Upper GI Surgery

LSG and reflux.

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Disclosures

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  - JnJ
  - Gore Medical
  - Medtronic
  - MSD
  - Olympus
  - Device Technologies/Da Vinci

Sleeve and reflux

- The sleeve does not cause reflux….

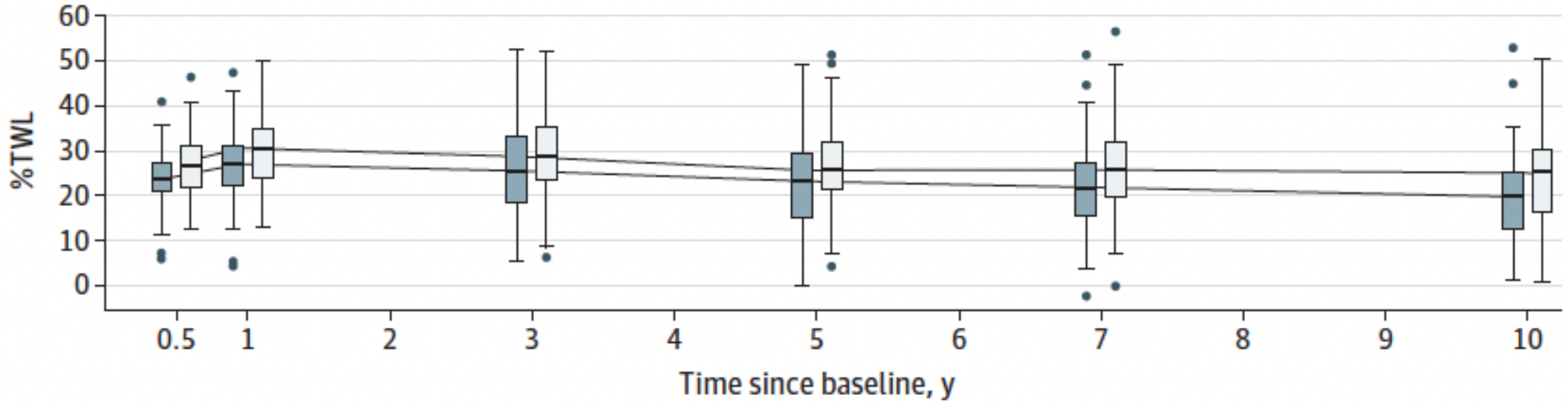
- However, some patients do get reflux after a sleeve.
- This is related to patient factors and surgical factors.

JAMA Surgery | Original Investigation

Effect of Laparoscopic Sleeve Gastrectomy vs Roux-en-Y Gastric Bypass on Weight Loss, Comorbidities, and Reflux at 10 Years in Adult Patients With Obesity

The SLEEVEPASS Randomized Clinical Trial

%TWL after LSG and LRYGB from baseline to 10 y



at risk

Improvement in gastroesophageal reflux disease symptoms after various bariatric procedures: Review of the Bariatric Outcomes Longitudinal Database

Pradeep K. Pallati, M.D. • Abhijit Shaligram, M.D. • Valerie K. Shostrom, M.S. • Dmitry Oleynikov, M.D., F.A.C.S. • Corrigan L. McBride, M.D., F.

Published: August 30, 2013 • DOI: https://doi.org/10.1016/j.soa

Of a total of 116,136 patients, 36,938 patients had evidence of GERD preoperatively. After excluding patients undergoing concomitant hiatal hernia repair or fundoplication, there were 22,870 patients with 6-month follow-up. Mean age was 47.6±11.1 years, with an 82% female population. Mean BMI was 46.3±8.0 kg/m^2. Mean preoperative GERD score for patients with Roux-en-Y gastric bypass (RYGB) was 2.80±.56, and mean postoperative score was 1.33±1.41 (P<.0001). Similarly, adjustable gastric banding (AGB, 2.77±.57 to 1.63±1.37, P<.0001) and sleeve gastrectomy (SG, 2.82±.57 to 1.85±1.40, P<.0001) had significant improvement in GERD score. GERD score improvement was best in RYGB patients (56.5%; 7955 of 14,078) followed by AGB (46%; 3773 of 8207) and SG patients (41%; 240 of 585).

All bariatric procedures improve subjective reflux scores for first 6 months.

Gastroesophageal Reflux Disease Outcomes After Vertical Sleeve Gastrectomy and Gastric Bypass

Leslie, Daniel MD*; Wise, Eric MD, MA*; Sheka, Adam MD*; Abdelwa
Benner, Ashley MPH‡; Ikramuddin, Sayeed MD, MHA*

Author Information

Annals of Surgery: October 2021 - Volume 274 - Issue 4 - p 646-653

"reflux" 3-48 months post-op, by any type of definition highly prevalent with statistically measurable but possibly clinically insignificant difference of about 5% favouring RYGB, but higher rate of admission/investigation also in RYGB

Results:

A total of 8362 patients undergoing VSG were matched 1:1 to patients undergoing RYGB, on the basis of post-operative follow-up interval. Age, sex, and follow-up time were similar between the 2 groups ($P > 0.05$). Among all patients, postoperative GERD was more frequently observed in VSG patients relative to RYGB patients (60.2% vs 55.6%, respectively; $P < 0.001$), whereas BE was more prevalent in RYGB patients (0.7% vs 1.1%; $P = 0.007$). Postoperatively, *de novo* esophageal reflux symptomatology was more common in VSG patients (39.3% vs 35.3%; $P < 0.001$), although there was no difference in development of the histologic diagnoses reflux esophagitis and BE. Furthermore, postoperative re-admission was higher in the RYGB cohort (38.9% vs 28.9%; $P < 0.001$).

Conclusions:

Compared to RYGB, VSG may not have inferior long-term GERD outcomes, while also leading to fewer re-hospitalizations. These data challenge the prevailing opinion that patients with GERD should undergo RYGB instead of VSG.

Reflux isn't caused by Sleeve Gastrectomy

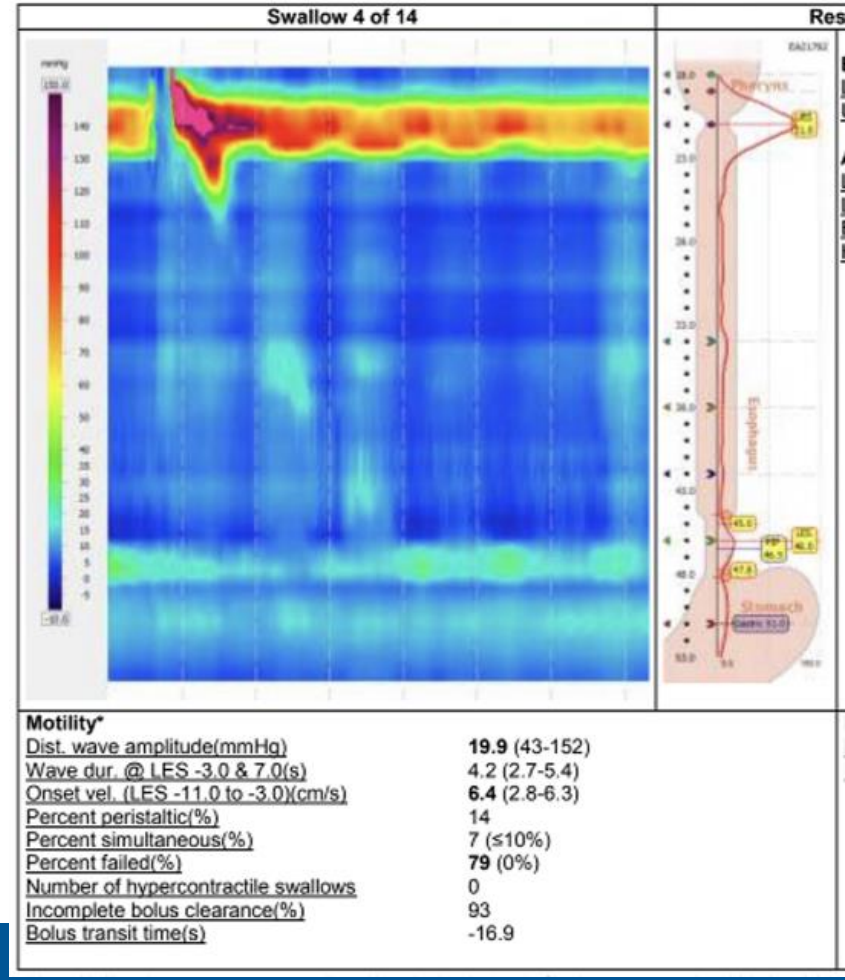
- Reflux driven by a number of factors:
  - Peristalsis, lower oesophageal tone (TLESR and HH), intragastric pressure (stenosis/angularis), oesophago-gastric junction compliance/distensibility, visceral sensitivity and mechanical (intra-abdominal) and visceral factors (metabolic) associated with obesity promote reflux.
- The more the patient complains of "reflux" the more likely it is that they have a non-reflux diagnosis.
  - Non-reflux foregut Sx highly prevalent in PPI non-responders.
- Its usual to make empiric management decisions about post-bariatric symptoms.
  - There is no role for empiric post-bariatric re-operations

Investigation of reflux drivers.

- Endoscopy. Poorly done, poorly reported, subjective.
- Barium swallow. OK in oesophagus, terrible in stomach.
- 3D CT.
  - Gold standard. More accurate than manometry and endoscopy for HH.
  - CT findings are always identical to operative findings.
  - Sometimes poorly reconstructed, need nipples to umbi view, and often lower oesophagus is missed.
- Manometry. Objective, but usually poorly done.
  - MUST include bolus assessment, intra-gastric pressures, solid swallows.

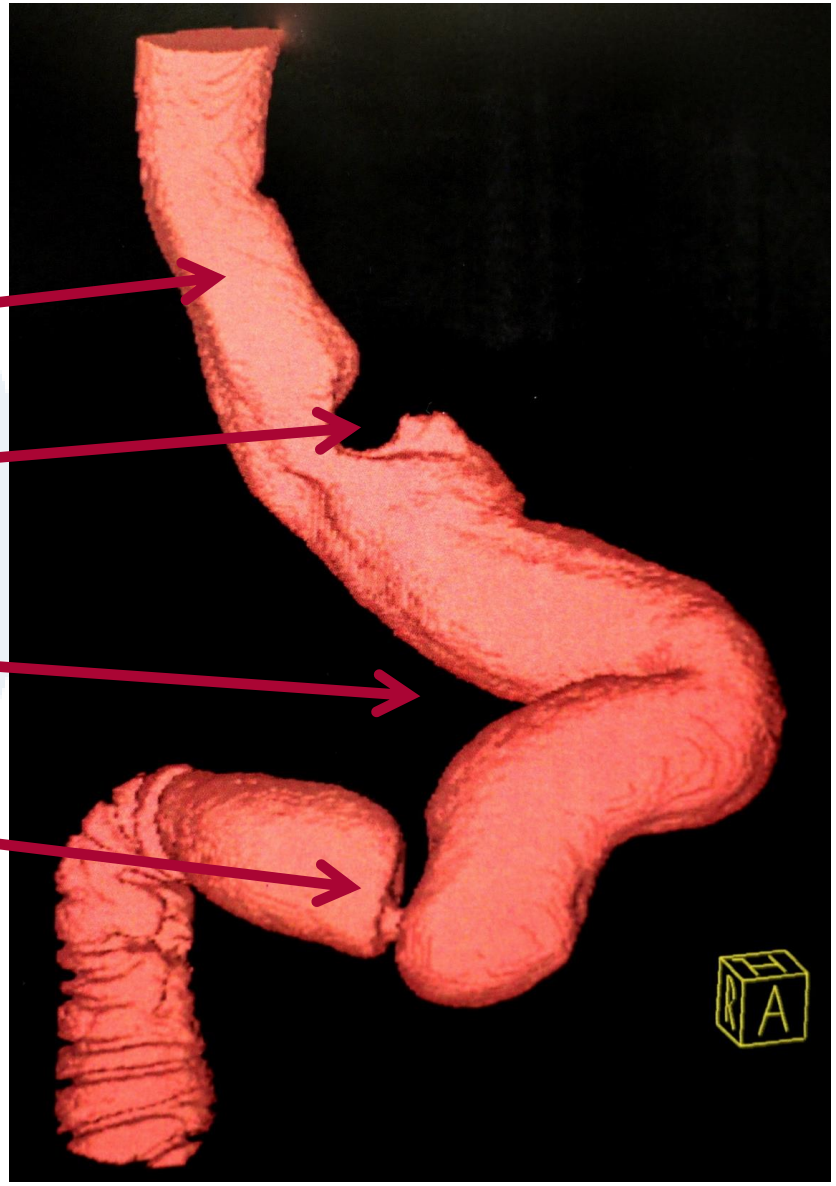
Peristalsis

- Disagreement about whether “reflux” is a contraindication.
- It all depends on what causes it.
  - Surgically reversible (HH)
  - Oesophageal failure.
- Patients with predictive factors for aperistalsis should be excluded from LSG.
  - Previous LAGB, Dysphagia, bad oesophagitis without hiatus hernia, poor PPI response.



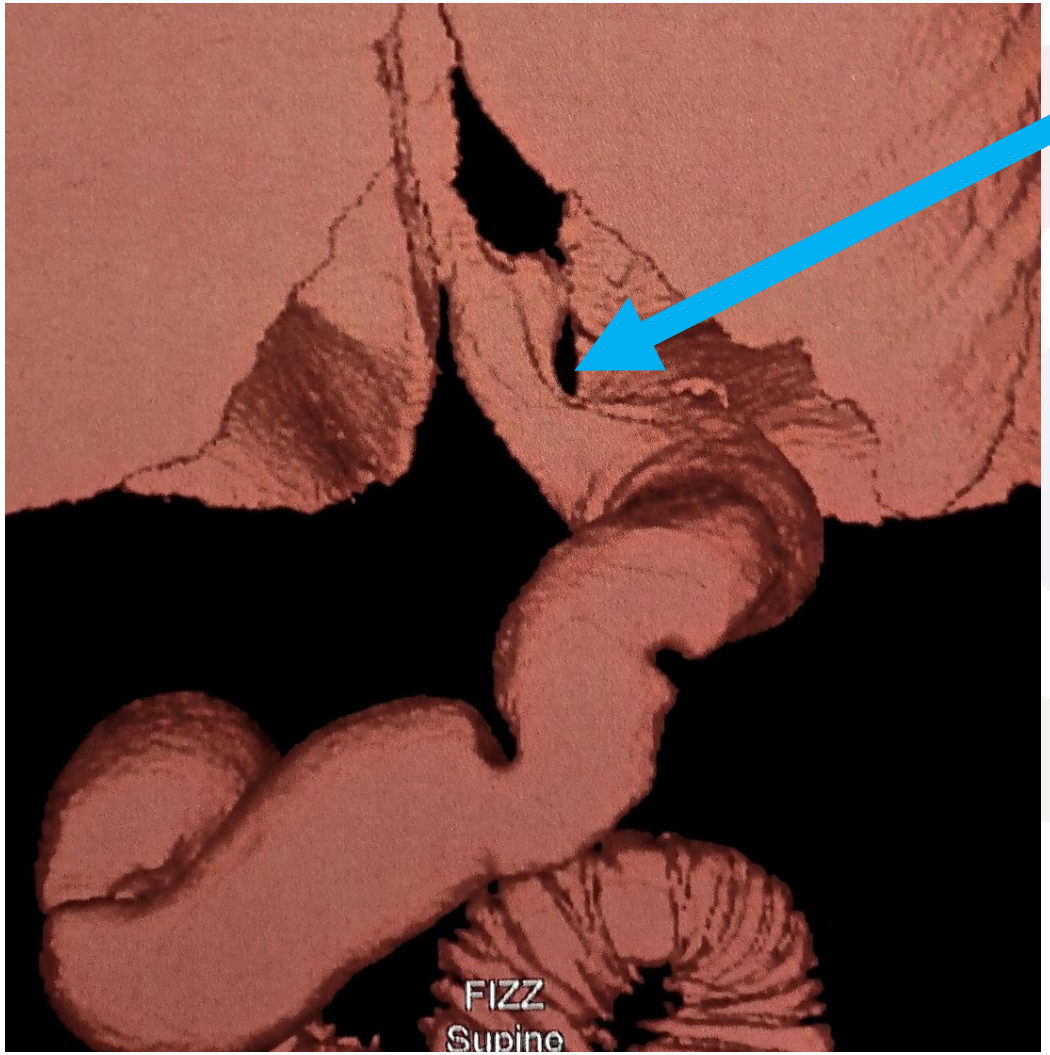
“Normal Sleeve”

- Tube volume. Range 120-300cc. Uniform
- Oesophageal diameter (motility).
- Diaphragm notch, no hiatus hernia
- Angularis wide
- Pyloric notch



Lower oesophagus

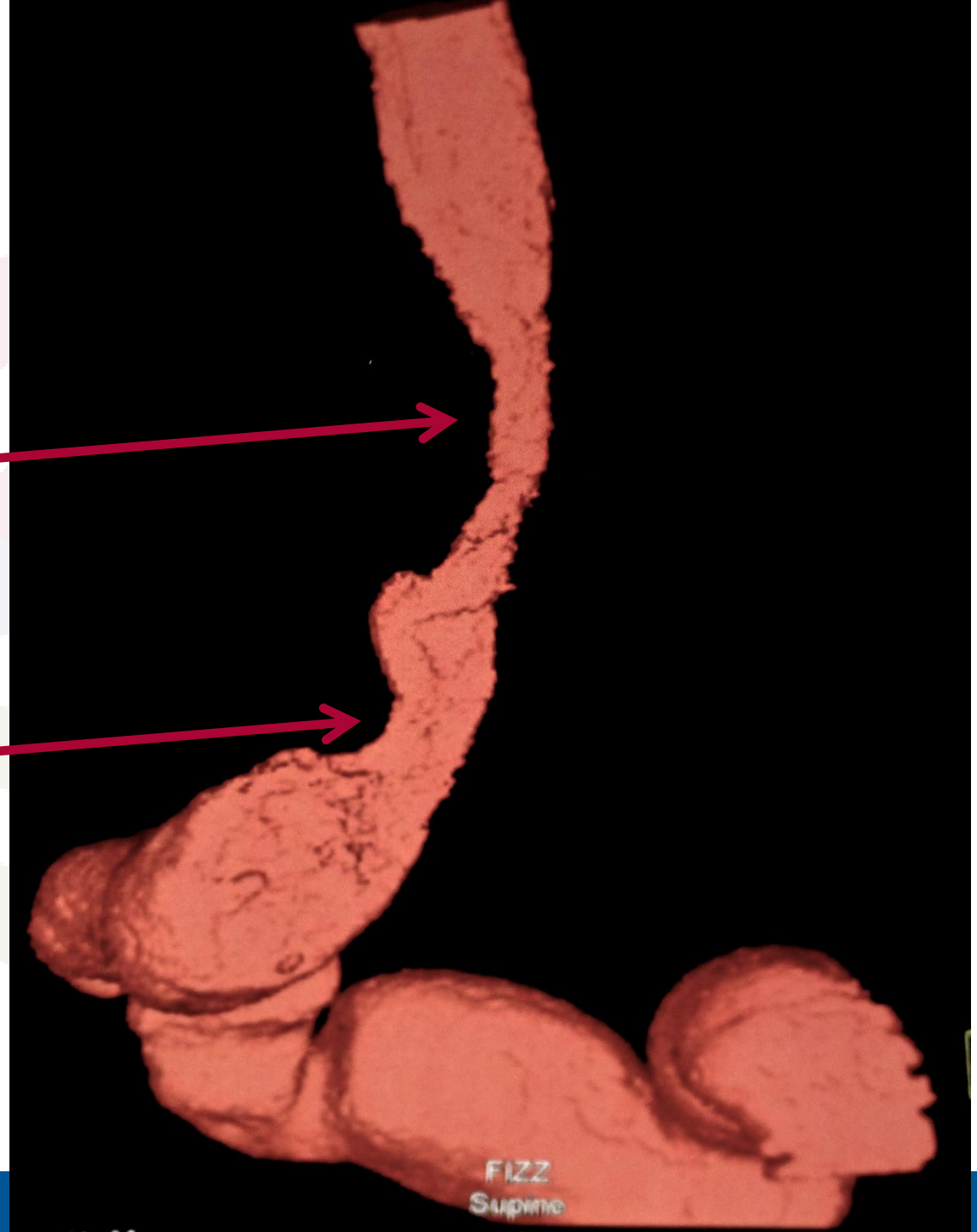
Crural indentation

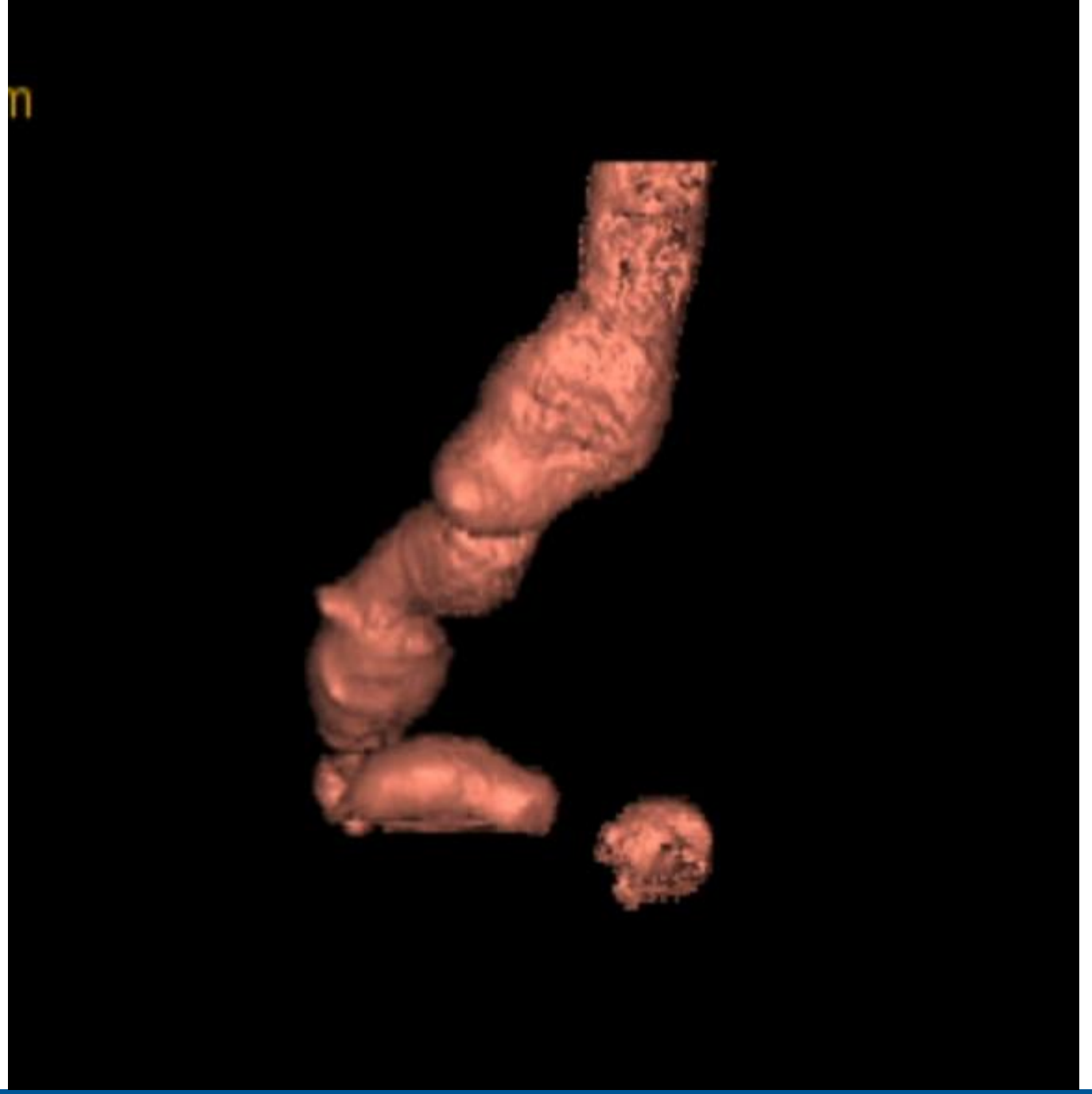


Hiatus hernia

Lower oesophageal sphincter

Diaphragm notch





Changes over time – maladaptive for reflux

- Most problems with LSG occur 5-8 yrs post-op.
  - Immediate problems are rare, often related either to grossly disordered physiology (aperistalsis or jackhammer oesophagus), disordered response to surgery, or obvious anatomy fail.
- Sleeve dilation.
  - Antrum dilates a lot if not stapled, but virtually never if its stapled even a little.
  - Angularis never dilates.
  - Vertical component can dilate and become wider than angularis and antrum.
  - Functional stenosis increases over time.
- Reflux. Association with telescoping of stomach into chest and oesophageal anatomy/function changes.
  - Assessment for hiatal hernia at time of original surgery is almost entirely subjective.

Prevalence of hiatus hernia late after sleeve

Check for updates

Incidence of de Novo Hiatal Hernia after Laparoscopic Sleeve Gastrectomy

Jorge Saba[1,2,3] · Magdalena Bravo[4] · Eugenio Rivas[1] · Roberto Fernández[1] · Alberto Pérez-Castilla[1] · Jorge Zajjur[1]

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Abstract

Purpose After laparoscopic sleeve gastrectomy (LSG), several studies have reported an increase in the incidence of gastroesophageal reflux (GERD). The etiopathogenesis of GERD post-LSG is multifactorial, and hiatal hernia (HH) is one of them.

The primary objective was to measure the incidence of de novo HH post-LSG. The secondary objectives were to relate the presence of HH with GERD, the chronic use of proton pump inhibitors (PPI), and the time elapsed from LSG.

Materials and Methods A surgical evaluation of the crura after LSG was performed. A retrospective cohort study of 74 consecutive patients with history of LSG submitted to an intra-abdominal surgery that allowed the evaluation of the crura.

Results Of a total of 74 patients, 51 were included. At the time of surgery, 37 patients (72.5%) had a HH; 24 patients (47.1%) had GERD, and 23 patients (45.1%) were frequently using PPI. When patients with HH and those without HH were compared, GERD was observed in 56.8% versus 21.4% ($p = 0.01$) and frequent consumption on PPI was found in 54.1% versus 21.4% ($p = 0.02$). According to the data of LSG, with a follow-up of < 18 months, 60% presented HH; meanwhile, with a follow-up of > 18 months, 84.6% presented HH ($p = 0.02$).

Conclusions Patients submitted to LSG showed a high incidence of de novo HH. HH was associated with a higher incidence of GERD and PPI dependence. The longer the time elapsed from the LSG, the greater the incidence of HH.

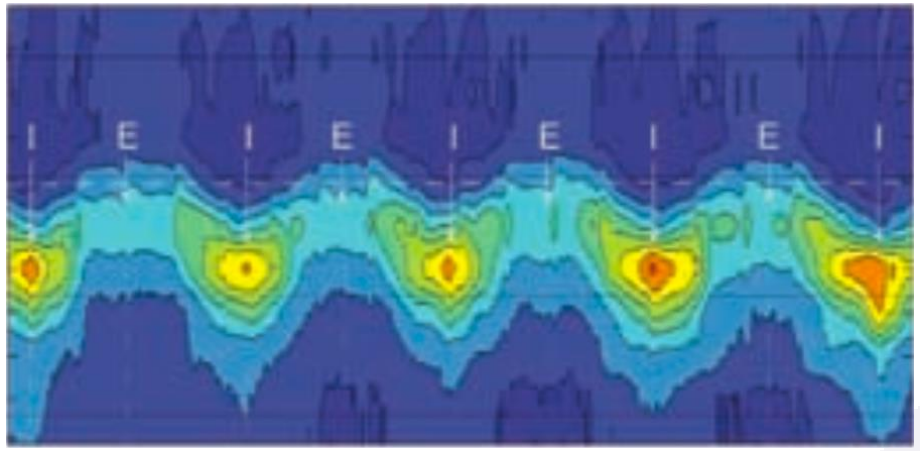
Keywords Sleeve gastrectomy · Hiatal hernia · Gastroesophageal reflux

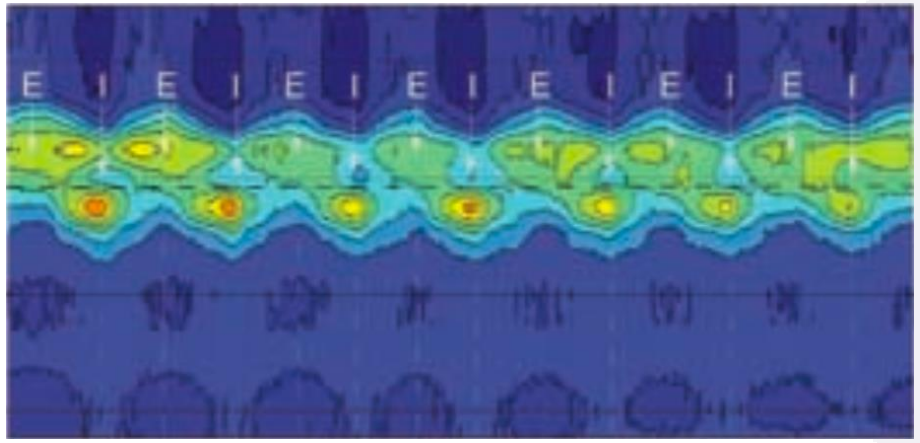
Findings

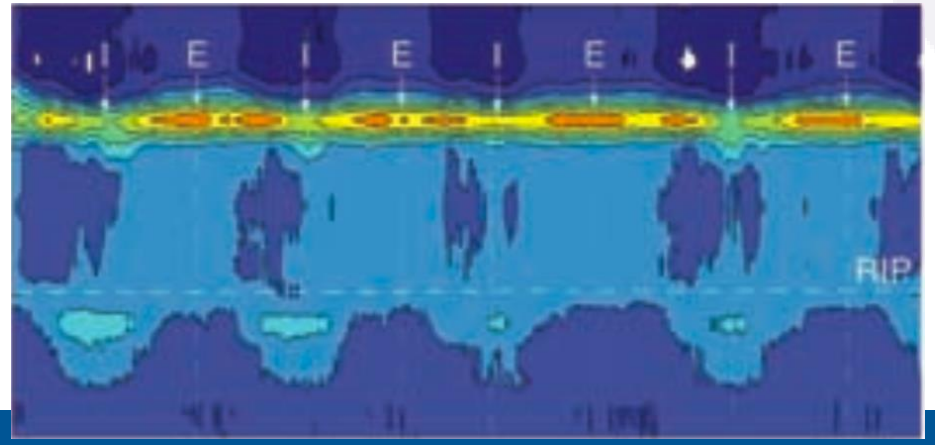
Patients having lap chole etc after LSG

HH very common 60-80%

Highly correlated with oesophagitis and PPI use.







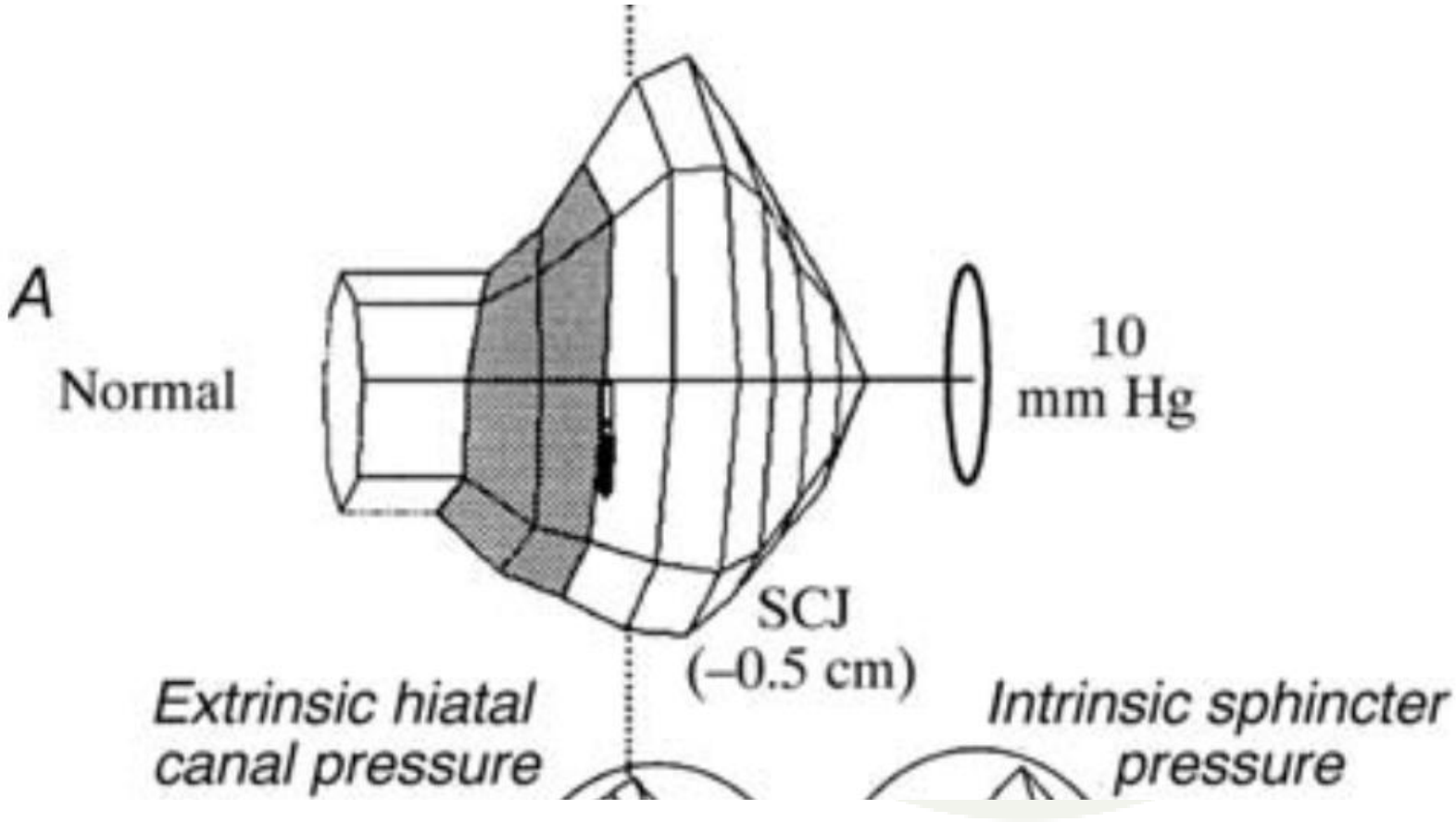
What does HH do?

Separation of the intrinsic and extrinsic sphincters.

Reduction of lower osophageal sphincter tone by around 10 mmHg

30-40% reduction of length of LOS

Lower oesophageal sphincter.



2 dominant components.

External crura

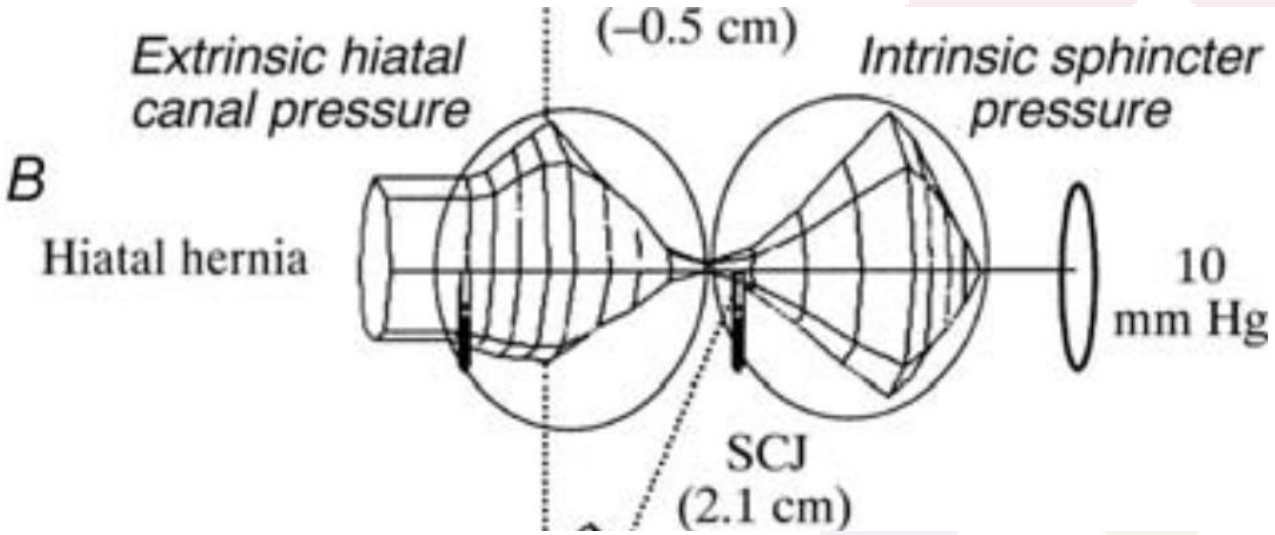
+

Intrinsic sphincter

Insertion of the phreno-oesophageal ligament also a lesser contributor (this becomes disrupted in hiatal hernia)

J Physiol 580.3 (2007) pp 961–975

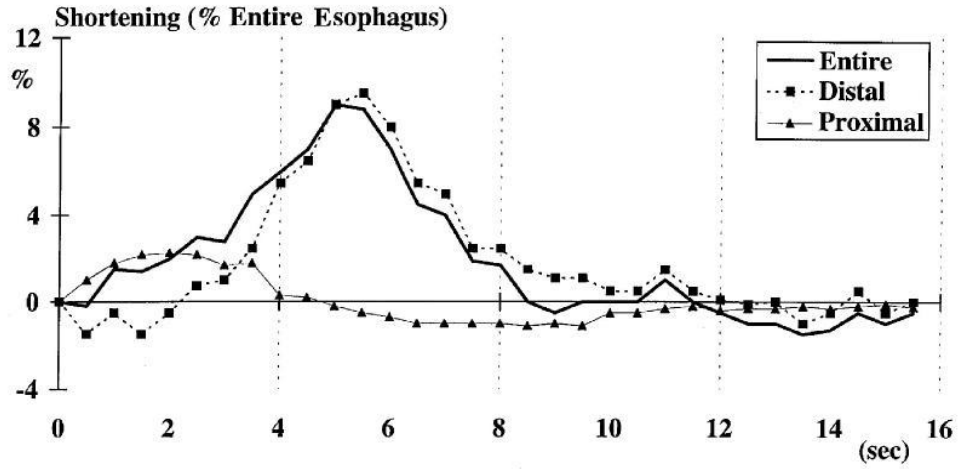
Hiatus hernia.



Hypotensive LOS predominantly caused by separation of the 2 components.

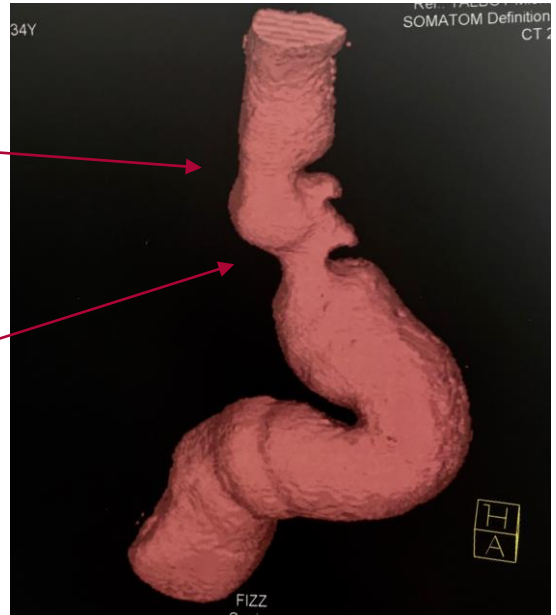
LOS weak + either measured as “long” for smaller hernias, or ”short” for larger hernias

Why does the OG junction telescope.

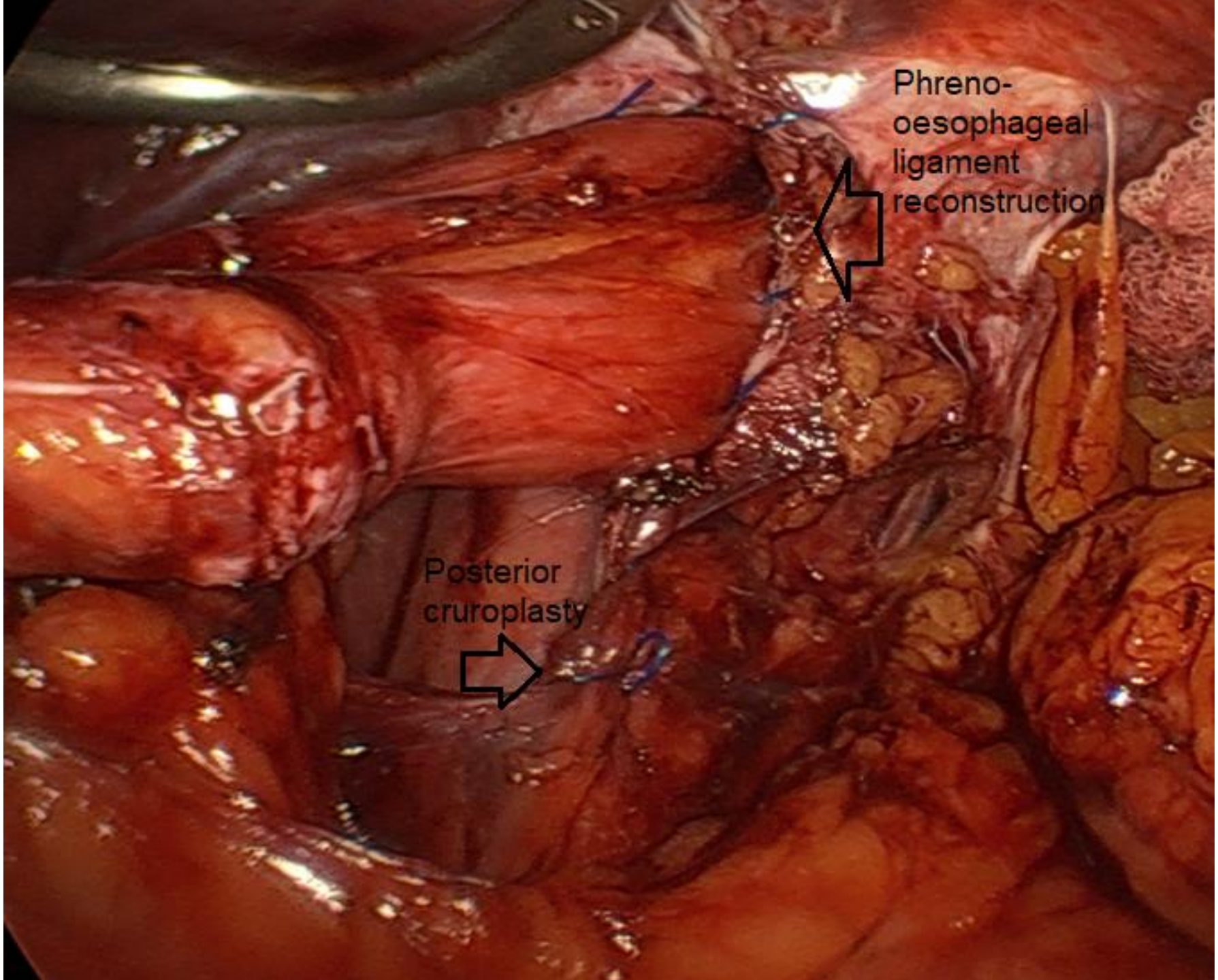


Lower oesophageal sphincter.

Hiatus



- Oesophago-gastric junction shortens 2-3 cm with each swallow
- If you cut the phreno-oesophageal ligament and don't reconstruct it the cardia will be in the chest by the time the patient is in recovery.
- Stapleline is "sticky".
- Phreno-oesophageal ligament attachment is the 3rd component of the LOS.


Phreno-
oesophageal
ligament
reconstruction
Posterior
cruroplasty

Changes induced by Sleeve Gastrectomy

ELSEVIER

Surgery for Obesity and Related Diseases ■ (2020) 1–9

Original article

High-resolution impedance manometry and 24-hour multichannel intraluminal impedance with pH testing before and after sleeve gastrectomy: de novo reflux in a prospective series

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Received 25 February 2020; accepted 16 September 2020

Abstract

Background: Laparoscopic sleeve gastrectomy (SG) is increasingly popular but concern regarding its effect on gastroesophageal reflux disease remain. The current literature is conflicting, and there have been little objective data.
Objectives: To objectively and more accurately assess the impact of SG on esophago-gastric physiology.
Setting: Centre of Excellence in Metabolic and Bariatric Surgery, Private Hospital, Australia.
Methods: Prospective cohort study of 31 patients undergoing SG with high-resolution impedance manometry (HRM), 24-hour multichannel intraluminal impedance combined with pH testing (MII-pH), and Gastroesophageal Reflux Disease Symptom Assessment Scale (GSAS) questionnaire 1 month before and 6 months after SG.

If you do fix hiatus hernia (70%)

Lower Oesophaeal Sphincter

Normal tone, 33mmHg

Normal length

Normal function

8% hypotensive

HH 1-2 cm when present post-op

4% 3 cm hiatal hernia

Reflux

Reflux the same pre-op and post-op overall. 50% abn pH

Reflux symptom scores unchanged (rare), most not on PPI.

Weak acid increases, and bolus clearance falls.

Increased intragastric pressure.

If you do fix hiatus hernia routinely

Surgical Endoscopy (2018) 32:2373–2380
https://doi.org/10.1007/s00464-017-5935-9

Does hiatal repair affect gastroesophageal reflux symptoms in patients undergoing laparoscopic sleeve gastrectomy?

Philip Le Page[1] · David Martin[1] · Craig Taylor[1] · Jennifer Wang[1] · Himanshu Wadhawan[2,3] · Gregory Falk[1] · Simon C. Gibson[1,2]

Received: 30 May 2017 / Accepted: 13 October 2017 / Published online: 12 December 2017

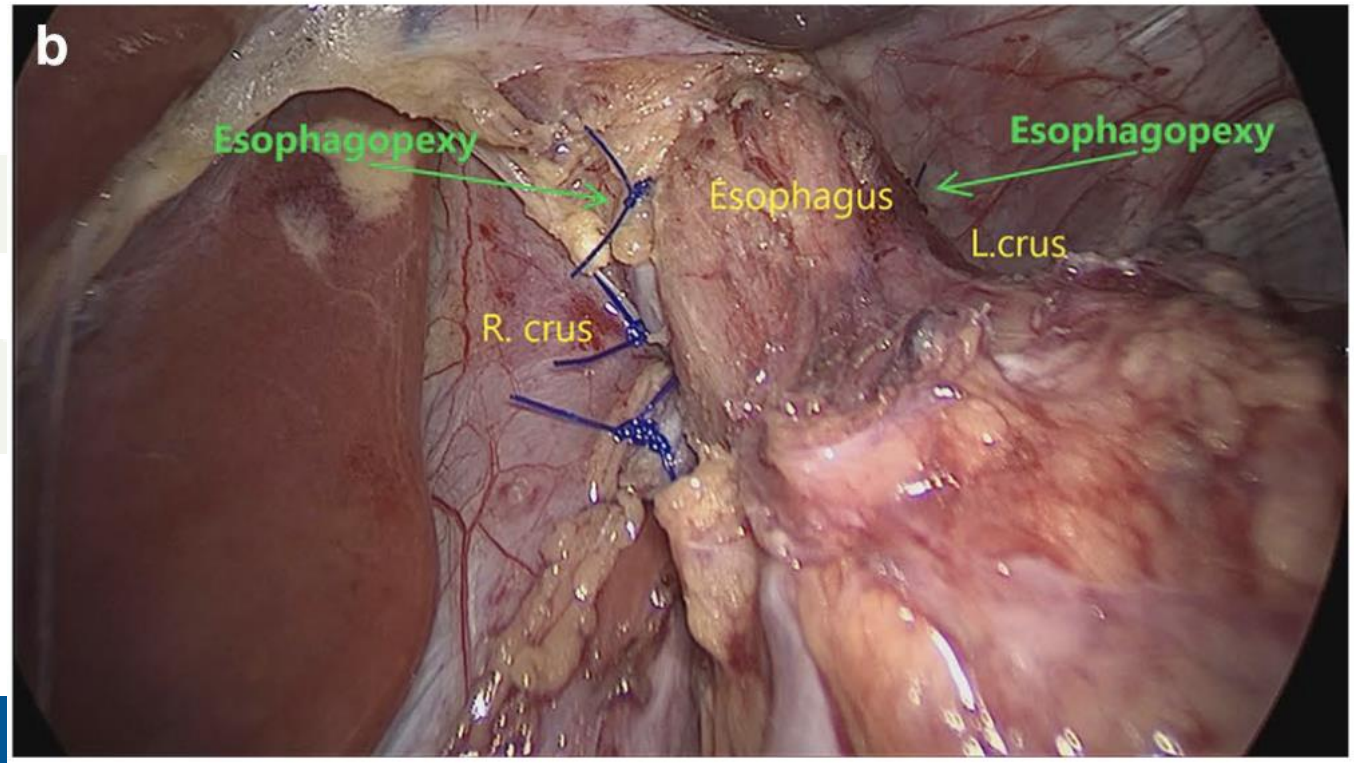
Abstract

Background Laparoscopic sleeve gastrectomy (LSG) has gained popularity as a treatment of choice for morbid obesity and associated comorbidities. There has been a concern about new onset or worsening of gastroesophageal reflux (GERD) following LSG.

Surgical Endoscopy
https://doi.org/10.1007/s00464-022-09829-z

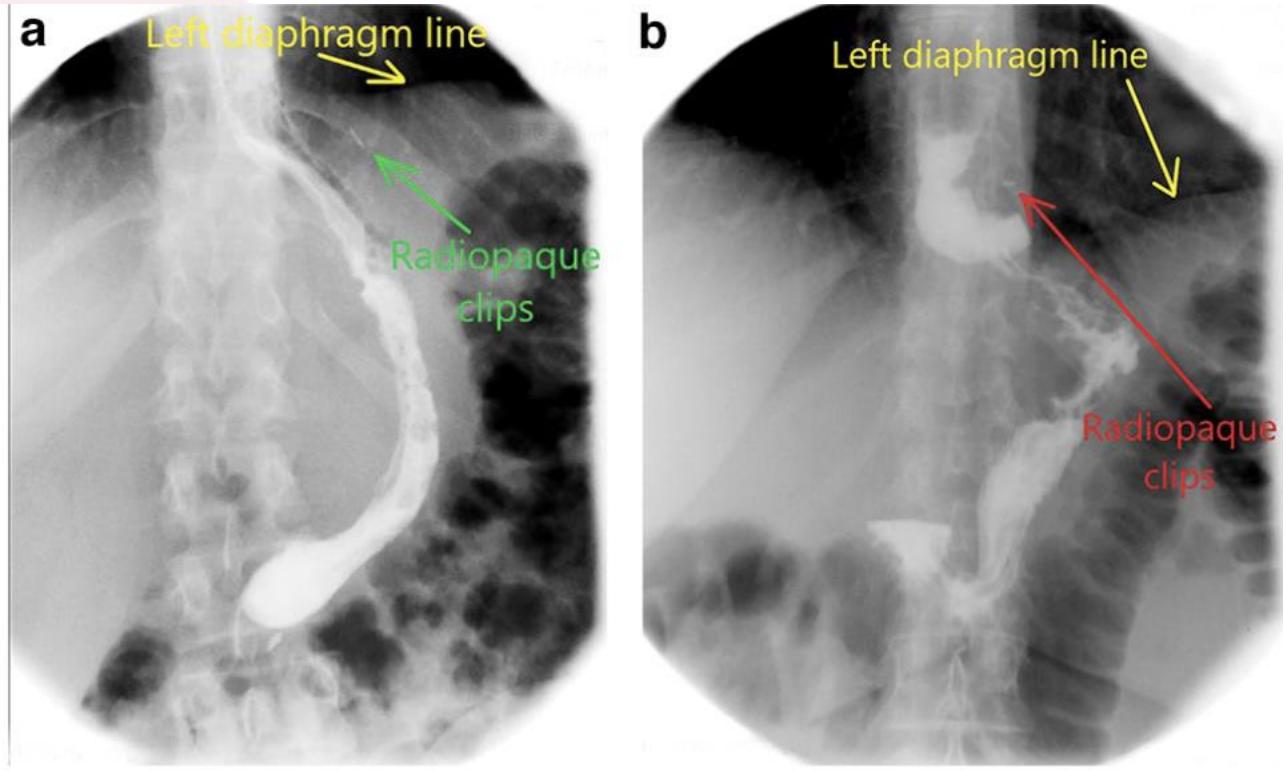
Reconstruction of the phreno-esophageal ligament (R-PEL) prevents the intrathoracic migration (ITM) after concomitant sleeve gastrectomy and hiatal hernia repair

I. Hutopila[1,2] · M. Ciocoiu[3] · L. Paunescu[3] · C. Copaescu[1,4,5]



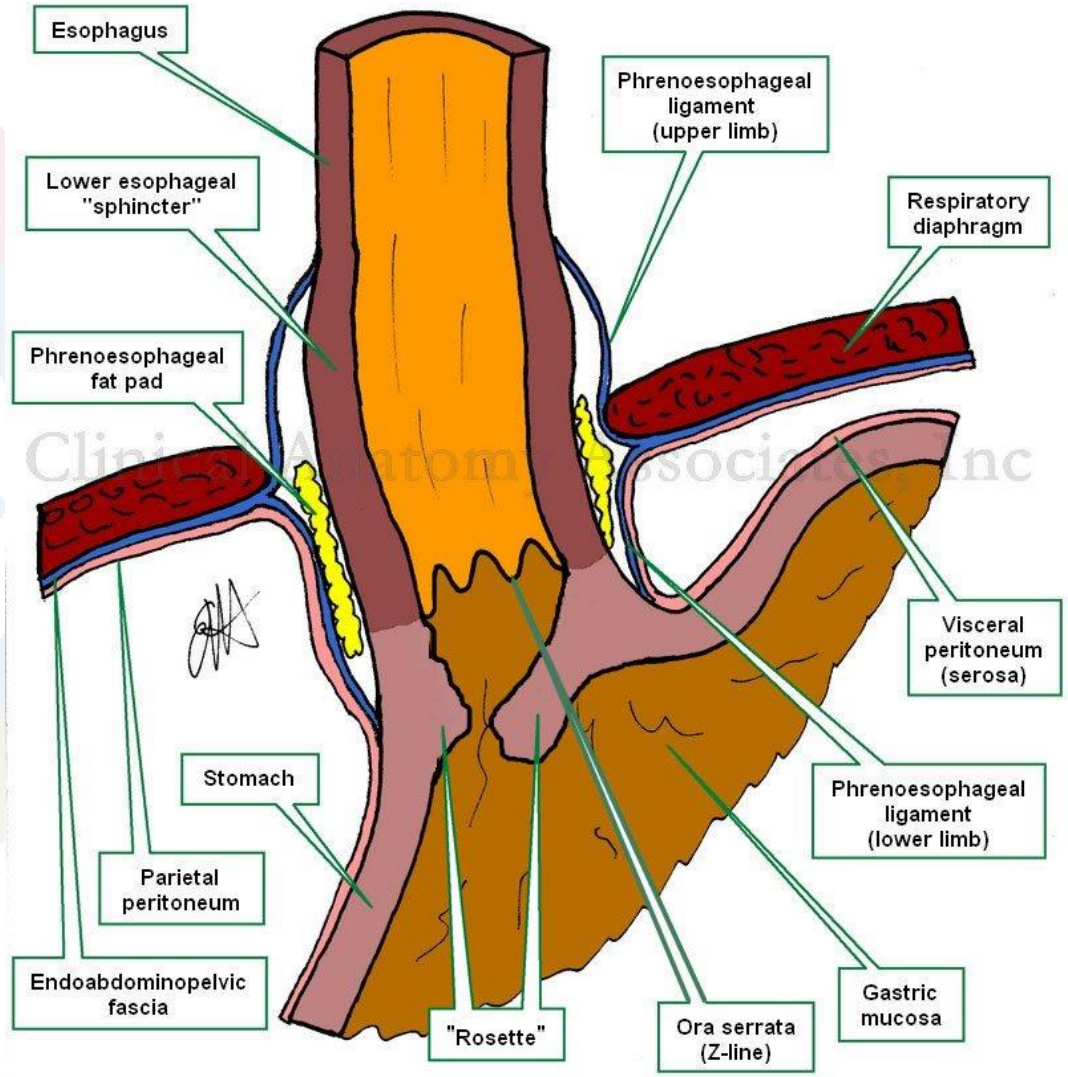
LSG + HH +Phreno reconstruction vs LSG + HH repair

- 146 HH vs 127 HH + phreno
- 35 vs 26% pre-op reflux
- Oesophagitis around 40% each pre-op.
- Post op oesophagitis 56% (grade C 3.4%) vs 42% (0.8 grade C)
- Reflux Sx 37% vs 21%
- Migration into chest 51% vs 8.7%



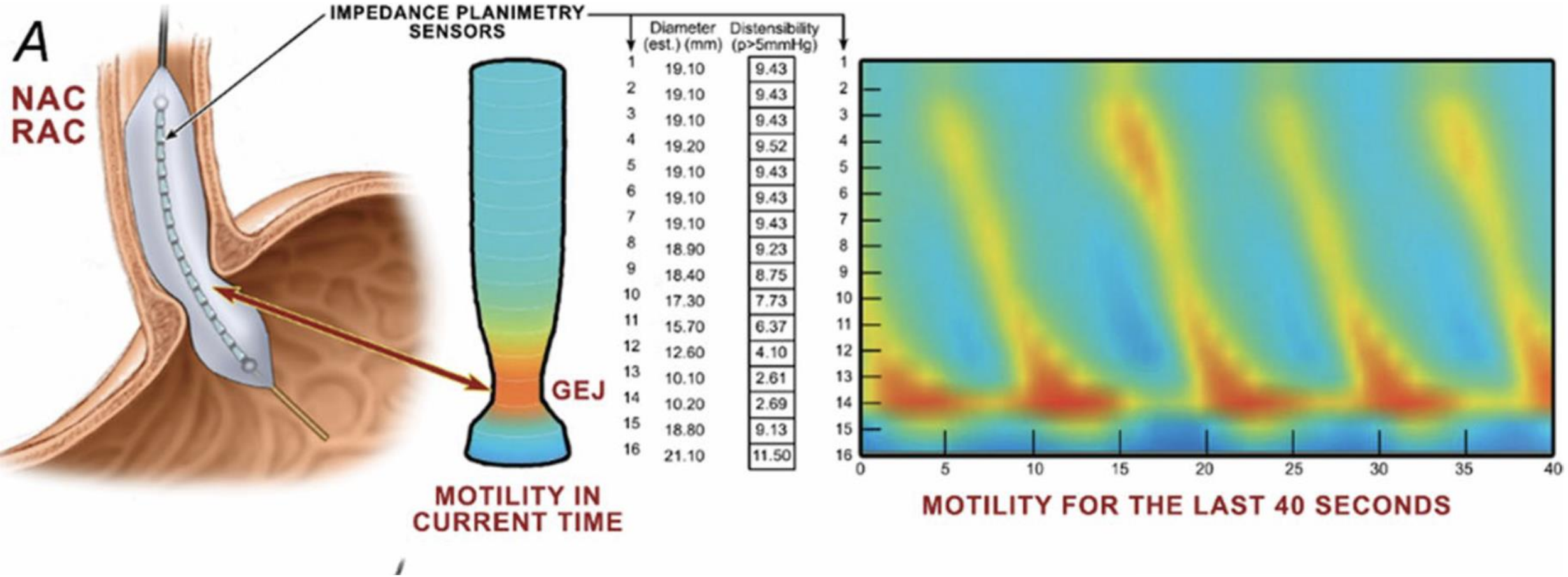
Lower oesophageal contractile segment – in bariatrics

- The lower oesophagus sphincter complex acts like a pump to assist passage of the bolus.
- Fatigue and late failure of this mechanism leads to dilation of this segment and retrograde bolus flow/oesophageal dilation/reflux etc. Symptomatic oesophageal collapse then occurs quickly with rapidly escalating symptoms.
- This mechanism of failure will be seen in all gastroplasty patients, band>sleeve>bypass.



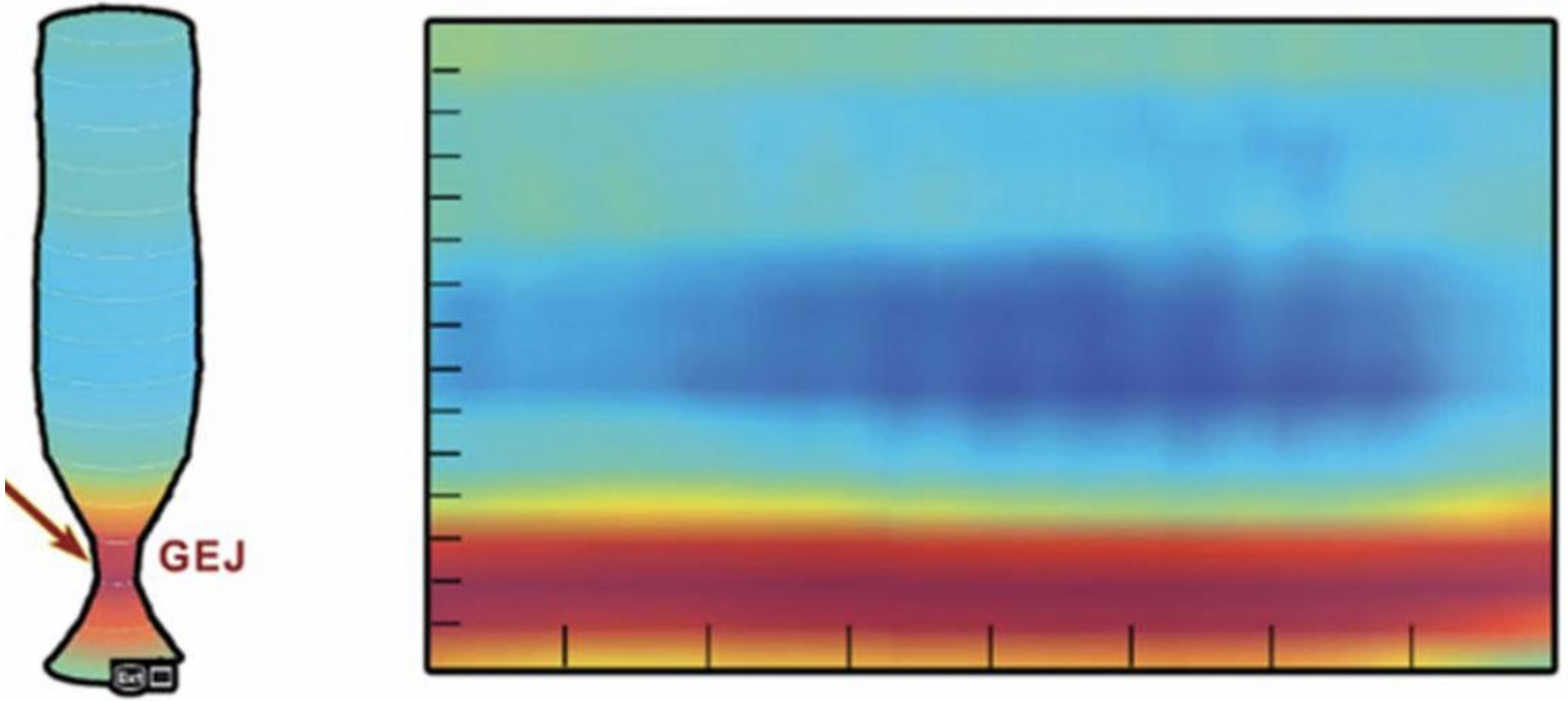
Secondary peristalsis (Endoflip).

Obesity Surgery (2024) 34:347–354 https://doi.org/10.1007/s11695-023-06959-8

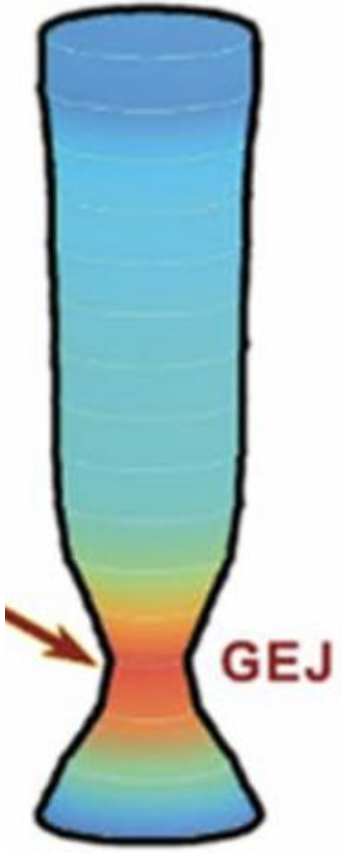


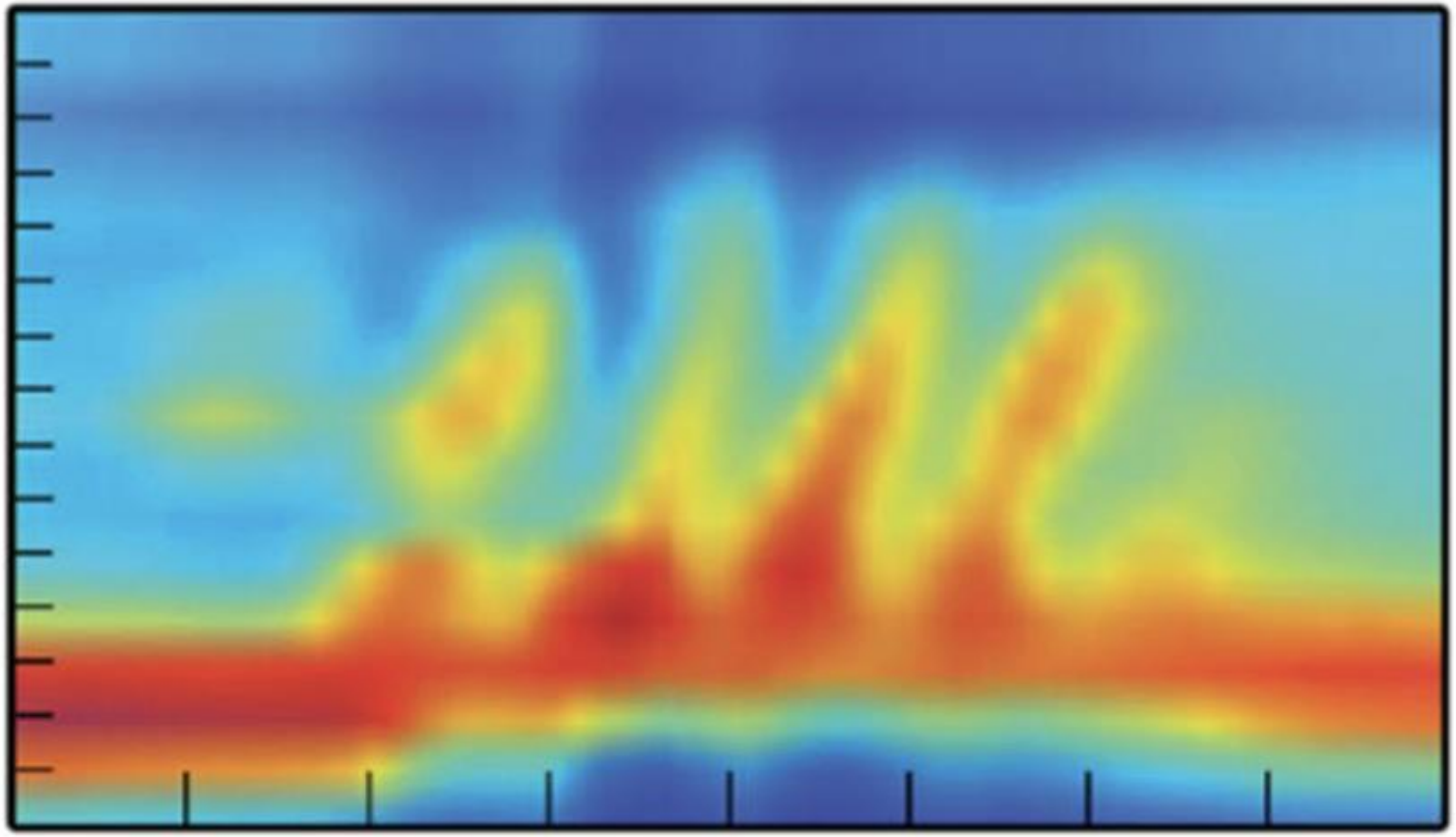
Obesity Surgery (2024) 34:347–354
https://doi.org/10.1007/s11695-023-06959-8

Absent peristalsis as a response to a challenge



Retrograde peristalsis as a response to a challenge



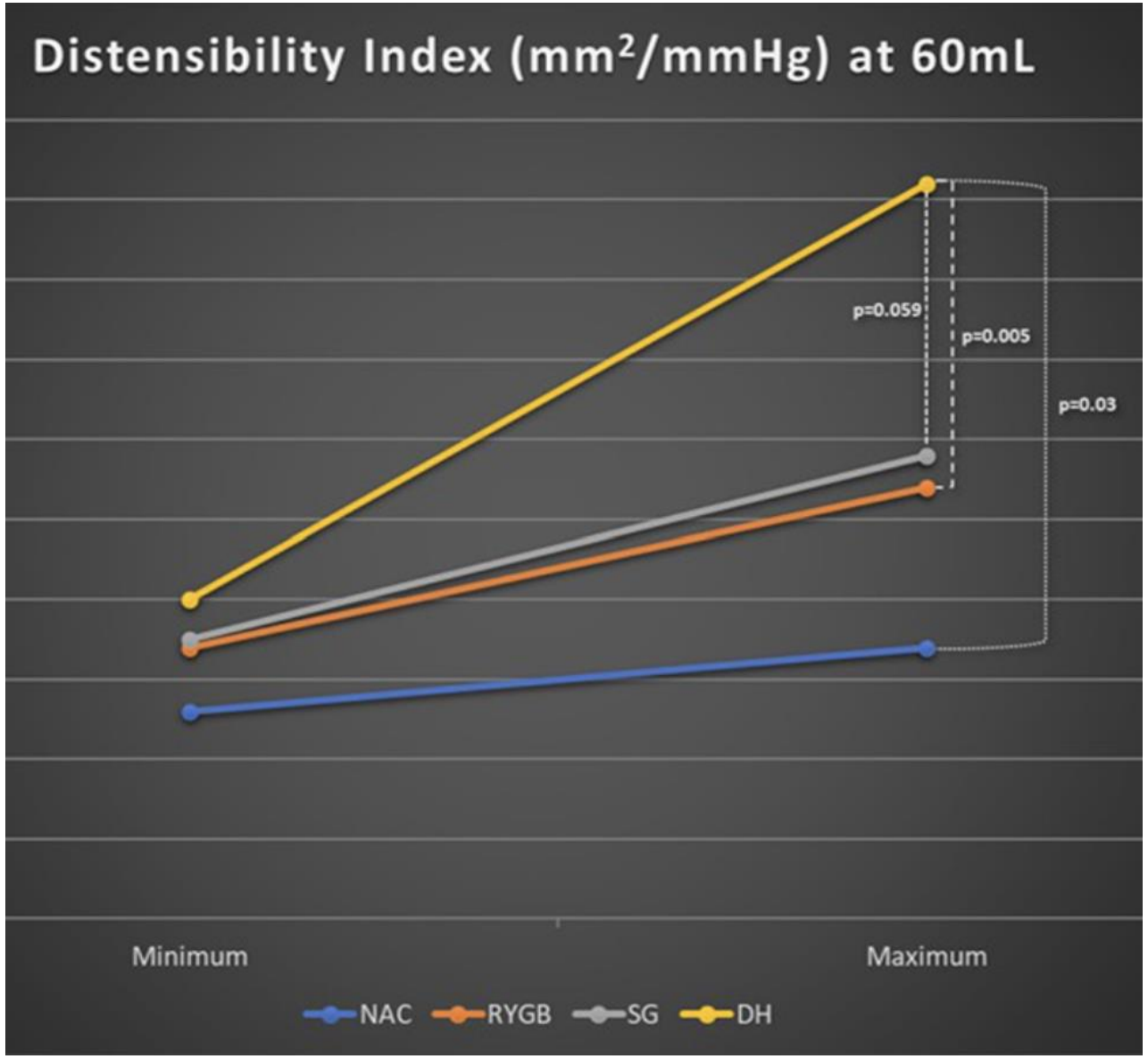


Abnormal motility patterns

Table 2 Difference in esophageal motility patterns between the different anatomical groups

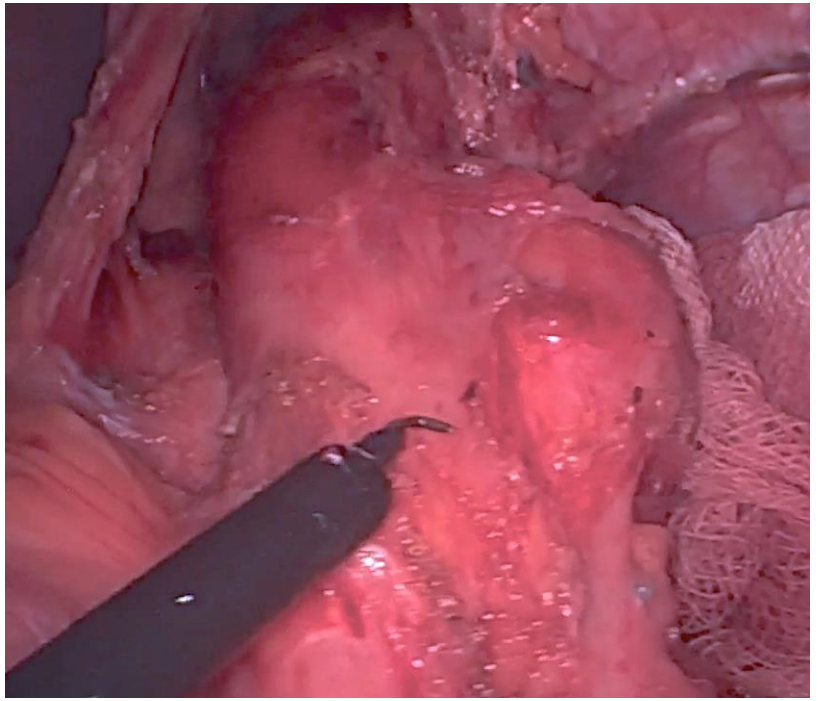
			RYGB ($n = 87$)	SG ($n = 33$)	NAC ($n = 22$)		Double hit ($n = 25$)
Motility pattern *n*							
Normal (RAC) *n* (%)			35 (40%)	12 (36%)	17 (77%)		5 (20%)
Abnormal *n* (%)			52 (60%)	21 (64%)	5 (23%)		20 (80%)
RRC *n* (%)			9 (10)	3 (9)	1 (5)		2 (8)
DDCR *n* (%)			14 (17)	6 (18)	0 (0)		4 (16)
AC *n* (%)			29 (33)	12 (37)	4 (18)		14 (56)
			p value				
RYGB vs. NAC	SG vs. NAC	RYGB vs.SG	RYGB vs. SG vs. NAC	DH vs. NAC	RYGB vs. DH	SG vs. DH	RYGB vs. SG vs. NAC vs. DH
0.002	0.005	0.835	0.004	< 0.001	0.096	0.247	< 0.001

Highly distensible or “blown” OGJ



Oesophagus and lower sphincter

- Both anatomy and function can change over time in response to sustained preload and afterload caused by surgery.
- Initially start as “normal” then lower sphincter blows out with pressure transferred up into oesophageal body. Probably explains why distal oesophageal dilation common, but total dilation is rare.
- Patient may initially tolerate sleeve misconfiguration and hiatal hernia as they are protected by a functional oesophagus but these will contribute to late (3 year plus) presentation.



Sleeve configuration.

- Ideal sleeve configuration is somewhat contested. Most will agree that avoiding proximal pockets of stomach and narrowing in the midpoint is important however definitions are lacking. Also, many will deny these things are important when presented with radiology images, maybe because misconfigurations are initially well tolerated.

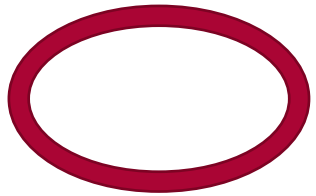
- Let's agree that fundic pouch and incisura stenosis isn’t great.

- Anatomy also changes over time.

Sleeve construction. Angularis.

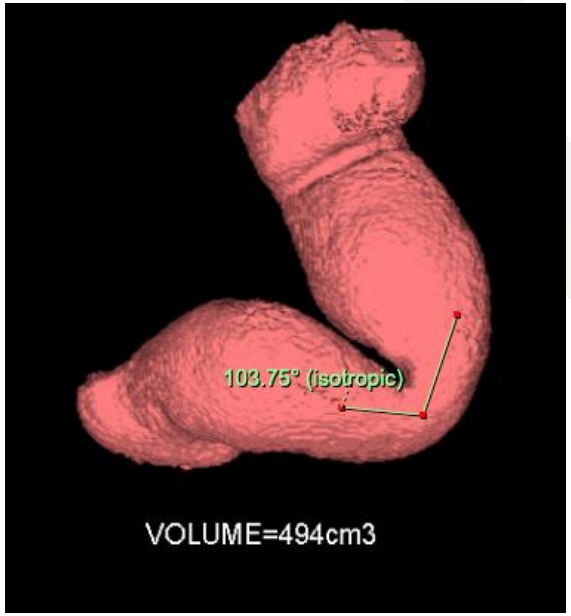
- Any non-reinforced tube that bends will kink.
- Sleeves are “created bent”. Any angularis stenosis will progress over time as the stomach lengthens.
- Angularis “stenosis” so prevalent that its probably normal to some degree.
- Diameter of angularis in a sample of 10 consecutive patients having 3DCT was always less in transverse plane mean 24 mm (15-36mm) than AP plane mean 30 mm (22-43 mm).

Angularis.

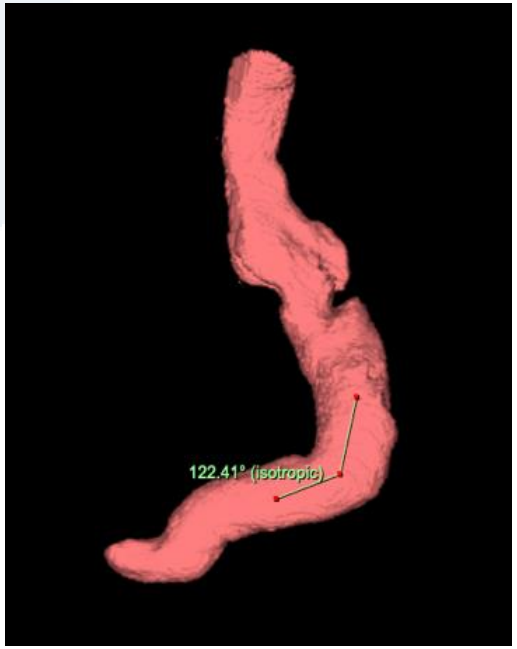


VS

- The angularis is oval rather than circular, greater bend = greater compression and obstruction. Functionally a sleeve stomach is “bi-compartmental”, after eating the vertical part fills, becomes pressurized and then empties. If the vertical stomach doesn’t empty across the incisura then patient likely vulnerable to reflux or regurgitation.
- Cross sectional area at angularis of 10 patients averages 78% of the circular lumen above and below the incisura (range 51% - 96%).

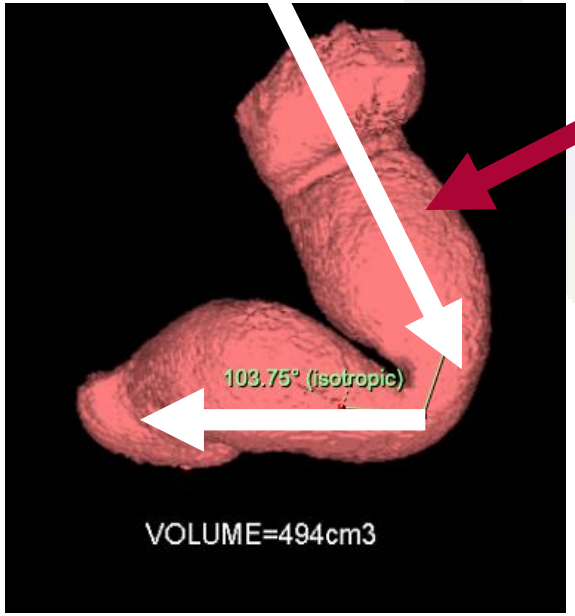


VS



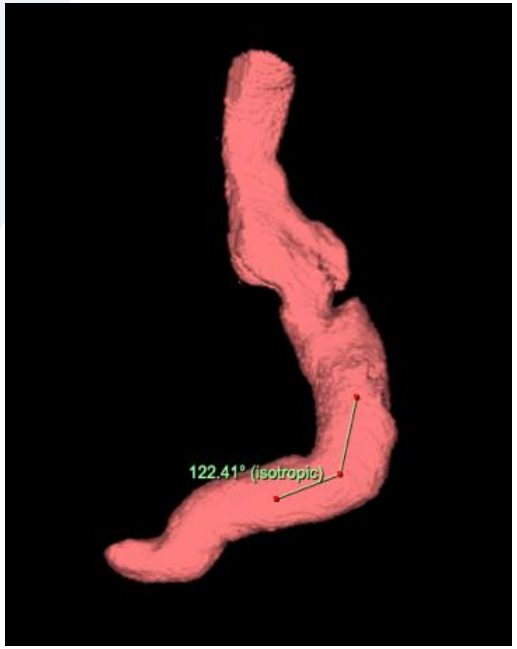
Angulation

- Angulation also leads to increased wall stress, especially with pulsatile flow.
  - Functional transient obstruction.
  - Angle varies between 100 and 125 degrees.



Direction of bolus flow

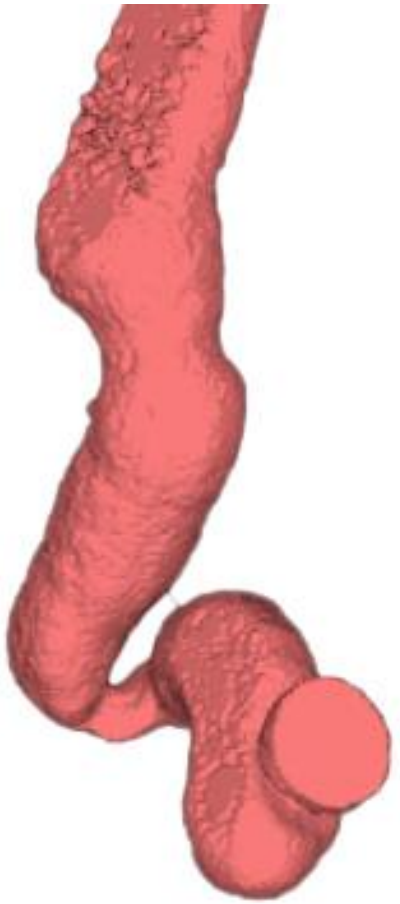
VS



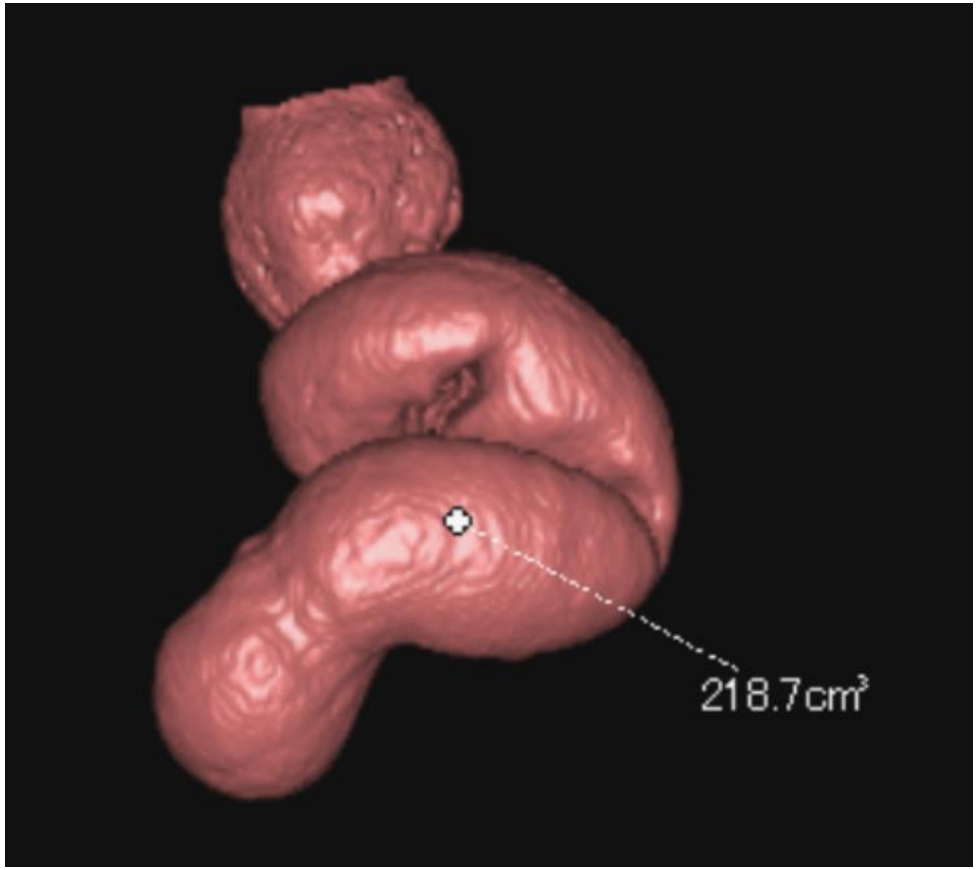
Implications

- There is always a degree of post-stapling crimping of the sleeved stomach at the angularis.
  - Greater angulation = greater crimping, increased risk of obstruction/stenosis
- Several “hose physics” formulas exist for industrial/hydraulic engineering solutions, and one could likely be created for sleeve gastrectomy.
- Simply put though, the angularis should be at least 25% wider than the vertical component to avoid functional stenosis.

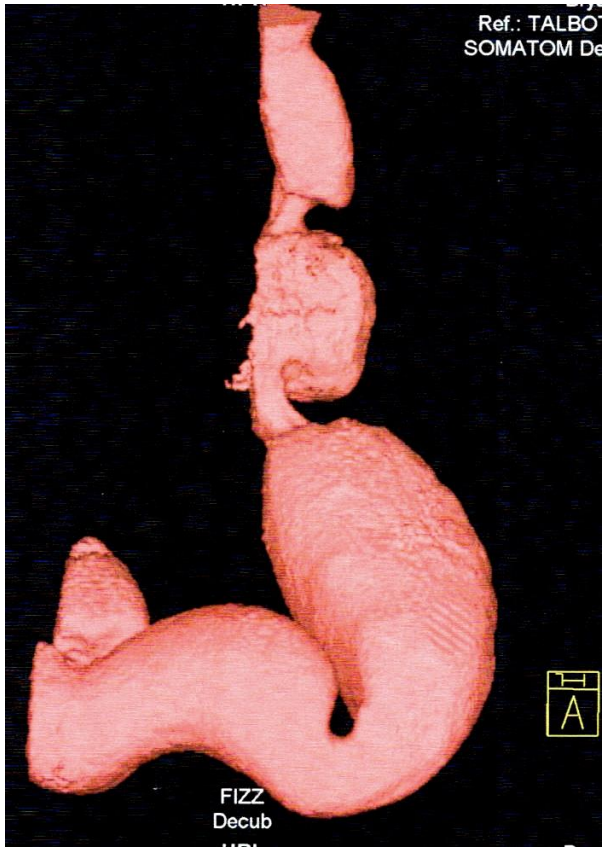
Practical considerations. Angularis stenosis may be under-reported.



Needs Bypass



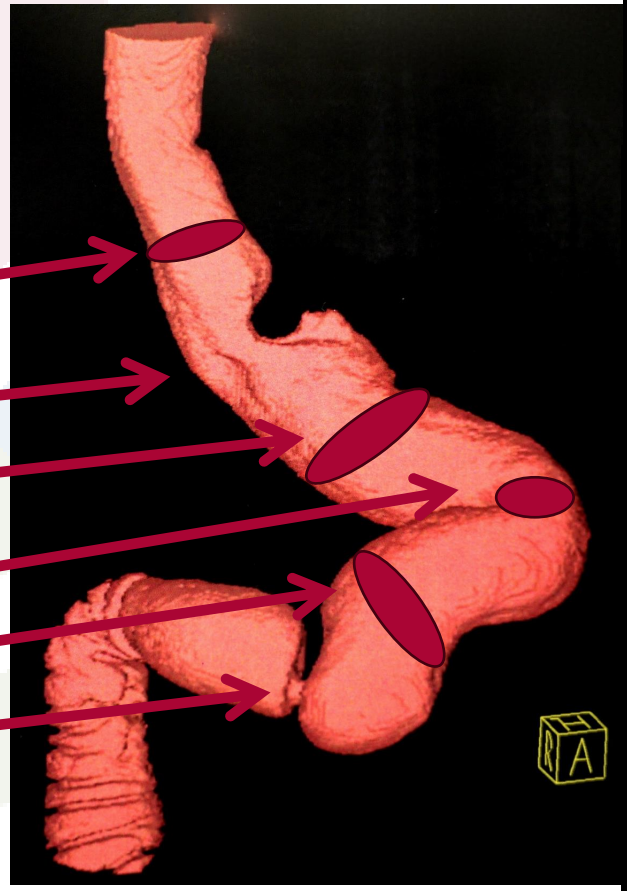
Needs Bypass

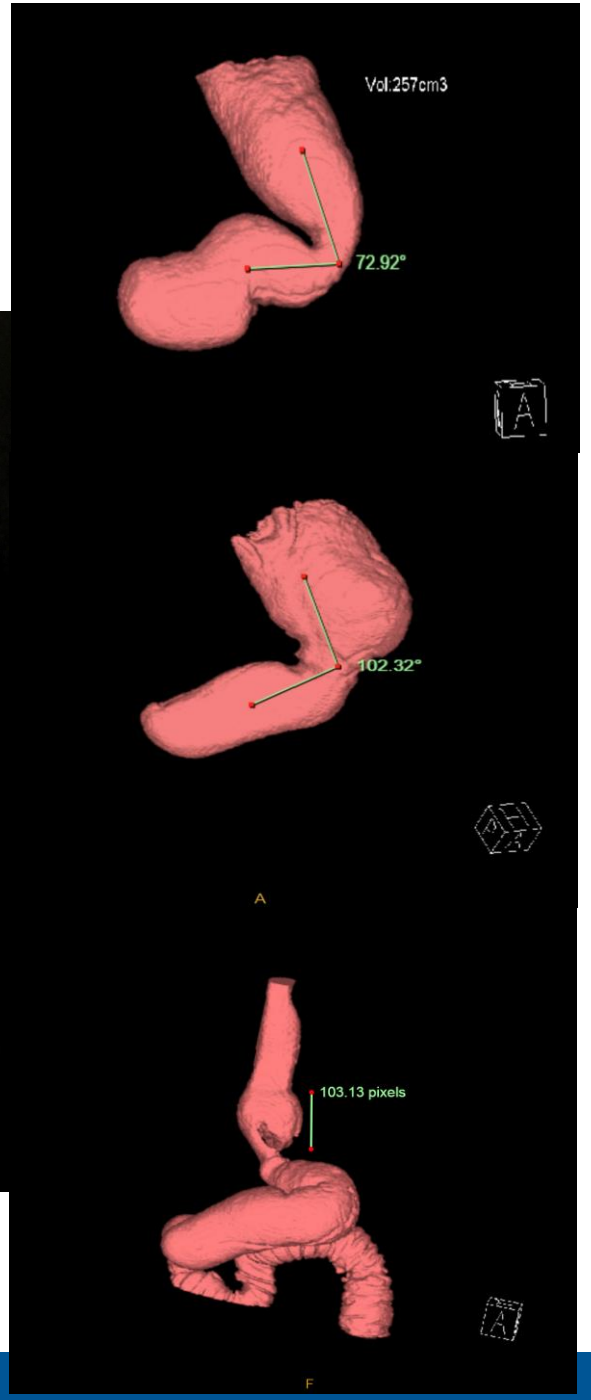


?

CT Reporting

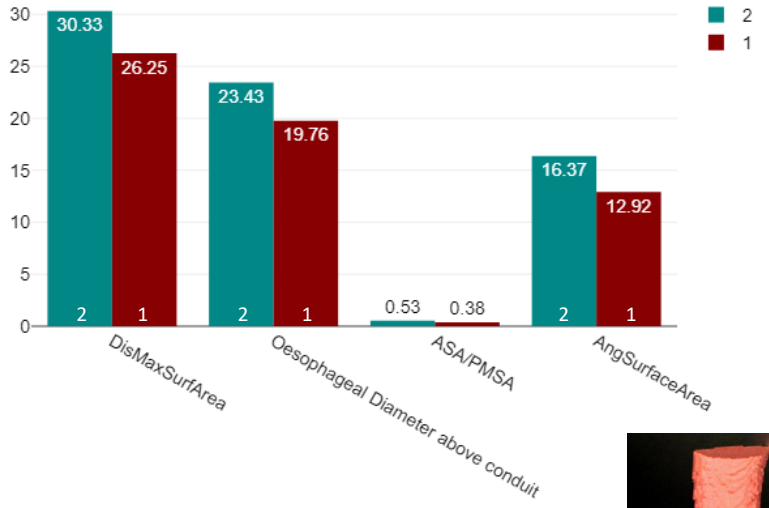
- Tube volumetry.
- Oesophageal diameter
- Diaphragm notch, staple line
- Proximal surface area
- Angularis: Angle and Surface Area
- Distal Surface area
- Pyloric notch



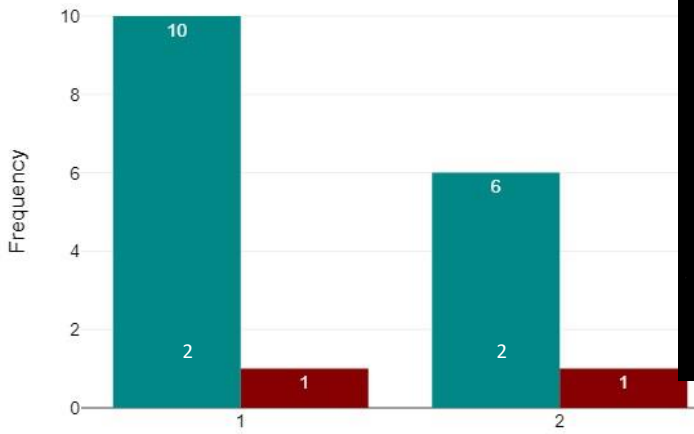


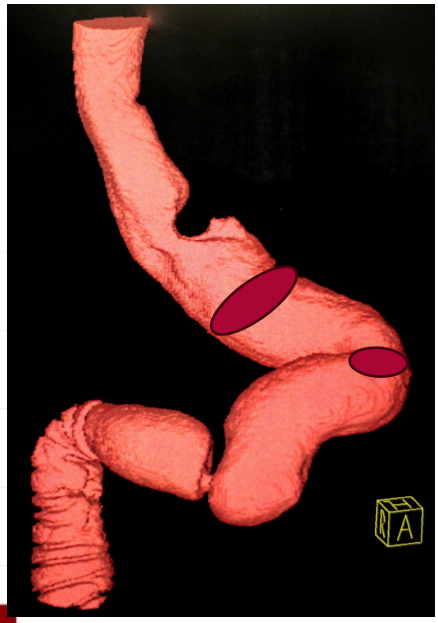
64 patients

- Bypass and other revisional surgery:
  - Further improvement in symptoms noted in those with:
    - Lower oesophageal diameter
    - Lower distal max surface area
    - Lower angularis surface area
    - Lower ASA/PMSA ratio
  - A ratio of ≤0.5 of ASA/PMSA was associated with more visick 1&2 than higher ratio

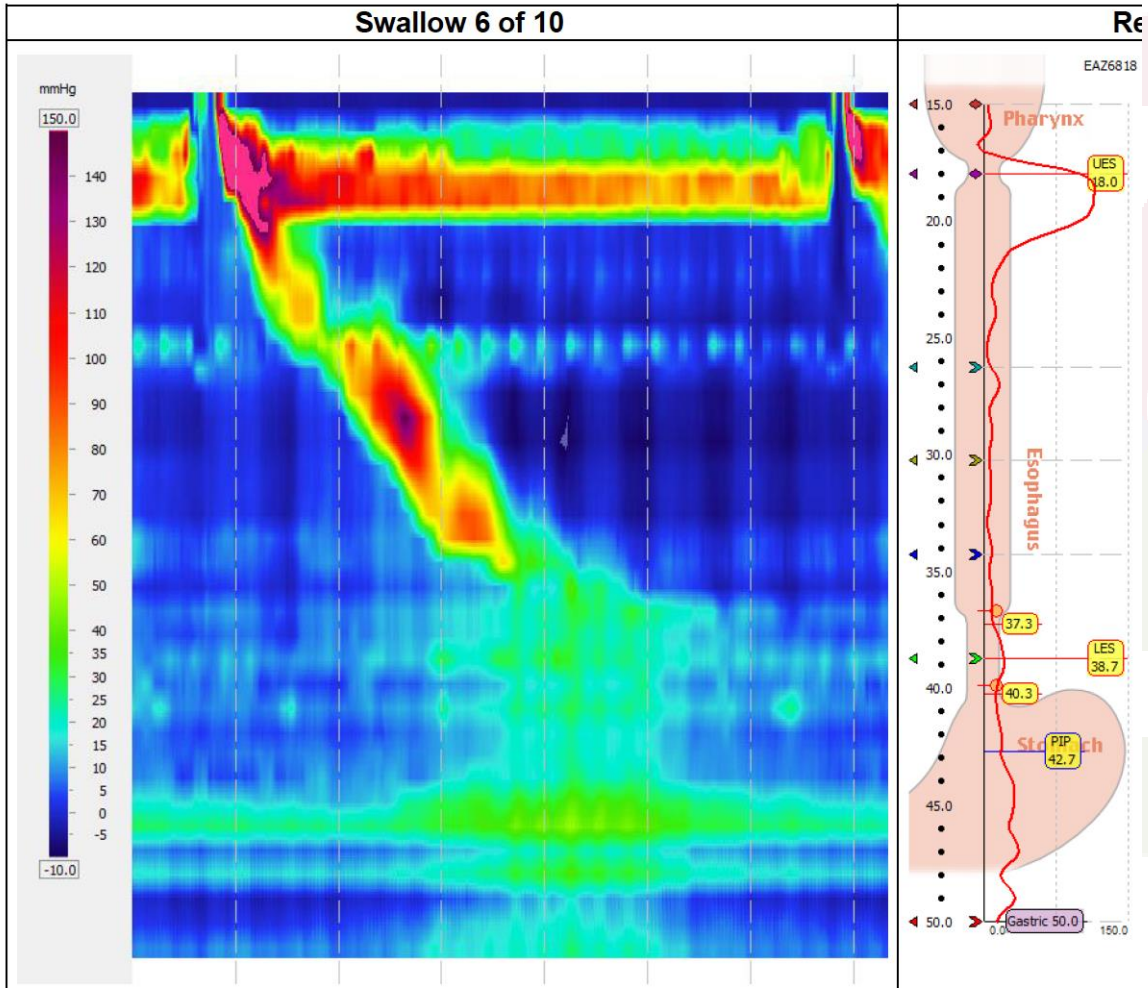


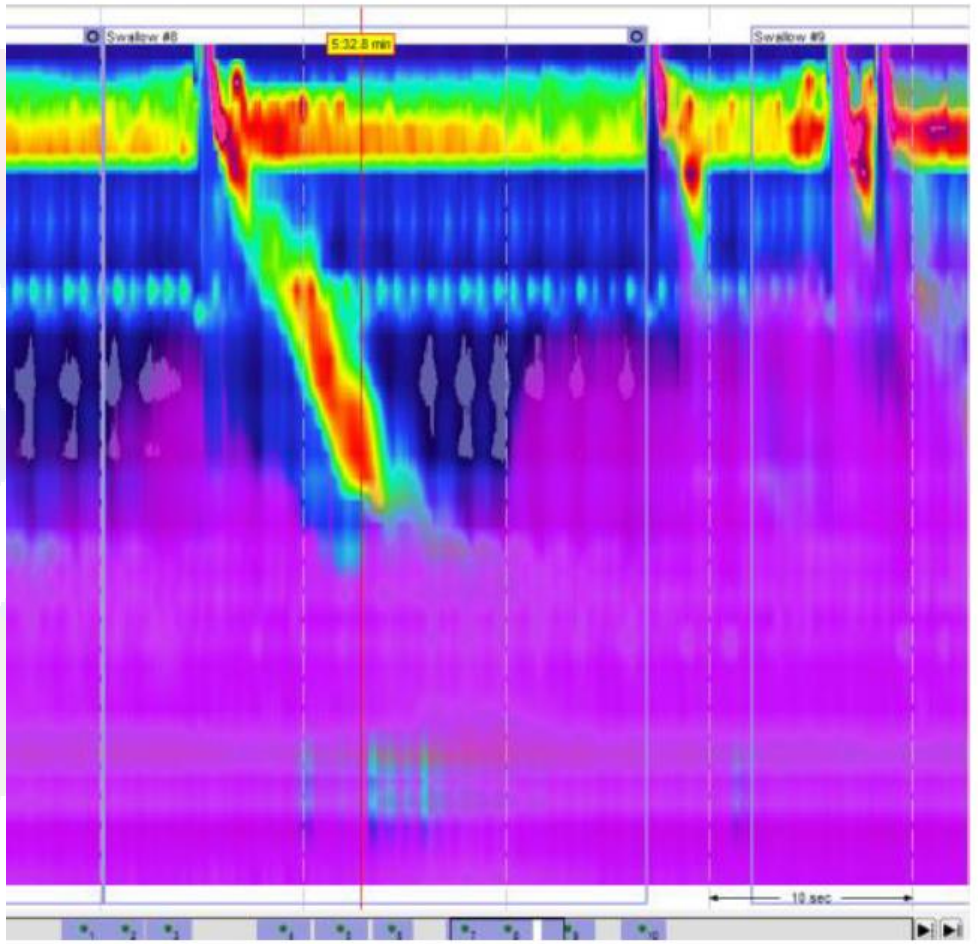
1= Visick 1&2 , 2 = Visick ≥3



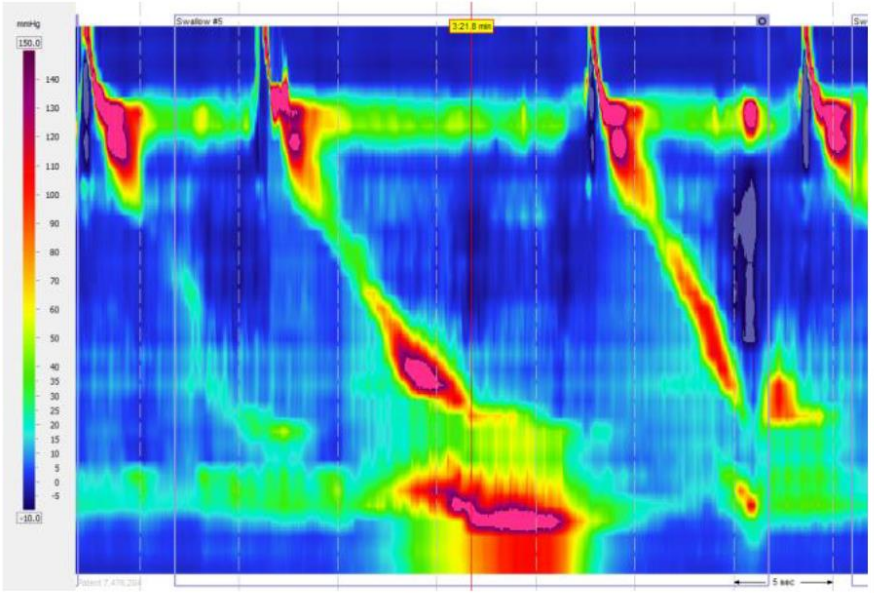


Late Post-LSG hiatus hernia and reflux/retrograde flow.

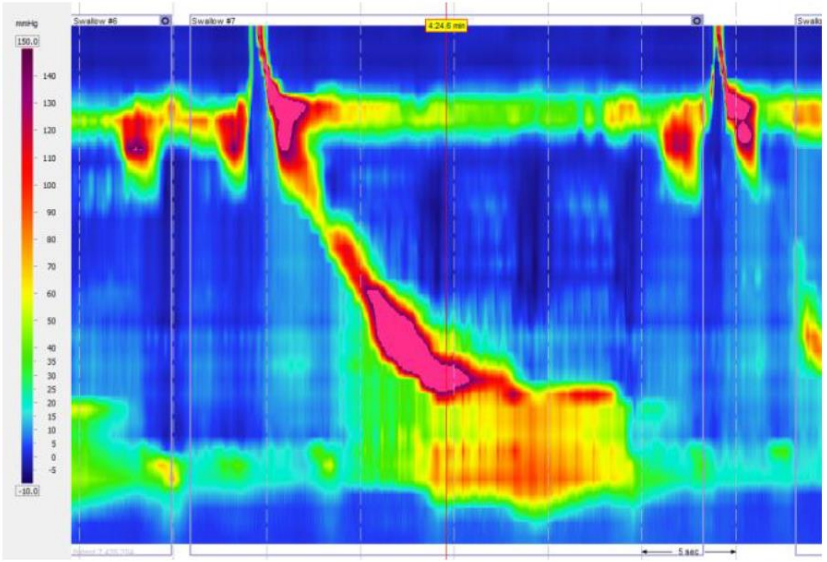




Regurgitation before and after Hiatus hernia repair

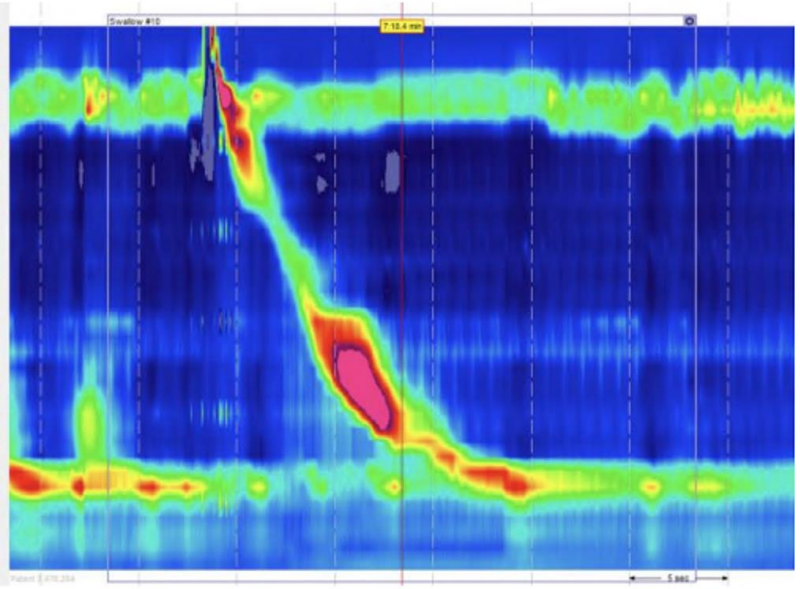


Liquid swallow



Solid swallow DCI >8000

Post-op after hernia repair, solid swallow.

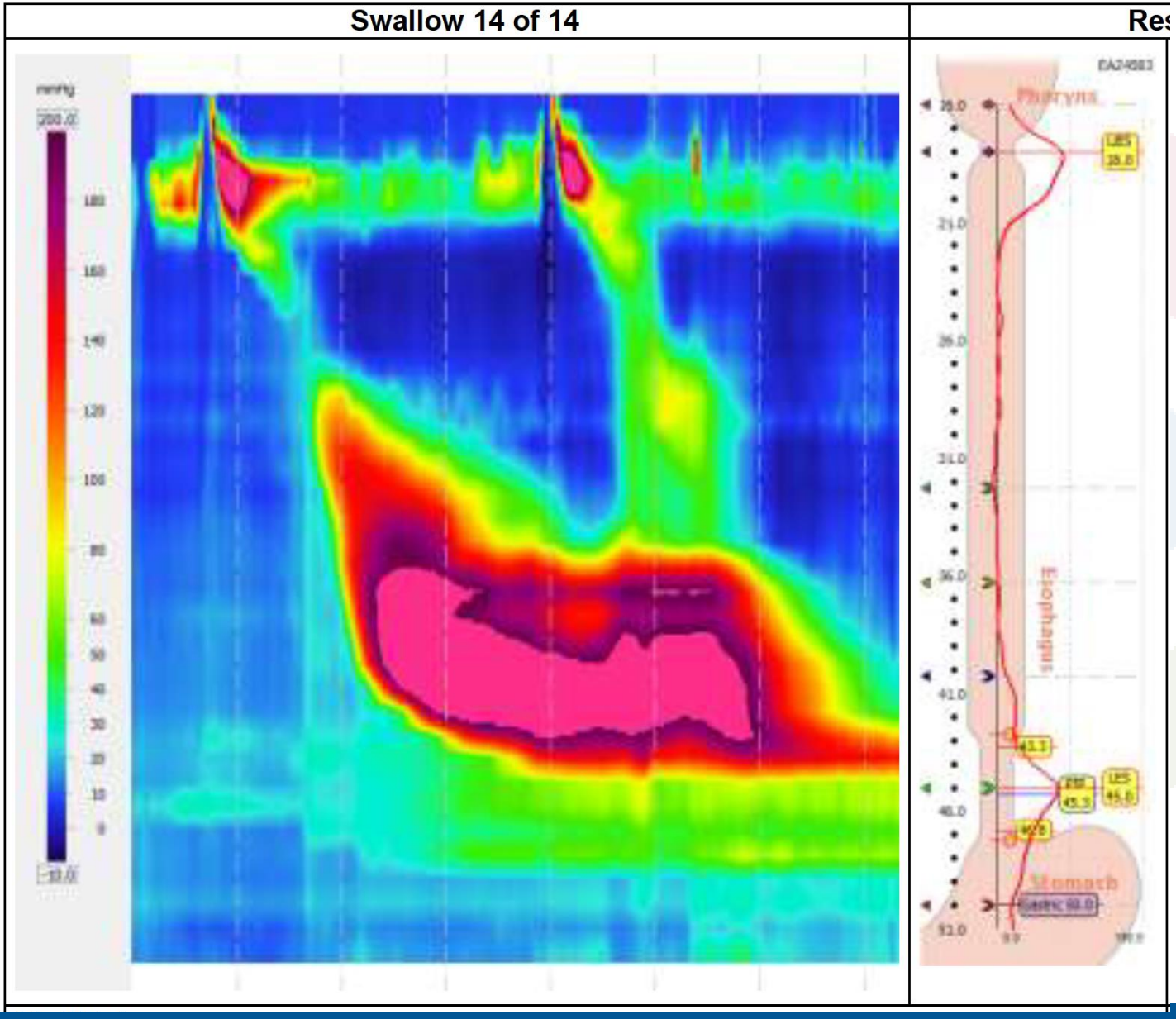


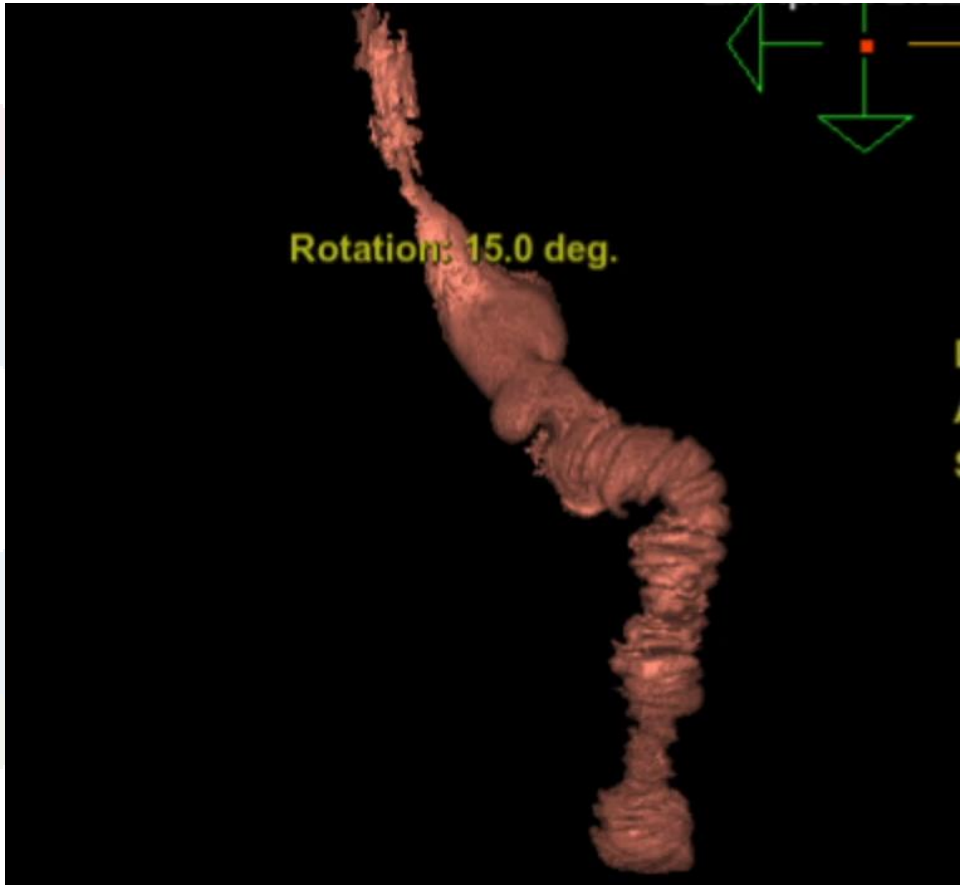
Post-LSG HH repair.

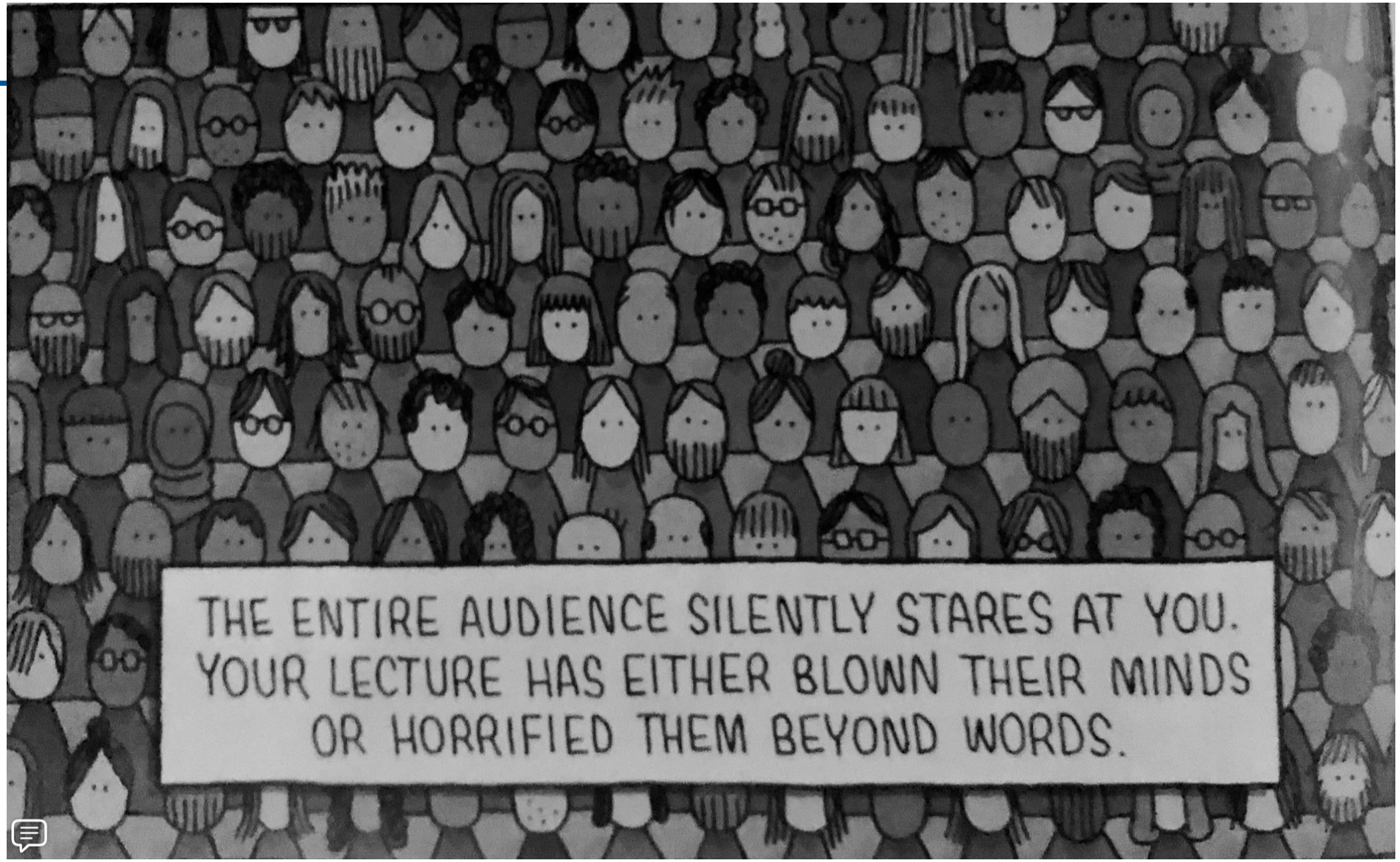
- Heterogeneous results, averaging 50% control
- Our own results indicate 72% control with HH repair and 82% with RYGBP
  - Patients had modified Hill repair +/- mesh.
  - Excluded sleeve configuration abnormalities.
  - Excluded peristaltic failure.
- Routine study of “failures” will usually reveal a reason.
  - Re-herniation
  - Abn anatomy below hiatus
  - In post LSG to bypass, retained antrum syndrome.
  - Incorrect initial diagnosis

Gálvez-Valdovinos R, Cruz-Vigo JL, Marín-Santillán E, Funes-Rodríguez JF, López-Ambriz G, Domínguez-Carrillo LG. Cardiopexy with Ligamentum Teres in Patients with Hiatal Hernia and Previous Sleeve Gastrectomy: An Alternative Treatment for Gastroesophageal Reflux Disease. Obes Surg. 2015;25(8):1539-43.
Hawasli A, Foster R, Lew D, Peck L. Laparoscopic Ligamentum Teres cardiopexy to the rescue; an old procedure with a new use in managing reflux after sleeve gastrectomy. Am J Surg. 2021;221(3):602-5.
Soong TC, Almalki OM, Lee WJ, Ser KH, Chen JC, Wu CC, et al. Revision of Sleeve Gastrectomy with Hiatal Repair with Gastropexy for Gastroesophageal Reflux Disease. Obes Surg. 2019;29(8):2381-6.
Indja B, Chan DL, Talbot ML. Hiatal reconstruction is safe and effective for control of reflux after laparoscopic sleeve gastrectomy. BMC surgery. 2022;22(1):1-8.

LSG to Bypass.



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YOUR LECTURE HAS EITHER BLOWN THEIR MINDS
OR HORRIFIED THEM BEYOND WORDS.