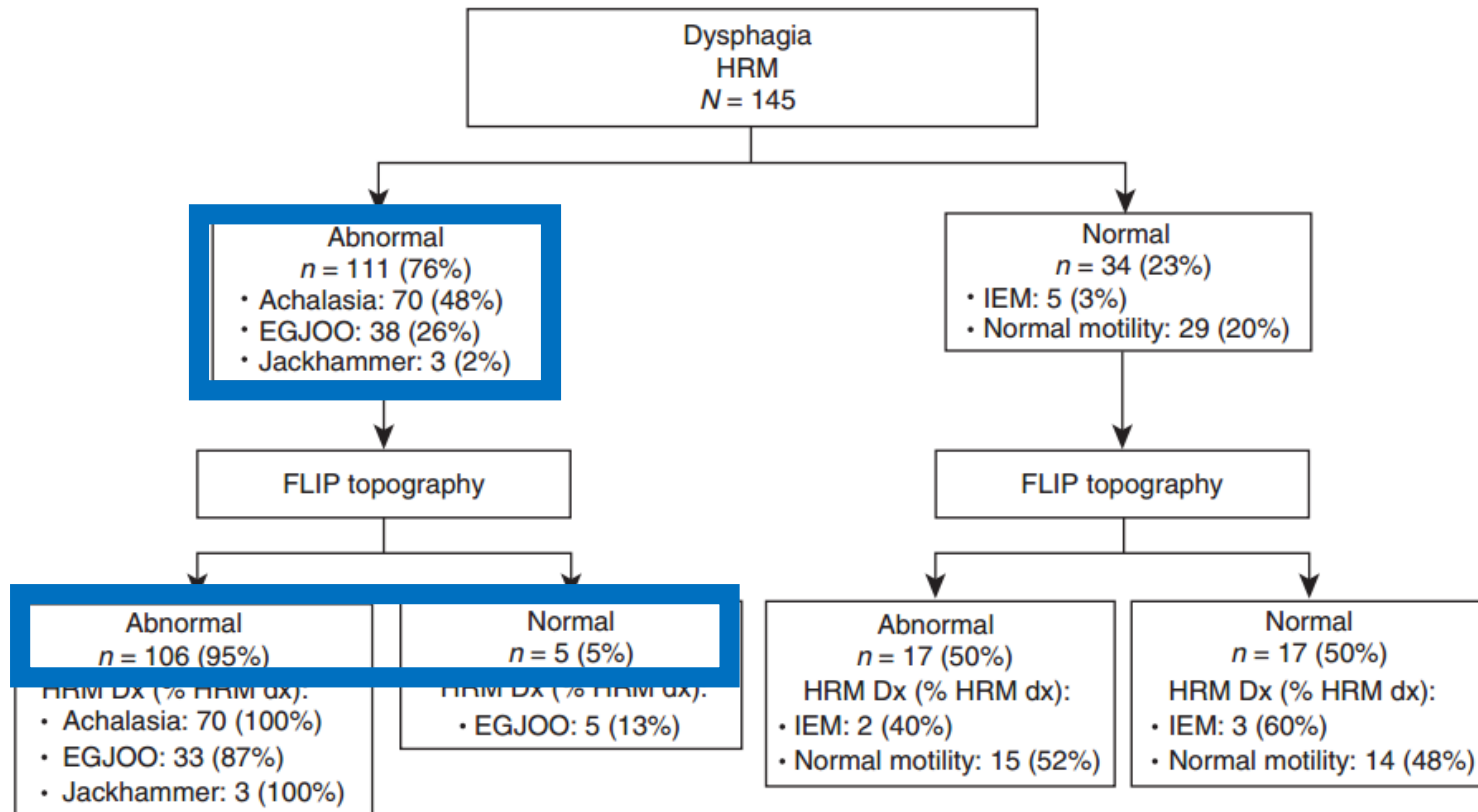
- *Diameter topography*
 - FLIP balloon (16 cm) inserted under sedation
 - Balloon slowly filled as per protocol
 - Patterns of contractions observed over time in patients with non-obstructive dysphagia
 - Contractions presumably from secondary peristaltic and other mechanisms



Contractile Patterns



FLIP Topography



FLIP Panometry

Table 2. The Endoflip™ Impedance Planimetry System Panometry diagnoses and disease states.

For application to endoscopy-negative dysphagia patients without a hernia > 3 cm or mechanical obstruction/esophagitis. EGJ-distensibility index (DI) at EF-322 60 mL fill volume or EF-325 40 mL fill volume. Clinical suspicion reflected by color intensity: Red – consider achalasia. Blue – consider GERD. Green – consider a spastic disorder.

	EGJ-DI 0-2 mm ² /mmHg	EGJ-DI 2.1-3.0 mm ² /mmHg		EGJ-DI 3.1-9.0 mm ² /mmHg	EGJ-DI > 9.0 mm ² /mmHg
		Max D < 12 mm Bag pressure >20 mmHG	Max D > 12 mm Bag pressure >20 mmHG*		
RACs	EGJOO with normal contractile response	EGJOO with normal contractile response	Normal contractile response	Normal contractile response	Normal contractile response with increased EGJ distensibility
DDCR	EGJOO w/ DDCR	EGJOO w/ DDCR	DDCR	DDCR	DDCR with increased EGJ distensibility
Absent	EGJOO w/ absent contractile response	EGJOO w/ absent contractile response	Absent contractile response	Absent contractile response	Absent contractile response with increased EGJ distensibility
RRCs	EGJOO w/ retrograde contractile response	EGJOO w/ retrograde contractile response	Retrograde contractile response	Retrograde contractile response	Retrograde contractile response with increased EGJ distensibility

*Rule out mechanical stricture if Max diameter is less than 18 and there is a fixed plateau max diameter during volumetric distention. Disordered and/or diminished contractile response (DDCR), Repetitive Antegrade Contractions (RACs), Repetitive Antegrade Contractions (RRCs)

Study #1

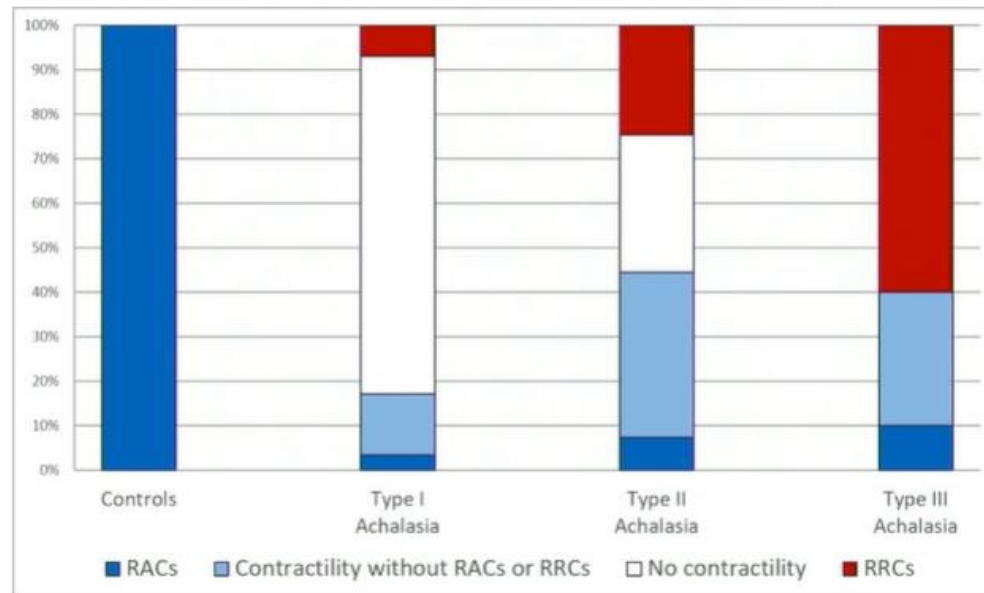
- How often is there still some contractility in achalasia?
- Can FLIP panometry assess and subtype achalasia reliably?
- Aim of study: to compare contractility in achalasia patients compared to that seen in normal controls, in order to demonstrate the former is consistently abnormal

Methods

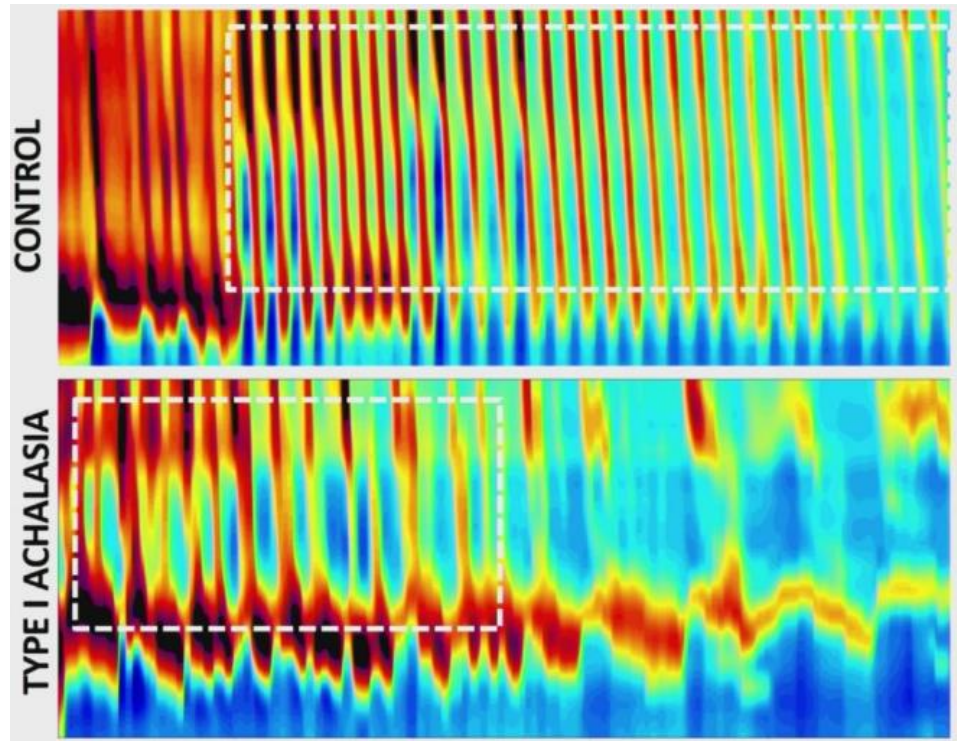
- 140 newly diagnosed and treatment-naïve patients with achalasia
 - 21% type I, 58% type II, 21% type III
 - 39% female, mean age 51
- 20 asymptomatic controls
 - 95% normal peristalsis on HRM
 - 70% female, mean age 30
- All patients had HRM and FLIP Topography

Results

- At all FLIP volumes
 - All (100%) control patients had RAC pattern
 - Minority (20%) of achalasia patients had RAC pattern
 - Only 11 (8%) had a RAC pattern without an RRC pattern
 - These still had abnormal characteristics



Example RAC in Achalasia



Conclusions

- Distension-induced contractility was present in achalasia, even in some patients without contractility on HRM, but it was not 'normal' and specific characteristics were observed
- The contractile characteristics can be applied to aid defining normal versus abnormal contractile response to achalasia as assessed with FLIP panometry
- Future directions
 - Apply to FLIP panometry in patients without achalasia on HRM
 - Assess for prognostic or management implications in achalasia

Study #2

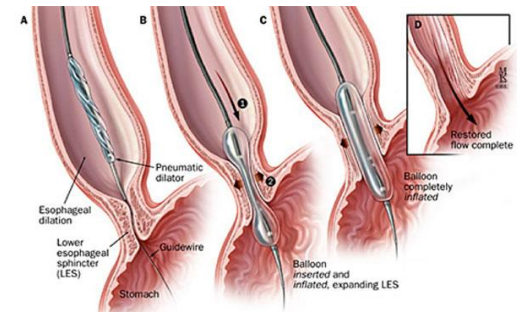
DeWitt JM et al.

Prospective evaluation of risk factors for gastroesophageal reflux disease by ambulatory wireless pH monitoring after per-oral endoscopy myotomy.

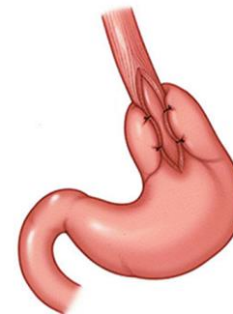
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Achalasia Treatment

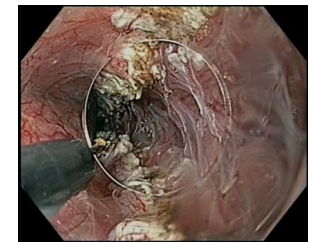
- Short-term options
 - Botulinum toxin
 - Medications
- Potential “definitive” options
 - Pneumatic dilation (PD)
 - Laparoscopic Heller myotomy (LHM) with partial fundoplication
 - Peroral endoscopic myotomy (POEM)



PD



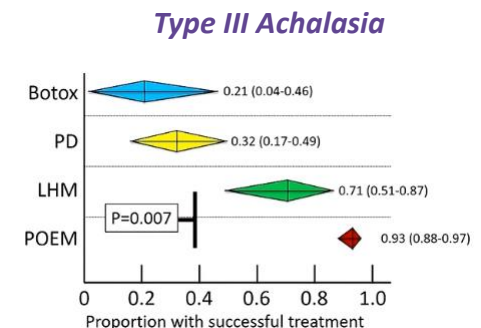
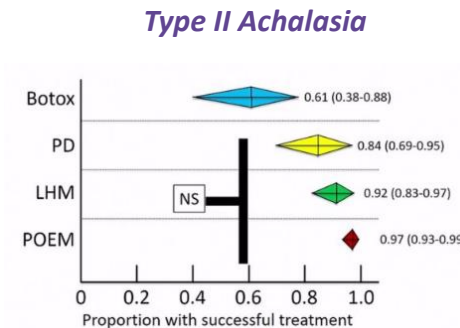
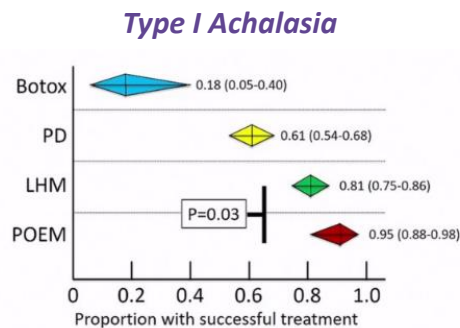
LHM



POEM

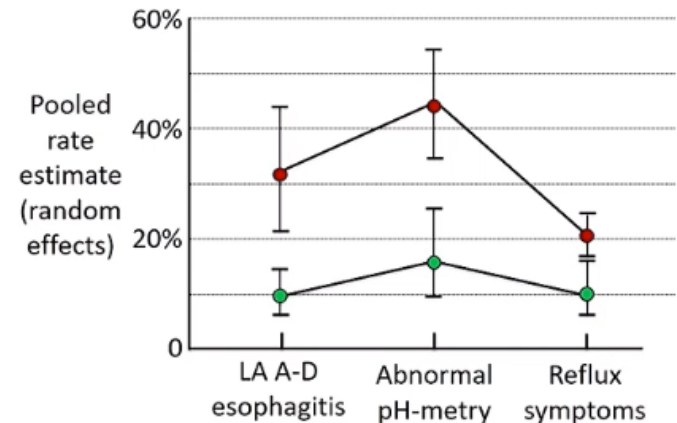
Comparing Treatments

- Recent meta-analysis comparing treatments by subtype in 1575 achalasia patients
 - POEM best for type I and type III achalasia
 - PD, LHM and POEM equivalent for type II achalasia



GERD Following Treatment

- PD with relatively low frequency
 - 15% at one year by pH study in one major achalasia trial
- LHM done with partial fundoplication to decrease incidence of GERD
- What about POEM?
 - Meta-analysis comparing LHM (2581 patients) to POEM (1582 patients)
 - Higher rates of GERD by esophagitis, pH-metry or symptom analysis
 - Studies heterogeneous without standardization
 - Not much is known about predictive factors for post-POEM GERD
 - This could help decide who should get POEM



Study #2

- Aims
 - To report the risk of GERD by ambulatory pH monitoring after POEM in a standardized fashion
 - To stratify risk of GERD by treatment response to Eckardt score, manometry IRP, FLIP DI, BMI and symptoms of heartburn

Methods

- Prospective study of POEM patients at one institution
- Baseline
 - Symptom scores
 - Upper endoscopy with FLIP
 - Esophageal HRM
- Six months after POEM
 - Symptom scores
 - Upper endoscopy with FLIP and wireless pH capsule placement (48-hour study) off acid suppressive therapy
 - Esophageal HRM

Results

- 115 consecutive POEM patients
- 48 patients had 6 month testing after POEM
 - Type I achalasia 9 (18.8%)
 - Type II achalasia 31 (64.6%)
 - Type III achalasia 2 (4.2%)
 - Other motility disorders 6 (12.5%)

GERD after POEM

- Esophagitis in 33/48 (69%)
- pH testing in 37 patients
 - Positive for GERD in 20/37 (54%) by DeMeester score being high overall on 48-hour study
 - Higher pH scores → more likely to have significant esophagitis
 - But not necessarily more likely to have heartburn
 - Not associated with BMI, FLIP DI, manometry IRP or Eckardt score

	Day 1 and 2 Total DeMeester score > 14.7 (n=37)		
	Yes (n=20)	No (n=17)	P-value
LA Esophagitis Grade n (%)			0.017
None	2/20 (10.0)	8/17 (47.1)	
Grade A	5/20 (25.0)	4/17 (22.5)	
Grade B	7/20 (35.0)	5/17 (29.4)	
Grade C	6/20 (30.0)	0/17 (0.0)	

	Day 1 and 2 Total DeMeester score > 14.7 (n=37)		
	Yes (n=20)	No (n=17)	P-value
Heartburn			0.424
No	16 (84.2)	11 (68.8)	
Yes	3 (15.8)	5 (32.2)	
BMI			0.936
<20	3 (15.0)	2 (11.8)	
20-24.9	5 (25.0)	3 (17.6)	
25-29.9	6 (30.0)	6 (35.3)	
30+	6 (30.0)	6 (35.3)	

Conclusions

- POEM has a high degree of GERD measured by esophagitis or pH testing
- The GERD does not appear associated with symptomatic heartburn or variables on manometry or FLIP
- Large scale studies are needed to identify factors leading to GERD after POEM

Thank You

Questions?

