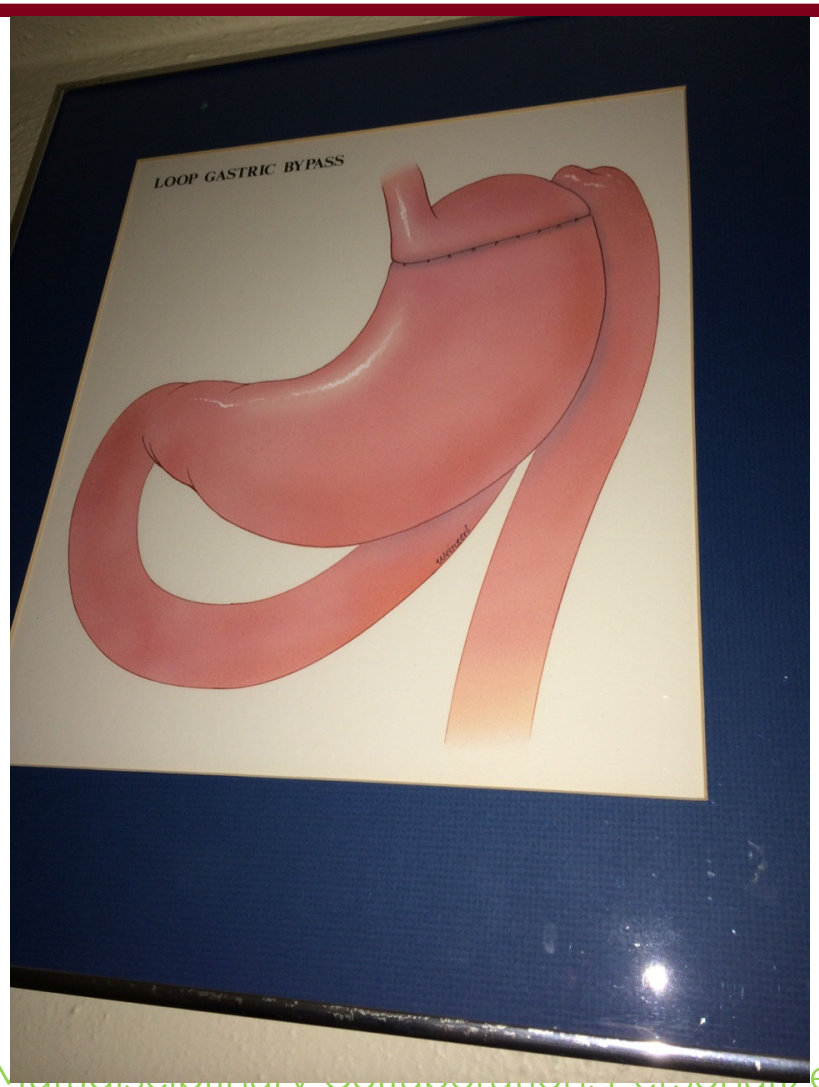
The Pendulum Swings - What is the Optimal Bariatric Procedure in 2021?

Ninh T. Nguyen
Professor & Chair, Department of Surgery
University of California Irvine Medical Center

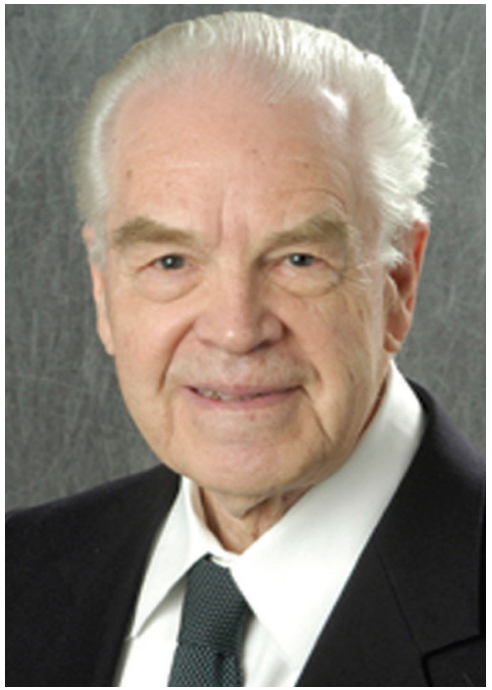
Disclosures

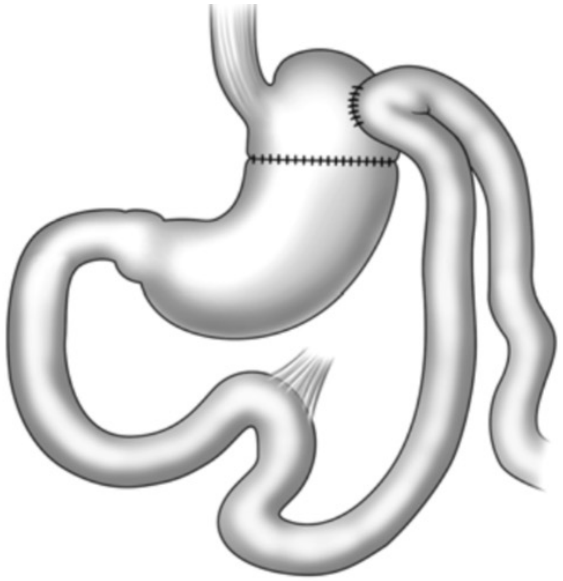
- Olympus
- Endogastric Solutions (TIF) – Do not use the TIF device. I am a speaker for the role of hiatal hernia repair in management of GERD.
- Support by EGS
  - RCT cTIF vs Lap Nissen
  - Prospective bariatric protocol

1966 Loop Gastric Bypass for Treatment of Severe Obesity



Mason’s Loop Gastric Bypass (1966)





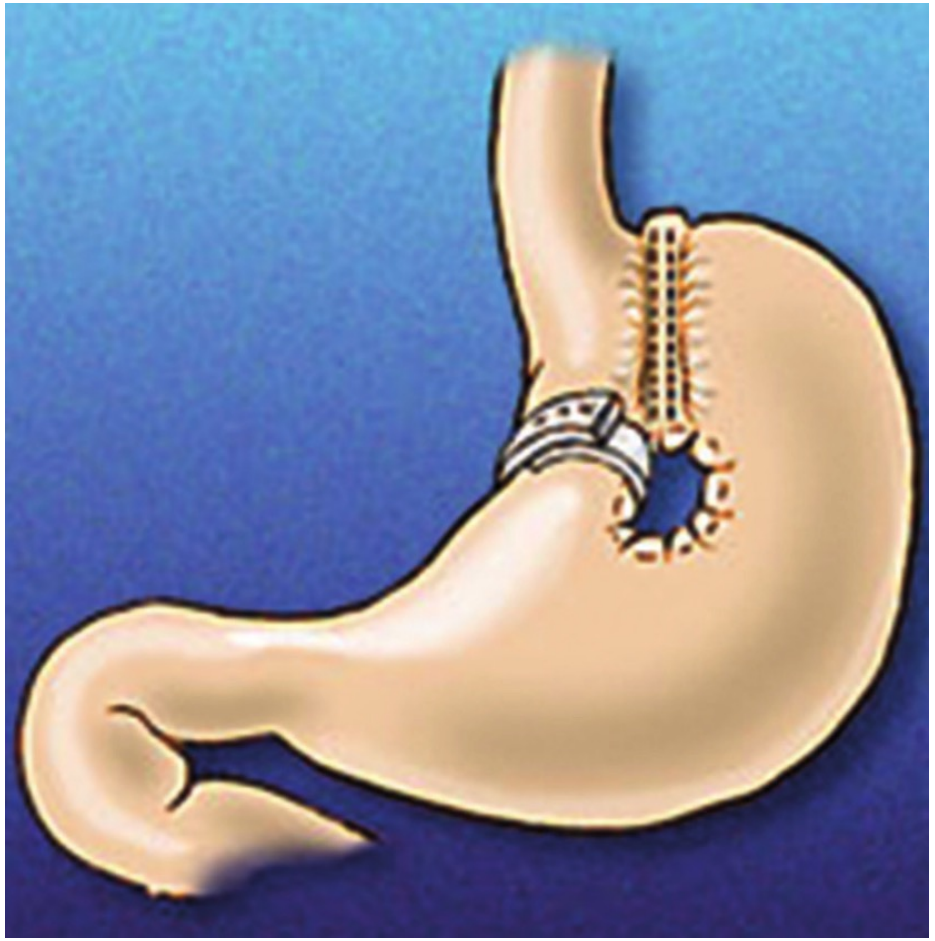
"I'd take the undesirable effect of gastric resection, which was weight loss, and use it for a desirable effect, to treat obesity", Ed Mason, MD

What are we trying to achieve in bariatric surgery?

- Weight loss
- Resolution of comorbidities and metabolic disease (DM)
- Avoid side effects or “unintended consequence” of the intervention (GERD)

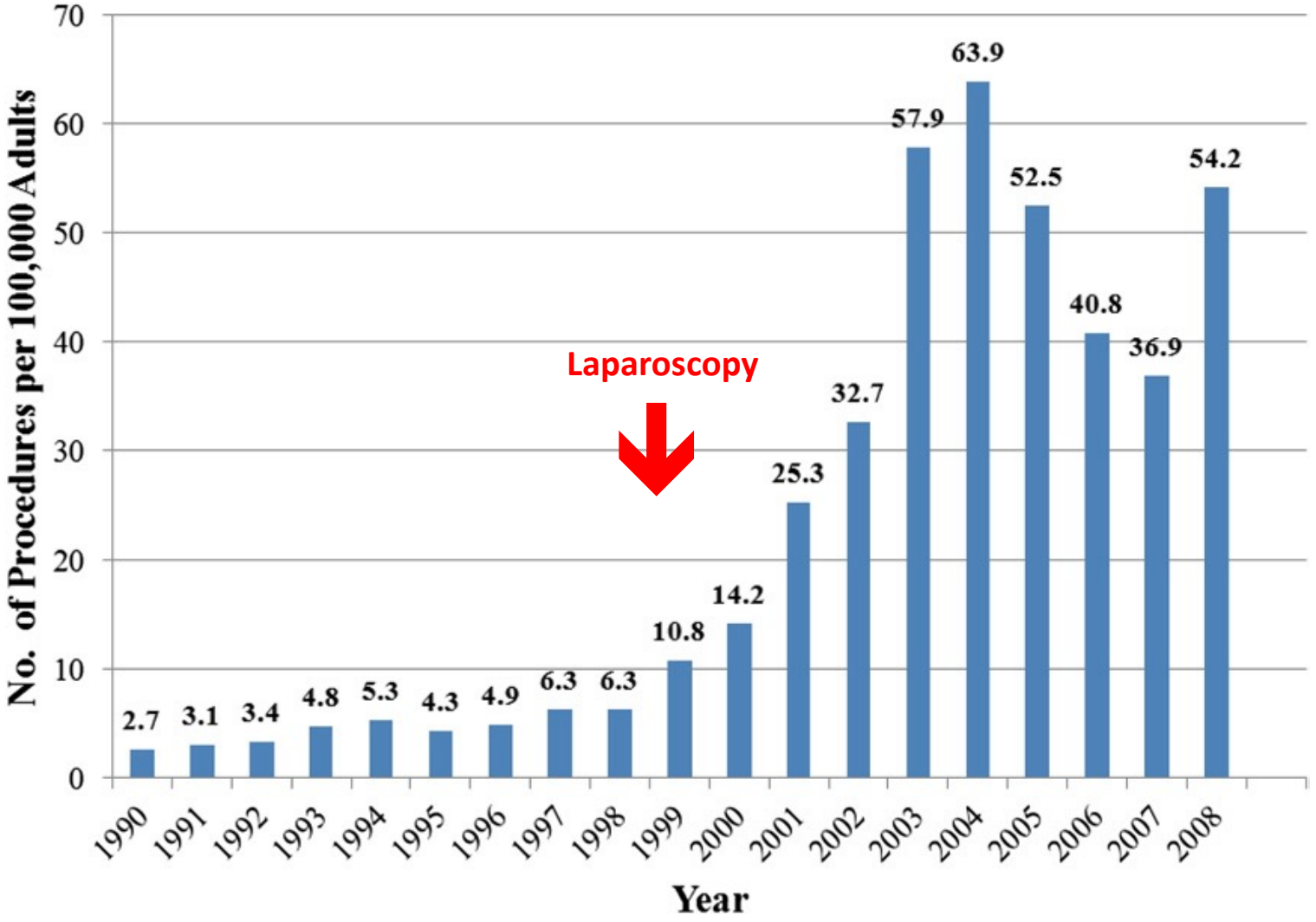
The Pendulum has Swung Many Times

1973 Mason Proposed the VBG



Dominant bariatric operation in 1990s

US Rates of Bariatric Surgery per 100,000 adults, 1990-2008



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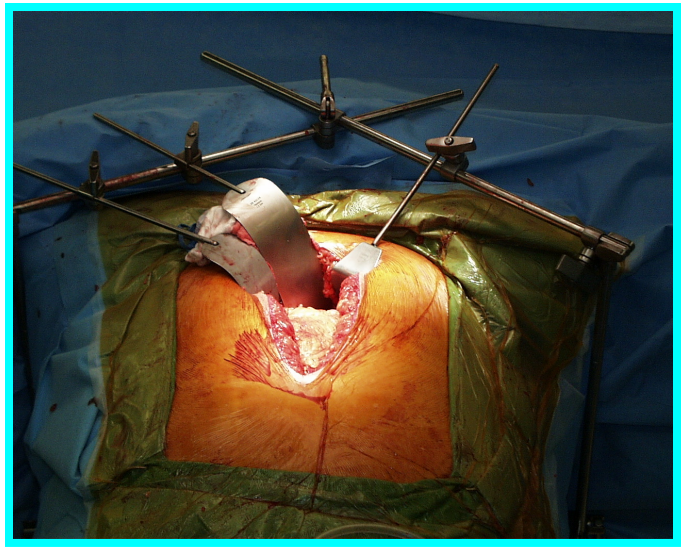
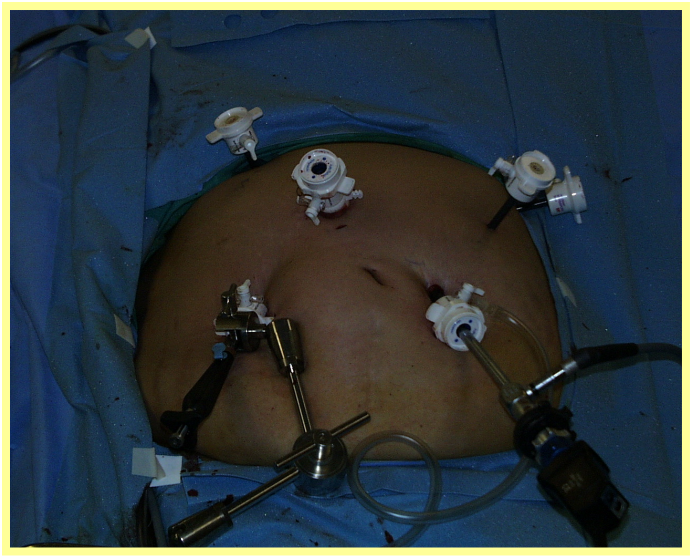
Multidisciplinary Collaboration. Personalized Treatment Strategies. Patient Advocacy.

Laparoscopy Changed Everything

OPEN



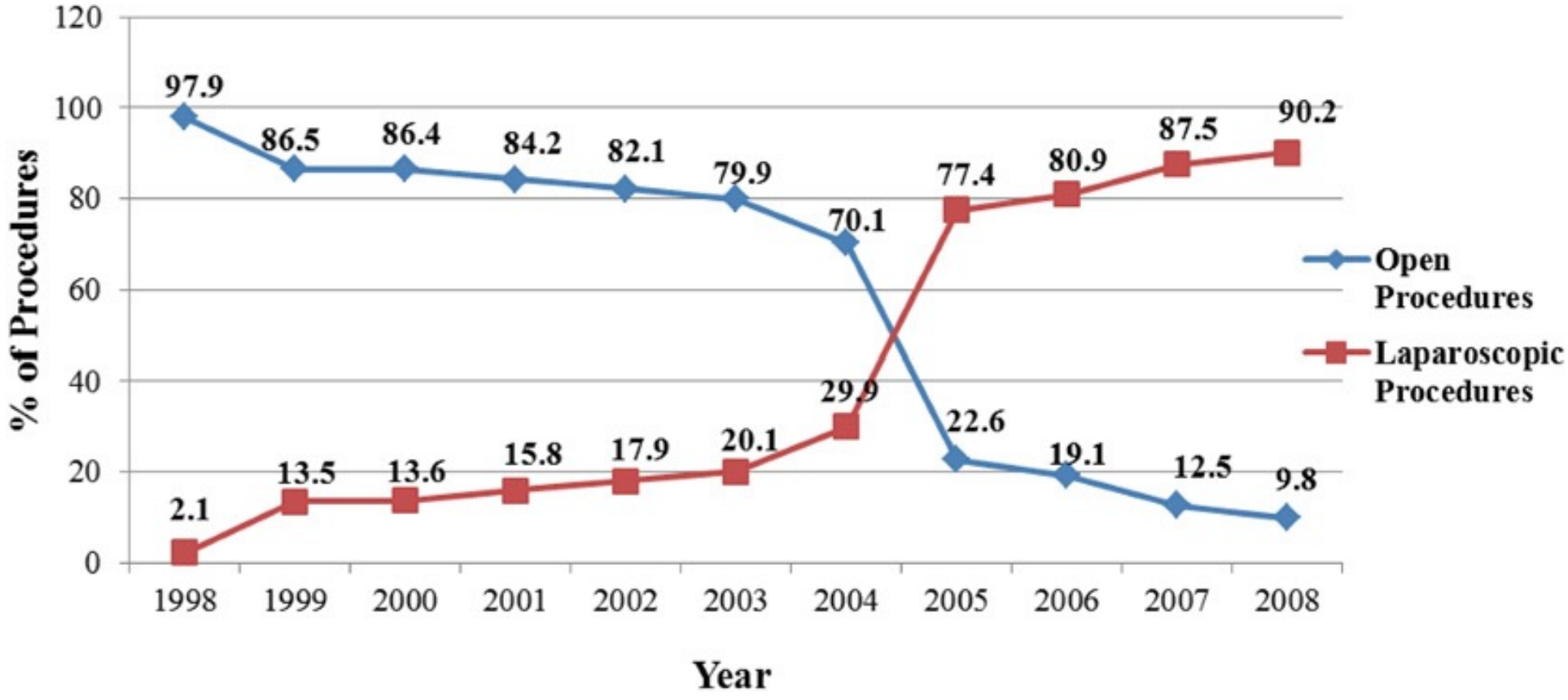
LAPAROSCOPY



RCT: Lap vs. Open Gastric Bypass

Nguyen et al. Ann Surg 2001

Pendulum Swung from Open to Lap in 2004

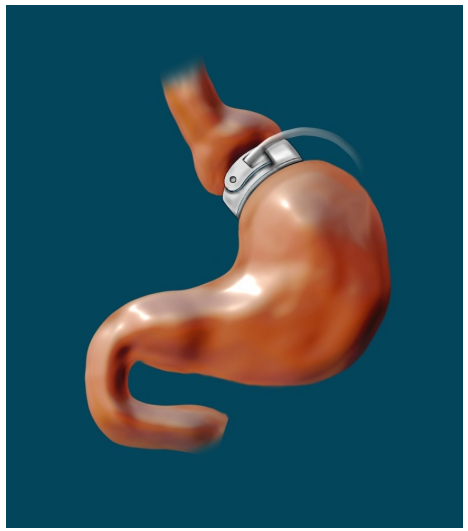


Nguyen NT, et al. JACS 2011:213(2):261-266.

Timeline of Bariatric Procedures

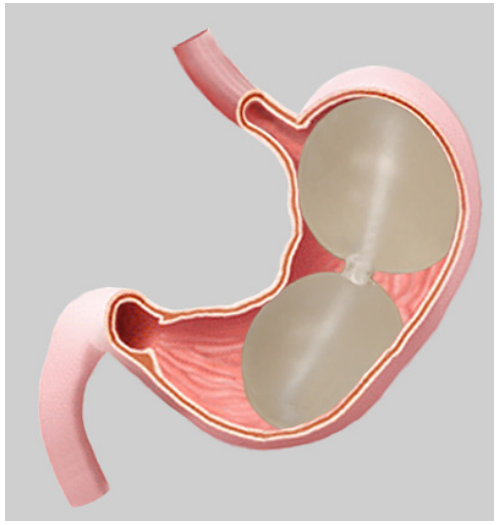
BYPASS (1960s)

BAND (2001)



SLEEVE (2010)

BALLOON (2015)



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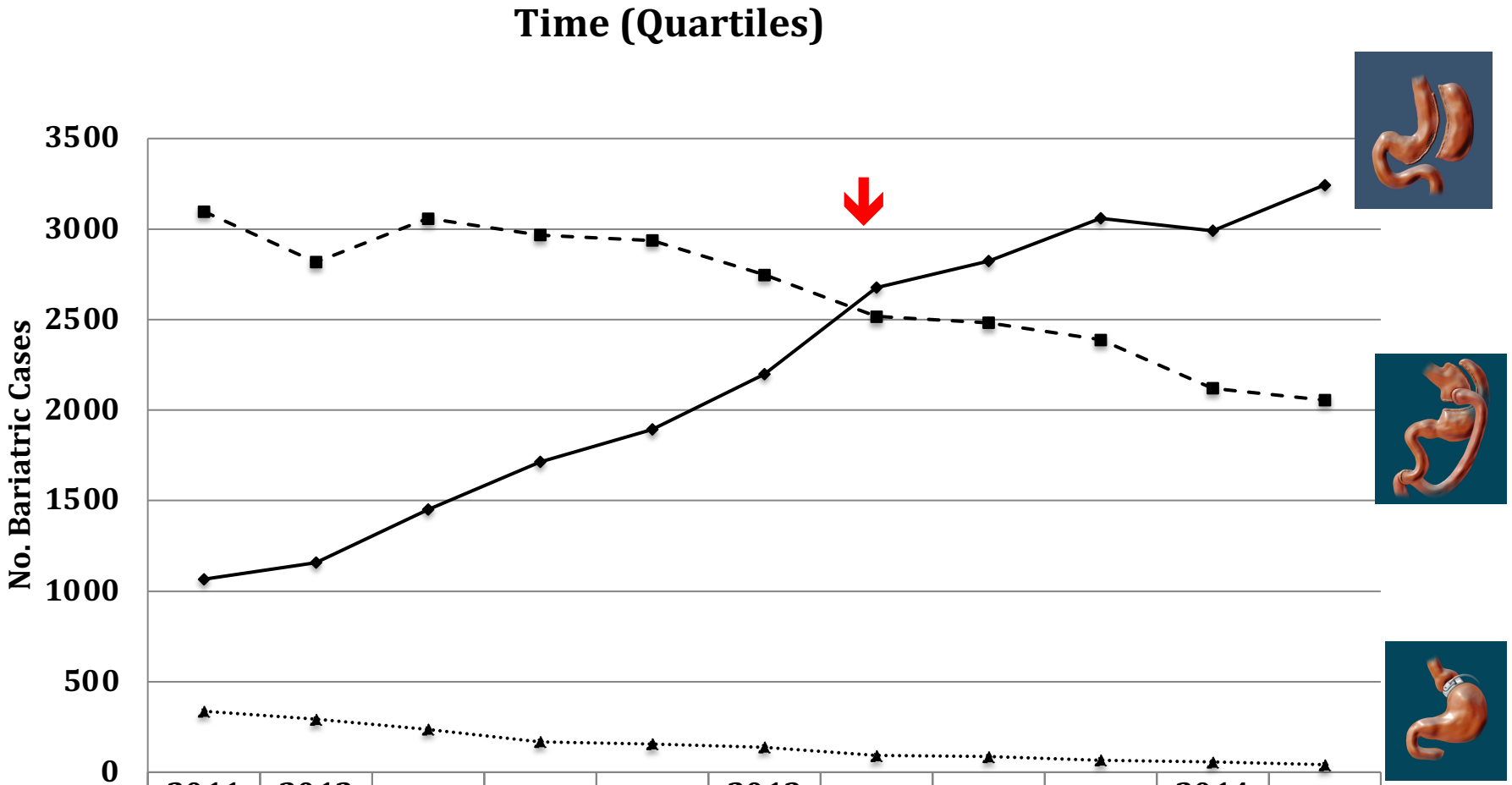
ASMBS Endorsed Procedures

- Sleeve
- Roux-en-Y gastric bypass
- FDA approved intragastric balloons
- BPD/duodenal switch or SADI
- Band

The Pendulum Swings: UHC Data



	2011 Q4	2012 Q1	Q2	Q3	Q4	2013 Q1	Q2	Q3	Q4	2014 Q1	Q2
LSG	1066	1158	1451	1714	1894	2198	2677	2823	3059	2991	3244
RYGB	3097	2817	3058	2967	2937	2747	2517	2482	2388	2121	2055
LAGB	337	292	237	168	157	138	92	86	66	56	42

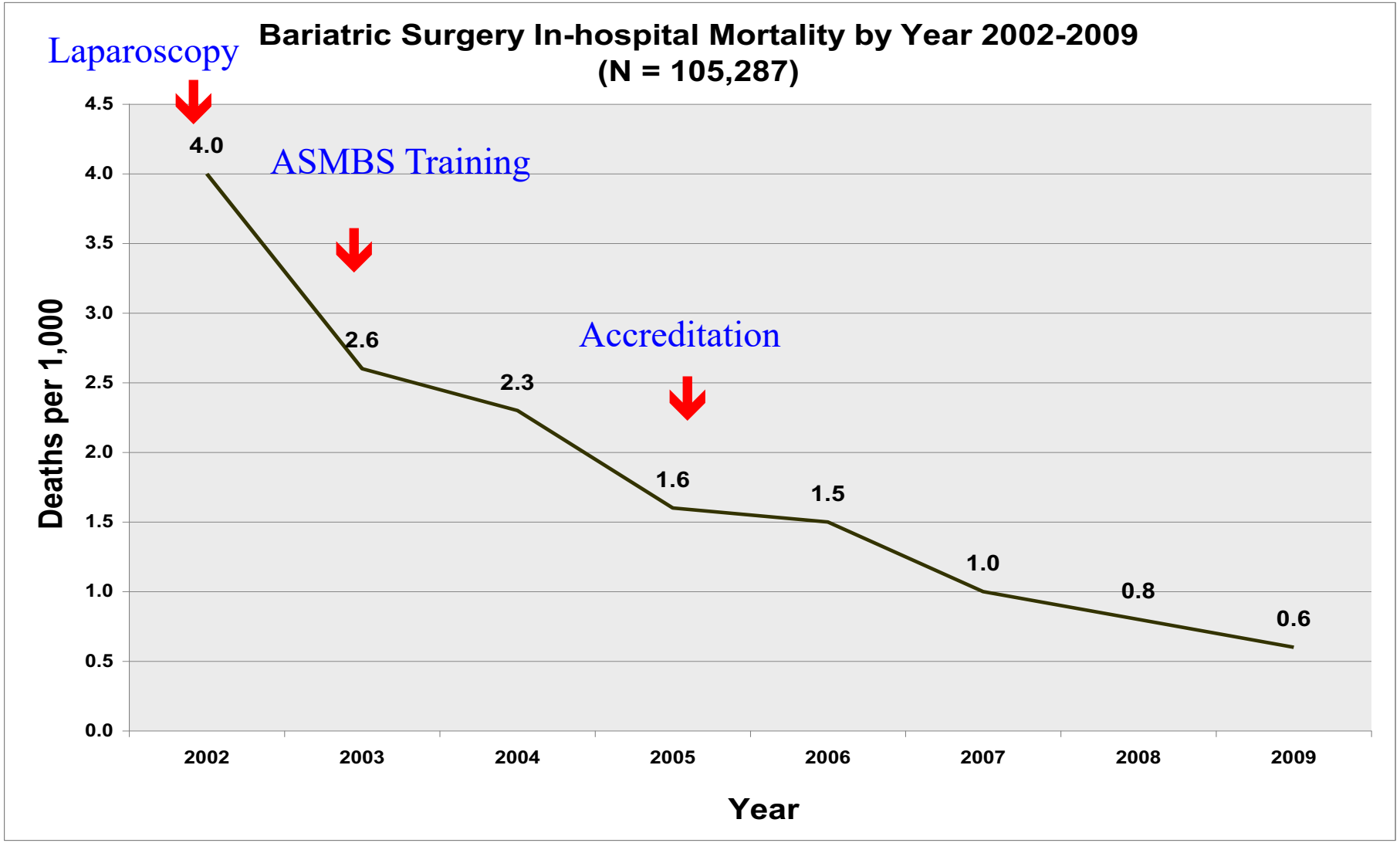
ASMBS Bariatric Surgery Procedures

Estimate of Bariatric Surgery Numbers, 2011-2019

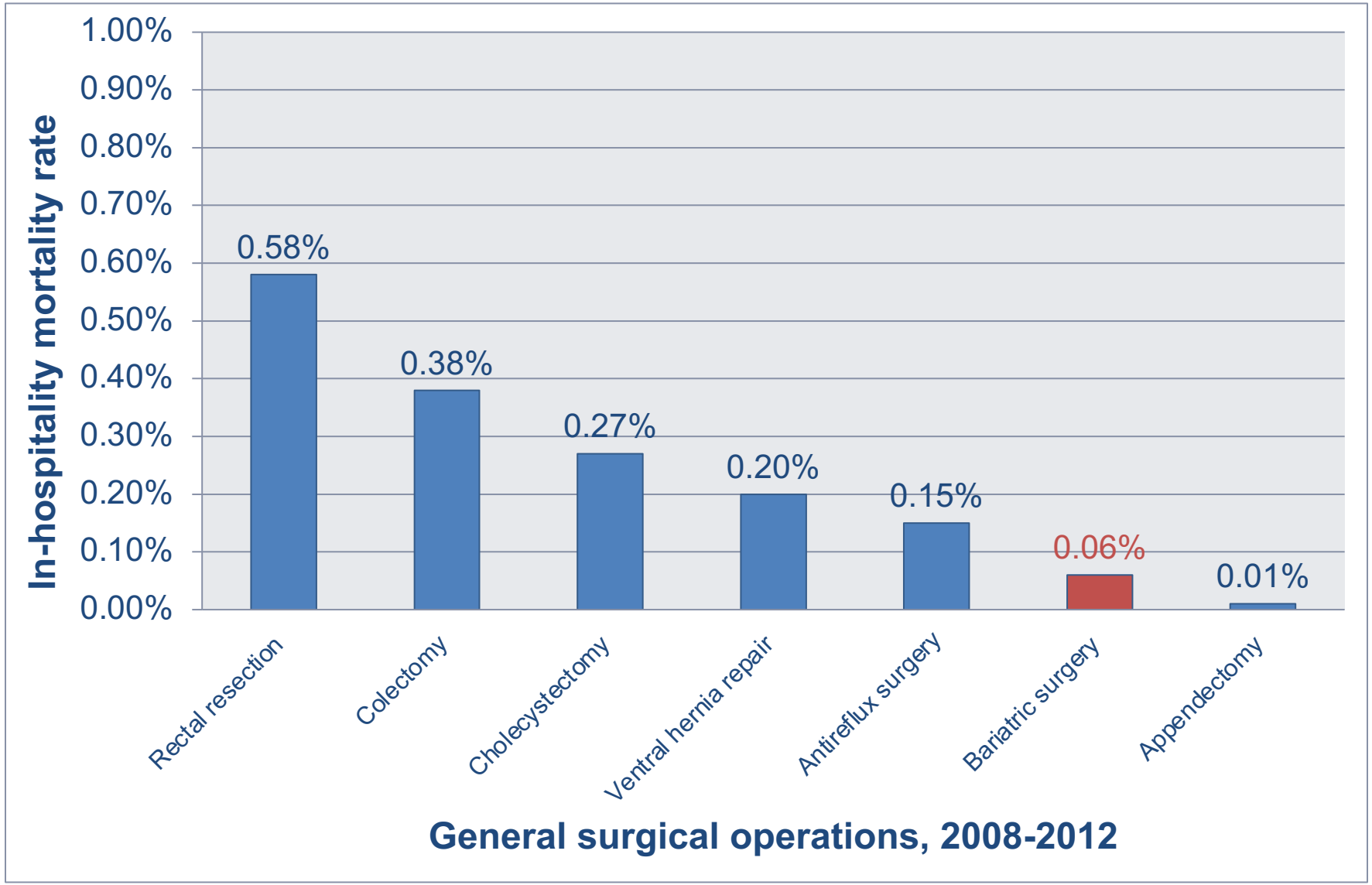
Published March 2021

	2011	2012	2013	2014	2015	2016	2017	2018	2019*
Total	**158,000**	**173,000**	**179,000**	**193,000**	**196,000**	**216,000**	**228,000**	**252,000**	**256,000**
Sleeve	17.8%	33.0%	42.1%	51.7%	53.6%	58.1%	59.4%	61.4%	59.4%
RYGB	36.7%	37.5%	34.2%	26.8%	23.0%	18.7%	17.8%	17.0%	17.8%
Band	35.4%	20.2%	14.0%	9.5%	5.7%	3.4%	2.7%	1.1%	0.9%
BPD-DS	0.9%	1.0%	1.0%	0.4%	0.6%	0.6%	0.7%	0.8%	0.9%
Revision	6.0%	6.0%	6.0%	11.5%	13.6%	14.0%	14.1%	15.4%	16.7%
Other	3.2%	2.3%	2.7%	0.1%	3.2%	2.6%	2.5%	2.3%	2.4%
Balloons	—	—	—	—	0.3%	2.6%	2.8%	2.0%	1.8%

Mortality for Bariatric Surgery

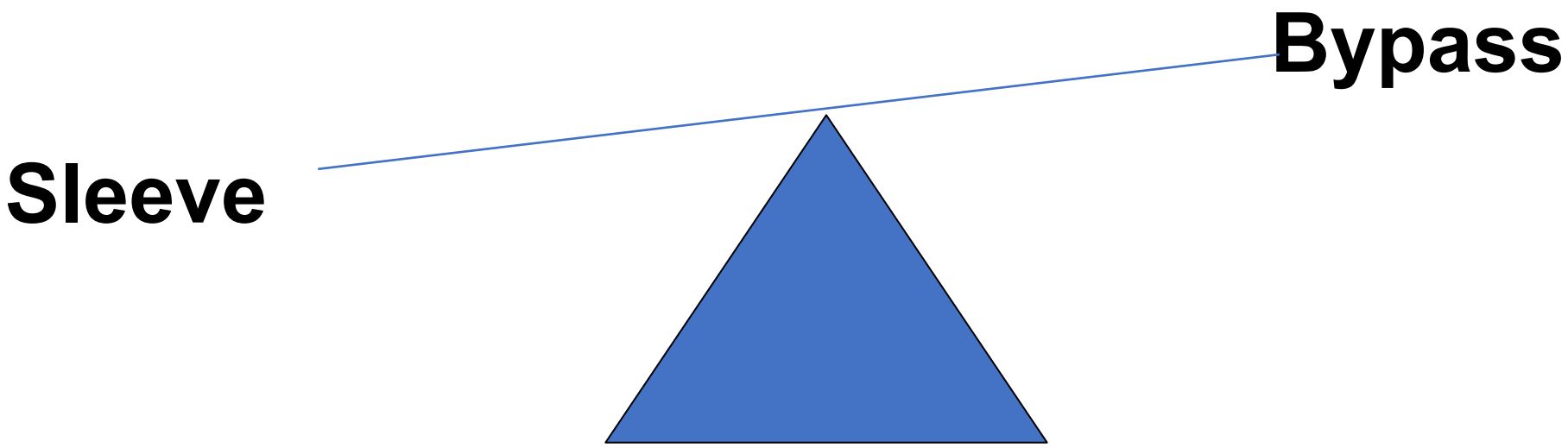


Nguyen et al. SOARD 2012



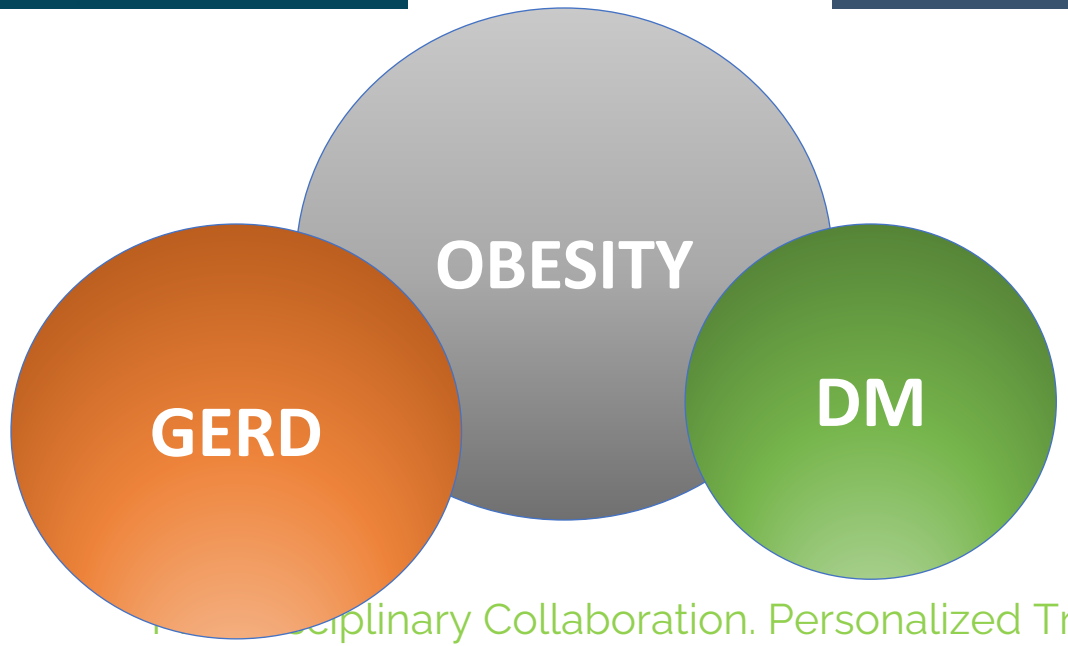
Nguyen et al. SOARD 2012

2021: Pendulum toward the Sleeve



What is the Optimal Bariatric Procedure in 2021?

VS



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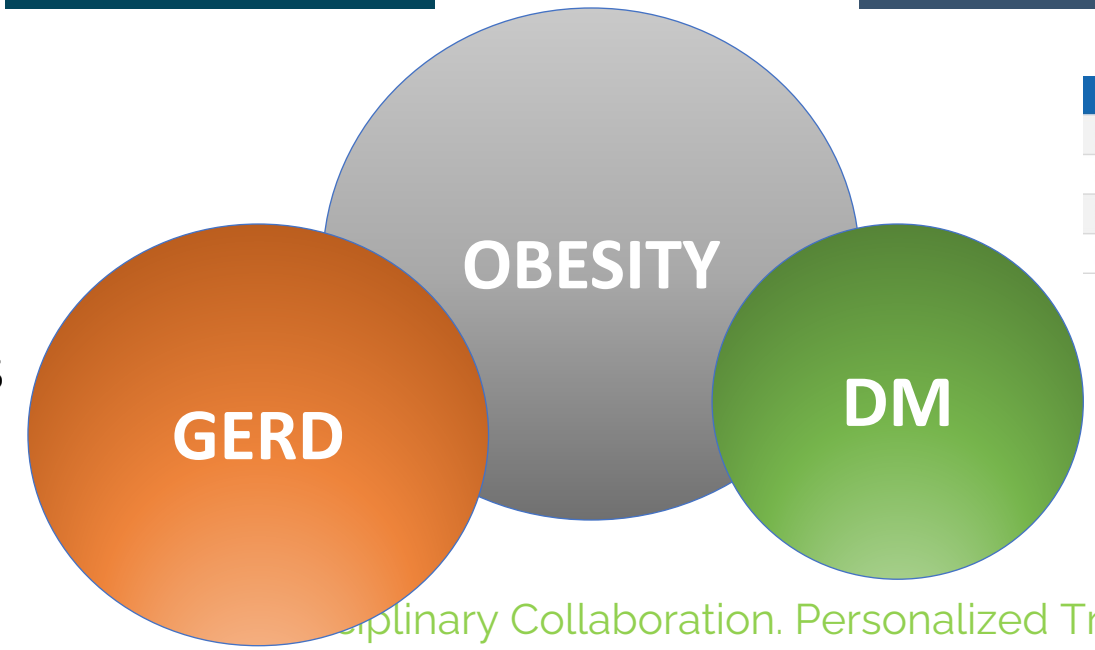
What is the Optimal Bariatric Procedure in Patients with GERD 2021?

VS



	All (Men and Women)
Overweight or Obesity	70.2
Overweight	32.5
Obesity (including extreme obesity)	37.7
Extreme obesity	7.7

20% of individuals in US
40 mil

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Pathophysiology of GERD & Sleeve

- High pressure system
- Lower compliance
- Technique related distal obstruction at the incisura angularis

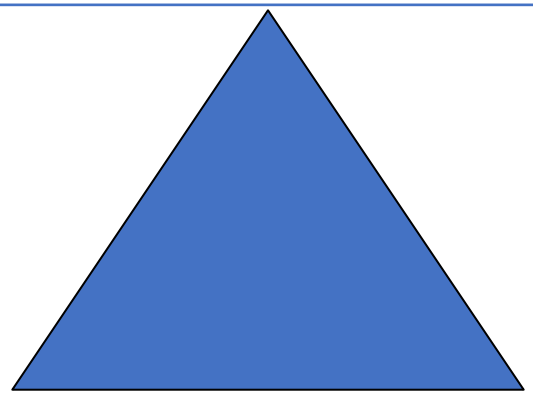
Pathophysiology of GERD & Sleeve

GERD

High pressure system

Lower compliance

Distal obstruction



GERD

Weight loss

5 yr RCT Bypass VS Sleeve (SLEEVEPASS)

Table 5. Complications Reported for Laparoscopic Sleeve Gastrectomy and Laparoscopic Roux-en-Y Gastric Bypass

Complication Category and Type	Sleeve Gastrectomy (n = 121)	Gastric Bypass (n = 119)	*P* Value
Minor Late (>30 d) Complications, No. (%)			
Vomiting/dehydration		3 (2.5)	
Gastroesophageal reflux	11 (9.1)		
Ulcer/stricture at gastrojejunal anastomosis	2 (1.7)	6 (5.0)	
Dumping		3 (2.5)	
Nonspecific abdominal pain		1 (0.8)	
Total	13 (10.7)	13 (10.9)	.96
Major Late (>30 d) Complications, No. (%)			
Gastroesophageal reflux	7(5.8)		
Internal herniation		17 (14.3)	
Incisional hernia	3 (2.5)	1 (0.8)	
Total	10 (8.3)	18 (15.1)	.10

Which of the 2 evils?

Salminen P et al. JAMA 2018

5 yr RCT Bypass VS Sleeve (SM-BOSS)

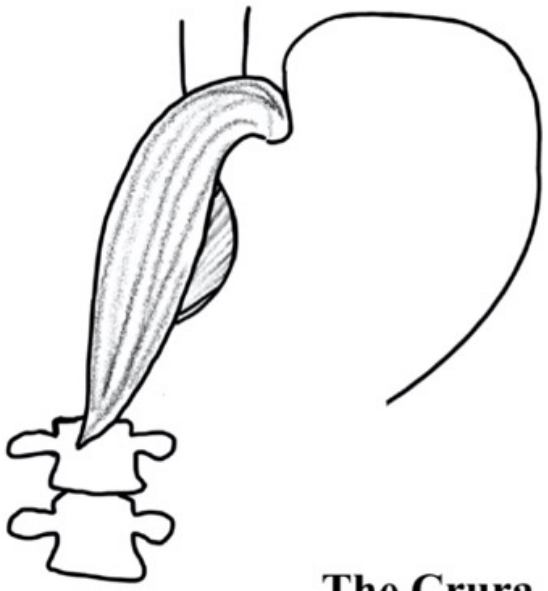
Table 3. Changes in Comorbidities at 5 Years

Comorbidities[a]	No. (%)		Absolute Difference, % (95% CI)[b]	*P* Value	
	Sleeve Gastrectomy (n = 101)	Roux-en-Y Gastric Bypass (n = 104)		Unadjusted	Adjusted[c]
Gastroesophageal Reflux					
Comorbidity present at baseline	44/101 (43.6)	48/104 (46.2)	−0.03 (−0.17 to 0.12)	.71[d]	
Remission	11 (25)	29 (60.4)	−0.36 (−0.57 to −0.15)	.0006[d]	.002
Improved	4 (9.1)	3 (6.3)	0.10 (−0.36 to 0.56)	.71[e]	.94
Unchanged	15 (34.1)	13 (27.1)	0.08 (−0.16 to 0.33)	.47[d]	.94
Worsened	14 (31.8)[a]	3 (6.3)	0.36 (0.13 to 0.59)	.002[e]	.006
De novo development of comorbidity	18/57 (31.6)	6/56 (10.7)	0.31 (0.08 to 0.54)	.01[d]	

You did not Change the ARB

Teterli R et al. JAMA 2018

Current Management for GERD/Hiatal Hernia + Obesity



The Crura

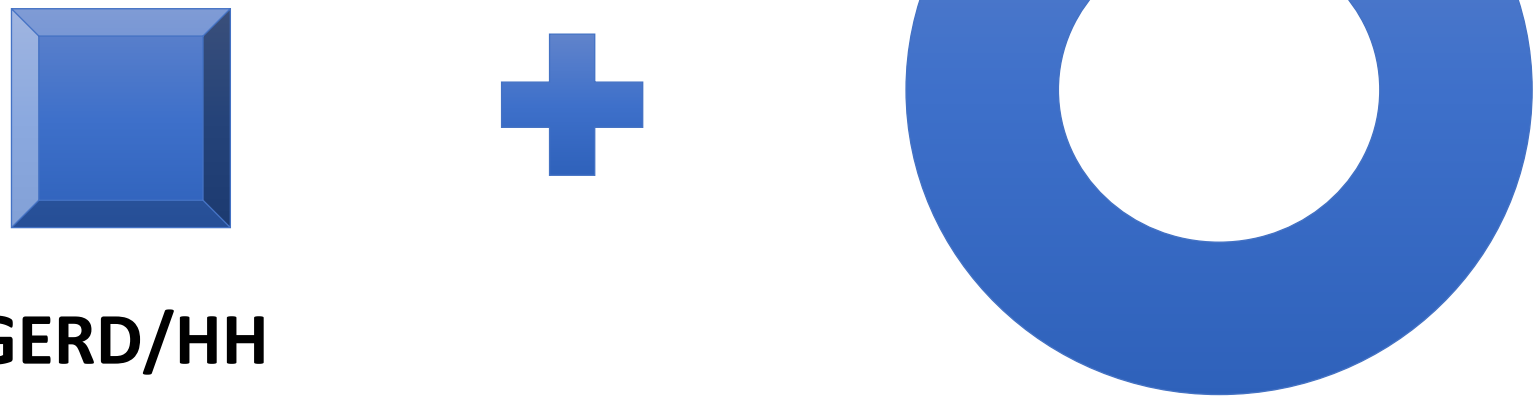
Is Hiatal Hernia alone a good operation?

2013 SAGES Guidelines for Management of Hiatal Hernia

- A necessary step of hiatal hernia repair is to return GEJ to an infradiaphragmatic position
- A fundoplication must be performed during repair of a sliding hiatal hernia to address reflux
- A fundoplication is also important during paraoesophageal hernia repair

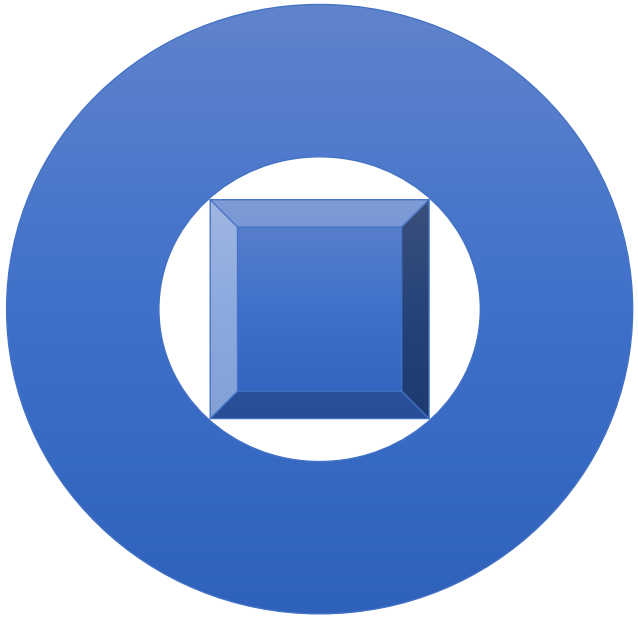
Kohn GP et al. Surg Endosc 2013

Current Management for GERD/Hiatal Hernia + Obesity



GERD/HH

Current Management for GERD/Hiatal Hernia + Obesity

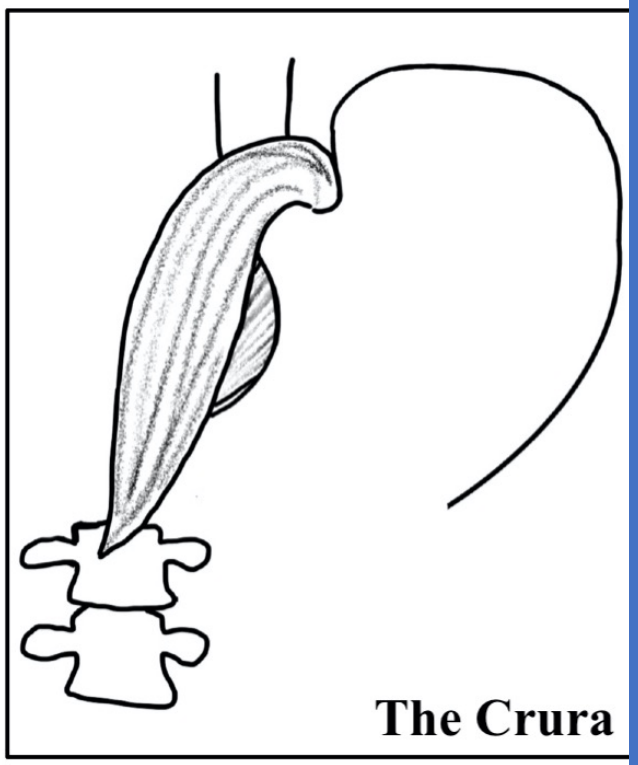


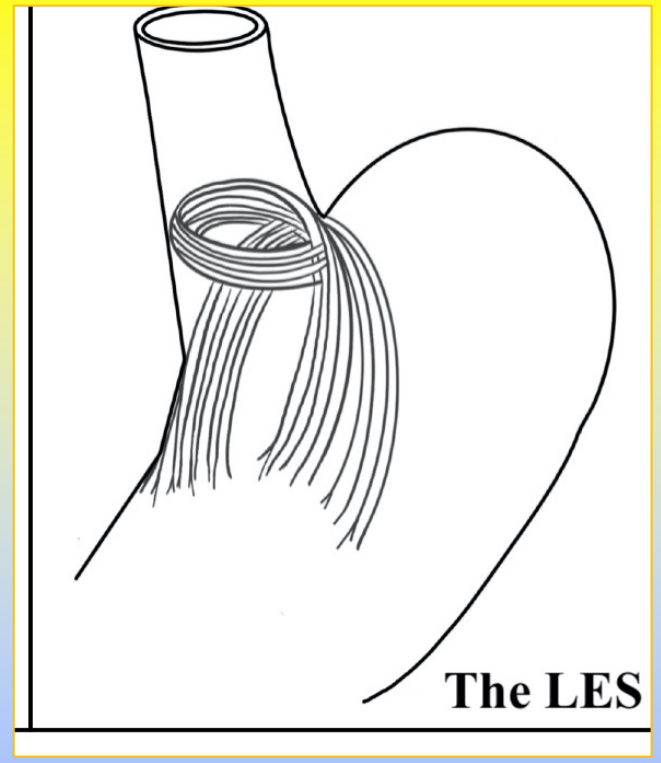
Handling the Reflux Barrier
"The Devil's in the Details"

What Constitute the ARB?

How does ARS works?

2 Valves Hypothesis





2010 SAGES Guidelines for Surgical Tx of GERD

- Exact nature of ARB is poorly understood, current view of the ARB:
  - LES
  - Diaphragmatic Crura
  - Phrenoesophageal ligament

Stefanidis D et al. Surg Endosc 2010

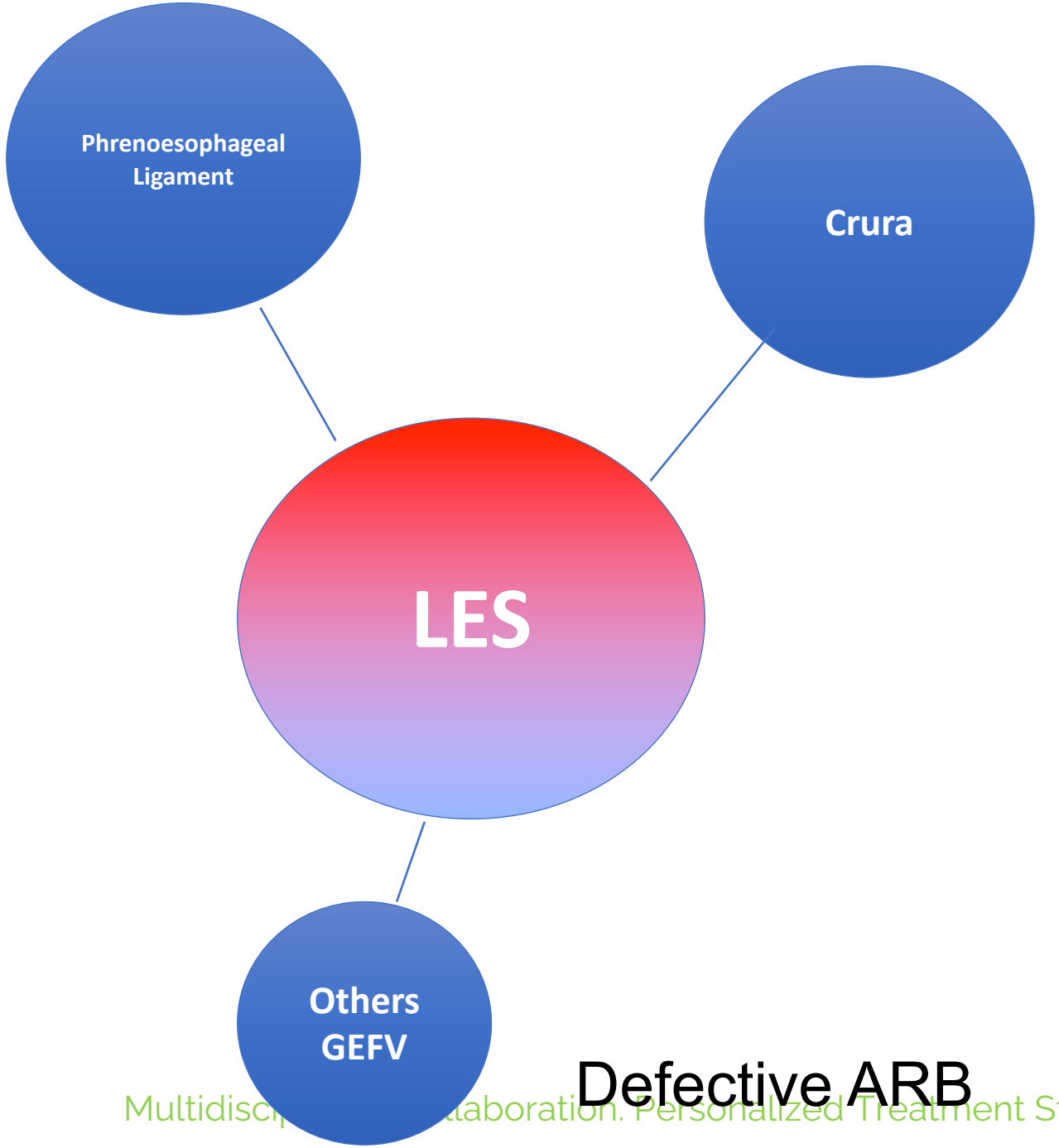
2020 SAGES Surgical Tx of GERD: Systematic Review & Meta-analysis

- Antireflux surgery mechanically augment the LES

Mckinlet SK et al. Surg Endosc 2021

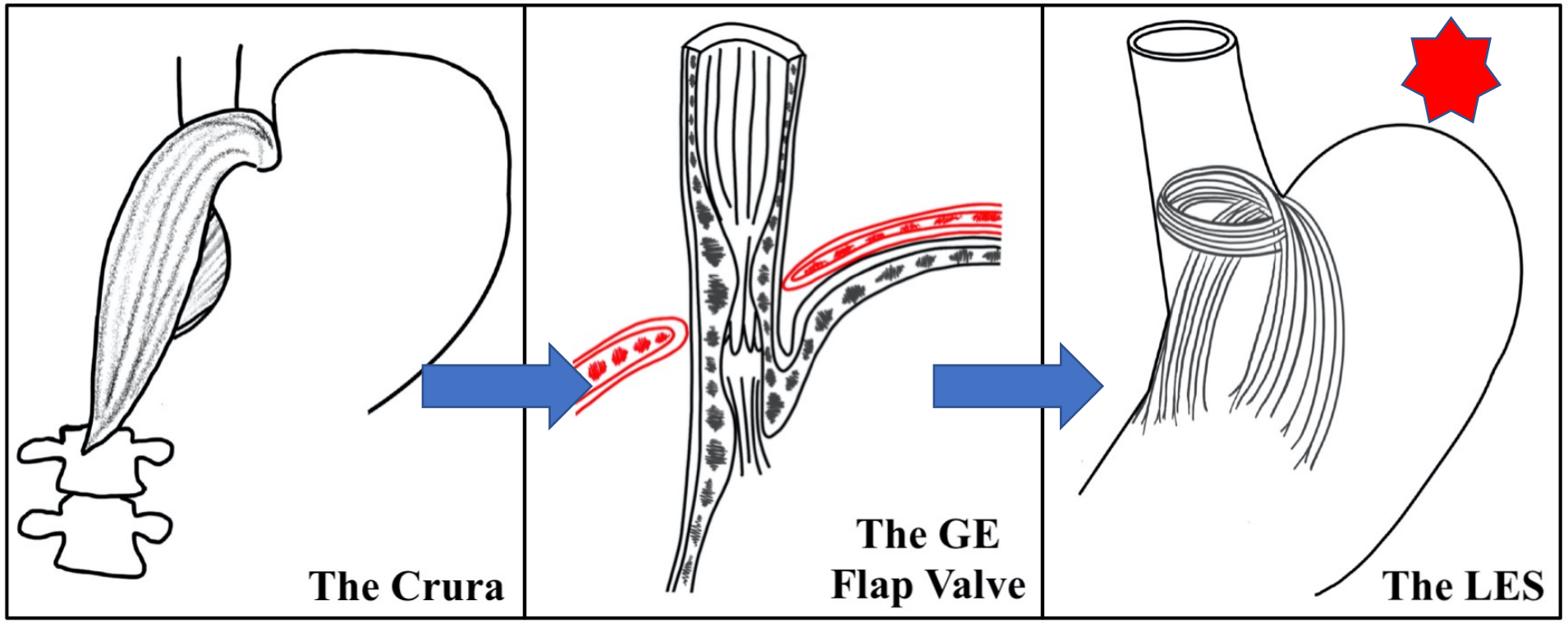
Mechanisms of Antireflux Surgery

- Castell D. Eval of antireflux mechanism following Lap Nissen. Br J Surg **1997** (increase LES pressure, may be mechanical effect of fundic wrap)
- Ireland et al. Mechanisms underlying the antireflux action of fundoplication. Gut **1993** (reduced triggering of TLESR)
- Little et al. Mechanisms of action of antireflux surgery: theory and fact. World J Surg **1992** (LES, GEFV, mechanical effects of the wrap)
- Lundell. Mechanism of action of antireflux procedures. Br J Surg **1999** (basal LES tone substantially higher)
- Fisher et al. Antireflux surgery: mechanism of action. Am J Dig Dis **1978** (increased LES pressure alone does not explain adequately)
- Mittal. Antireflux mechanism of Nissen. Gastroenterology **2011** (reduces TLESR)
- Holloway. The antireflux barrier (ARB) and mechanisms of GERD. (TLESR + crural diaphragm)



Defective ARB

Components of ARB



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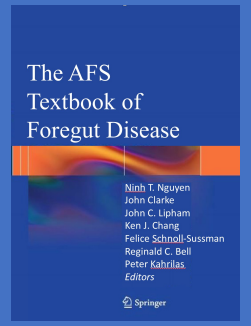
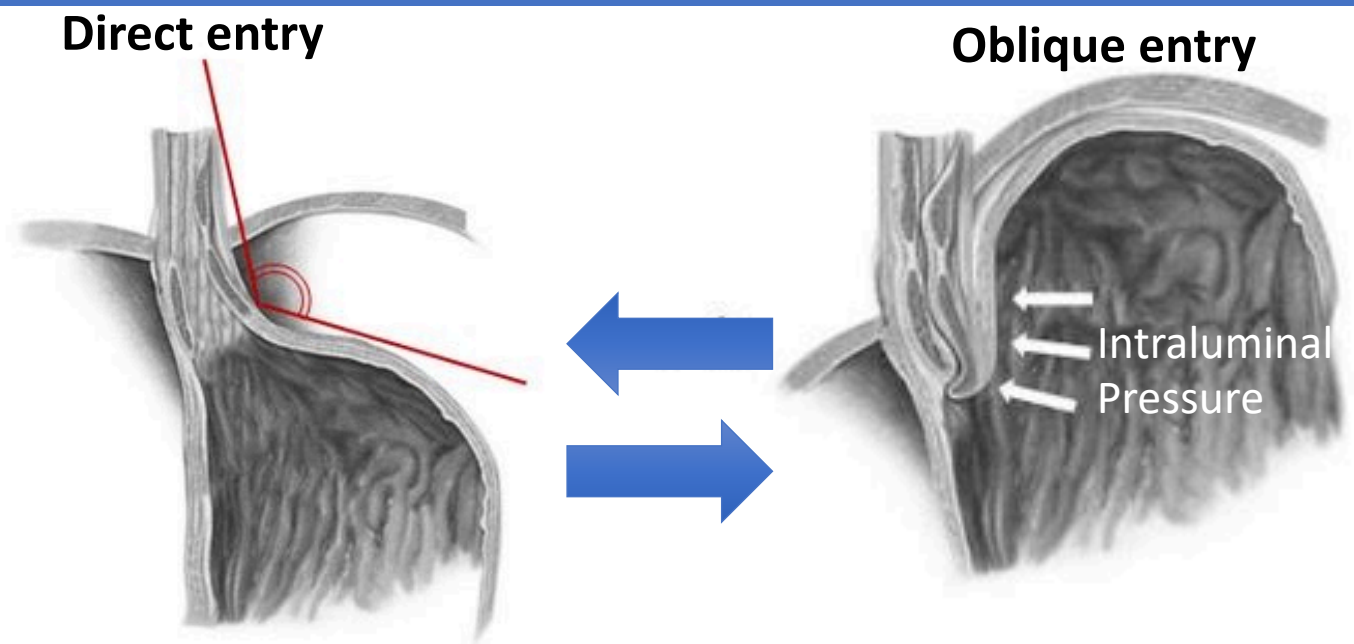


Naturally Occurring GEFV: 120º musculomucosal fold



55 y/o with chronic GERD x 5 years

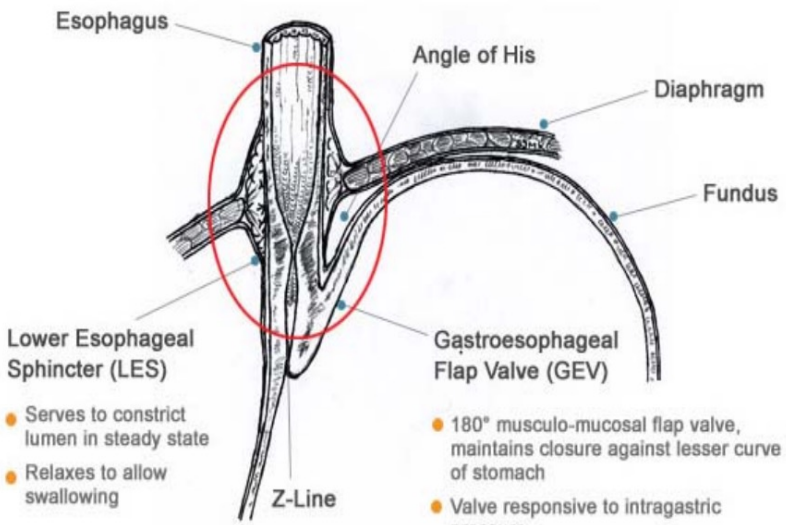
Can you restore me to my original anatomic barrier to what I had when I was 25 y/o?

1. Reduce hiatal hernia
2. Increase intraabdominal esophageal segment
3. Crural closure
4. **Accentuate the LES/GEFV (Nissen/Toupet)**

Hill LD et al., GI Endosc 1996

Anatomic Flap Valve
EGJ vs UVJ

Gastroesophageal Reflux



- Serves to constrict lumen in steady state
- Relaxes to allow swallowing

- 180° musculo-mucosal flap valve, maintains closure against lesser curve of stomach
- Valve responsive to intragastric pressure
- Occludes esophagus to prevent reflux

VESICOURETERIC REFLUX

Pathophysiology

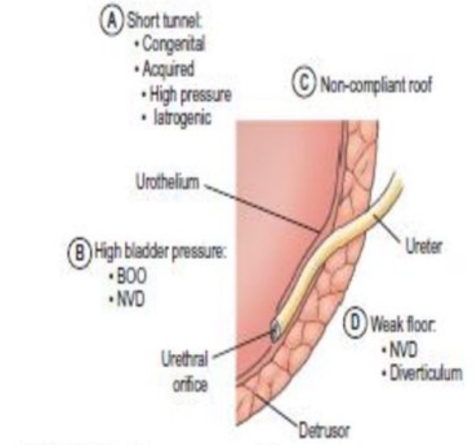


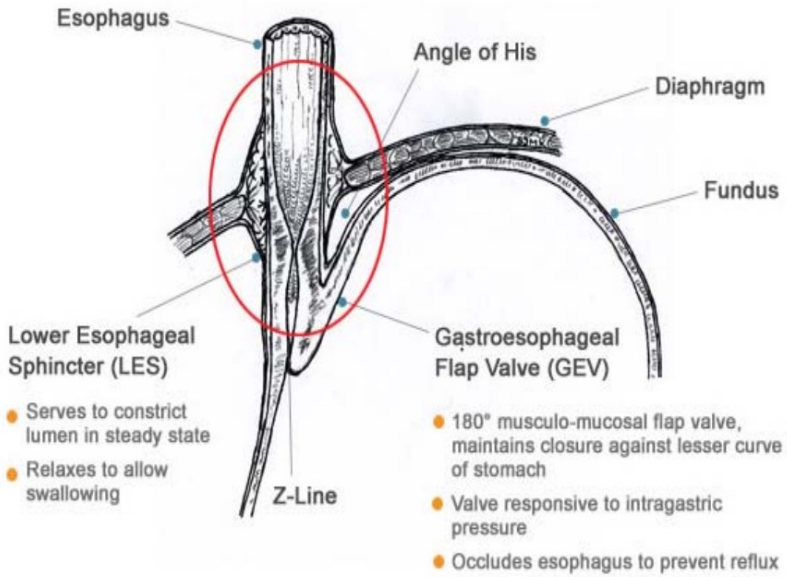
FIGURE 55-7 ■ Components of the competent ureterovesical junction. Those abnormalities most often implicated in the etiology of vesicoureteral reflux are outlined. BOO, bladder outlet obstruction; NVD, neurovesical dysfunction.

- The normal UVJ is characterized by an oblique entry of the ureter into the bladder and a length of submucosal ureter providing a high ratio of tunnel length to ureteral diameter.
- This anatomic configuration provides a predominantly passive valve mechanism. As the bladder fills and the intravesical pressure rises, the resulting bladder wall tension is applied to the roof of the ureteral tunnel.
- This results in a compression of the ureter which prevents retrograde passage of urine.

Ashcraft Pediatric Surgery 6E. 2014

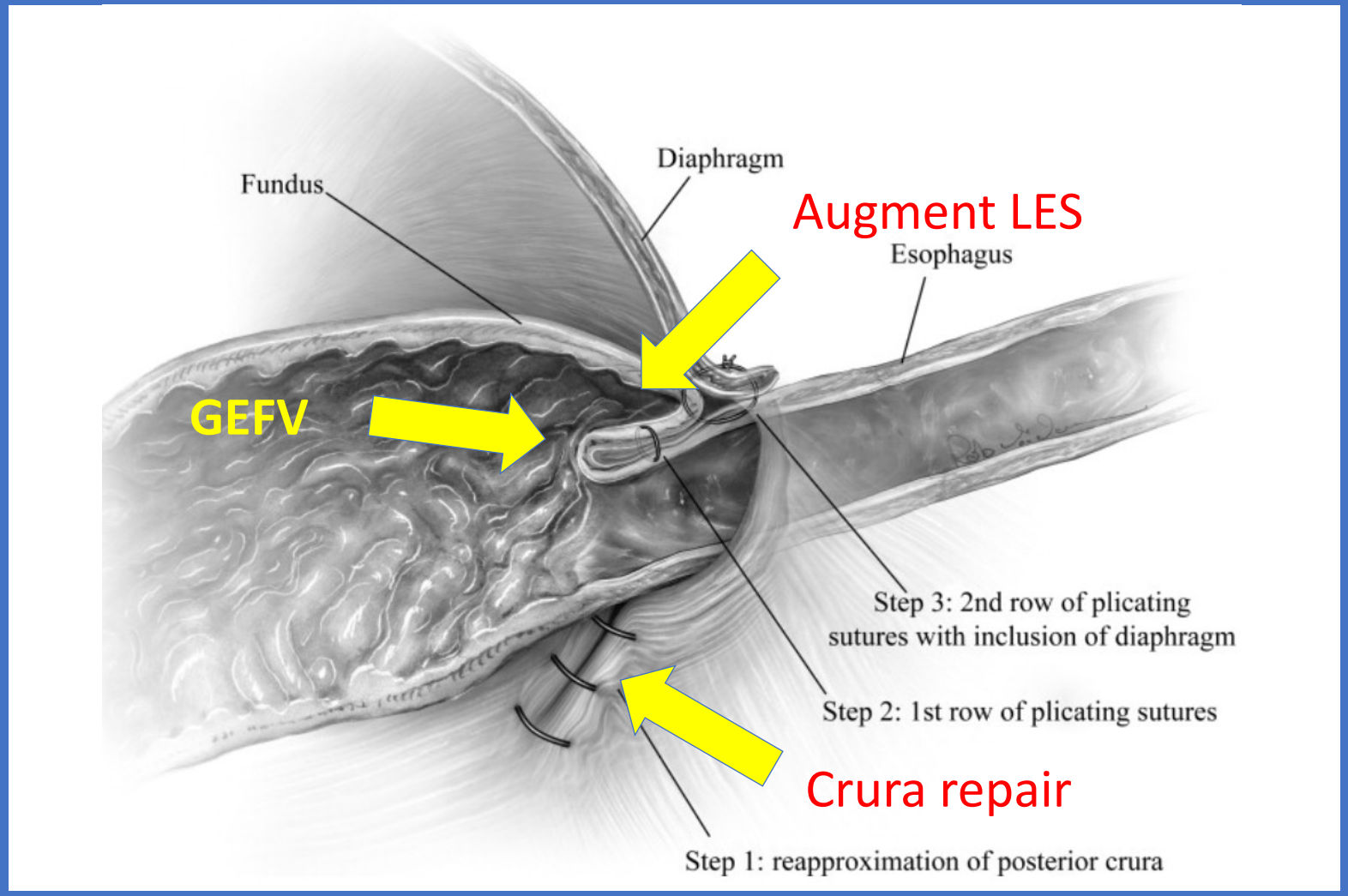
Preventing Reflux: Engineering

Good intraabdominal esophageal length
Oblique entry



Loss of intraabdominal esophageal length
Direct entry

Belsey Fundoplication



Cook D, Operative Techniques 2013

Gut, 1962, 3, 1

Mechanisms protecting against gastro-oesophageal reflux: a review

MICHAEL ATKINSON

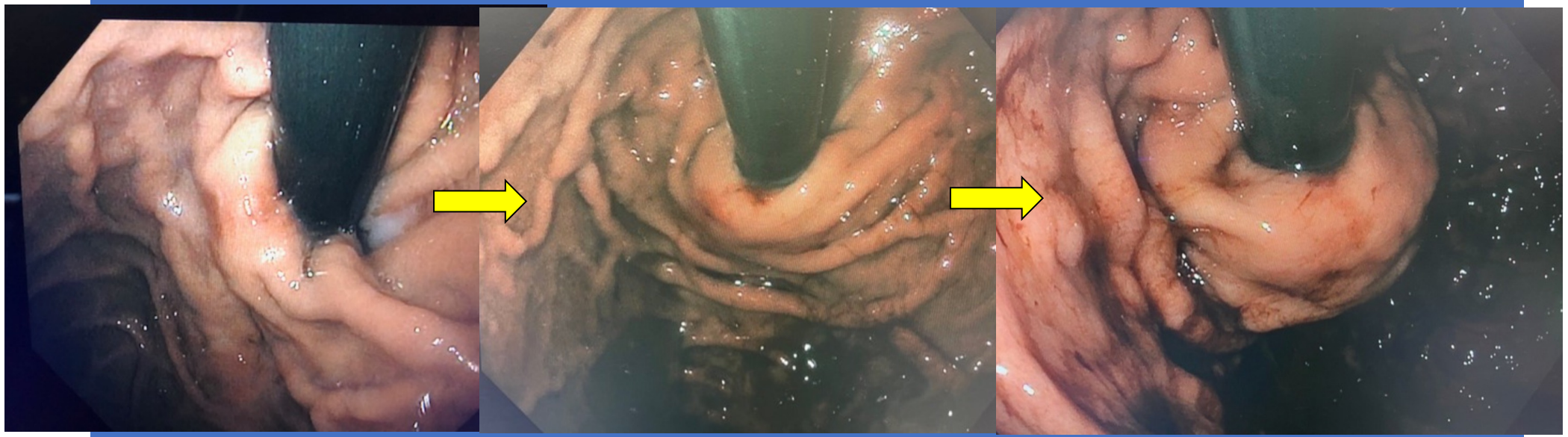
From the Department of Medicine, University of Leeds, The General Infirmary at Leeds

- Mechanisms are anatomic and physiologic
- LES (physiologic)
- Crura of the diaphragm (Physiologic + anatomic)
- Mechanical valve or mucosal fold (anatomic)

Adler RH et al. A Valve Mechanism to Prevent GERD. Surgery 1958

- Method of making a one-way cardioesophageal valve
- LES (physiologic)
- Crura of the diaphragm (Physiologic + anatomic)

Antireflux Barrier (ARB)
"There is an anatomic mechanical barrier"



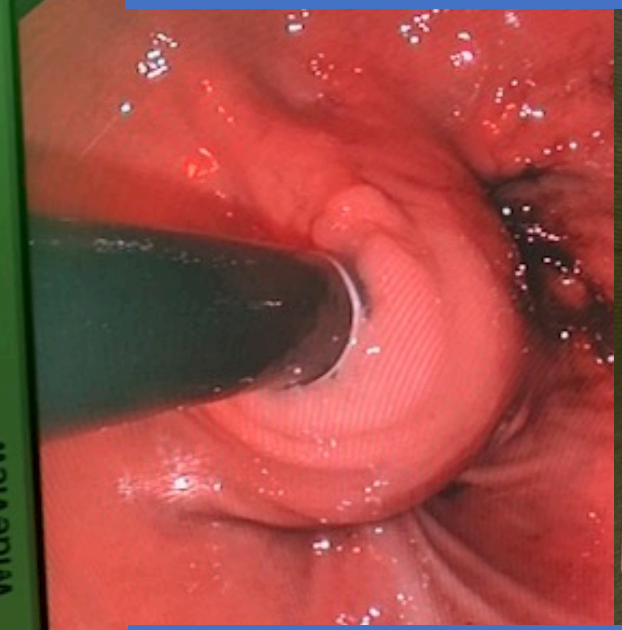
Surgical Endoscopy
https://doi.org/10.1007/s00464-021-08416-y

NEW TECHNOLOGY

Collaboration between GI surgery & Gastroenterology improves understanding of the optimal antireflux valve—the omega flap valve

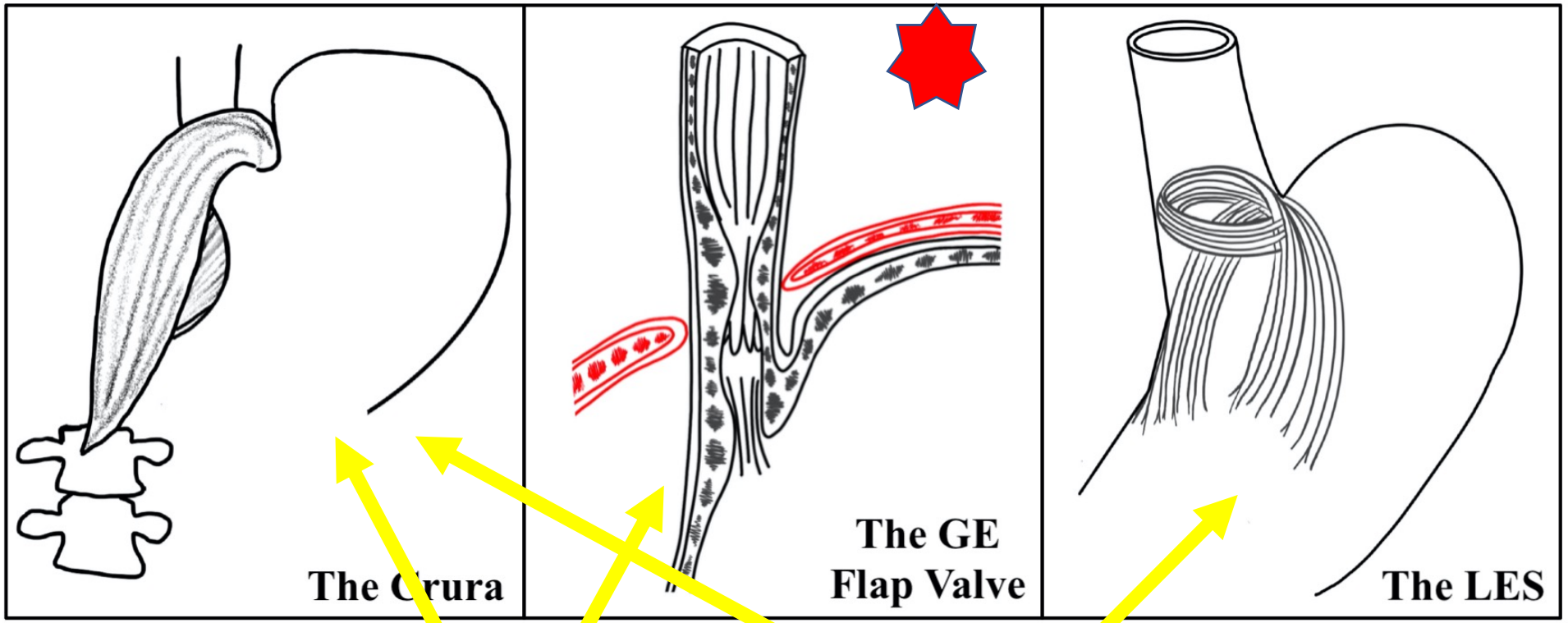
Ninh T Nguyen[1] · Justine Chinn[1] · Kenneth Chang[2]

Variation of Fundoplications/GEFV
Which one is Total?



A. B. C. D.

Components of ARB



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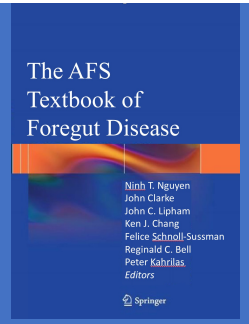
Mechanical Valves

Physiologic Valves



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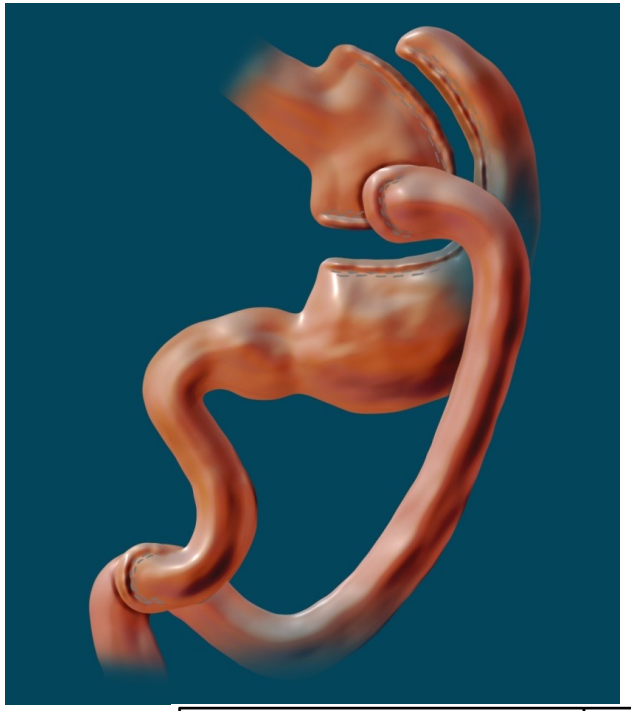
ient Advocacy.

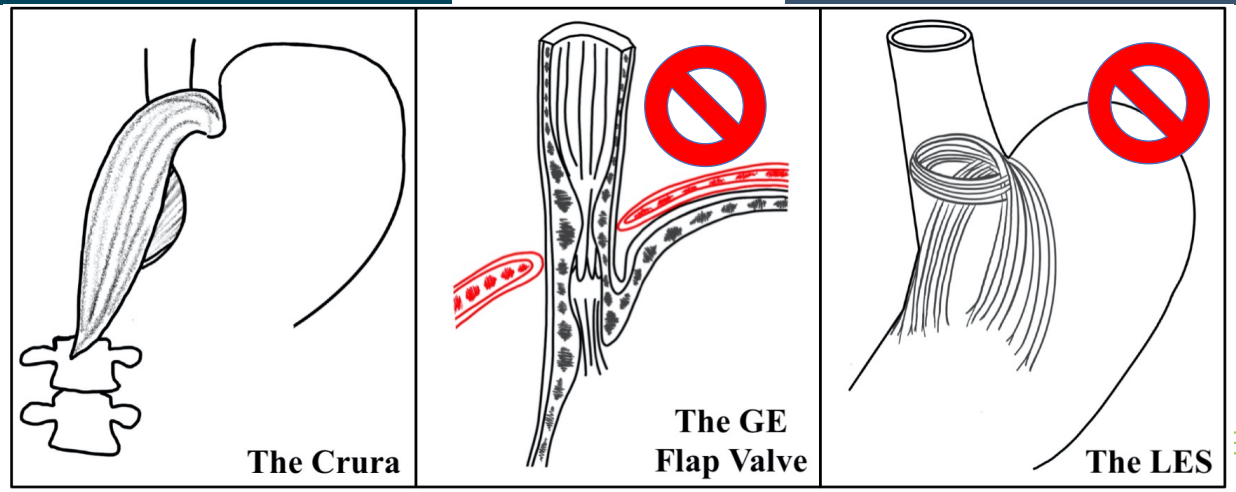
What is the Optimal Bariatric Procedure in Patients with GERD in 2021?

HH repair + Bypass



VS

HH repair + sleeve



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ent Strategies. Patient Advocacy.

Manometric and pH-monitoring changes after laparoscopic sleeve gastrectomy: a systematic review

Andrea Balla [1], Francesca Meoli [2], Livia Palmieri [2], Diletta Corallino [2], Maria Carlotta Sacchi [3], Emanuela Ribichini [3], Diego Coletta [4], Annamaria Pronio [5], Danilo Badiali [3], Alessandro M Paganini [2]

- 14 manometric studies (n=402)
- 12 studies with pH data (n=547)
- Worsen pH data observed in 9 articles
- De novo GERD 18-69%

> Pol Arch Intern Med. 2018 Oct 31;128(10):594-603. doi: 10.20452/pamw.4334.
Epub 2018 Sep 20.

Esophageal pH and impedance reflux parameters in relation to body mass index, obesity-related hormones, and bariatric procedures

- 53 patients
- De novo GERD 18%

Cruroplasty added to laparoscopic sleeve gastrectomy; does it decrease postoperative incidence of de-novo acid reflux?: A randomised controlled trial

Masoud Sayadi Shahraki [1], Mohsen Mahmoudieh Dehkordi [1], Mahmoud Heydari [1], Shahab Shahabi Shahmiri [1], Maryam Soheilipour [2], Abbas Hajian [3]

- 80 patients
- GERD-HRQL were not different between groups
- Postop de novo GERD was not considerable less after cruroplasty + sleeve

ASMBS Updated Position Statement on GERD & Sleeve (2017)

- Preexisting GERD should not be excluded
- GERD improvement is less predictable and GERD may worsen or develop de novo
- De novo GERD after SG in 8-11% (1 study at 26.7%)
- 5yr after SG de novo GERD at 7.4%
- SG + HH repair, de novo GERD developed in 15.6%
- Presence of Barrett esophagus is controversial in the preferential use of RYGB

5 yr RCT Bypass VS Sleeve (SM-BOSS)

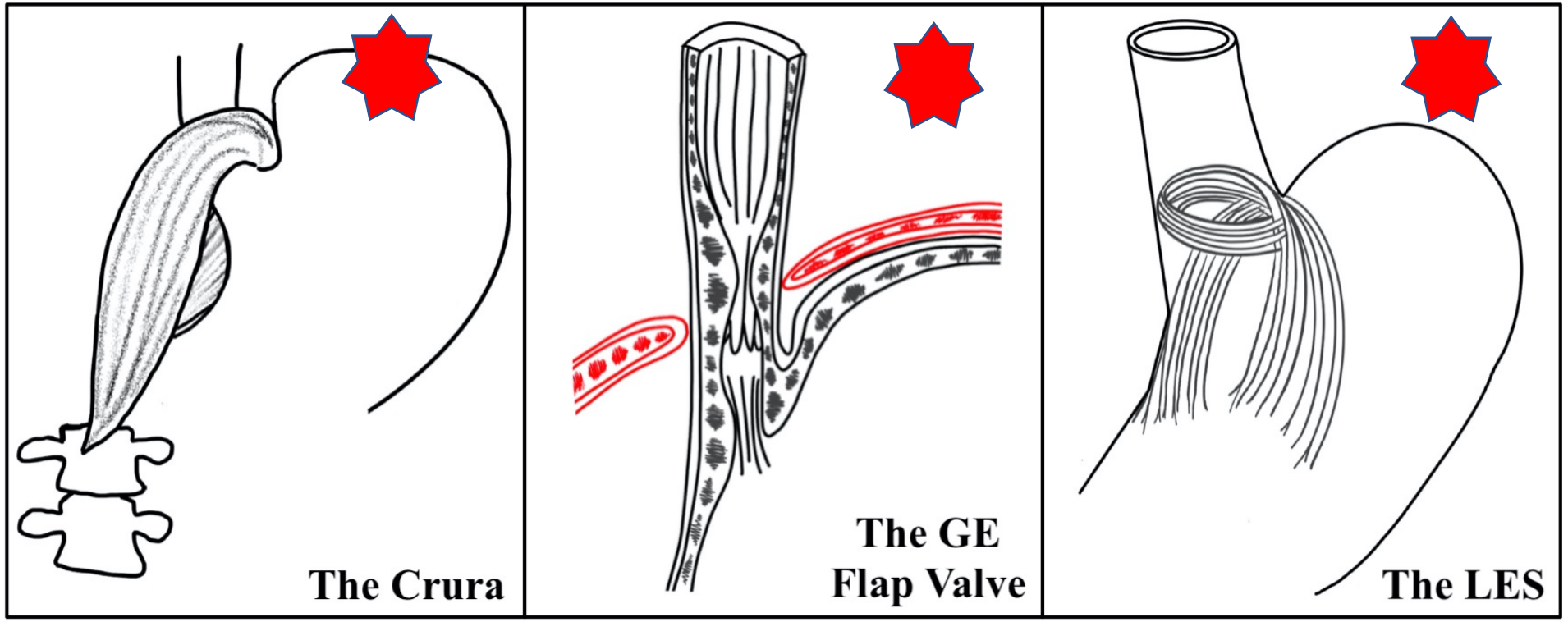
Table 3. Changes in Comorbidities at 5 Years

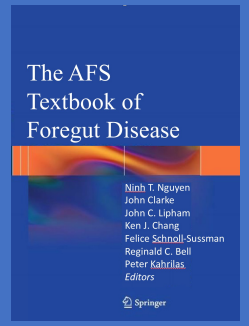
Comorbidities[a]	No. (%)		Absolute Difference, % (95% CI)[b]	*P* Value	
	Sleeve Gastrectomy (n = 101)	Roux-en-Y Gastric Bypass (n = 104)		Unadjusted	Adjusted[c]
Gastroesophageal Reflux					
Comorbidity present at baseline	44/101 (43.6)	48/104 (46.2)	−0.03 (−0.17 to 0.12)	.71[d]	
Remission	11 (25)	29 (60.4)	−0.36 (−0.57 to −0.15)	.0006[d]	.002
Improved	4 (9.1)	3 (6.3)	0.10 (−0.36 to 0.56)	.71[e]	.94
Unchanged	15 (34.1)	13 (27.1)	0.08 (−0.16 to 0.33)	.47[d]	.94
Worsened	14 (31.8)[a]	3 (6.3)	0.36 (0.13 to 0.59)	.002[e]	.006
De novo development of comorbidity	18/57 (31.6)	6/56 (10.7)	0.31 (0.08 to 0.54)	.01[d]	

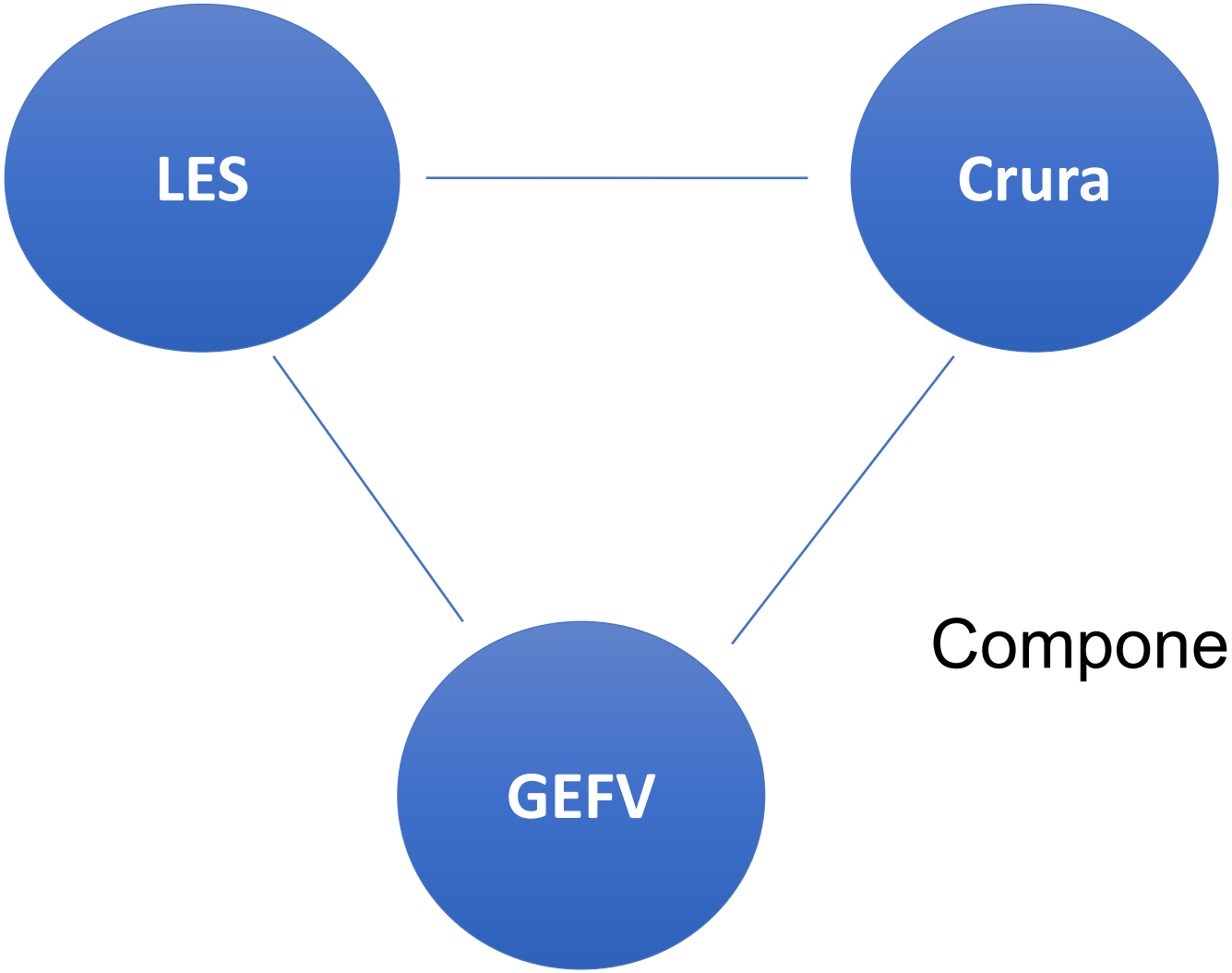
De Novo GERD

Teterli R et al. JAMA 2018

Components of ARB



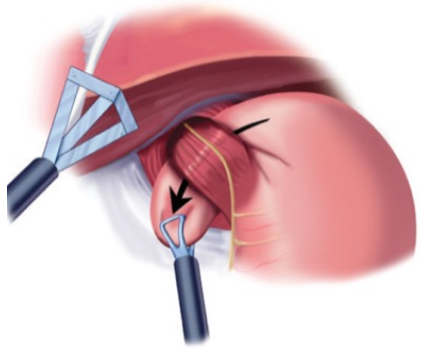




Components of the ARB

What is the Optimal GERD Procedure in 2021?

HHR + augment GEFV/LES

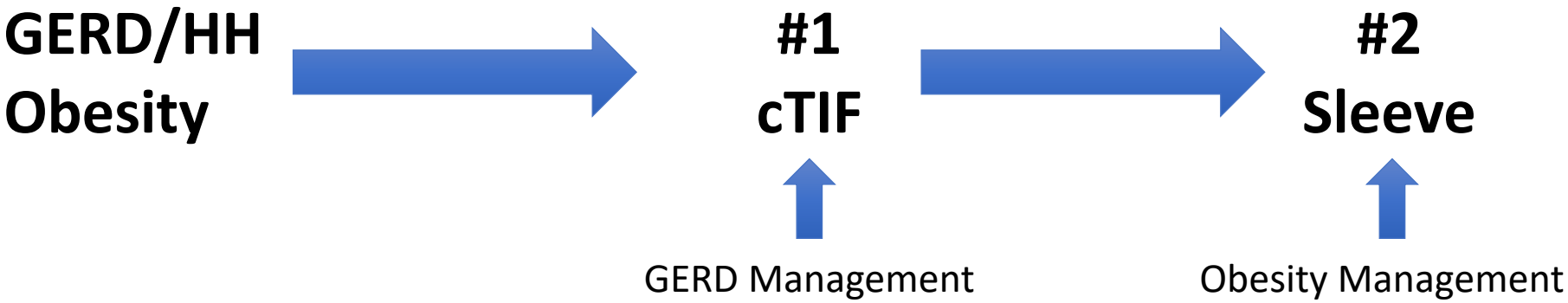


What is the Optimal Bariatric Procedure in 2021?

Sleeve

Prospective Protocol
GERD/HH + Severe Obesity

Inclusion criteria: BMI 35-45



Why cTIF? Uses lowest amount of gastric fundus

Why sequential? Safety & quality reason for risk of disruption of cTIF

The Pendulum Swings
Where are we at Today with Bariatric Surgery (50+ yrs)

Open	→	Laparoscopic
Low volume	→	>250,000 operations/yr
Gastric Bypass	→	Sleeve Gastrectomy
Bariatric surgery	→	Metabolic surgery (lower BMI)
Minimal standards	→	Accreditation in bariatric surgery
No endoscopy	→	Extensive Application of Endoscopy
Renegade	→	Surgical Discipline
GERD a Byproduct	→	GERD a Focus

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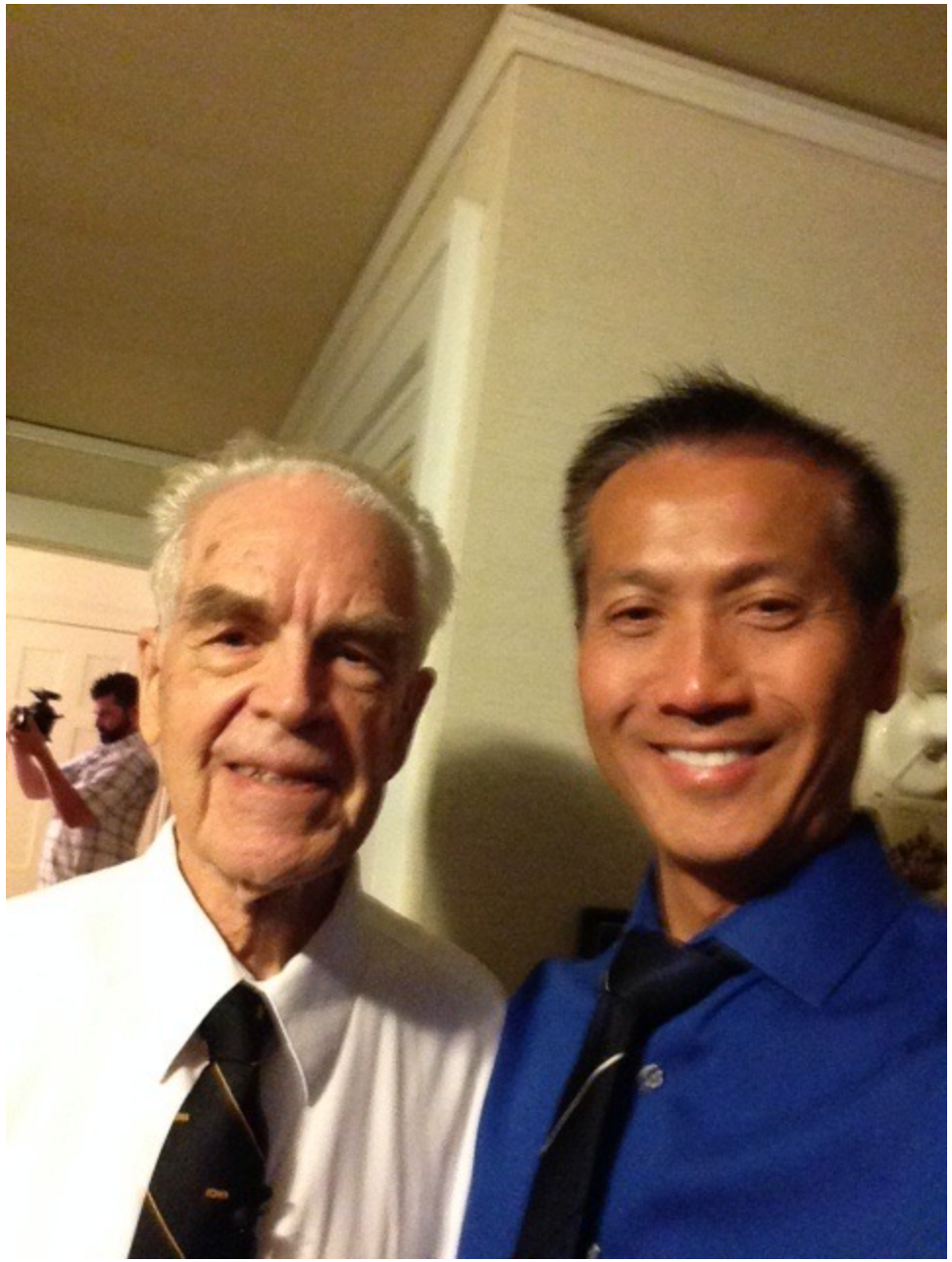

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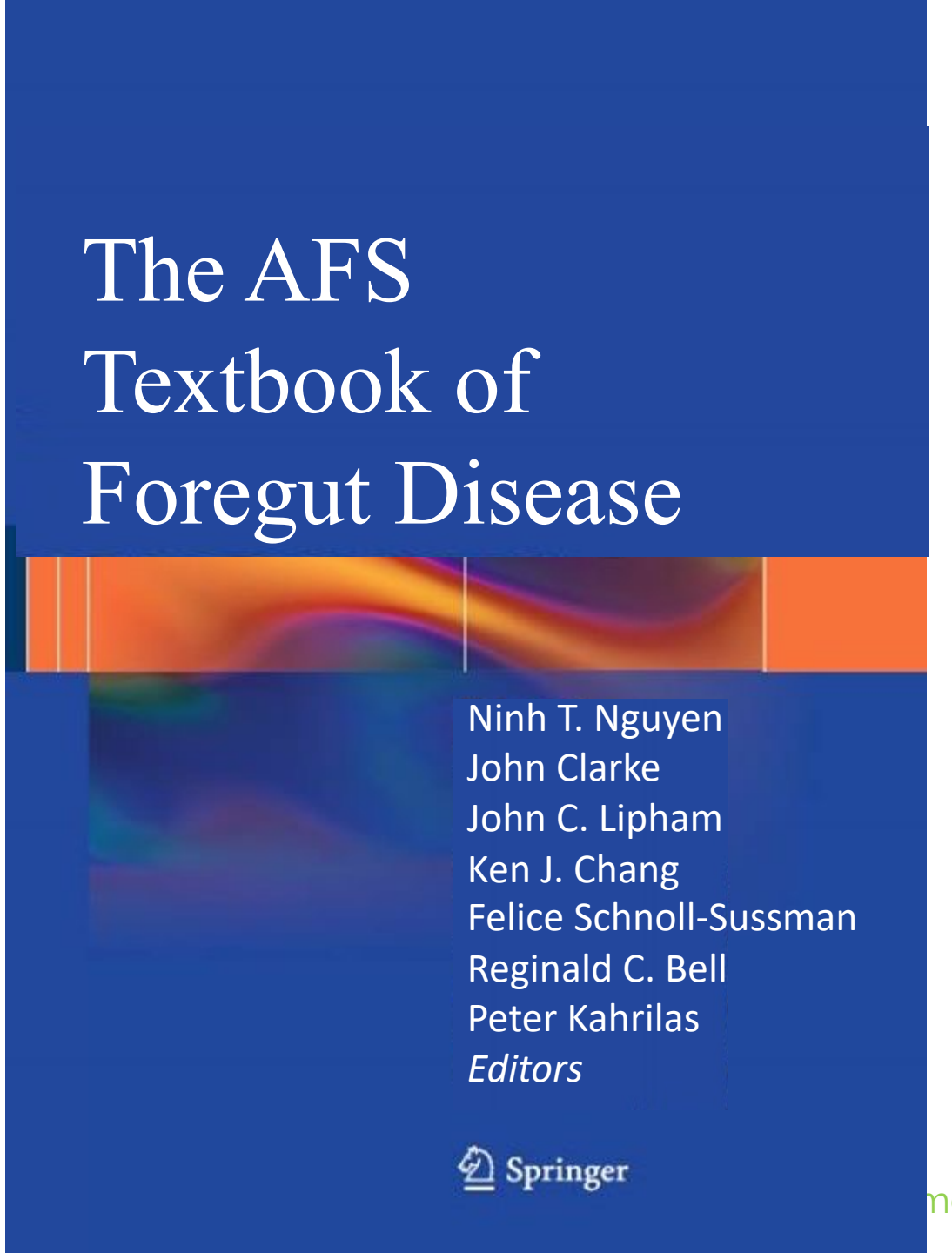

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The Pendulum Swings - What is the Optimal Bariatric Procedure in Patients with GERD 2021?

Ninh T. Nguyen
Professor & Chair, Department of Surgery
University of California Irvine Medical Center

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