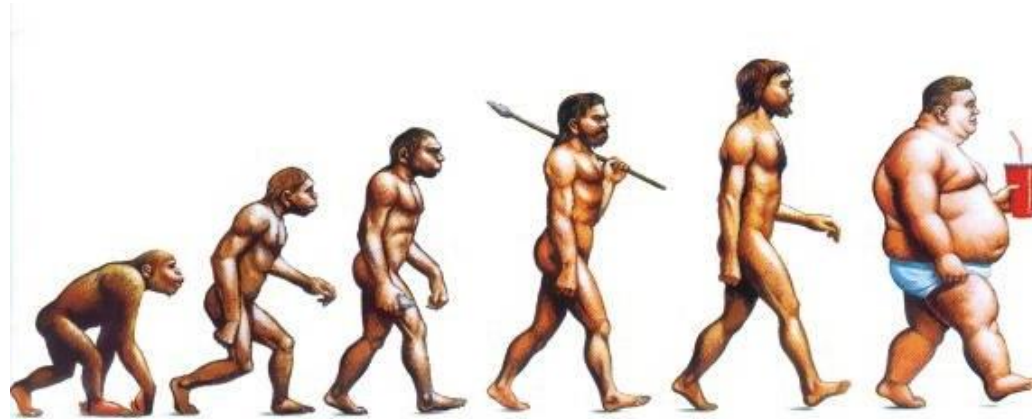


Endoscopic Treatment of Obesity



Nikhil A. Kumta, MD, MS

Director of Surgical and Bariatric Endoscopy

Director, Sinai Lab for Innovation and
Developmental Endoscopy (SLIDE)

Mount Sinai Hospital

Disclosures

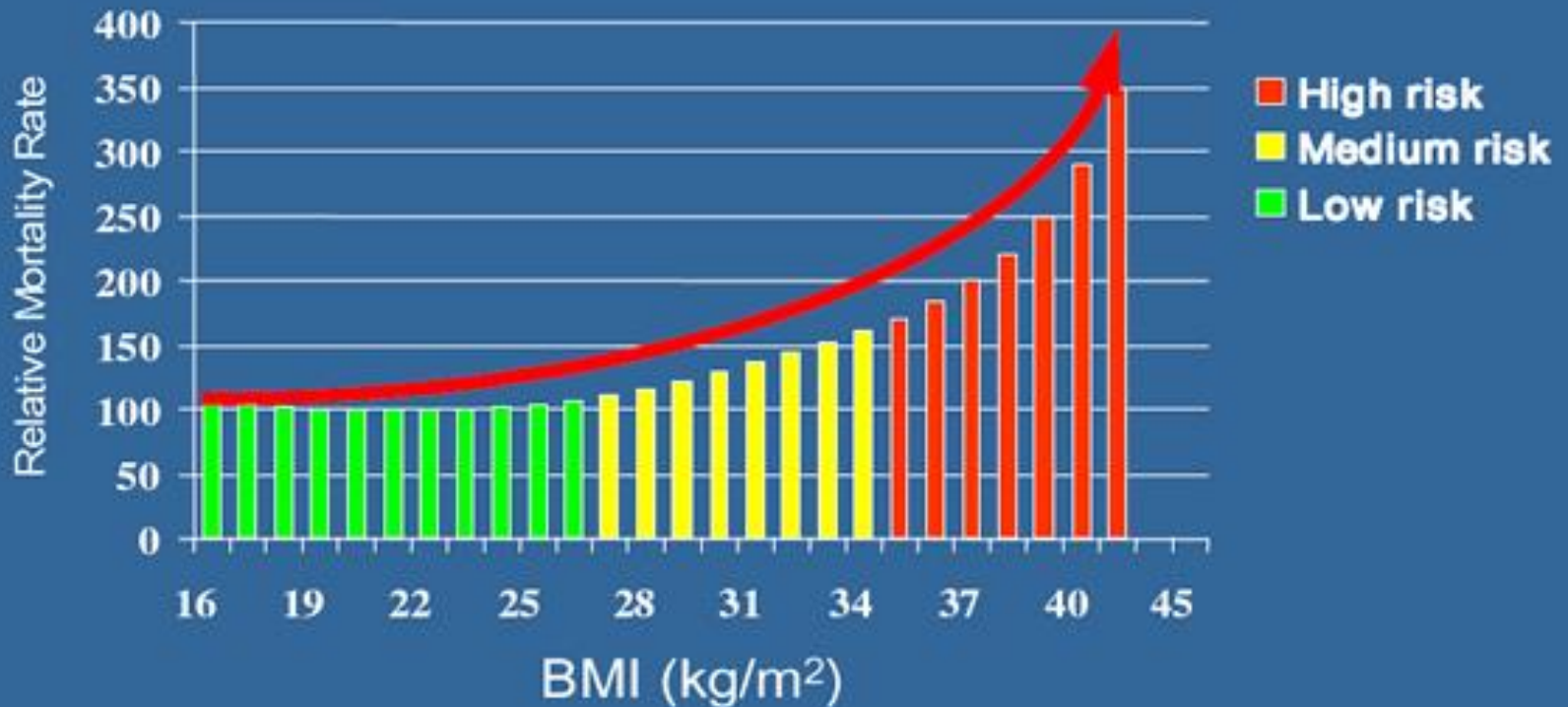
- Consultant: Apollo Endosurgery, Boston Scientific, Olympus

Introduction to the Obesity Epidemic

- Obesity is a metabolic disease with severe toll of co-morbid illness
- Prevalence is rising: 15% in 1980, 36% in 2010
- Estimated 32 million *more* people will be obese in 2030 (42% of US population)
 - Severe obesity (> 100 pounds overweight) expected to double (11% of US population)
- Costs
 - Obesity accounts for at least 9% of health spending -> \$150 billion
 - Incremental cost of \$1,429/obese person

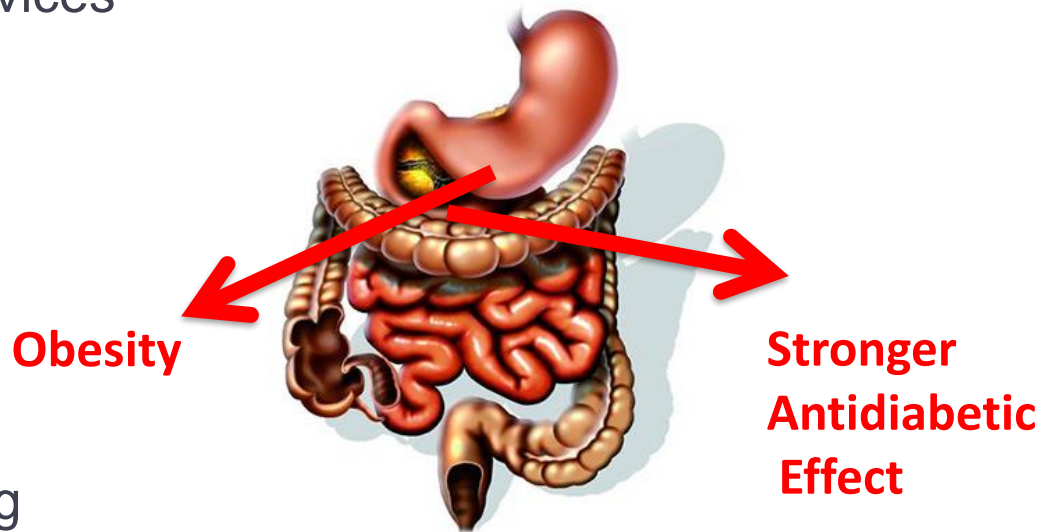
Body Mass Index vs. Mortality

Exponential Increase in Risk



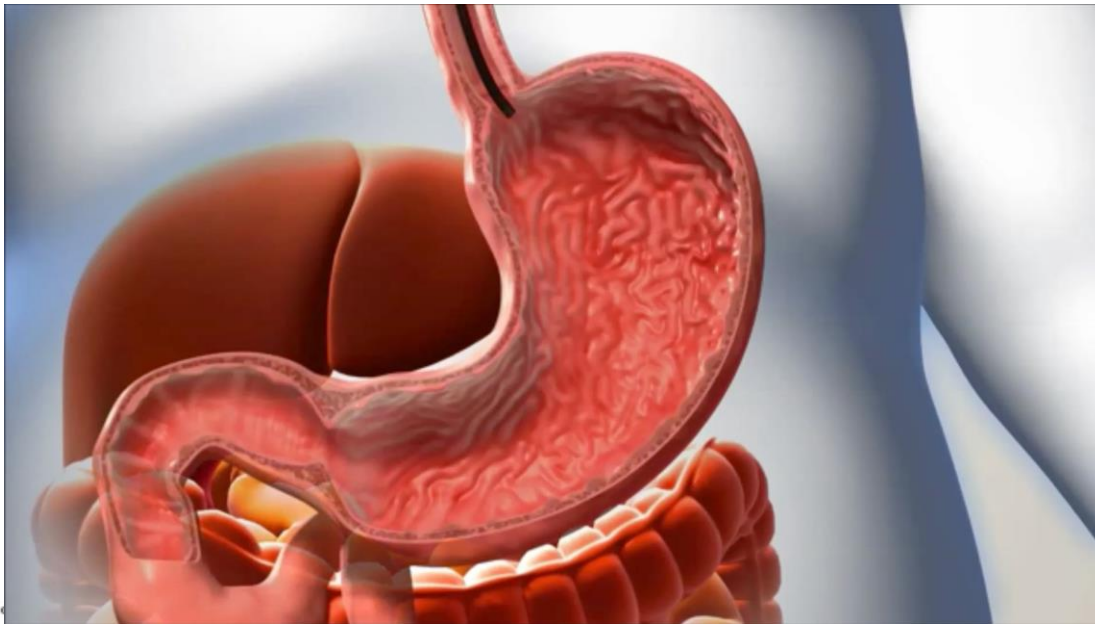
Targeted Endoscopic Therapy

- Stomach
 - Space occupying devices
 - Gastric plication
 - Aspiration
- Small Bowel
 - Sleeves
 - Duodenal resurfacing
 - Anastomosis
 - Flow altering



TransPyloric Shuttle

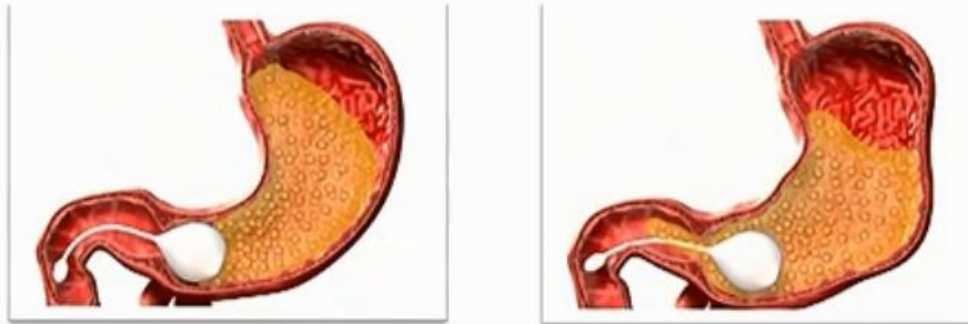
- Large spherical bulb filled with a coiled cord of silicone attached via flexible tether to a smaller distal bulb
- Endoscopic delivery and removal (1 year), outpatient procedure
- Mechanism involves delay in gastric emptying
- FDA approved April 2019: BMI 35-40 or BMI 30-35 with an obesity related co-morbidity



TransPyloric Shuttle Treatment Improves Cardiometabolic Risk Factors and Quality of Life in Patients with Obesity:

Results from a Randomized, Double-blind, Sham-controlled Trial

Richard Rothstein, M.D., George Woodman, M.D. James Swain,
M.D., Nestor de la Cruz Munoz, M.D., Vladimir Kushnir, M.D., Aurora
Pryor, M.D., Wayne English, M.D., Elizabeth Odstrcil, M.D., Santiago
Horgan, M.D., Shelby Sullivan, M.D.



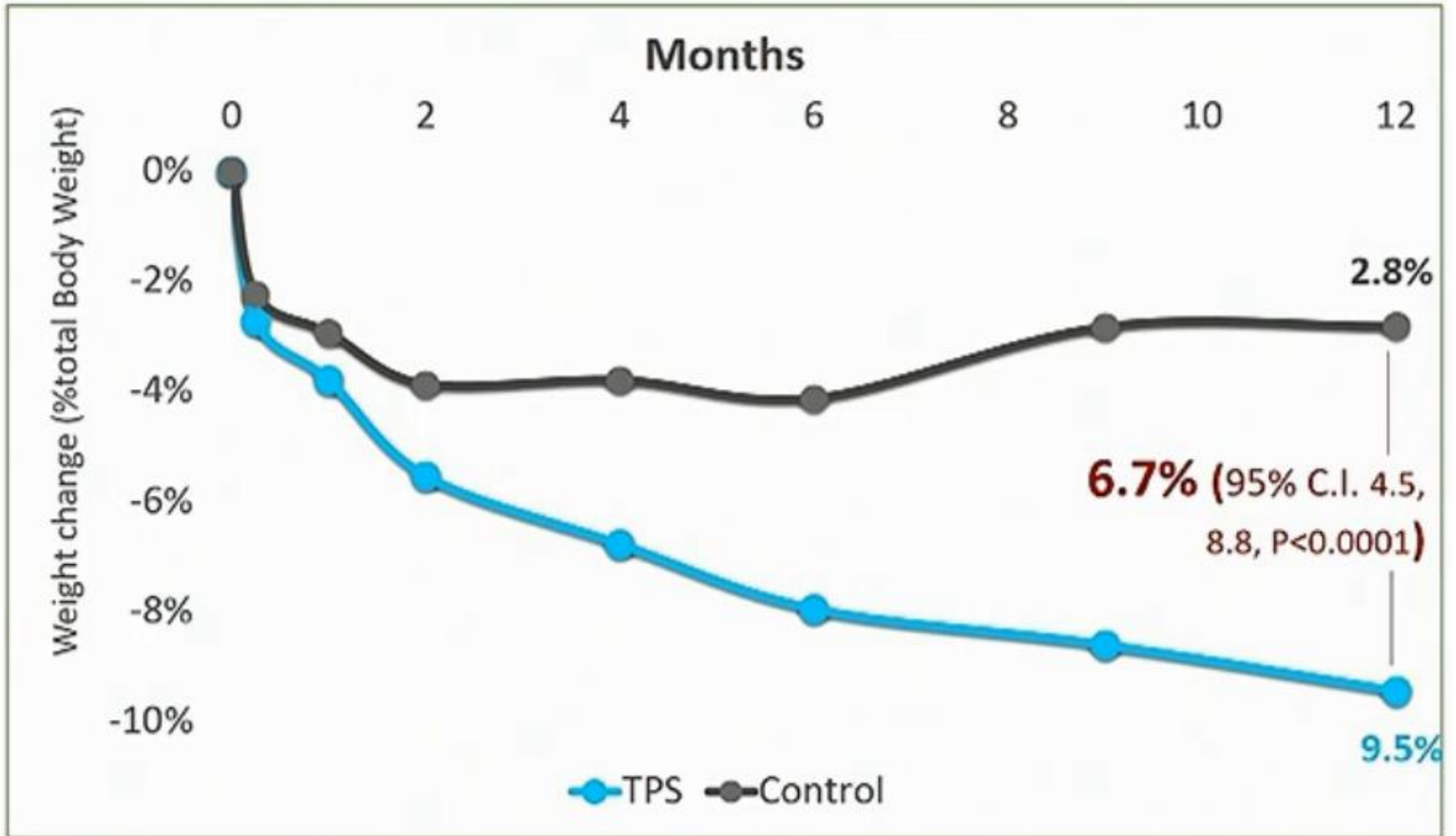
Methods

- 302 patients across 9 centers with 2:1 randomization, sham-controlled, double-blind
- BMI 30-34.9 with comorbidity or BMI 35-40
- Endoscopy study team was separate and isolated from study coordinator team that followed the subjects

Outcomes

- Mean %TBWL between TPS and control at 1 year
- % of TPS subjects with >5% TBWL at 1 year

Results



Responder Rates

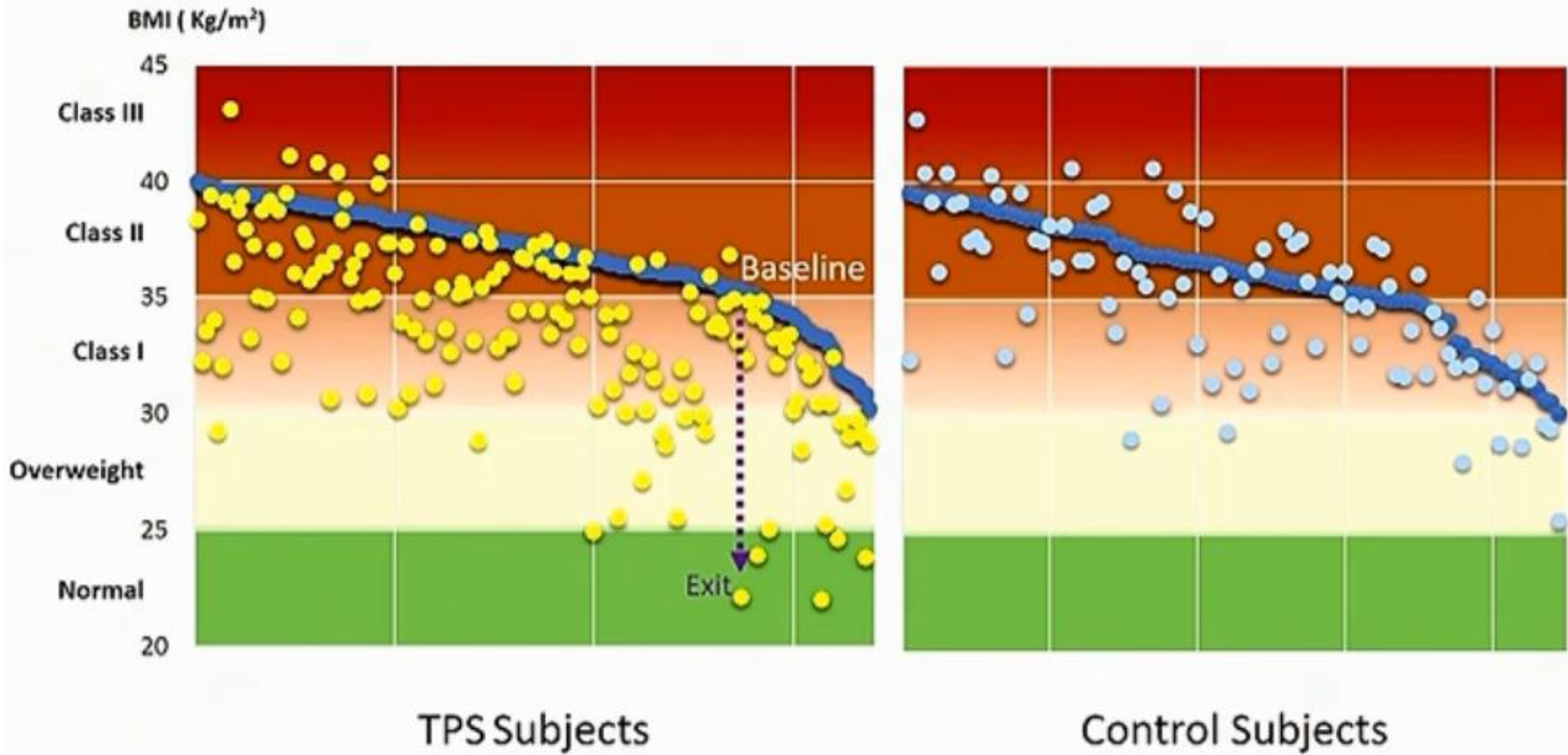
	% TPS Subjects	95% C.I.	P value*
≥5%TBL @ 12M	67.0%	59.5%, 74.4%	<0.0001

Responder Rate TPS vs. Control

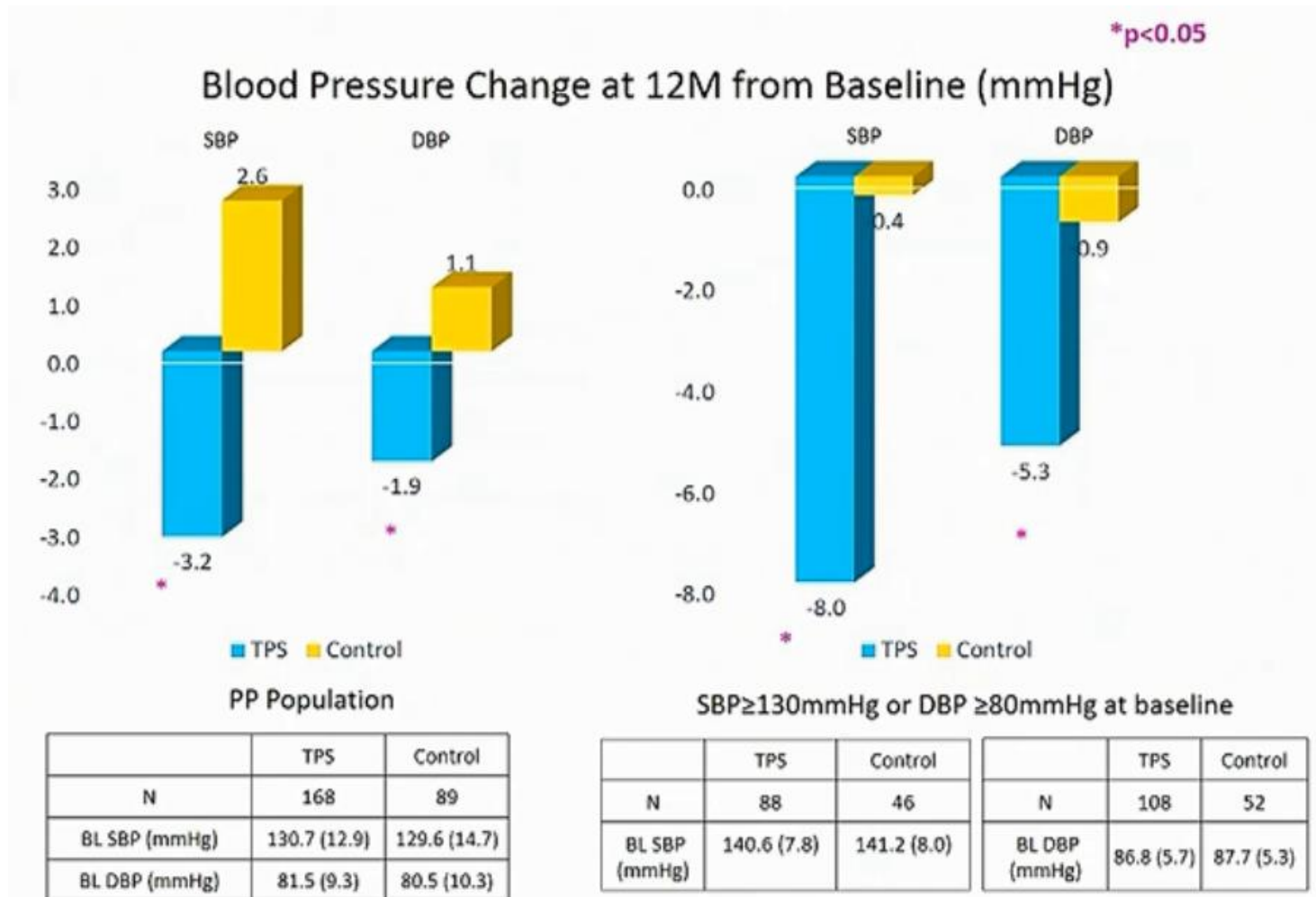
*p-value for Wilson's Midpoint Estimate against performance goal of 50%

	TPS	Control	P value
≥5% TBL	67.0%	29.3%	<0.0001
≥7% TBL	53.8%	25.2%	<0.0001
≥10%TBL	39.5%	14.0%	0.0001

BMI changes from baseline

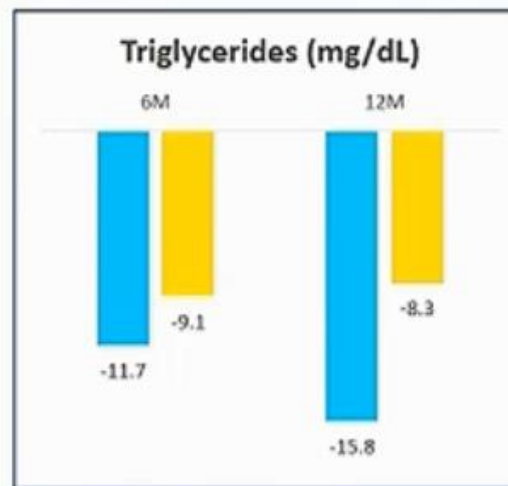
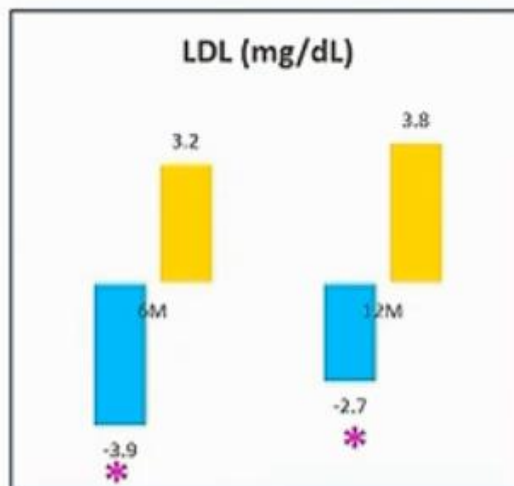
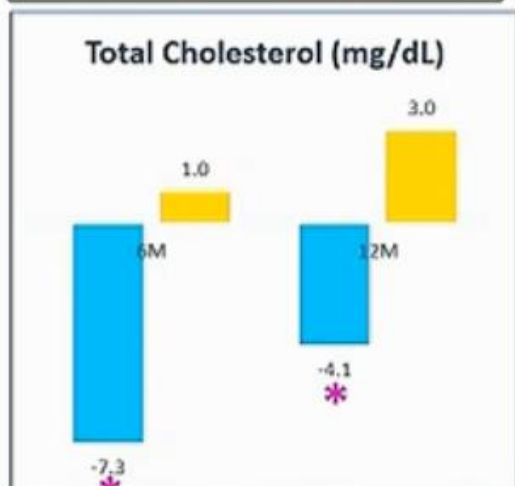
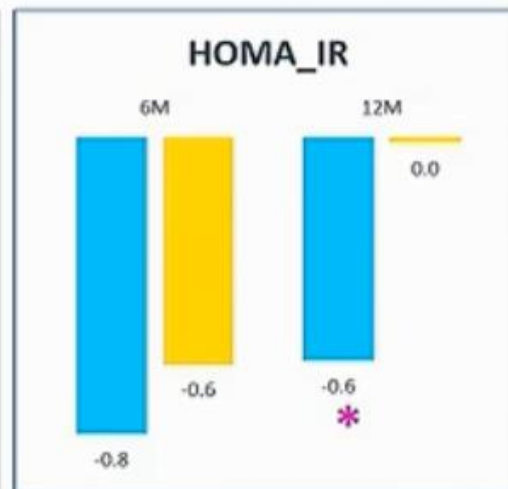
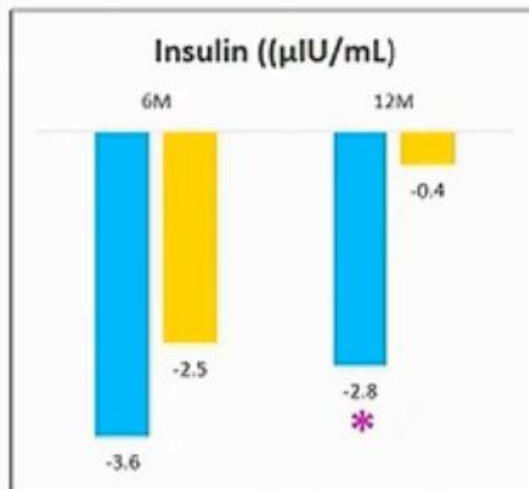


Significant change in BP in TPS group



Improvements in
Cardiometabolic
Risk Factors was
Significantly
Greater in TPS
Group than in
Control Group

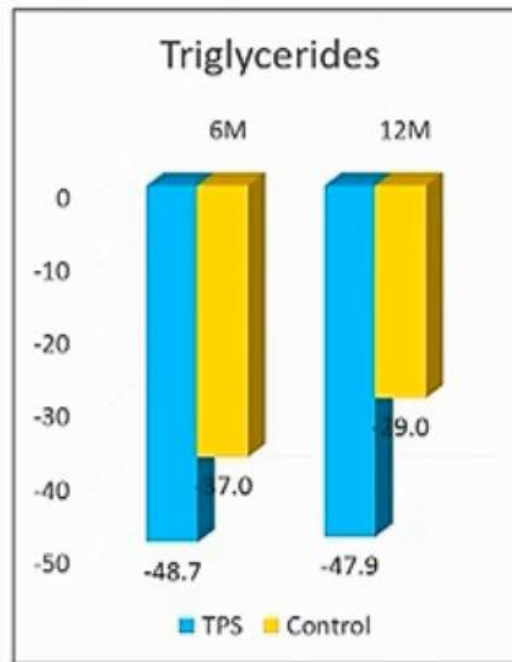
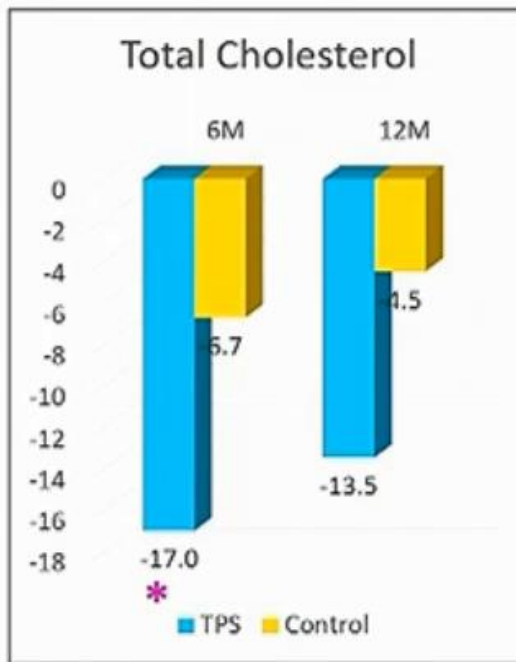
*p<0.05



■ TPS ■ Control

Improved in lipid profile in patients with baseline hyperlipidemia

*p<0.05, **p<0.01



	TPS	Control		TPS	Control		TPS	Control
N	52	31	N	67	42	N	50	26
BL LDL (mg/dL)	152.7 (21.7)	154.3 (26.1)	BL TC (mg/dL)	227.7 (30.4)	231.0 (32.7)	BL TG (mg/dL)	214.5 (54.6)	230.2 (109.7)

Factors associated with cardiometabolic improvement

- Treatment with TPS resulted in cardiometabolic improvement through weight loss
- Extent of improvement correlates with magnitude of weight loss
- Baseline values and age were confounders:
 - The higher the baseline, the more improvement in BP and lipid parameters
 - Younger age was associated with greater improvement in lipid parameters

Serious Adverse Events

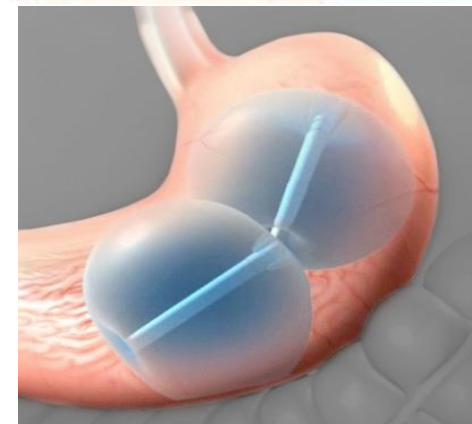
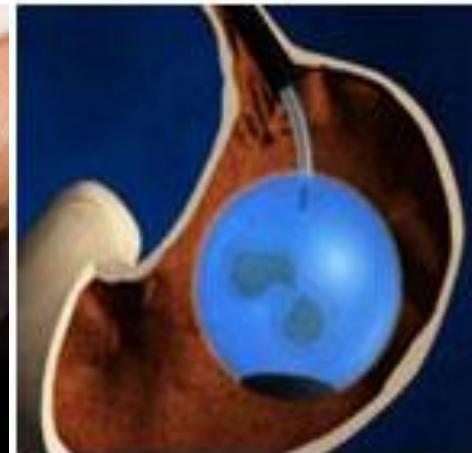
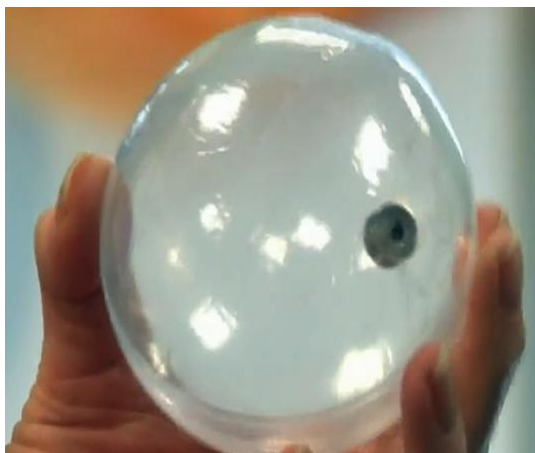
Serious Adverse Event	# of Events	Time to Onset (days)
Esophageal Rupture*	1	0
Pneumothorax*	1	0
Upper ABD Pain	1	2
Gastric Ulcer [†]	1	119
Vomiting [†]	1	189
Device Impaction ^{††}	4	Range 119-261

- Device and procedure-related TPS SAE – 2.8%
- All SAEs resolved
- For comparison: fluid-filled balloon SAE 7.5-10%, gas-filled balloon SAE 0.3%

DDW Conclusion

- TPS: 9.5% TBWL vs 2.8% control at 12 months
- At 1 year, ~67% of TPS patients achieved >5% TBWL and ~40% achieved >10% TBWL
- TPS group with significantly greater improvement in cardiometabolic risk factors
- SAE rate 2.8%

Space Occupying Balloons



FDA Approved Space Occupying Balloons

Name	Company	Design	Fill	Placement/Retrieval
ORBERA (formerly BioEnterics IntraGastric Balloon)	Apollo Endosurgery, Austin, TX	500ml Silicone balloon	500 ml Saline with methylene blue	Endoscopic/Endoscopic 6 month duration
ReShape Duo Balloon	ReShape Medical, San Clemente, CA	Two 450ml Silicone balloons tethered to a flexible silicone shaft	375-450 ml Saline with methylene blue	Endoscopic/Endoscopic 6 month duration
Obalon	Obalon Therapeutics, Carlsbad, CA	250 ml porcine protein balloon, up to 3 placed sequentially	Nitrogen gas	Swallowed Pill/Endoscopic 3 months

Spatz Adjustable Intra-gastric Balloon

Author	N	Weight loss	SAE/Early removal
Machytka†‡	18	15.7 kg	1 SAE
Genco‡	40	BMI change 40.9 to 31.0	7 events with 6 early removal
Brooks†	73	20.1% TBWL	21 early removal, 3 catheter impactions





A randomized, controlled, multicenter study comparing the Spatz3 Adjustable Balloon System plus diet and exercise to diet and exercise alone

Abu Dayyeh B, Noar M, Lavin T, Hisham H, Chapman C, Popov V, Acosta A, French M, Rizk M, Huseini M, Grothe K, Clark M, Vargas E, Thompson C

Mayo Clinic, Rochester; Endoscopic Micro Surgery, Maryland; Surgical Associates of Louisiana, Metairie; Ohio State University Medical Center, Columbus; Univ of Chicago Med Center, Chicago; NY VA Medical Center, NY; Brigham&Womens Hospital, Boston.

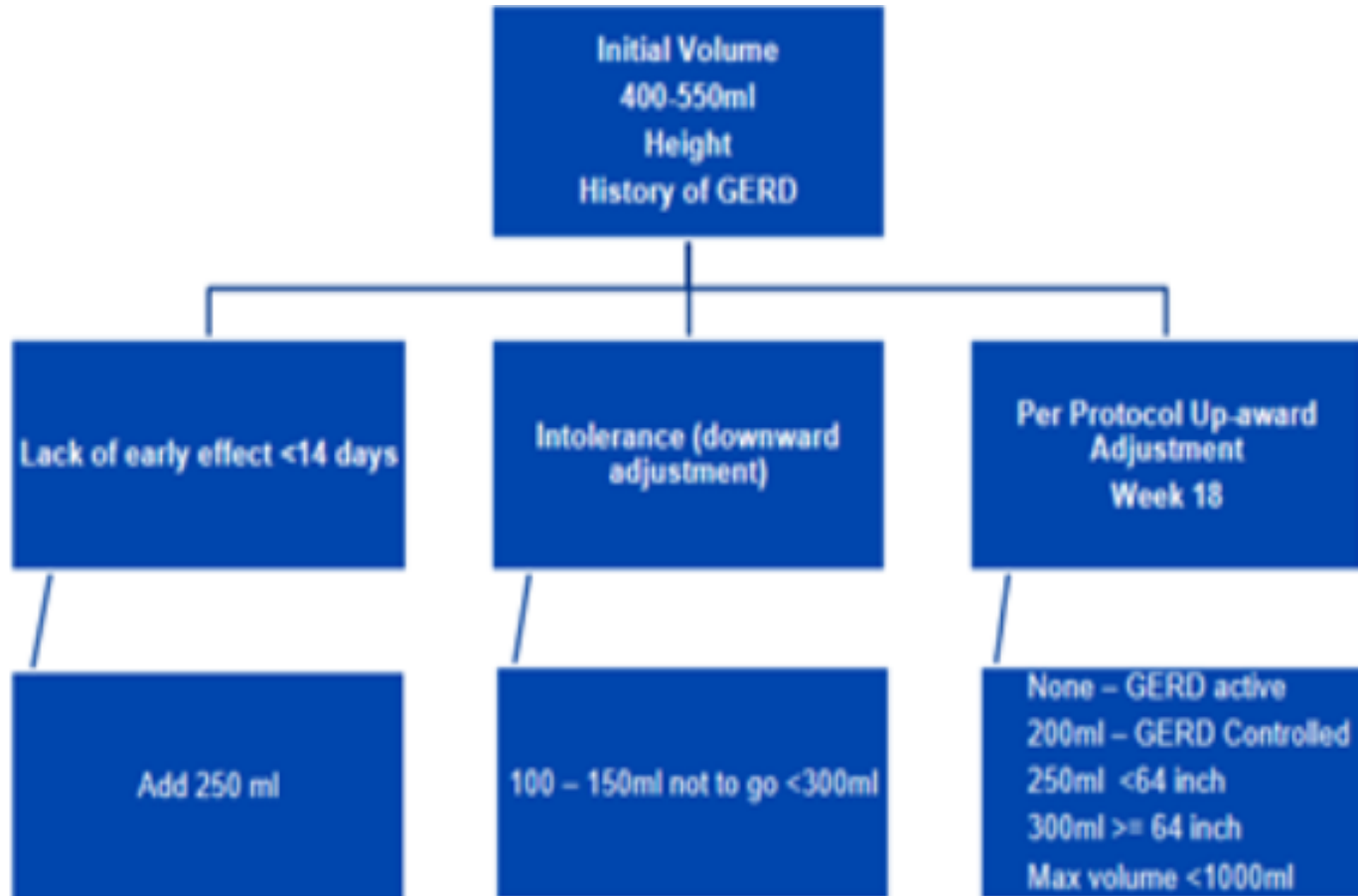
DDW 2019



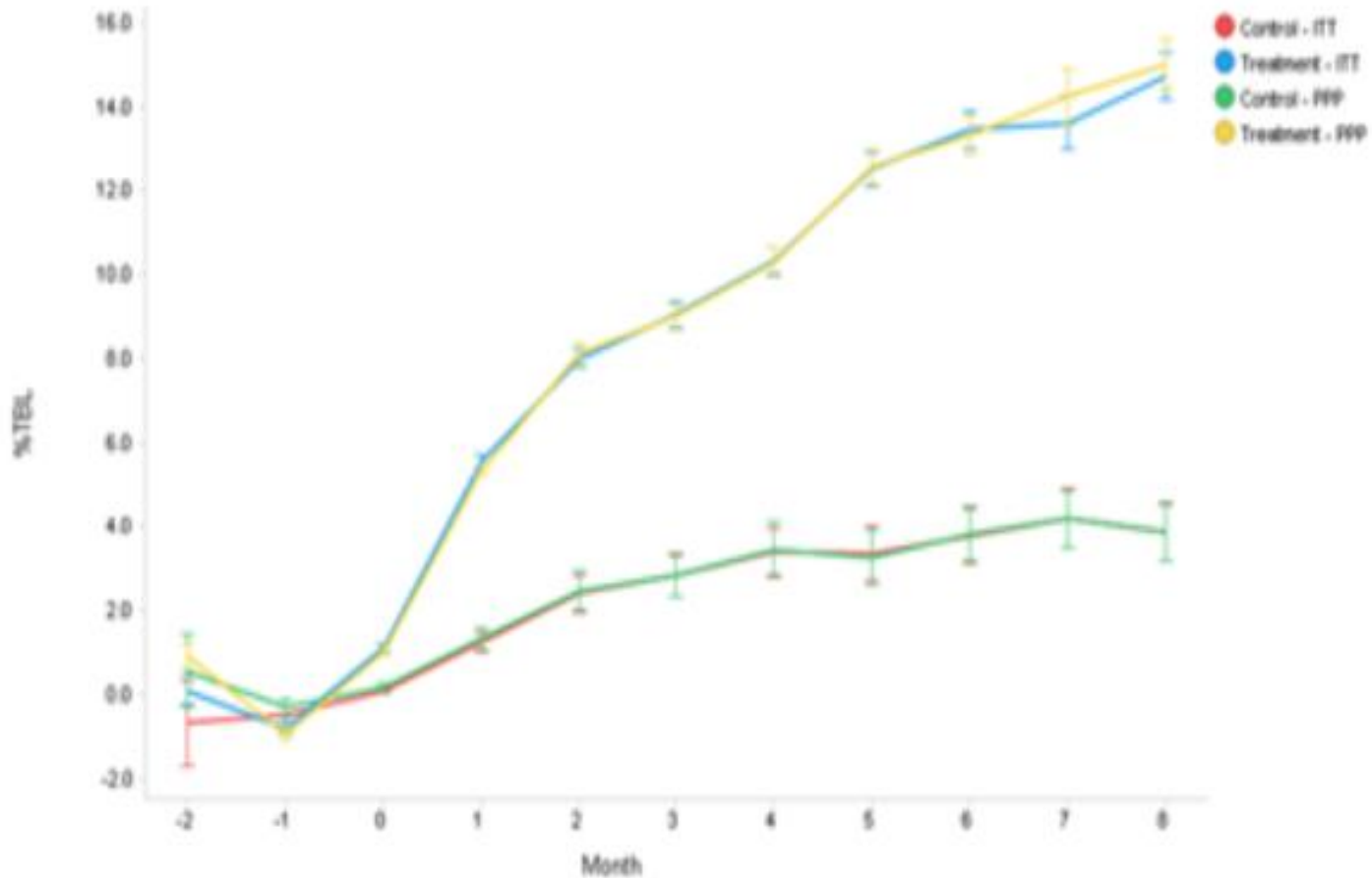
Methods

- 288 patients across 7 centers
- Open-label RCT of adjustable IGB plus lifestyle therapy vs lifestyle therapy alone

Adjustment Algorithm



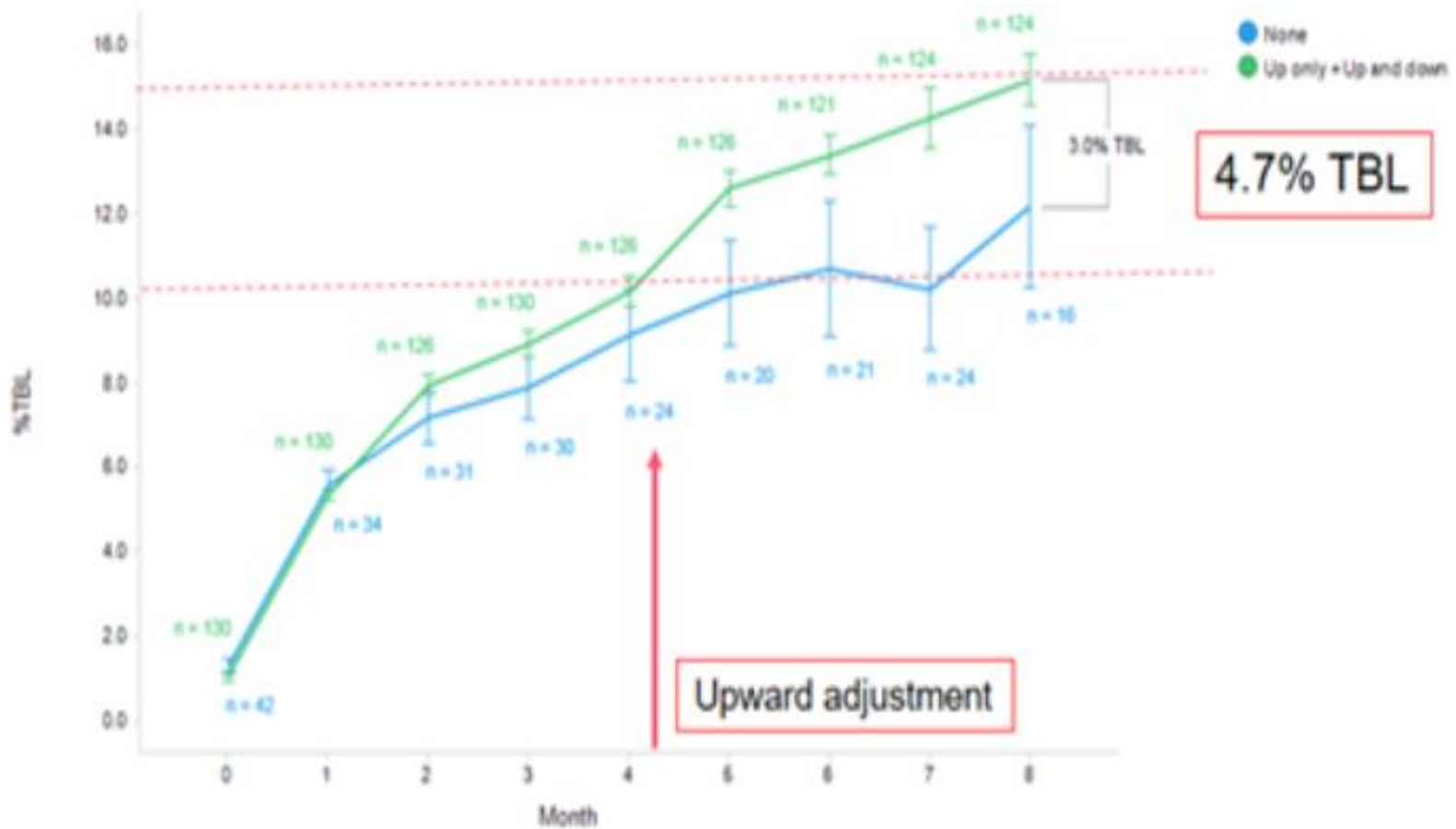
%TBWL between groups



Downward adjustment of IGB

- 52 patients with intolerance
 - 24 IGB explanted
 - 28 down adjusted

Upward adjustment of IGB



Serious adverse events – 3.7%

Standard Term	Balloon (N=187)		Control (N=101)	
	Related		Not Related	
	Anticipated		N/A	
	N(%)	Events	N%	Events
Total	7 (3.7%)	24	1 (1.0%)	1
Gastrointestinal disorders	7 (3.7%)	19	0	
Nausea	6 (3.2%)	7	0	
Vomiting	5 (2.7%)	5	0	
Abdominal pain	2 (1.1%)	2	0	
Diarrhoea	2 (1.1%)	2	0	
Abdominal discomfort	1 (0.5%)	1	0	
Gastroesophageal reflux disease	1 (0.5%)	1	0	
Abdominal pain upper	1 (0.5%)	1	0	
Metabolism and nutrition disorders	4 (2.1%)	5	0	
Dehydration	3 (1.6%)	3	0	
Failure to thrive	1 (0.5%)	1	0	
Hypokalaemia	1 (0.5%)	1	0	
Musculoskeletal and connective tissue disorders	0	0	1 (1.0%)	1
Spinal column stenosis	0	0	1 (1.0%)	1

Comparison to other space occupying devices

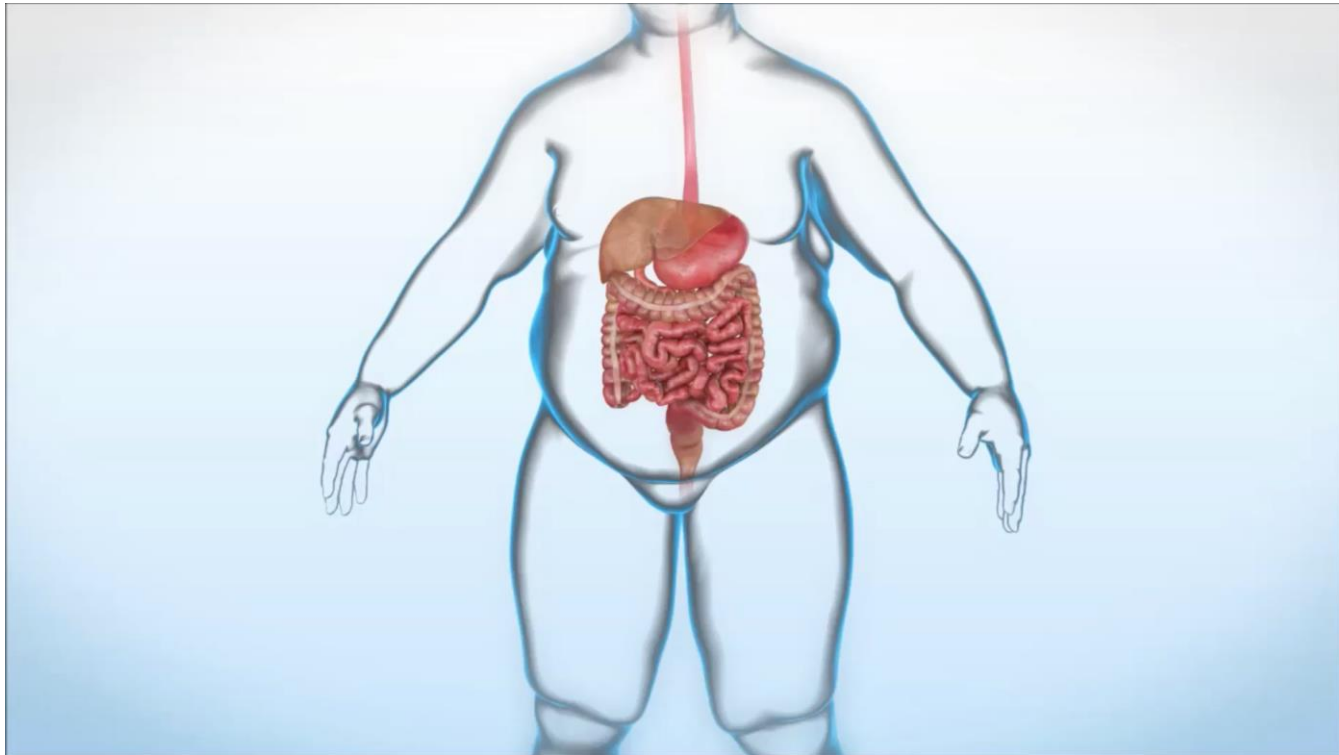
Intragastric Balloon	FDA Obalon	FDA Reshape	FDA Orbera	FDA Trans Pyloric Shuttle	FDA Spatz3
% TBL	6.6%	6.8%	10.2%	9.4%	14.9%
% EWL	24.1%	25.1%	38%	30.2%	52.9%
Weight Loss	14.4 lbs	14.3 lbs	21.8 lbs	20.5 lbs	31.7 lbs
Response Rate (> 10% TBL)	24.7%	48.8%	46.4%	38.7%	83.7%
Duration of Treatment	6 months	6 months	6 months	12 months	8 months

DDW Conclusion

- Adjustable IGB system results in significant weight loss and maintenance compared to lifestyle alone
- Good safety profile
- Adjustability feature: maximize tolerance and manage weight loss plateaus
- Results submitted to FDA for approval

Endoscopic Sleeve Gastroplasty (ESG)

- Incisionless, minimally invasive technique via endoscopic approach
- Utilizes full thickness sutures



LONG-TERM FOLLOW UP AND OUTCOMES AFTER ENDOSCOPIC SLEEVE GASTROPLASTY FOR TREATMENT OF OBESITY: 5 YEAR DATA

Kaveh Hajifathalian, Bryan Ang, Qais M. Dawod , Shawn L. Shah , Enad Dawod, Amit Mehta, Saurabh Mukewar, SriHari Mahadev, Kartik Sampath, David L. Carr-Locke, Danny Issa, Louis J. Aronne, Rekha Kumar, Alpana Shukla, Reem Z. Sharaiha



Weill Cornell
Medicine



Aims

- To evaluate the durability of weight loss up to 5 years after ESG
 - Predictors of long term weight loss
 - Characterize average weight loss trajectory after ESG
 - Assessment of procedural adverse events

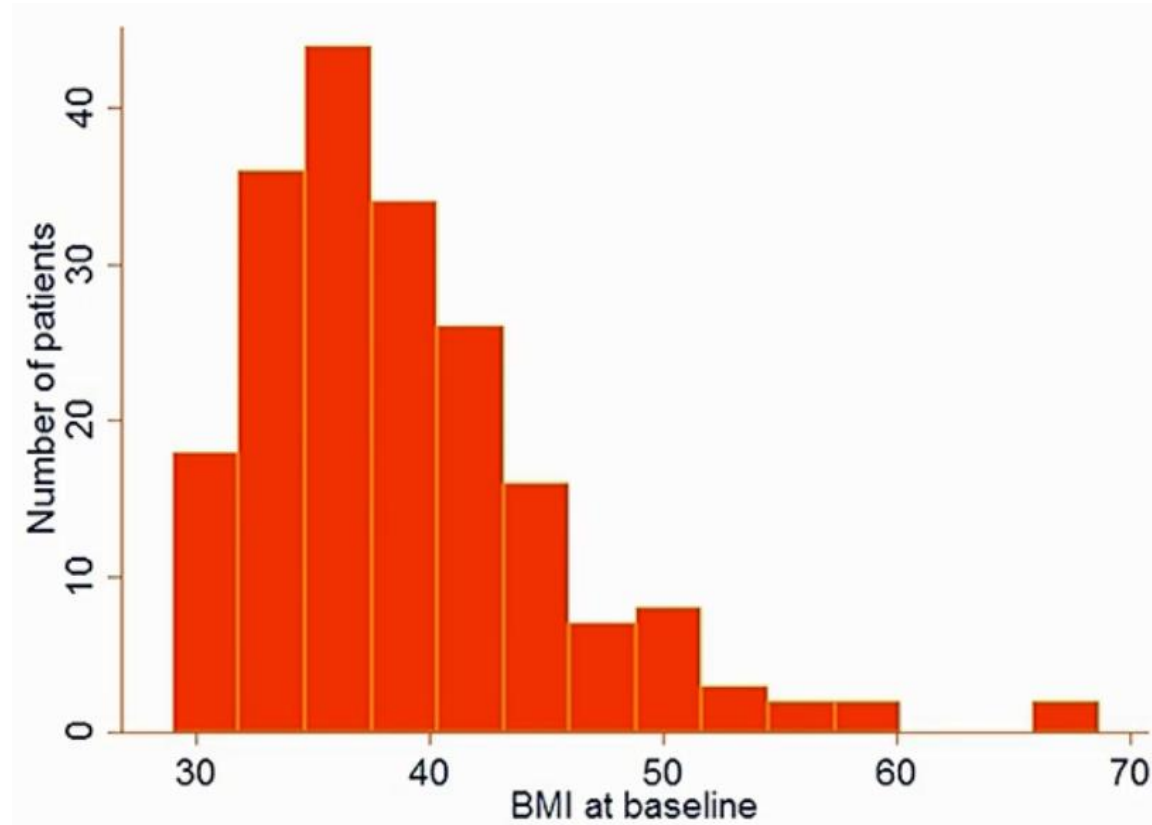
Methods

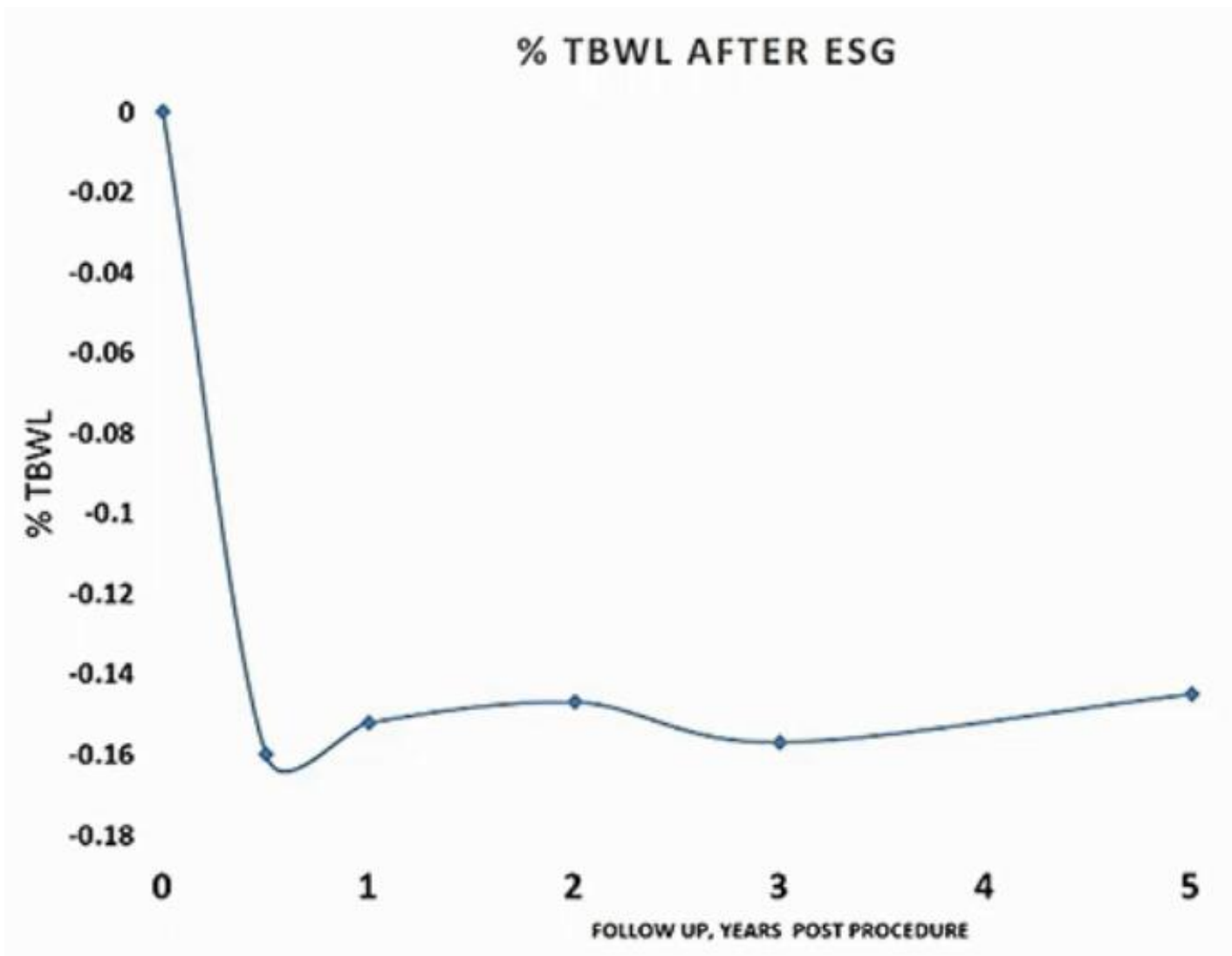
- Retrospective single center analysis
- 203 patients who underwent ESG between Aug 2013 and Oct 2018
 - Body Mass Index (BMI) > 30 kg/m²
 - Failed noninvasive weight loss measures
 - Non-surgical candidates or refused surgery
- Primary outcome: %TBWL

Baseline Characteristics

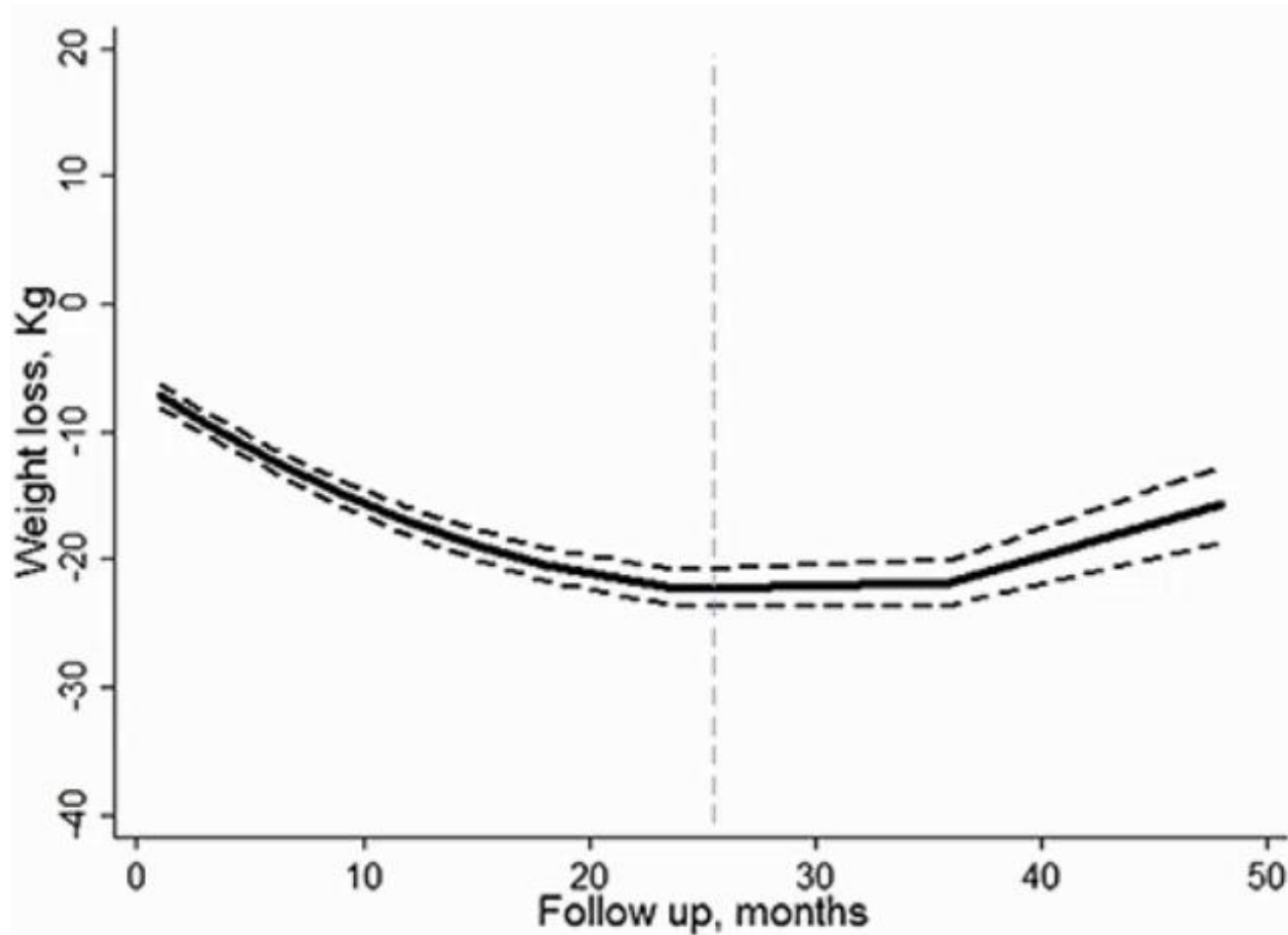
Characteristics	N=203
Age	46 ±13
Female	135 (67%)
BMI	39 ±7
Hgb A1C	5.6 ±1.5
Diabetes	57 (29%)
Elevated ALT	110 (54%)

Baseline BMI distribution





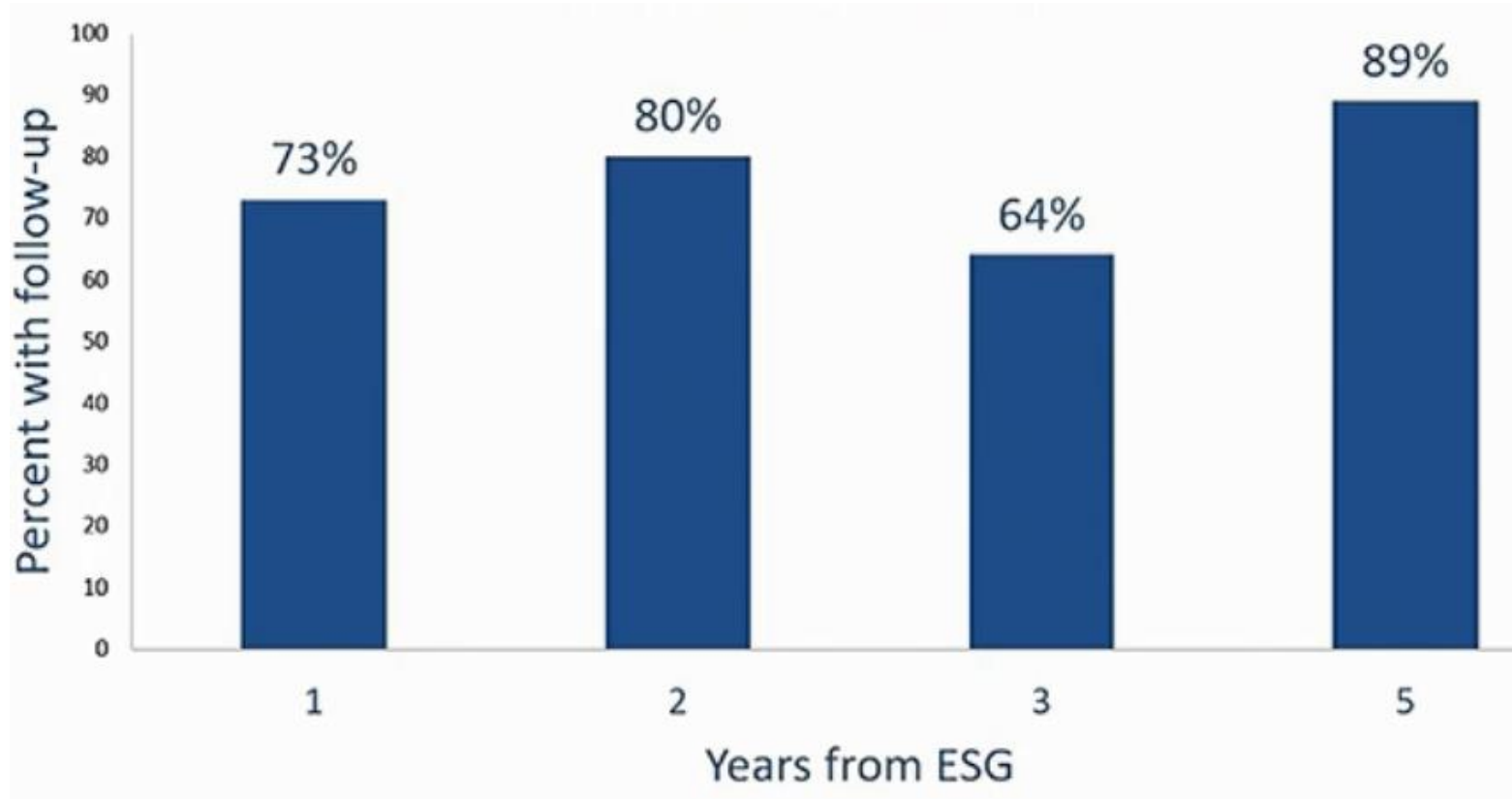
Maximum weight loss: 24 months



Early post-ESG weight loss predicts long term outcomes

	Odds of %TBWL>10% at 24 months	95% CI	p-value
%TBWL at 3 months<10%	0.23	0.07-0.74	0.014
Age	0.96	0.91-1.02	0.154
Gender	2.09	0.61-7.18	0.24
Baseline BMI	1.06	0.97-1.16	0.202

Follow-up rates after ESG



Adverse Events

- Serious adverse events: < 1%
 - Peri-gastric fluid collection
 - Gastric perforation managed with OTSC

Limitations

- Lack of sham-controlled randomization
- Generalizability of findings
- Use of concurrent medications for weight loss (~25%)
- Lack of insurance coverage

DDW Conclusion

- 5 year retrospective ESG study:
 - Long term durable weight loss: 14.5% TBWL
 - Maximum weight loss achieved at 24 months
 - Safe with SAE < 1%
 - Failure to achieve significant weight loss (>10% TBWL) within 3 months post-ESG
- Ongoing prospective RCT comparing ESG + diet/lifestyle vs diet/lifestyle alone

Thank-you

- Nikhil.Kumta@m Mountsinai.org