

Hiatal Hernia: The Nemesis of Antireflux Surgery

- and why you should know about Hill sutures!

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**American Foregut Society
Nashville, TN
September 23-26, 2021**



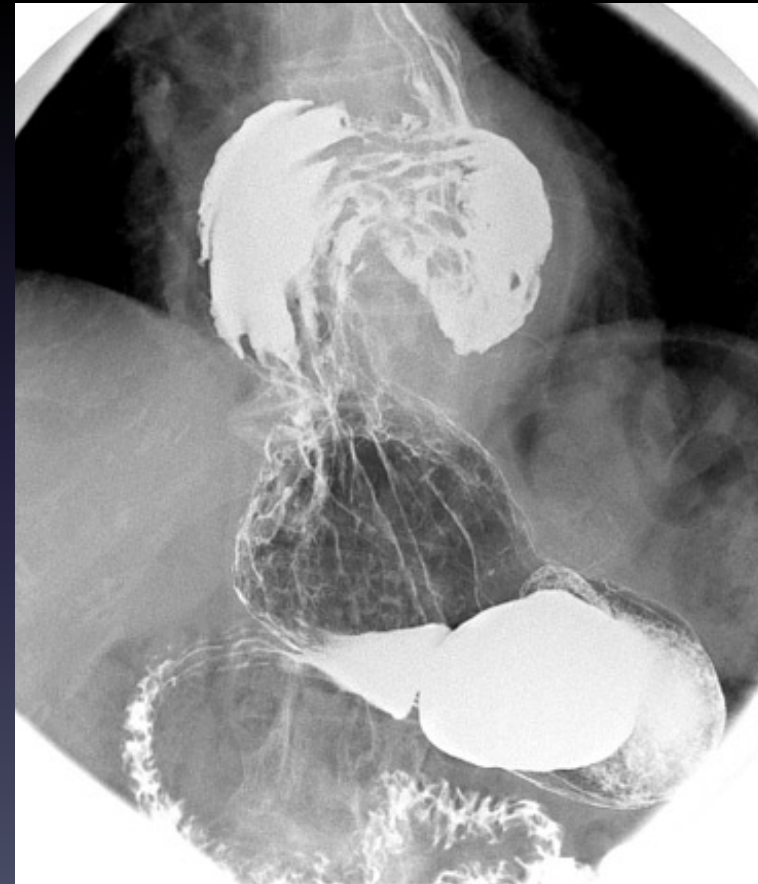
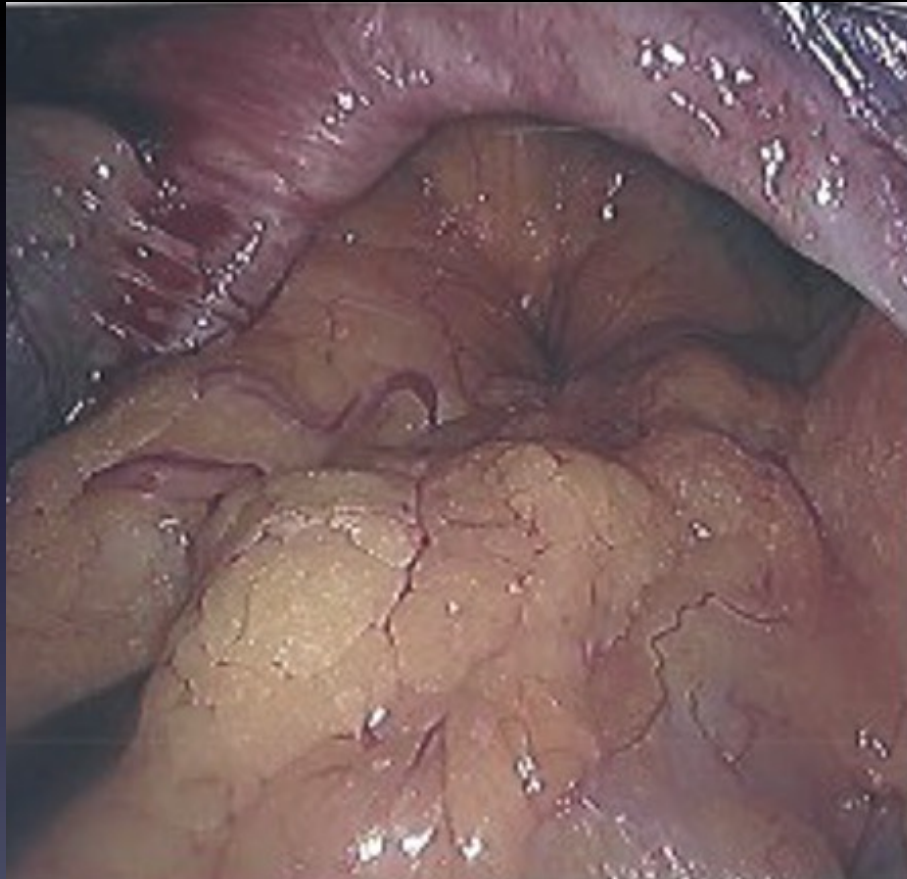
Conflict of interest

- Nothing to disclose

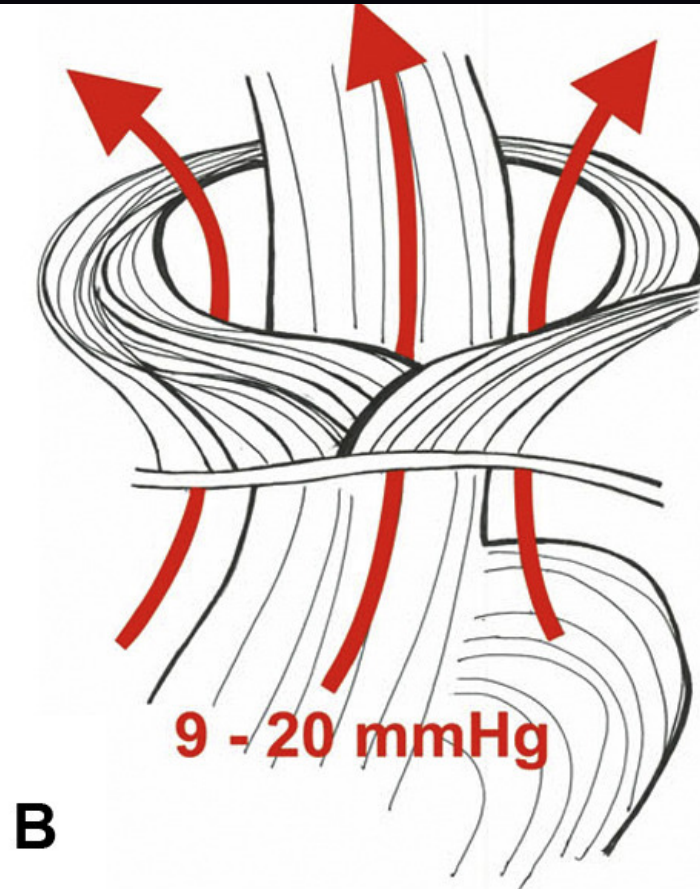
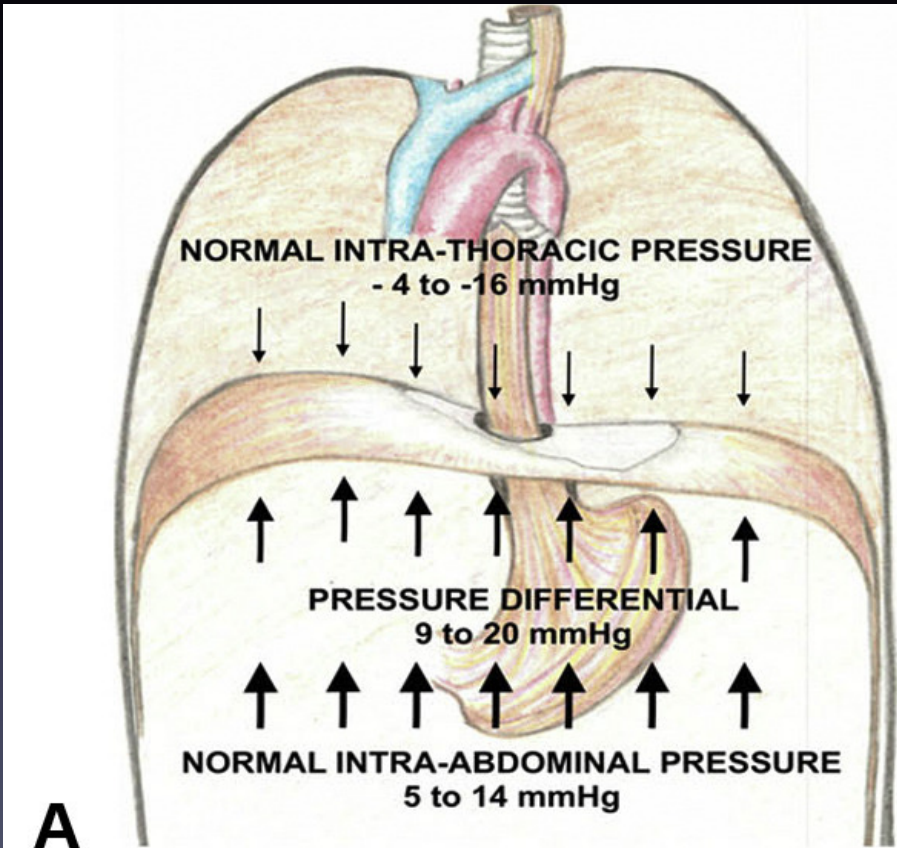
Outline

- Our nemesis
- Radial tension
- Axial tension
- Hill sutures
- The phrenoesophageal membrane

Our Nemesis



Our Real Nemesis – Transdiaphragmatic Pressure Gradient!

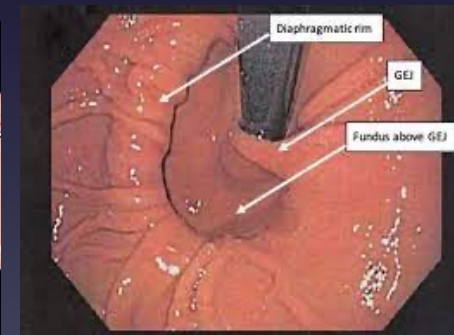
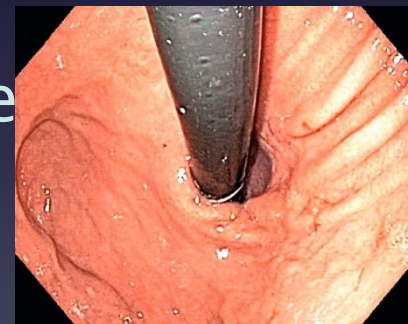
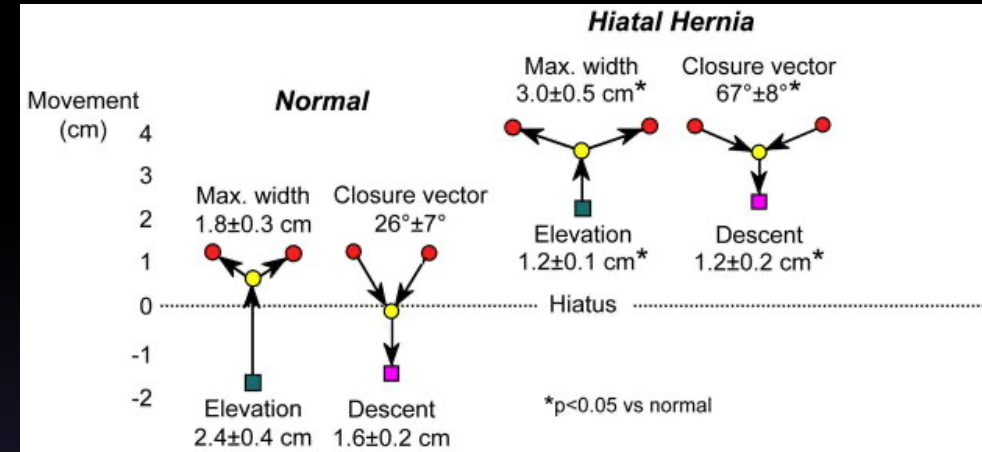


Physiology of Hiatal Hernia

- Factors increasing intra-abdominal pressure
 - Obesity
 - Pregnancy
 - Straining
 - Coughing
 - Trauma
- Age, nutrition, immunosuppression

Hiatal hernia size correlates with severity of reflux

- Displacement of LES
- Loss of intra-abd pressure
- Transient relaxation LES
- Laxity of PEM
- Loss of diaphragmatic support
- Decreased esophageal clearance
- Loss of flap valve



Hiatal hernia size correlates with operative complexity

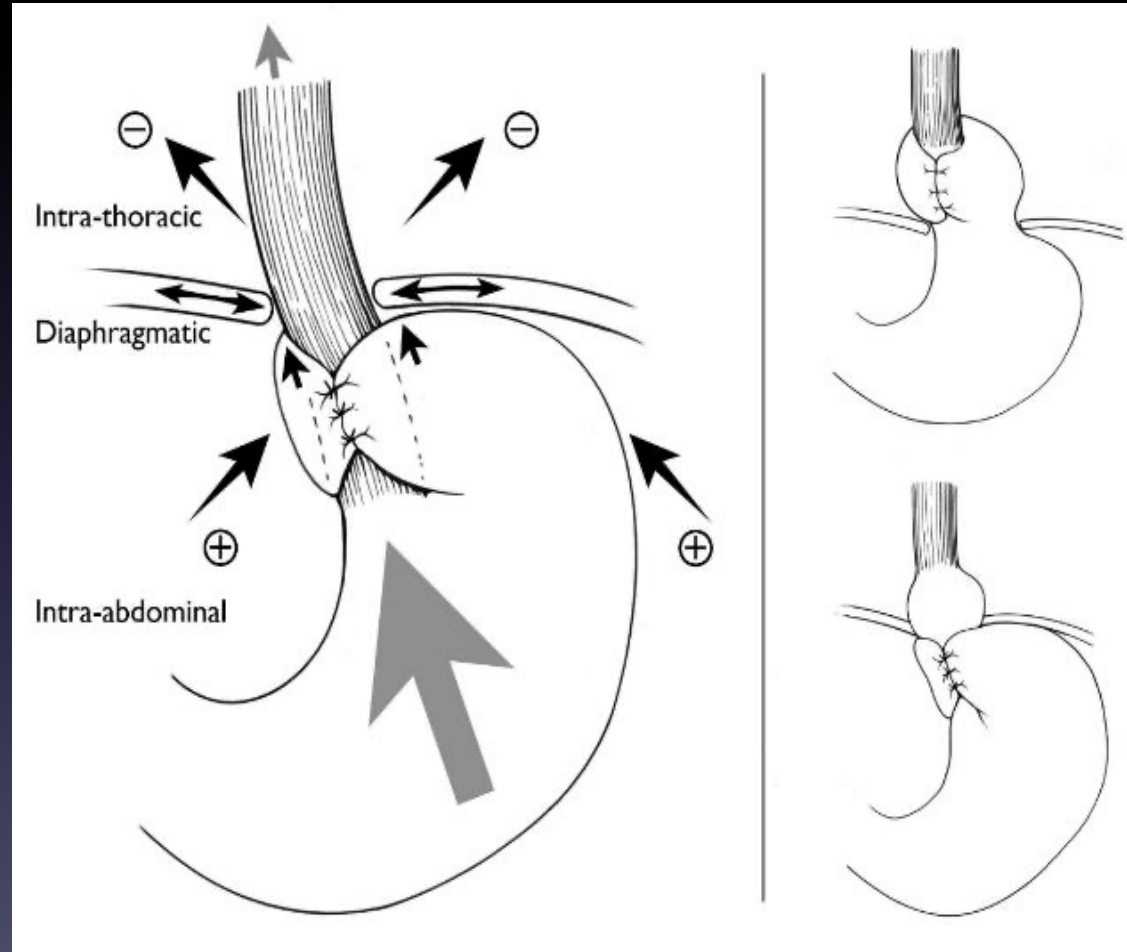
- Complication rate
- Short esophagus
- Age and comorbidity

Hiatal hernia size correlates with failure after repair

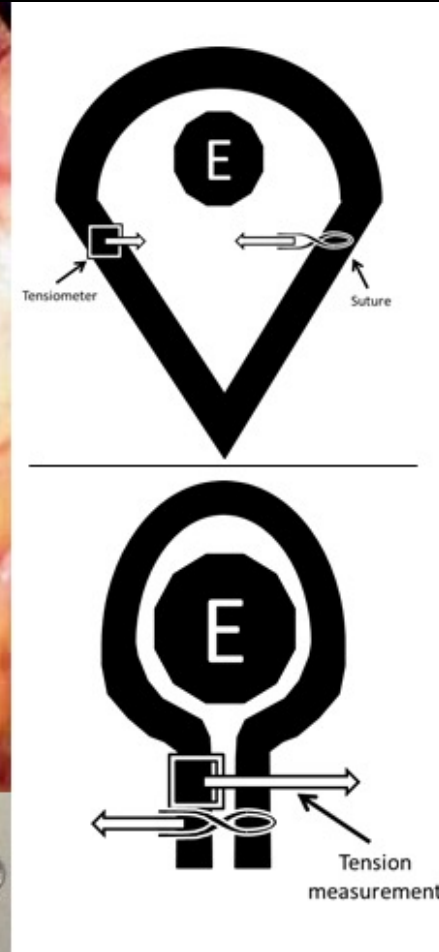
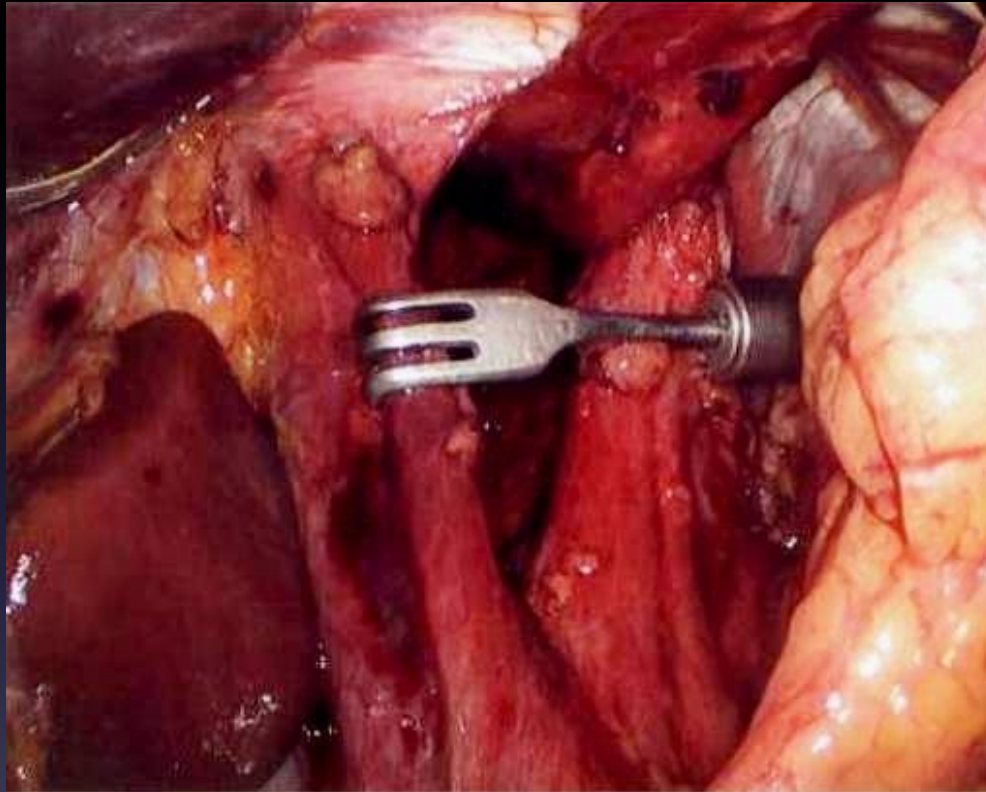
- Paraesophageal hernia: ~50% recurrence at 5-10 years
- Single institution study and others
 - independent correlation with preoperative size of hernia

The enemies of repair: -tension vectors

- Radial tension
- Lateral tension
- Axial tension
- Pressure
 - Transdiaphragm
 - Intra-gastric
 - Intraabdominal

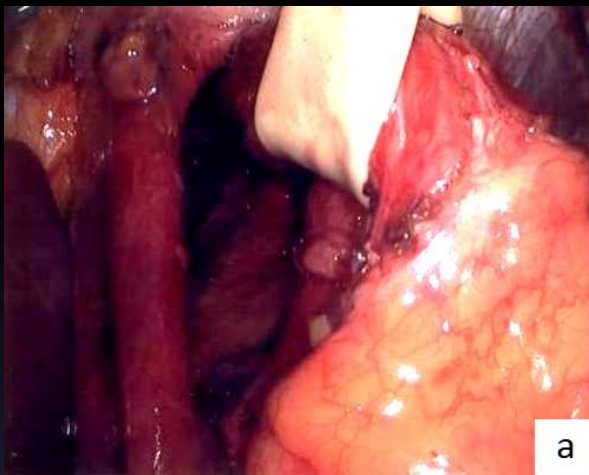


Radial tension and reduction



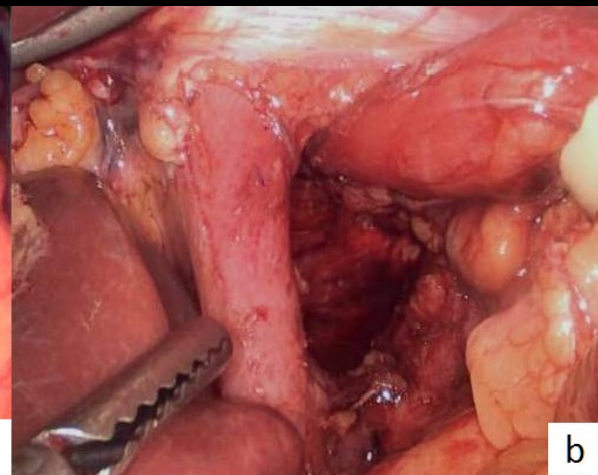
Hiatal shape, tension

Slit



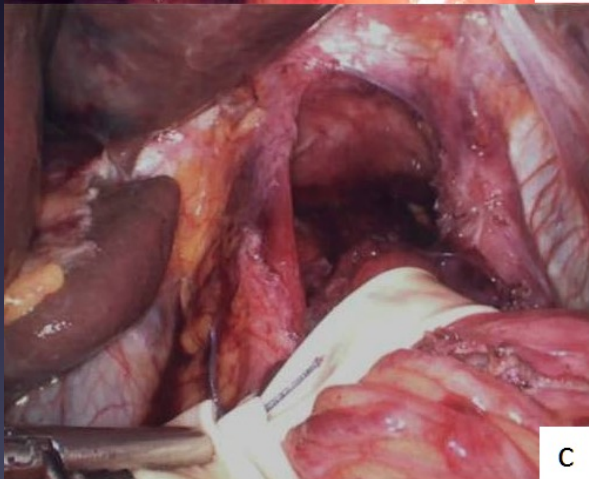
a

Teardrop



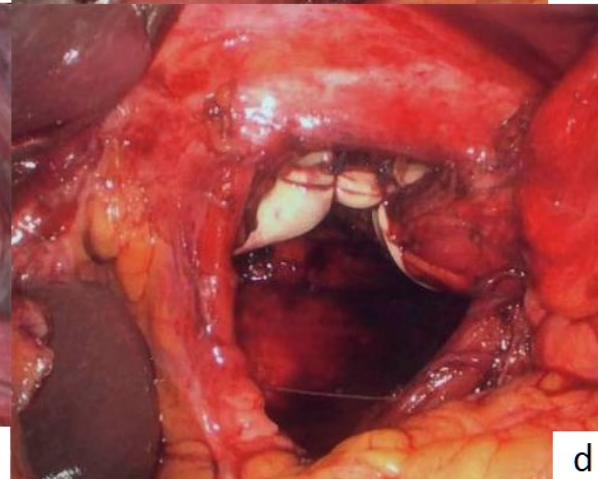
b

“D”
shape



c

Oval



d

Reducing radial/lateral tension

Relaxing incision

- Reduces hiatal tension
- Reduces hiatal recurrence
- Adds time, cost, morbidity
- Only used selectively

Mesh

- Biologic vs permanent
- Location
- Time, cost, ? Risk of erosion

Reconstruction of phrenoesophageal membrane?

Reducing axial tension

Maneuvers

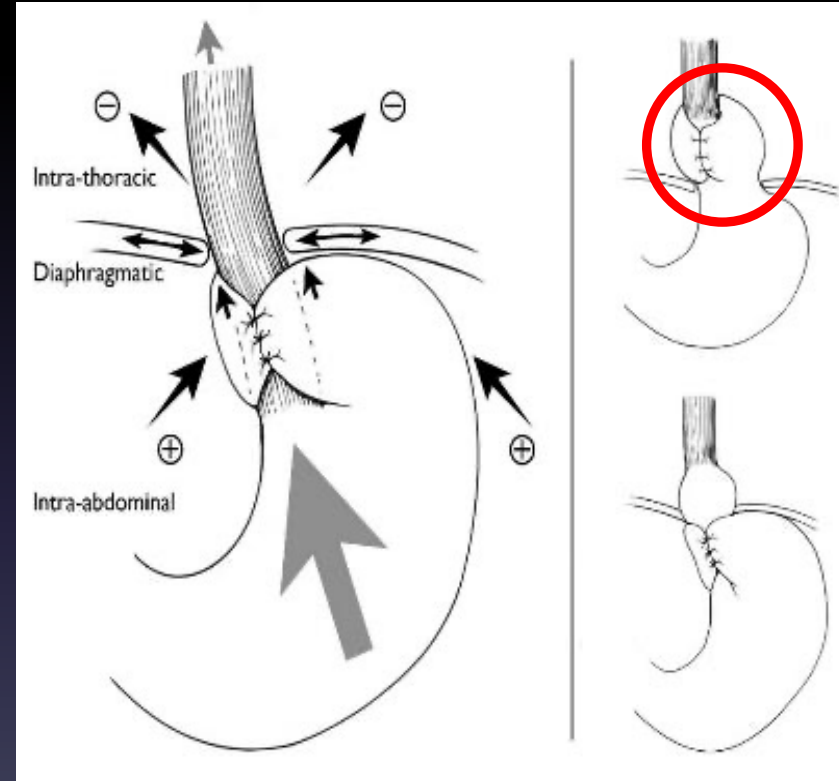
- High mobilization
- Collis gastroplasty
- Vagus nerve division
- *Hill sutures*

Esophageal lengthening

- Reduces axial tension
- Adds time, cost, morbidity
- Alters physiology
- Effectiveness and necessity is disputed

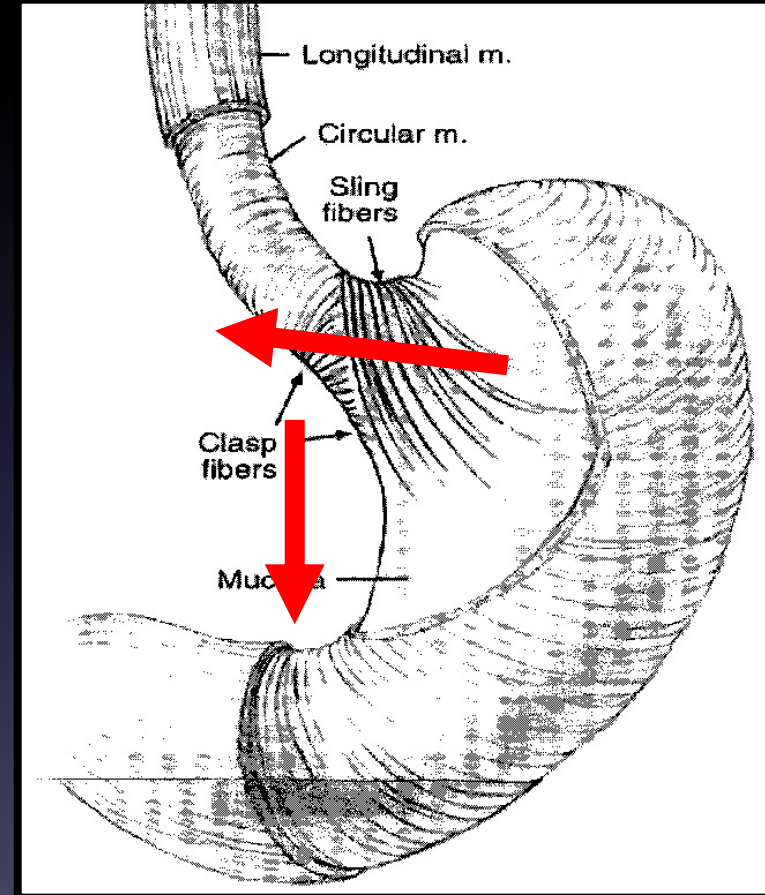
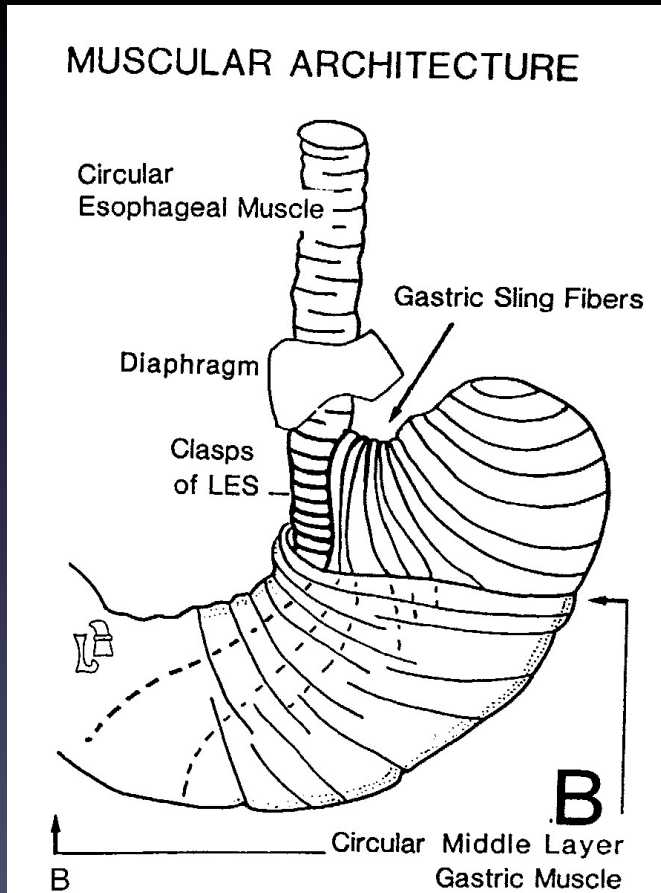
Hill Sutures

- *The ONLY repair sutures which anchor the GE junction, rather than the fundus or the esophagus, intra-abdominally*
- *Unloads axial tension*



Anatomy of the gastroesophageal junction and placement of Hill sutures

Lower esophageal sphincter - asymmetrical muscle components

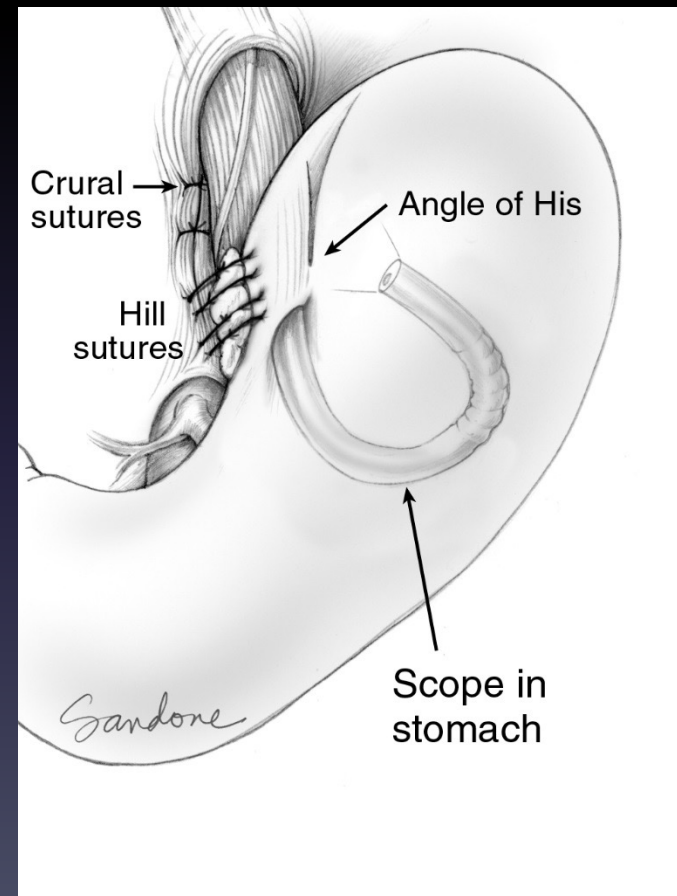
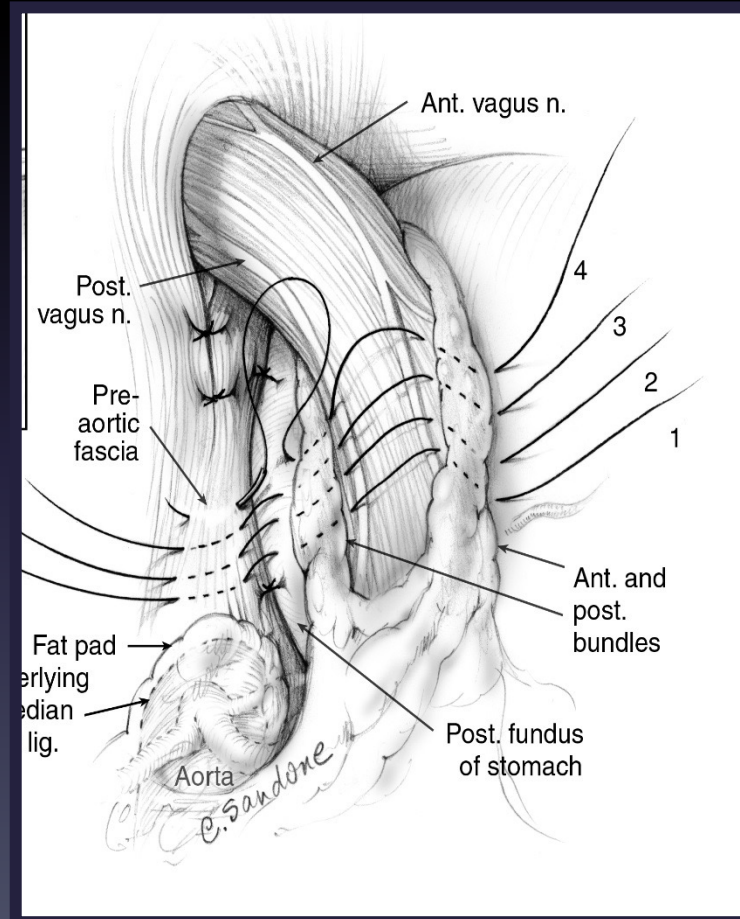


D. Liebermann-Meffert. Gastro 1979;76:31-39

Hill repair - in a nutshell

- Not exactly a posterior gastropexy
 - think **Valvuloplasty**
- Simple!
 - Sling fibers of GEJ to:
 - Median arcuate ligament - open repair
 - Pre-aortic fascia – laparoscopic repair

Hill repair – suture placement and re-creation of GE valve



Open Hill repair @ 25 yrs

- In 1181 patients undergoing open Hill repair with median follow up of 9.98 years:
 - 93% of patients had good or excellent results
 - 22% were on PPI's
 - 2.5% required GEJ re-operation
- Open Hill repair was successfully performed by surgeons not trained by Hill

Laparoscopic Hill repair: 25-year follow-up

Yeseul Park¹ · Ralph W. Aye¹ · Jeffrey R. Watkins¹ · Alex S. Farivar¹ · Brian E. Louie¹

Received: 29 July 2017 / Accepted: 21 March 2018

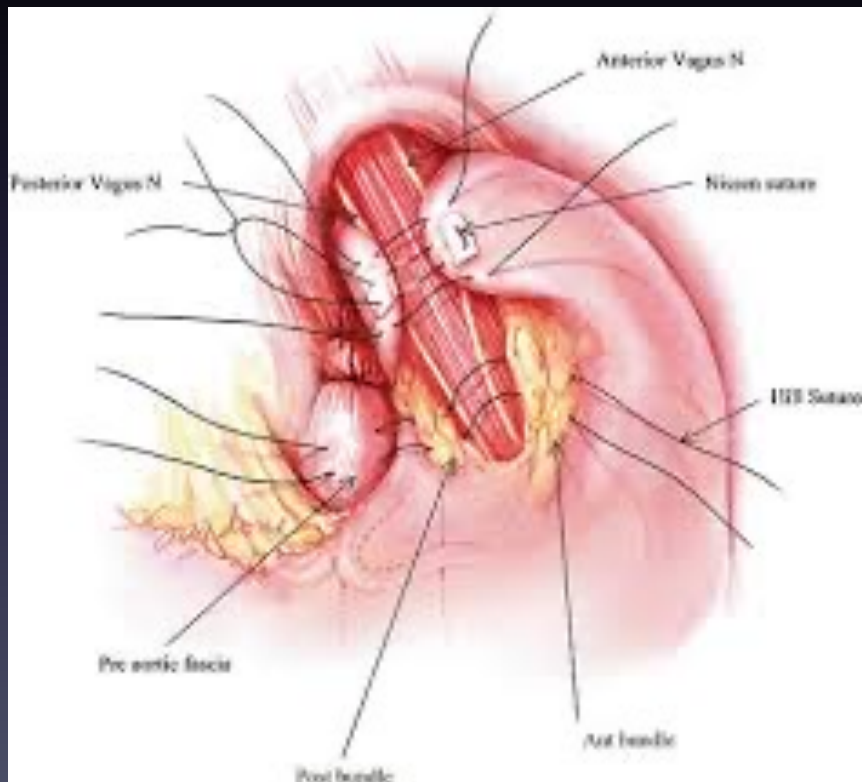
- LHR with at least 5 yrs f/u = 727; 648 GERD, 79 PEH
— 242 responders (38%)
- Median f/u 18.5 yrs
- Good/excellent symptomatic outcome = 85%
- Daily PPI use = 30%
- Reoperation for failure 9.9% (9.9% GERD, 10.3% PEH)

Adding Hill *Sutures*

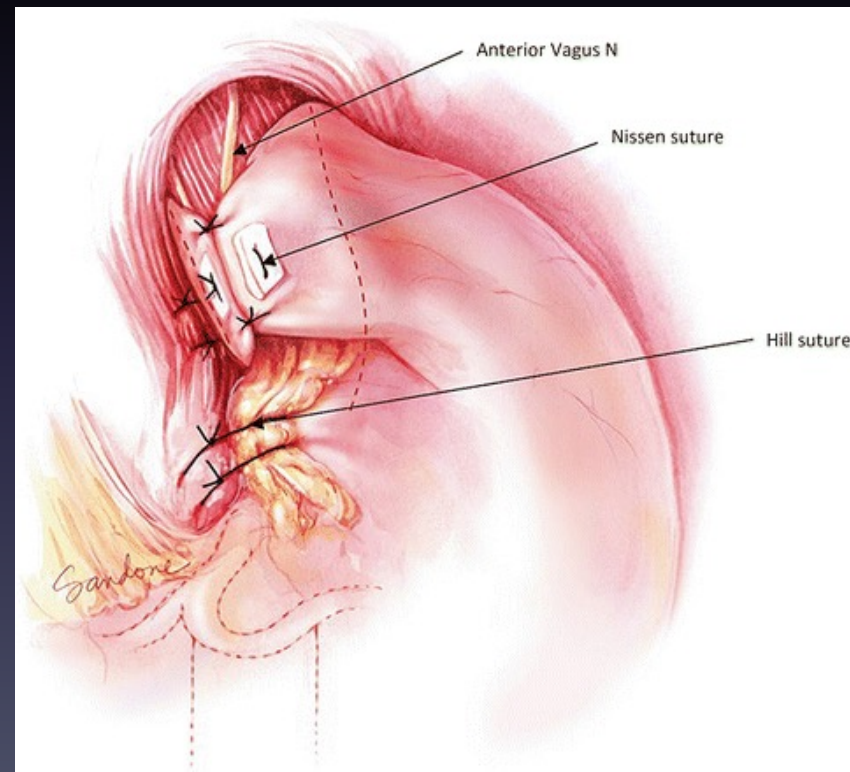
- As a structural addition to other repairs
- No need for manometry
- Precise location is less critical
- Preaortic fascia is pretty safe
- ? no increase in side effects or complications

Nissen-Hill hybrid

Hill sutures to keep the Nissen from herniating



Nissen wrap to keep the Hill sutures from loosening



A Combined Nissen Plus Hill Hybrid Repair for Paraesophageal Hernia Improves Clinical Outcomes and Reduces Long-Term Recurrences Compared with Laparoscopic Nissen Alone.

[Levy G](#)¹, [Aye RW](#)^{2,3}, [Farivar AS](#)¹, [Louie BE](#)¹.

N= 70	Hybrid	Nissen	P value
	N=39 (%)	N=31 (%)	
Median f/u	61mo	62mo	
Anatomic Recurrence	2 (5%)	14 (45%)	0.002
Surgical revision	1 (2.6%)	3 (9.7%)	0.2

Tri-Comparison, Nissen, Hill, Hybrid - uncomplicated reflux disease (13, 19 and 25 mo f/u)

	Hill (56)	Nissen (46)	Hybrid (51)	P - value
QOLRAD	6.24	6.24	6.60	0.247
Swallow	38.1	37.2	41.2	0.270
DeMeester	10.89	6.58	6.69	0.359
Recurrence	4	5	2	0.63
Re-ops	3	2	0	
PPI use	5.9%	5.7%	7.3%	0.97

Managing short esophagus

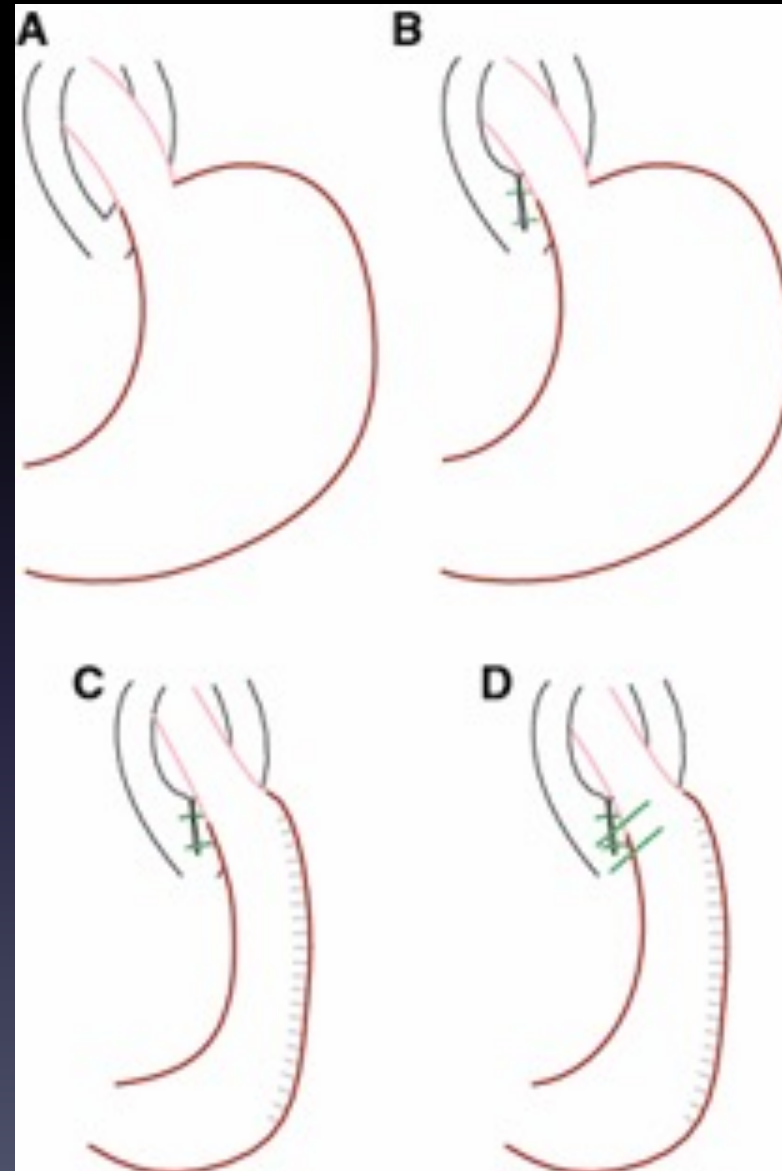
A Hill Gastropexy Combined with Nissen Fundoplication Appears Equivalent to a Collis-Nissen in the Management of Short Esophagus

Oliver C. Bellevue, Brian E. Louie, Zeljka Jutric, Alexander S. Farivar, Ralph W. Aye

Retrospective study w case-matched controls; 26 mo f/u

	Hill Nissen N=30 (%)	Collis-Nissen N=27(%)	Nissen Control (not short; N=105)	P-Value
esophagitis	16%	18%	10%	0.56
DeMeester	11.1	19.1	14.2	0.49
pH<4	2.6	5.3	4.1	0.33
Complications	18%	16%	19%	0.78
Recurrence	11.7%	5.5%	7%	0.43
Reoperation	4%	4%	3%	0.89
GERD HRQL	6.8	6.7	6.4	0.3
PPI use	16%	22%	15%	0.56

Gastric sleeve combined with Hill repair



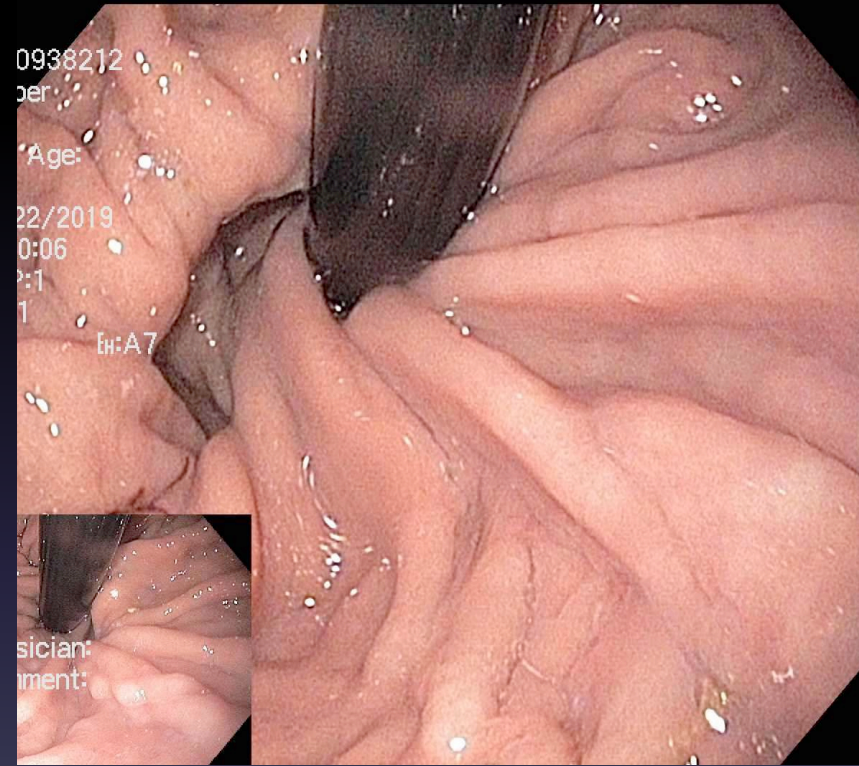
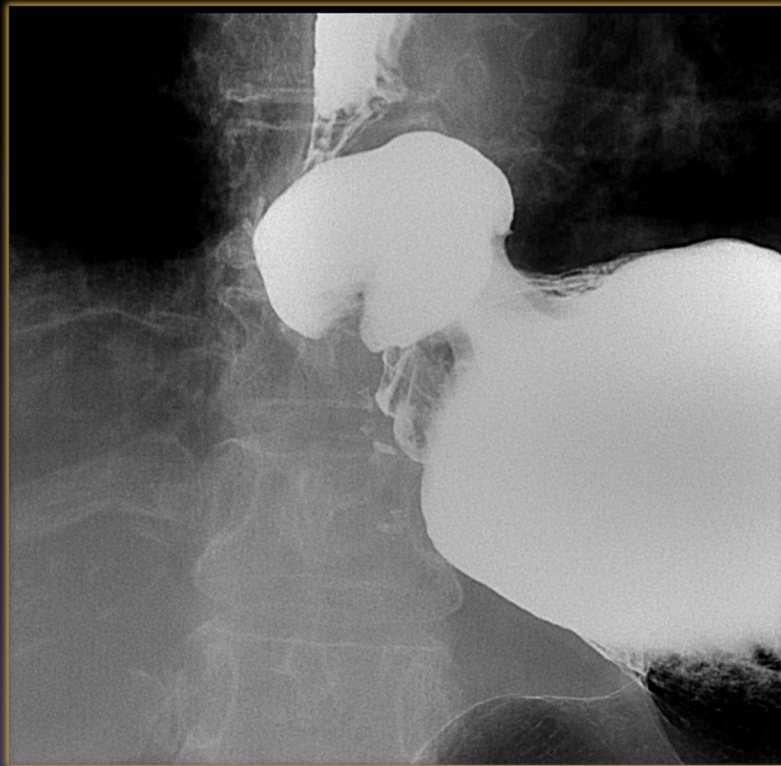
Hill sutures and bariatrics

- Chow – 3 pts w + pH, 3.7 yrs after bypass
 - Re-op w Hill sutures added
 - Good Sx resolution but short f/u
- Gero – 14 pts w GERD undergoing sleeve
 - 5 w gastric band, 12 w HH
 - Postop GERD 3/14; PPI use 1/14

Chow – SAGES abstract 2015

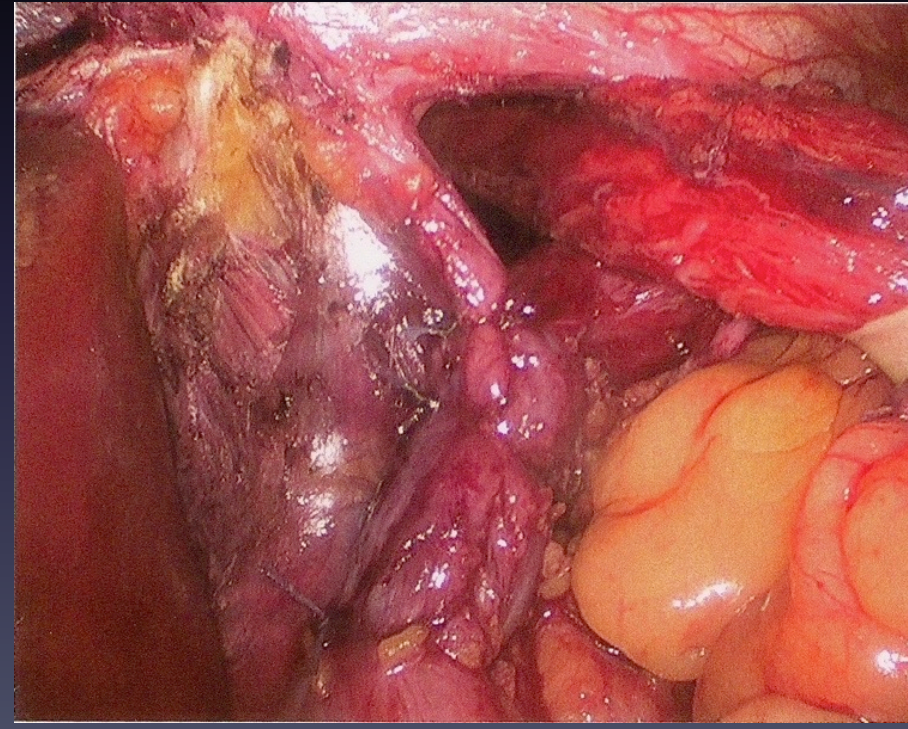
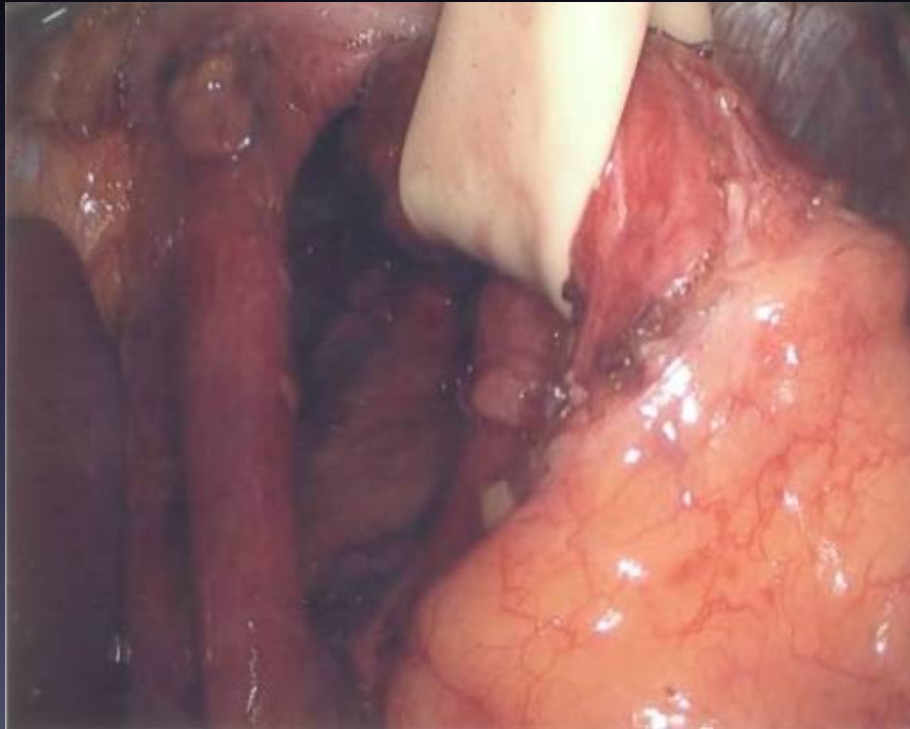
Gero – World J Surg 2017; 41(4):1035-39

Our nemesis, undeterred – The Hiatus!!



Recurrence following Nissen-Hill hybrid
– fundus herniation!

The disrupted phrenoesophageal membrane



Pediatric experience

- **Minimal vs maximal esoph dissection RCT**
 - LNF, std hiatal dissection vs none
 - 177 patients, 74% f/u @ median 6.5 yrs
 - Herniation: **12.2% vs 36.5%**
 - Rates in both groups increased over time
 - 2.8% to 12.2%; 22.7% to 36.5%

Reconstructing the PEL

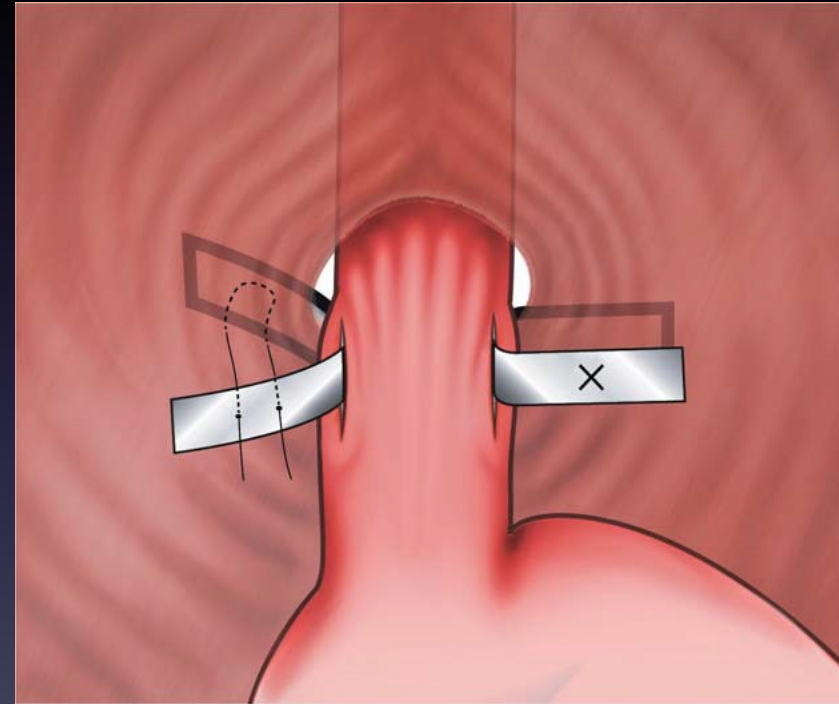
24 dogs, artificial PEL \pm hiatal closure

Group 1 open: 4/4 HH

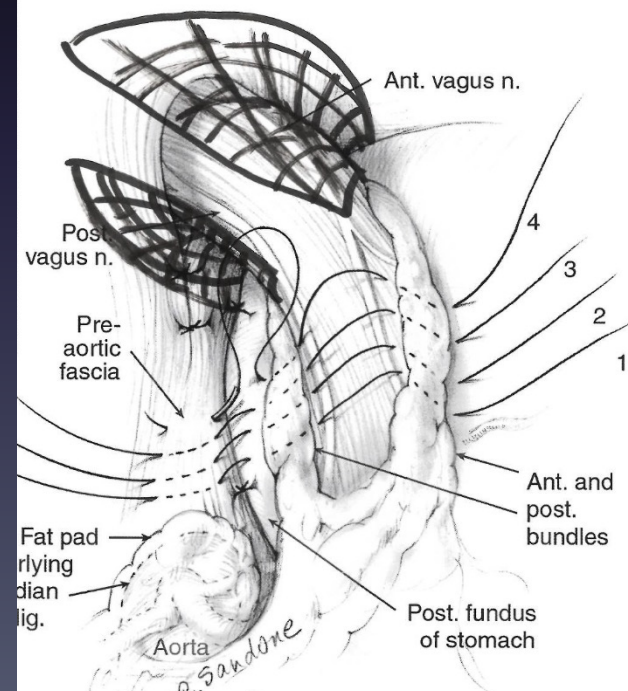
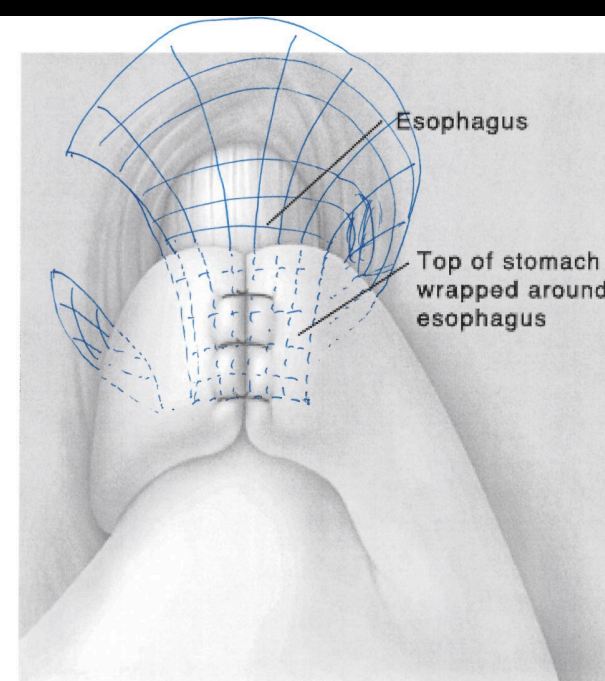
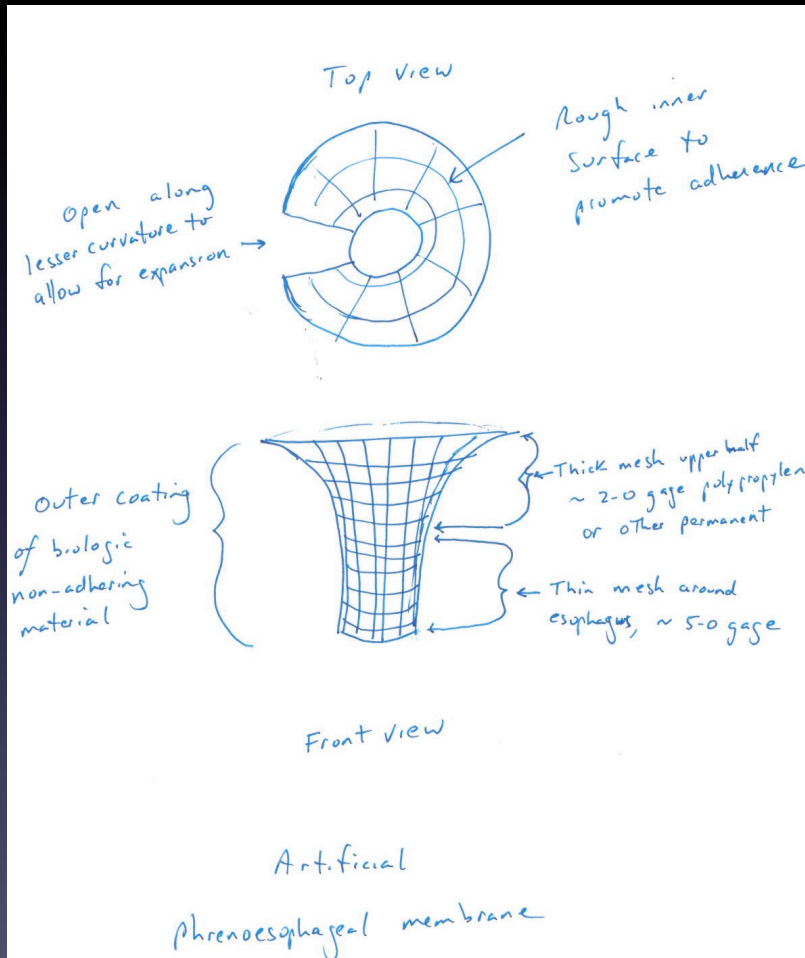
Group 2 PEL: 25% PEH

Group 3 PEL + closure:
no hernia

Group 4 closure only:
29% sliding HH



Artificial Phrenoesophageal membrane?



Summary

- There are intrinsic persistent forces affecting the esophageal hiatus and anti-reflux procedures which every proceduralist must take into account.
- Hill sutures effectively address axial tension but the hiatus remains problematic and is an area in high need of investigation.



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