Gastric Balloons for Obesity:
Past, Present and Future

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Disclosures and Credits

- Allurion Technologies: Senior medical advisor, Equity position
- Boston Scientific: Consultant
- Olympus: Consultant

Credits:

Dr. Alfredo Genco

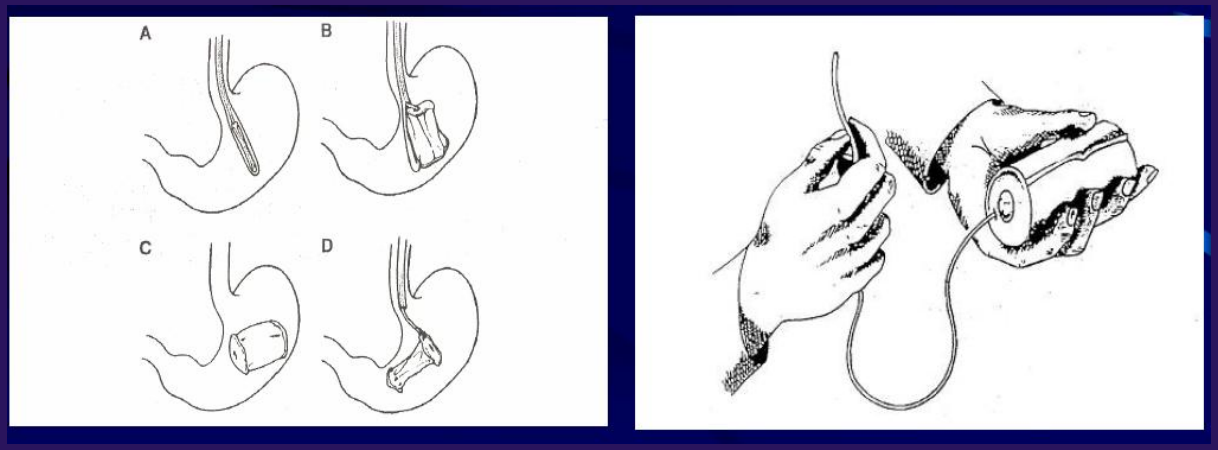
Dr. Eduardo Moura

Dr. Evzen Machytka

Dr. Yannis Rafthapoulos

Early Intragastric Balloons had a Suboptimal Benefit/Risk balance

Garren Edwards Balloon (1987)



250 cc, air-filled cylinder

Premature deflation resulted in small bowel obstruction in ~2% of patients

1987 Tarpon Springs Conference was held to define the ideal IGB

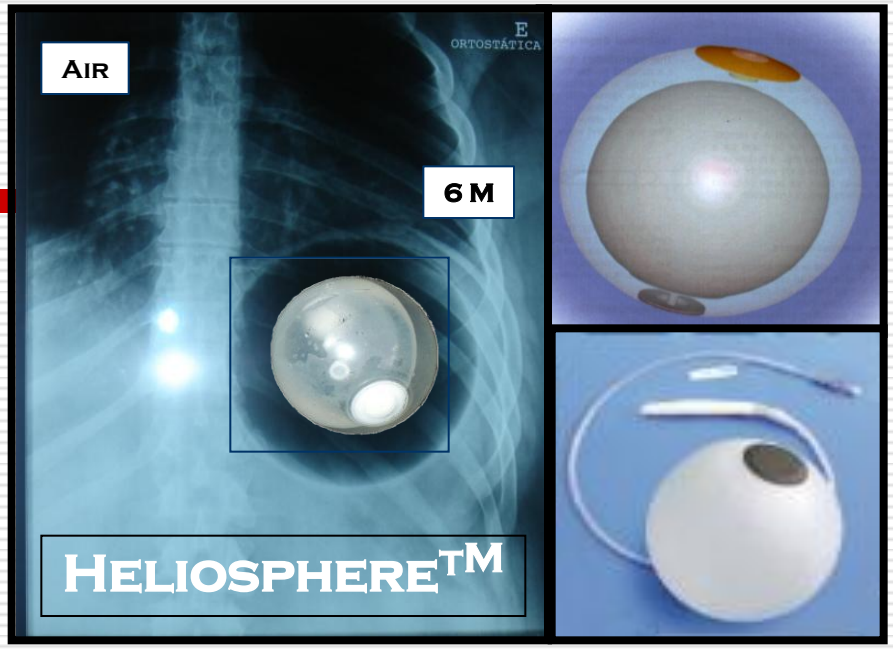
Ideal Gastric Balloon Design Criteria:

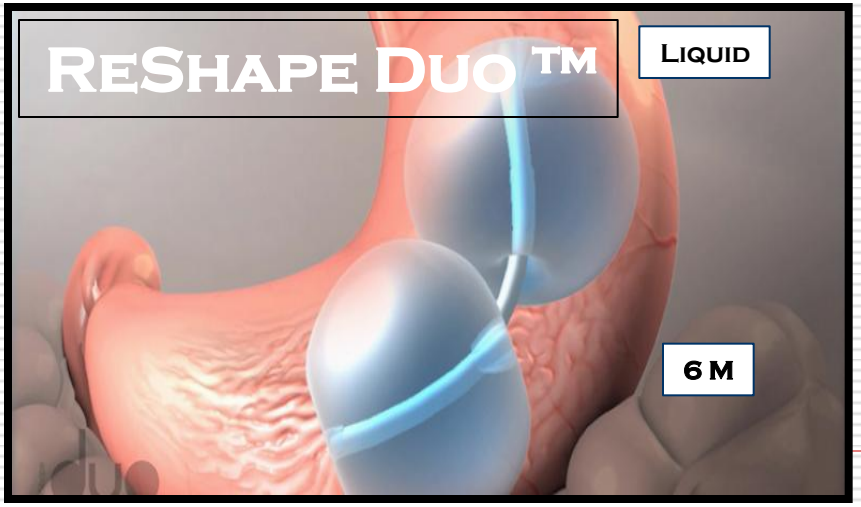
- Constructed of a high quality elastomer resistant to gastric acidity and sharp pieces of food
- Liquid-filled, 500 cc volume
- Smooth surface to reduce erosion/obstruction risk
- Radiopaque Marker

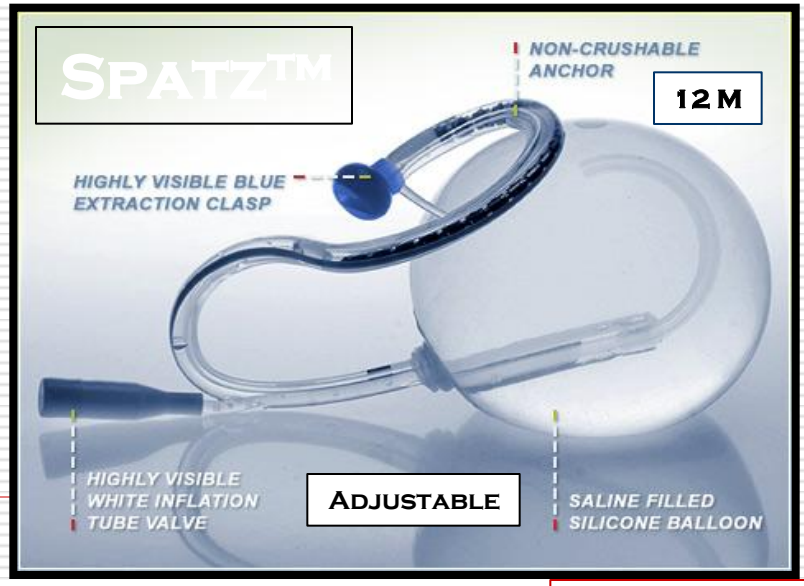
Intragastric Balloon's

Orbera™

6 M







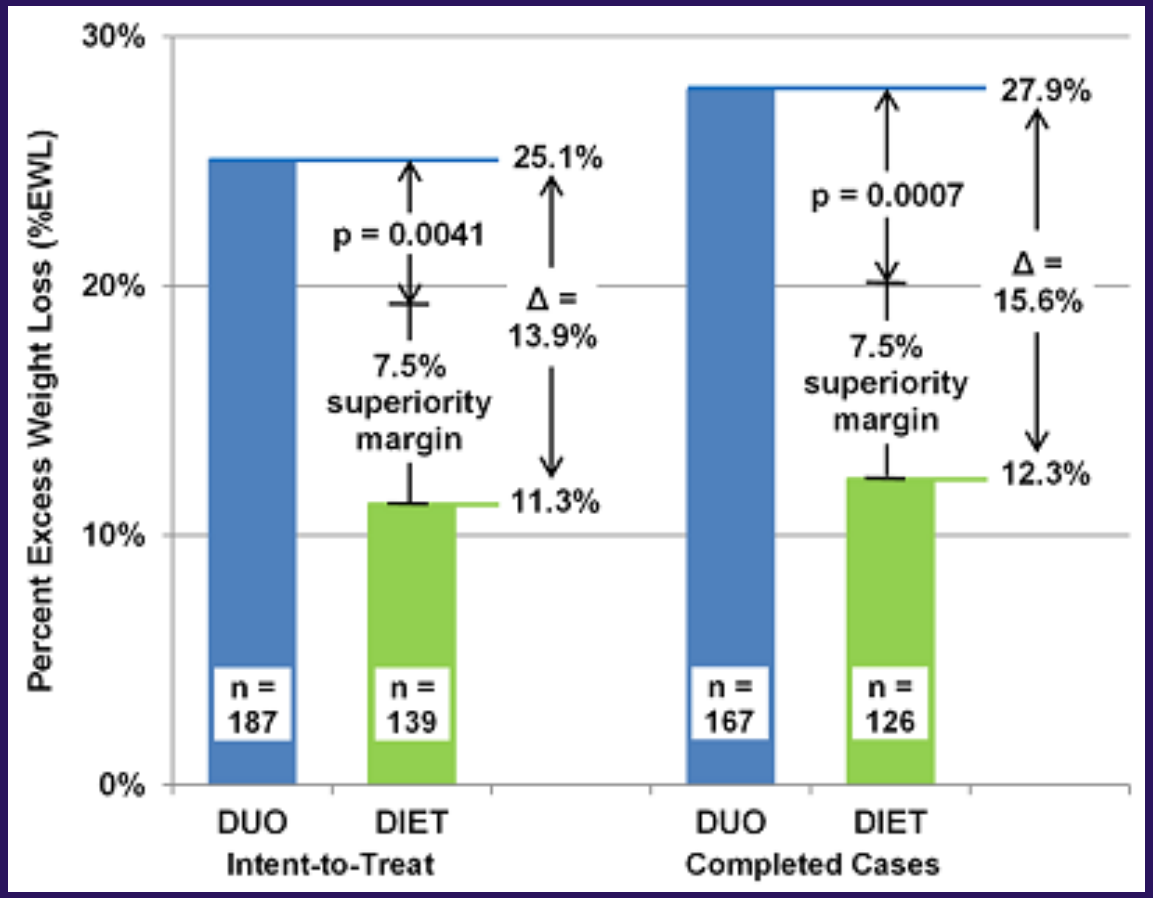
Not FDA approved

VIDEO: Orbera

Question 1: Do intragastric balloons work?

Weight loss in gastric balloon patients is superior to sham in a larger sample size of US patients.

N = 326; multi-center, randomized, sham controlled trial[1]



Source: Ponce et al. *Surg Obes Rel Dis*. 2015; In press.

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Meta-analysis of 15 studies including 3,608 BIB® patients demonstrates efficacy and safety[1]

	Mean (95% CI)
Weight Loss (kg)	14.7 (12.4-17)
% Total Body Weight Loss (TBL)	12.2 (10-14.3)
BMI Loss (kg/m^2)	5.7 (4.4-6.9)
% Excess Weight Loss (EWL)	32.1 (26.9-37.4)

	N	%
Nausea and vomiting after first week	295	8.6
Abdominal discomfort	171	5.0
Deflation and migration of balloon*	87	2.5

* typically seen in patients who are lost to follow-up[2]

Sources: 1) Imaz et al. *Obesity Survery*. 2008; 18: 841-46. 2) Gaur et al. *Gastrointest. Endosc.* 2015; 81(6): 1330-6.

Question 2: How do intragastric balloons work?

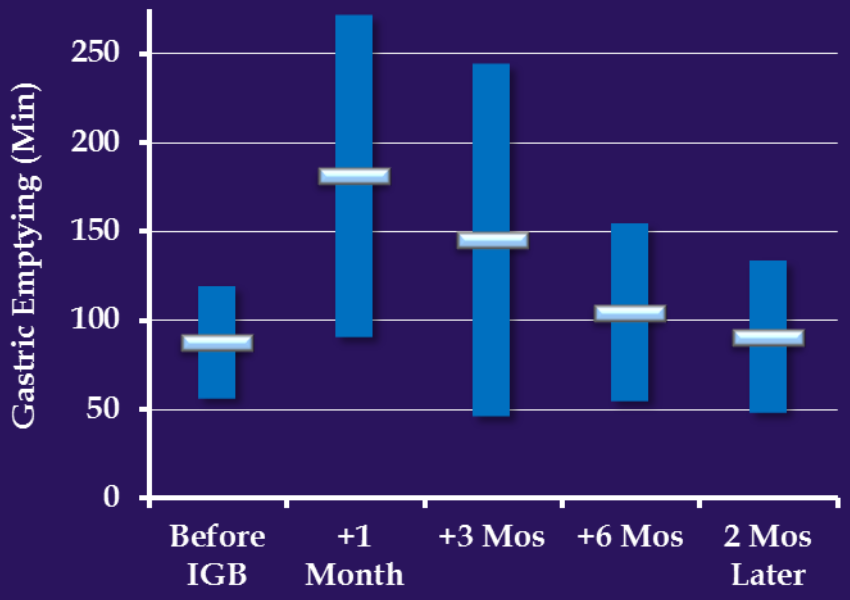
Multiple hypotheses of action exist, but none have been tested thoroughly.

Hypothesis	Studies	Outcomes
Changes in leptin/ghrelin	Mion et al.	↓ ghrelin, ↓ leptin
	Mathus-Vliegen et al.	No change in ghrelin
Delayed gastric emptying	Bonazzi et al.	Rapid decrease in gastric emptying time, returning to normal over 6 mos.
	Mion et al.	
	Su et al.	

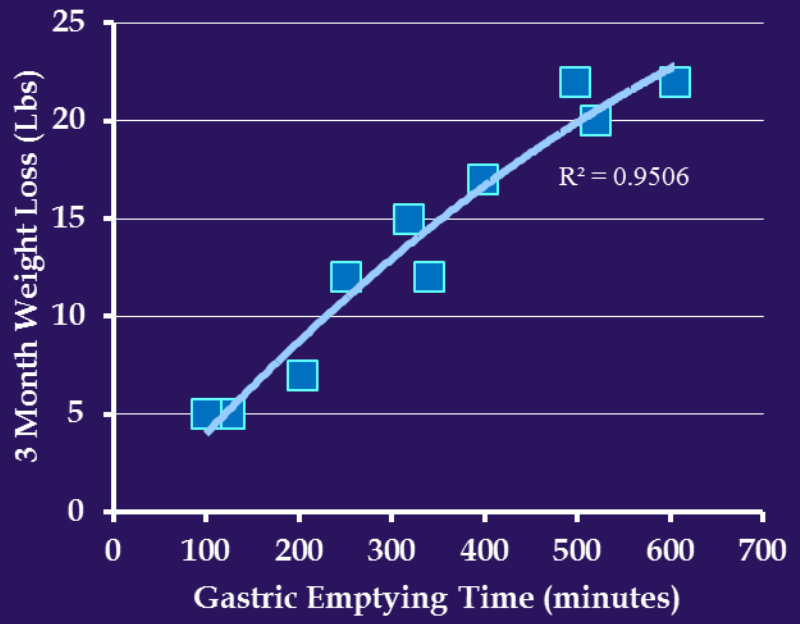
Sources: Bonazzi et al. *Eur Rev Med Pharmacol Sci*. 2005; 9: 15-21. Mion et al. *Obes Surg*. 2005; 15: 510-16. Mathus-Vliegen et al. *Obes Surg*. 2014; 24(1): 85-94. Su et al. *Clin Nucl Med*. 2013; 38: 863-8.

Slowed gastric emptying may also contribute to mechanism of action

IGB Placement Dramatically Slows Gastric Emptying [1]



Emptying Time Correlates Positively with BIB-Induced Weight Loss[2]



[1]Bonazzi et al, ERMCS, 2005. [2]Su et al, Clinical Nuclear Medicine, 2013. Note: different methods were used to measure GET resulting in substantially different absolute measures.

Question 3: How well do intragastric balloons work?

The right answer depends on the context in which gastric balloons are studied

US sham controlled, pre-market study

- *N* ~ 218
- Starting BMI = 35.4
- **7.6%** TBL at 24 weeks[1]

- **Free** devices
- **Uncustomized** follow-up
- **Less intense** diet/exercise recs

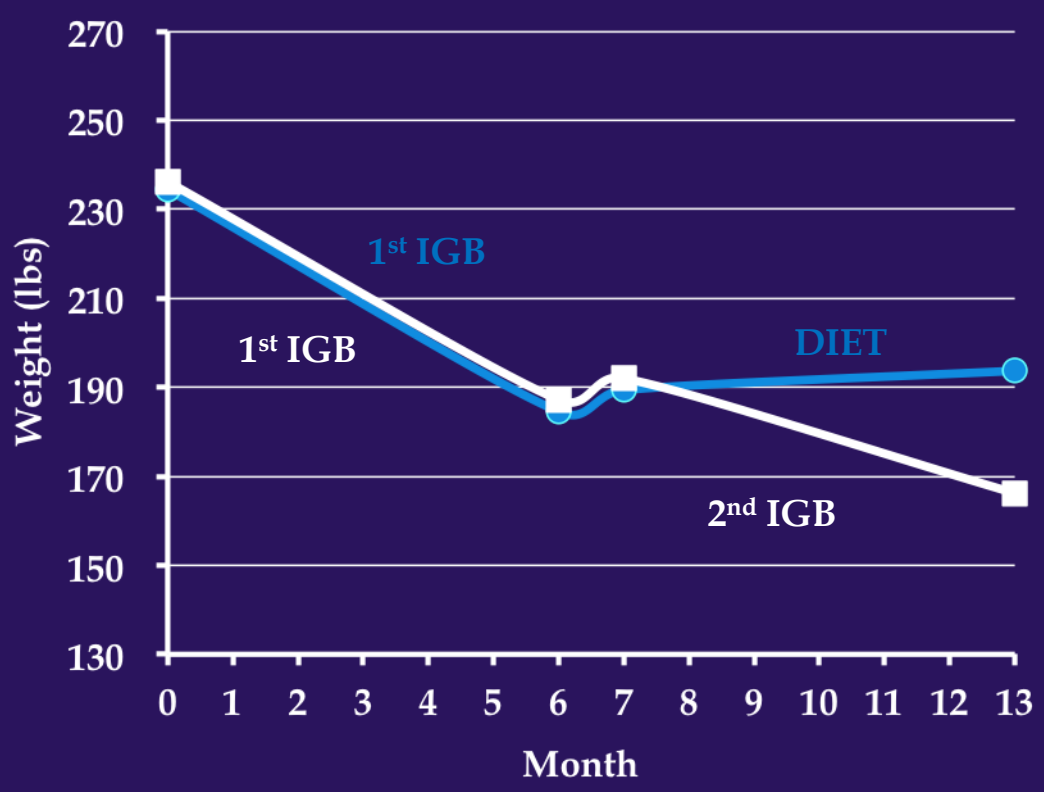
EU single-arm, post-market study

- *N* = 60
- Starting BMI = 38.8
- **15.5%** TBL at 24 weeks[2]

- **Patients pay** for devices
- **Customized** follow-up
- **More intense** diet/exercise recs

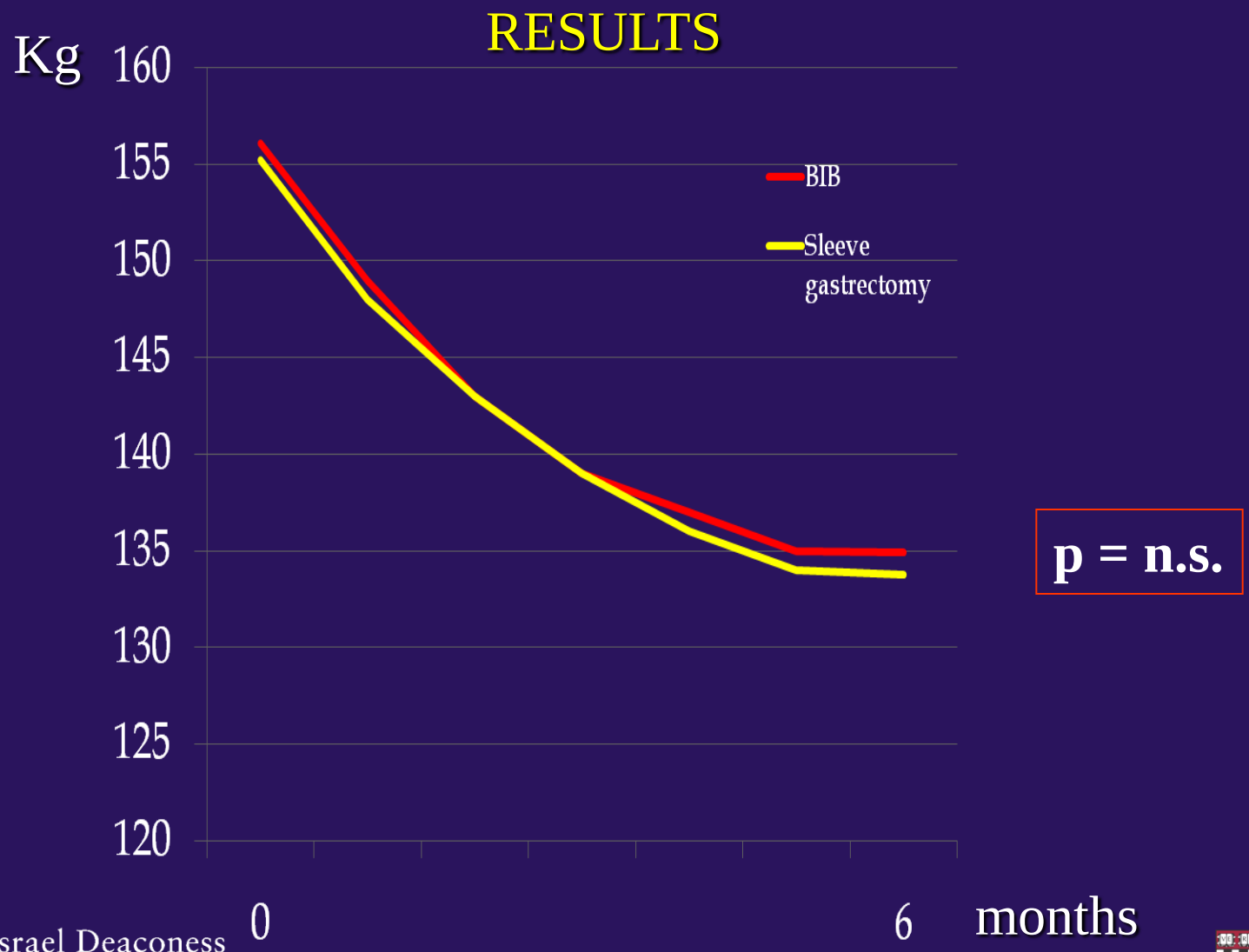
Sources: 1) Ponce et al. *Surg Obes Rel Dis*. 2015; In press. 2) Lopez-Nava et al. *Obes Surg*. 2015; In press.

Serial IGB Placement vs. Diet Control



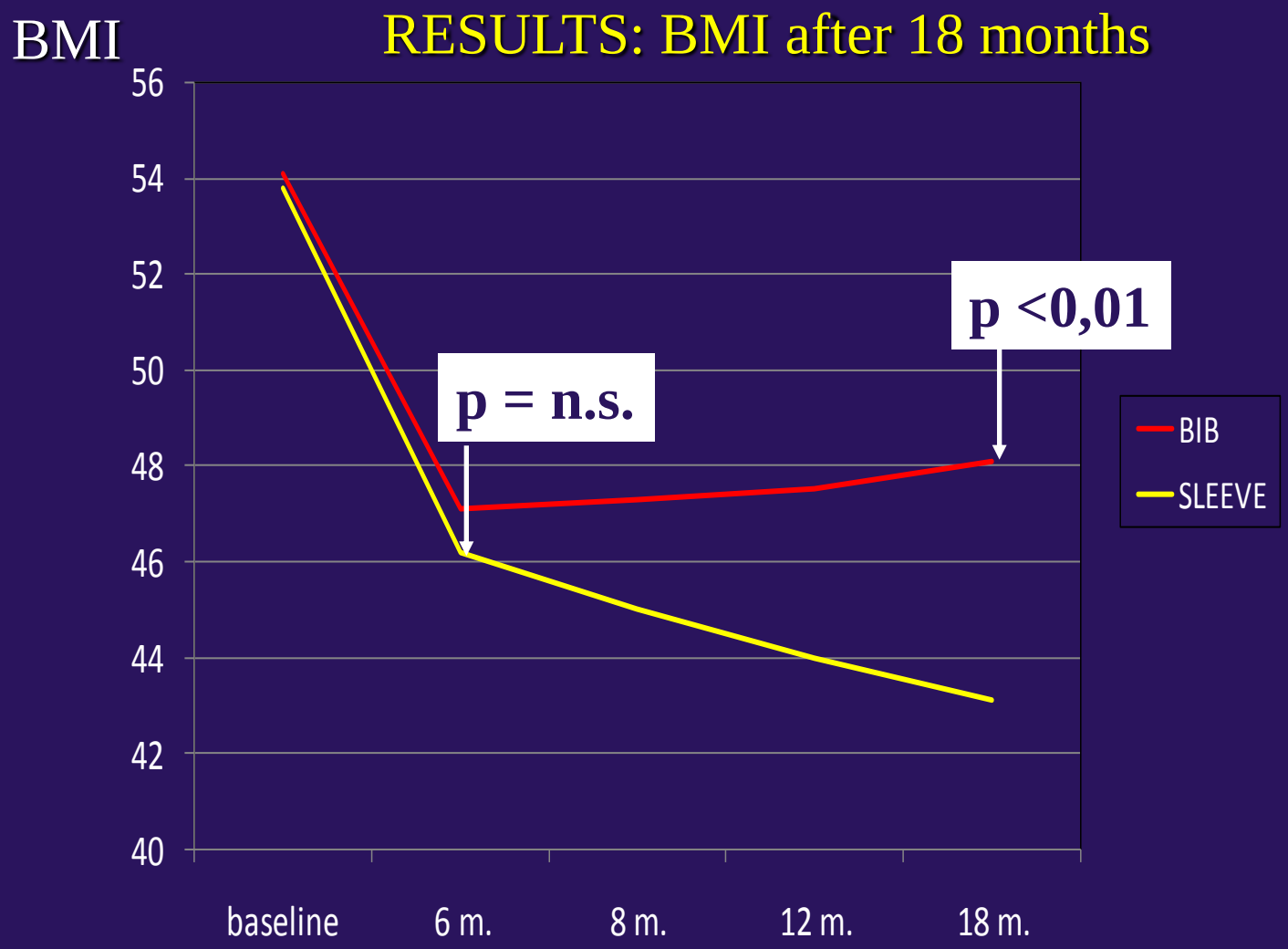
"[30 days] allows the stomach to restore the pre-BIB placement conditions."
- Genco et al., 2010

BIB treatment vs Sleeve Gastrectomy



p = n.s.

BIB treatment vs Sleeve Gastrectomy



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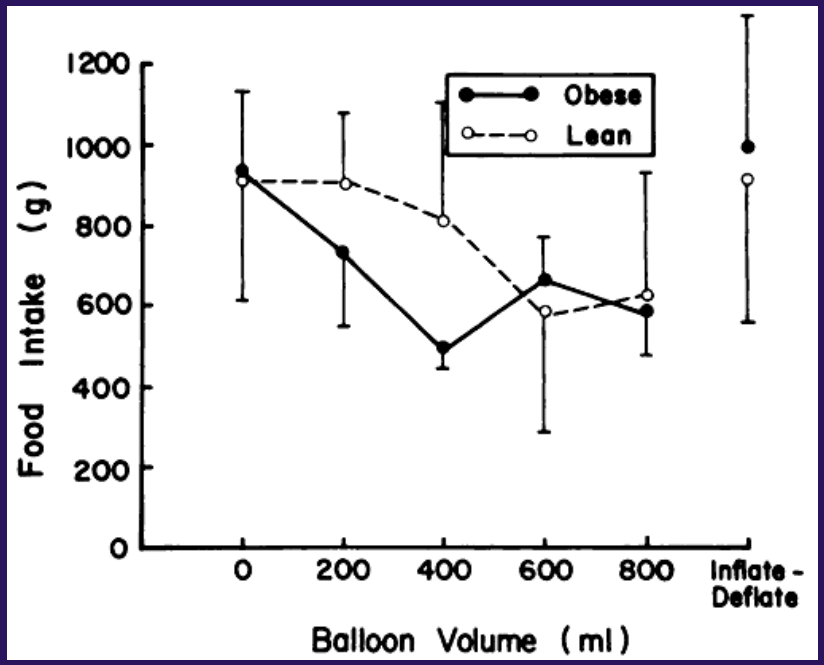
Question 4: Does intragastric balloon size matter?

Yes, but only beyond a certain threshold.

N = 4 lean and 4 obese subjects[1]



Balloon	*N*	Design	Starting BMI	Fill (mL)	Weight Loss (kg)
BIB[2]	126	Single-arm, post-market	37.7	500	15.7
Duo[3]	60		38.8	900	16.6

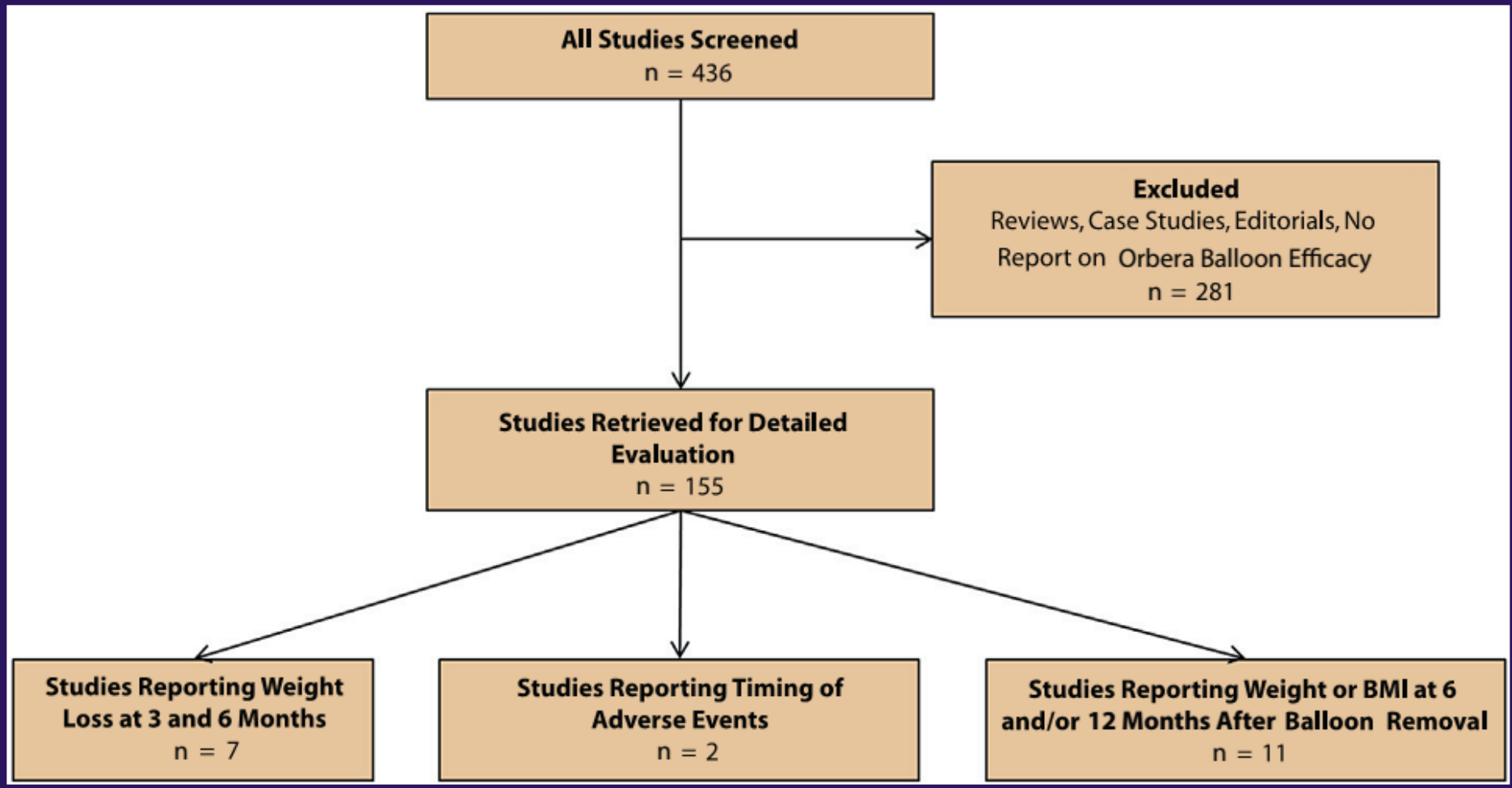
Sources: 1) Geliebter et al. *Am J Clin Nutr*. 1988; 48: 592-4. 2) Totte et al. *Obes Surg.* 2001*;* 11: 519-23. 3) Lopez-Nava et al. *Obes Surg*. 2015; In press.

Question 5: What happens after the end of intragastric balloon therapy?

Key Questions:

- Is weight loss that results from Orbera® therapy time-limited?
- How long is weight loss sustained after Orbera® removal?

Study Design



Gaur et al. 2015, *GI Endoscopy*,

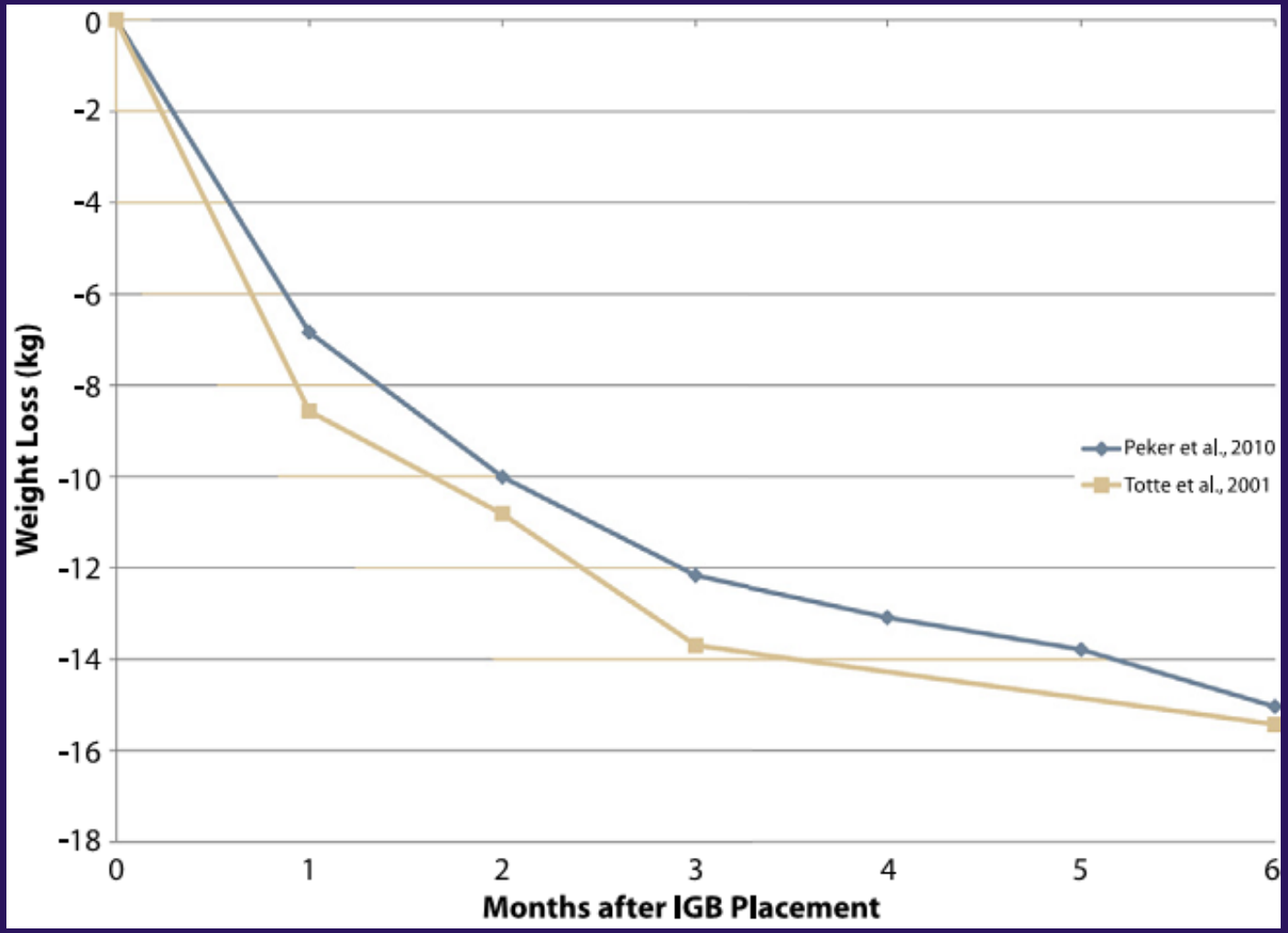
Results: Time-defined Weight Loss

Reference	No.	Starting BMI, kg/m^2	Fill volume, mL	Weight loss at 3 mo, kg	Weight loss at 6 mo, kg	% of weight loss at 3 mo
Bonazzi et al,[22] 2005	12	38.5	700	12.4	14.4	86
Fuller et al,[36] 2013	31	36.0	450-750	10.5	14.4	73
Mathus-Vliegen and Tytgat,[37] 2005	19	43.3	500	12.9	16.7	77
Mathus-Vliegen et al,[25] 2014	19	43.0	500	13.1	16.4	80
Peker et al,[38] 2010	31	41.8	600	12.17	15.04	81
Stimac et al,[39] 2011	171	41.9	600	12.8	16.9	76
Totte et al,[40] 2001	126	37.7	500	13.7	15.4	89
Total	409					
Weighted mean ± weighted SD				12.9 ± 0.8	16.0 ± 0.9	80 ± 6

Gaur et al. 2015, *GI Endoscopy*, in press

80% of weight occurs in the first 3 months of Orbera® therapy.

Results: Time-defined Weight Loss

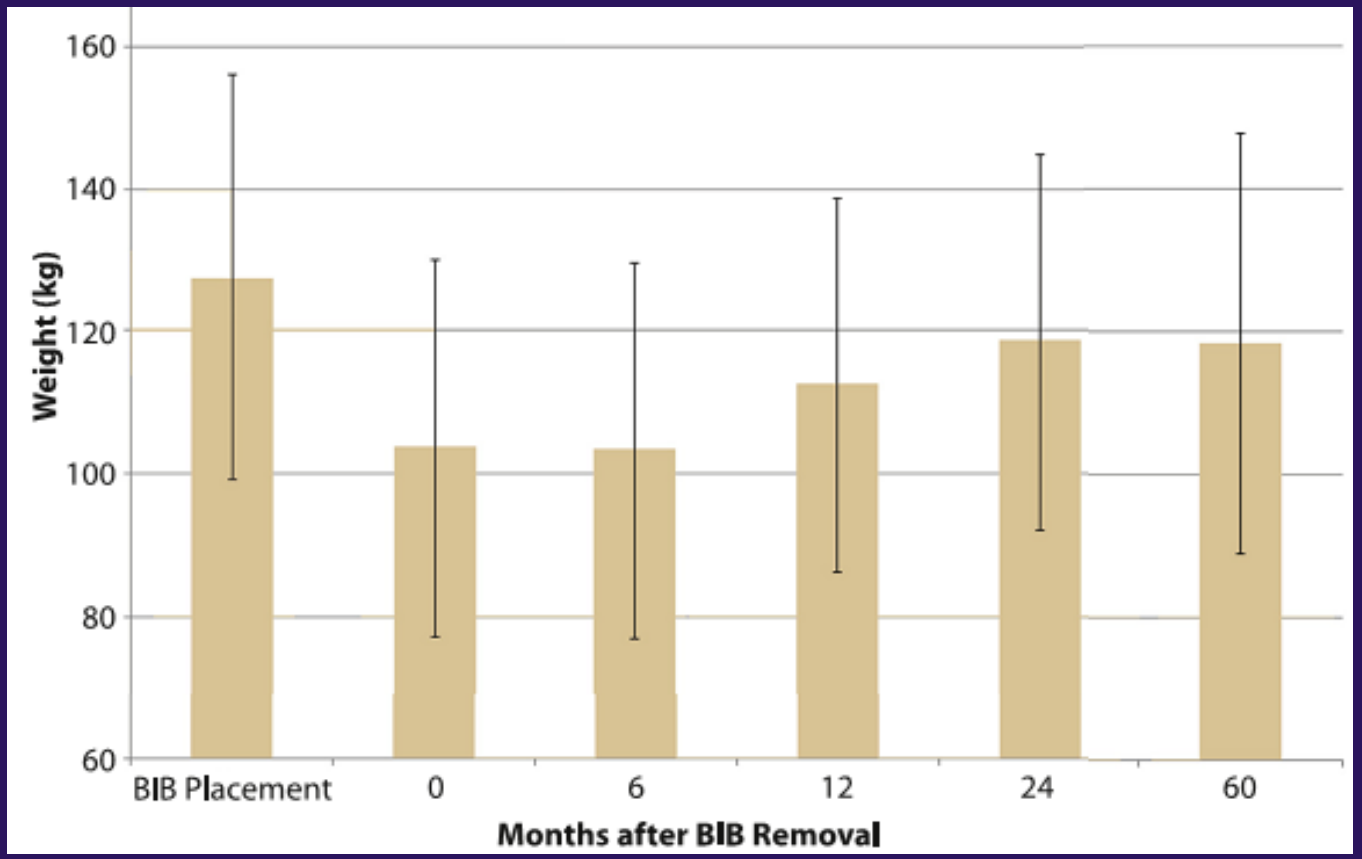


Gaur et al. 2015, *GI Endoscopy*, in press

Ref.	No.	Patient seen regularly after Orbera balloon removal?	Fill volume, mL	Baseline weight, kg	Orbera balloon removal		6 mo post-removal		12 mo post-removal	
					Weight, kg	Difference from baseline, kg	Weight, kg	Net loss	Weight, kg	Net loss
Dastis et al,[41] 2009	100	No	500-650	96.5	83.9	12.6	N/A	N/A	88.6	7.9
Dogan et al,[42] 2013	50	Yes	600	127.6	114.9	12.7	118.1	9.5	120	7.6
Fuller et al,[36] 2013	31	Yes	450-700	104.6	90.2	14.4	95.2	9.4	N/A	N/A
Genco et al,[43] 2009	80	N/A	500	156.1	134.9	21.2	137.8	18.3	N/A	N/A
Genco et al,[26] 2010*	50	Yes	500	127.5	102.4	25.1	107.4	20.1	N/A	N/A
Herve et al,[44] 2005	100	Yes	500	95.9	83.9	12.0	N/A	N/A	87.3	8.6
Mathus-Vliegen and Tytgat,[37] 2005	43	Yes	400-800	125.1	103.8	21.3	N/A	N/A	112.4	12.7
Ohta et al,[45] 2009	8	Yes	448	97	85	12.0	N/A	N/A	90.6	6.4
Sallet et al,[46] 2004*	85	No	400-700	114.0	94.9	19.2	96.7	17.4	N/A	N/A
Total	547	Weighted mean		116.2	99.5	16.7	113.1	15.9	96.8	8.7
		% Sustained						95		52

Gaur et al. 2015, *GI Endoscopy*

Over 50% of weight lost is sustained 1 year after Orbera® removal



In patients followed for 5 years, ~30% of weight loss is sustained

Source: Kotzampassi et al. *Obes Surg*. 2012; 22: 896-903.

Serious Complications Are Rare

Meta-analysis[1] of 3,429 patients with the BIB balloon[1]

	N[a]	%[b]
Nausea and vomiting after first week	295	8.6
Abdominal pain and other mild digestive disorders[c]	171	5.0
Deflation and displacement of the balloon[d]	87	2.5
Inflammation or lesions in digestive lining[e]	73	2.1
Gastro-esophageal reflux	63	1.8
Dehydration	54	1.6
Deflation without displacement of the balloon[d]	29	0.9
Obstruction in the digestive tract	26	0.8
Diarrhea and/or constipation	23	0.7
Gastric ulcer	12	0.4
Gastric perforation	4	0.1
Mortality related with balloon (gastric perforation)	2	0.1

[a] Absolute number of patients experienced each type of complication. A patient could suffer several types of complication.
[b] Percentage of patients experienced each type of complication
[c] Dyspepsia, heartburn, flatulence, and digestive subocclusion
[d] Deflation more than 50% of the volume
[e] Esophagitis, gastritis, erosions, and Mallory–Weiss tears are included.

[1]Imaz I et al, 2007

Innovative IGBs: Obalon

- Up to three are swallowed
- 250 cc, gas-filled design
- ***Must be endoscopically removed at 3 months***

DDW
Digestive Disease Week®
May 21-24, 2016
Exhibit Dates: May 22-24
www.ddw.org

World's First Procedureless Gastric Balloon

Final Results From A Multi-Center, Prospective Study Evaluating Safety, Efficacy, Metabolic Parameters, Quality Of Life, and 6-month Follow-Up

Ram Chuttani, Evzen Machytka, Ioannis Raftopoulos, Martina Bojkova, Tomas Kupka, Marek Buzga, Andreas Giannakou, Kandiliotis Ioannis, Kathryn Stecco, Samuel Levy, and Shantanu Gaur

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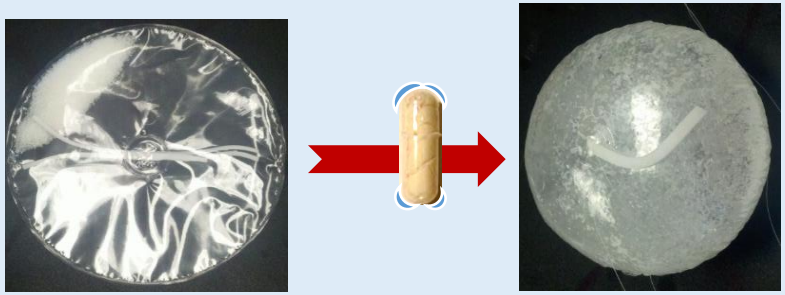
Harvard Medical School

The Team

Then and Now

Gastromer Technologies



allurion™

allurion


Elipse™: the first procedureless gastric balloon for weight loss

VIDEO: Elipse

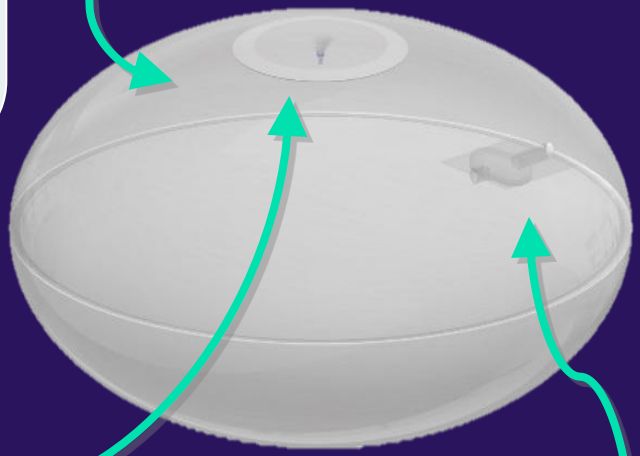
Novel Patented Filling and Emptying Technologies

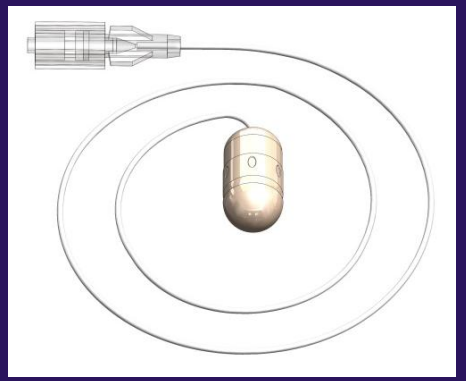
1. Balloon Film

- 85% thinner than silicone balloons
- Flexible enough to fold into capsule and safely pass GI tract
- Durable enough to spend months in stomach

2. Swallowing

- Balloon is rolled into a capsule and swallowed along with a thin Delivery Catheter for filling





4. Release Valve

- Made from thin film
- Only exposed to inside of device
- Weakens over time, then opens catastrophically, allowing balloon to empty

3. Fill Valve

- Made from thin film
- Seals shut after Delivery Catheter is pulled out

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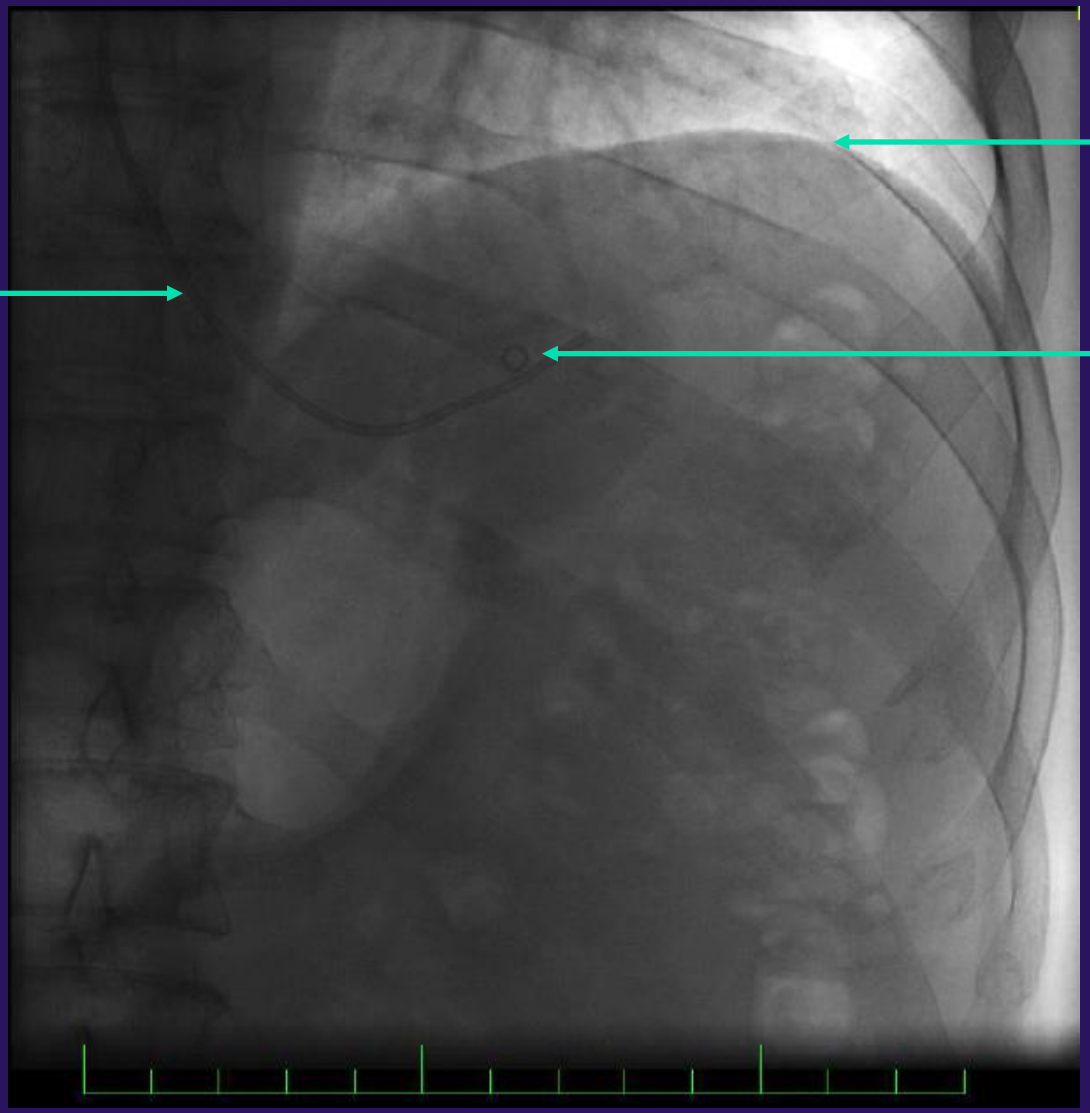
Multi-Center Trial Design

n	Up to 50
Gastric Residence	16 weeks
Fill Volume (mL)	550
Follow-Up	Basic nutritional counseling
Starting BMI (kg/m^2)	27.0 – 40.0

Endpoints	• Safety-related
	• Efficacy-related
	  ○ Change in weight
	  ○ Change in metabolic parameters
	  ○ Change in QOL

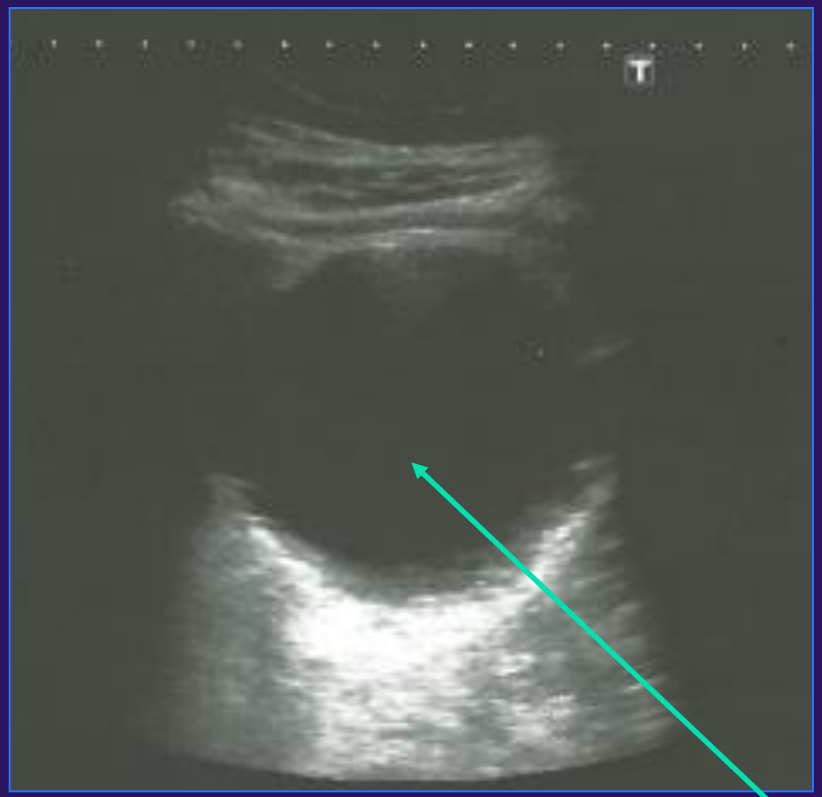
Imaging: Pre-Filling

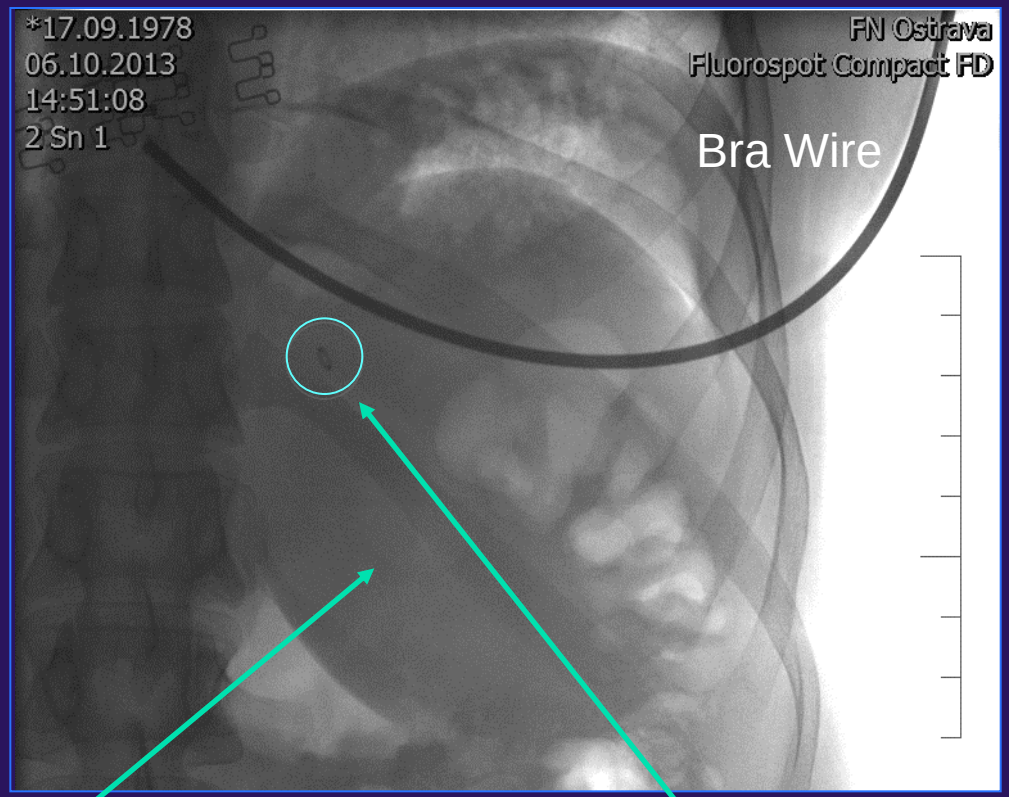


Imaging: Post-Filling

Ultrasound

X-ray





Elipse™

Radiopaque Marker

Patient Characteristics

n	34
Sex	23 female / 11 male
Age	42 (range: 18-59)
BMI	34.8 (range: 27.0 – 40.0)
Key Exclusion Criteria	• Dysphagia • Prior open abdominal surgery • Multiple laparoscopic abdominal surgeries • Inflammatory bowel disease • Prior intestinal obstruction
Sites	• University Hospital Ostrava, Czech Republic • Iatriko Medical Center, Athens, Greece

Results: Safety

- No serious adverse events
- No serious adverse device effects
- Adverse events (AEs):

	Number of AEs	Participants with AE (N)	Participants with AE (%)
Abdominal distension	1	1	3.6
Abdominal pain	7	7	25.0
Constipation	5	5	17.9
Diarrhea	4	4	14.3
GERD	3	3	10.7
Nausea	19	15	53.6
Vomiting	21	18	64.3

Results: Performance

Elipse™ Placement

- All devices swallowed without endoscopy or sedation
- Mean visit time: 22min +/- 8 min
- Mean device fill time: 6 min
- 34/34 (100%) catheters successfully detached

Results: Performance (cont'd)

Elipse™ Excretion

- 13 (39.4%) balloons were recovered by the patient
- All recovered balloons were analyzed and had emptied exactly as designed
- Mean residence time = 117 days +/- 14 days
- Remaining balloons were not recovered, and these patients were also asymptomatic

Results: Weight Loss

Elipse™ led to weight loss and waist circumference reduction

	Mean reduction
Weight (kg)	-10.0
BMI (kg/m^2)	-3.9
Waist Circumference (cm)	-8.4
% Excess Weight Loss (EWL)	39%
% Total Body Weight Loss (TBL)	10.0%

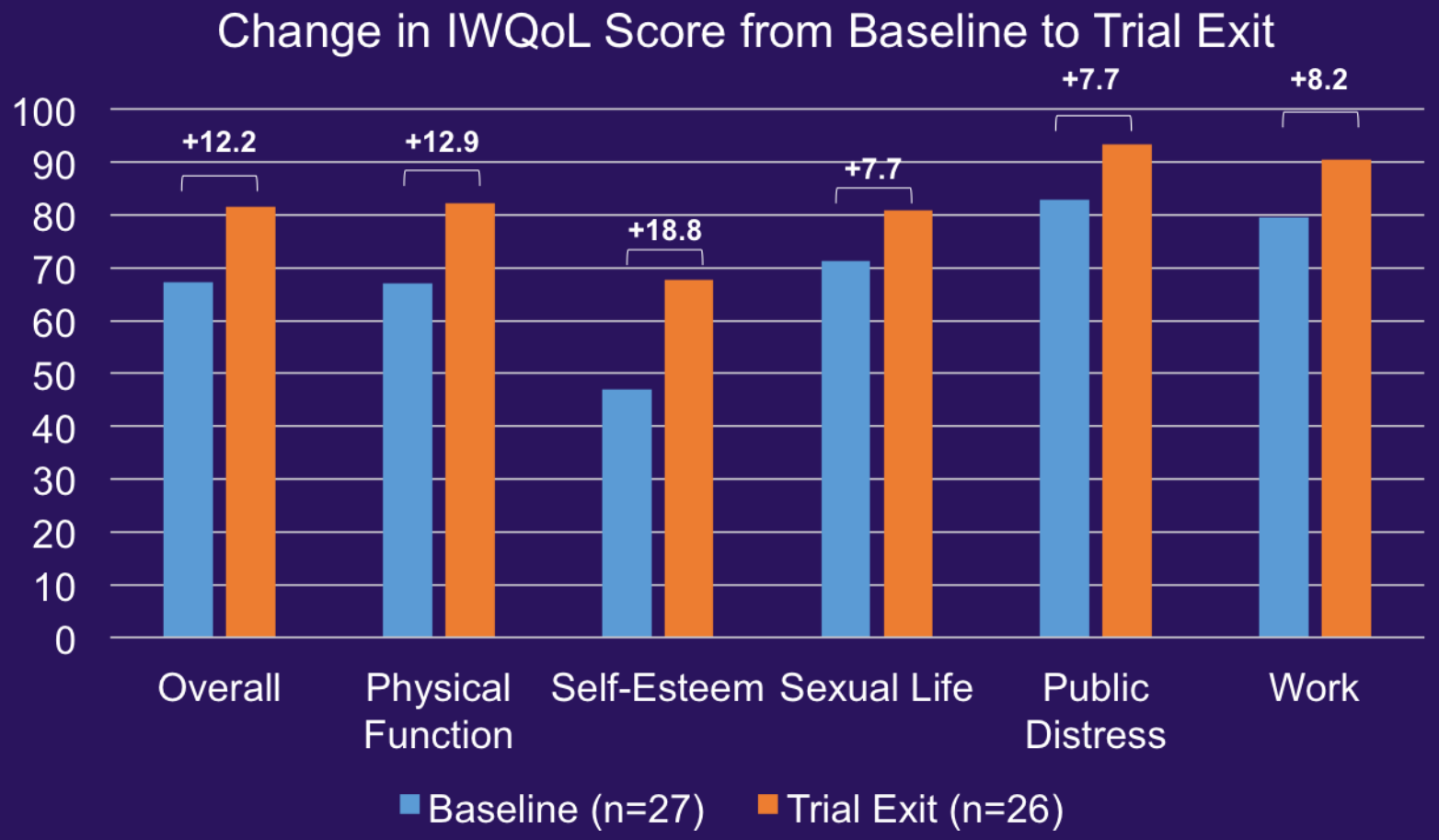
Results: Metabolic Parameters and Vitals

Elipse™ led to reduction in metabolic parameters & blood pressure

	Mean Reduction
HbA1c (%)	-0.16%
Triglycerides (mg/dL)	-16.4
LDL (mg/dL)	-9.7
Systolic BP (mmHg)	-9.6
Diastolic BP (mmHg)	-5.8

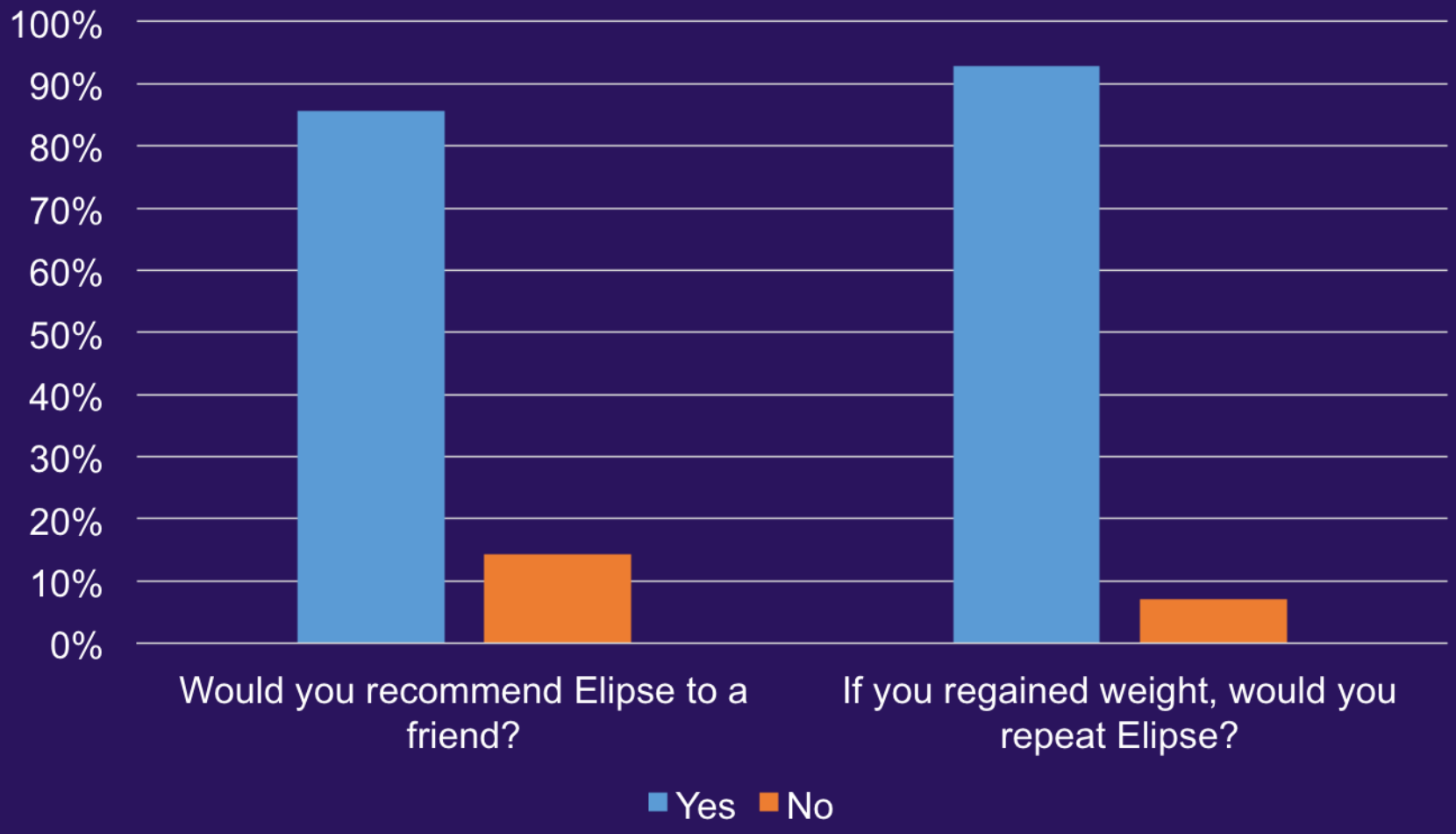
Results: Quality of Life

Elipse™ led to significant improvement in QOL across all domains



Results: Participant Preference

Most Elipse™ participants would repeat therapy & recommend it to a friend



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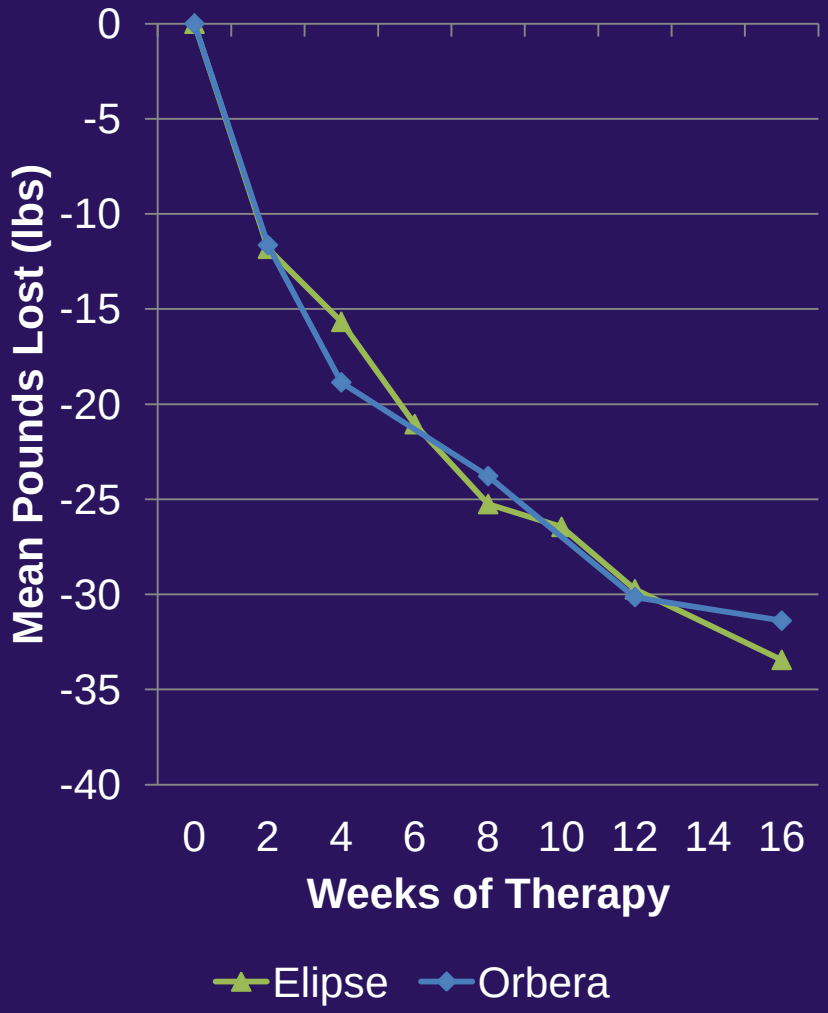
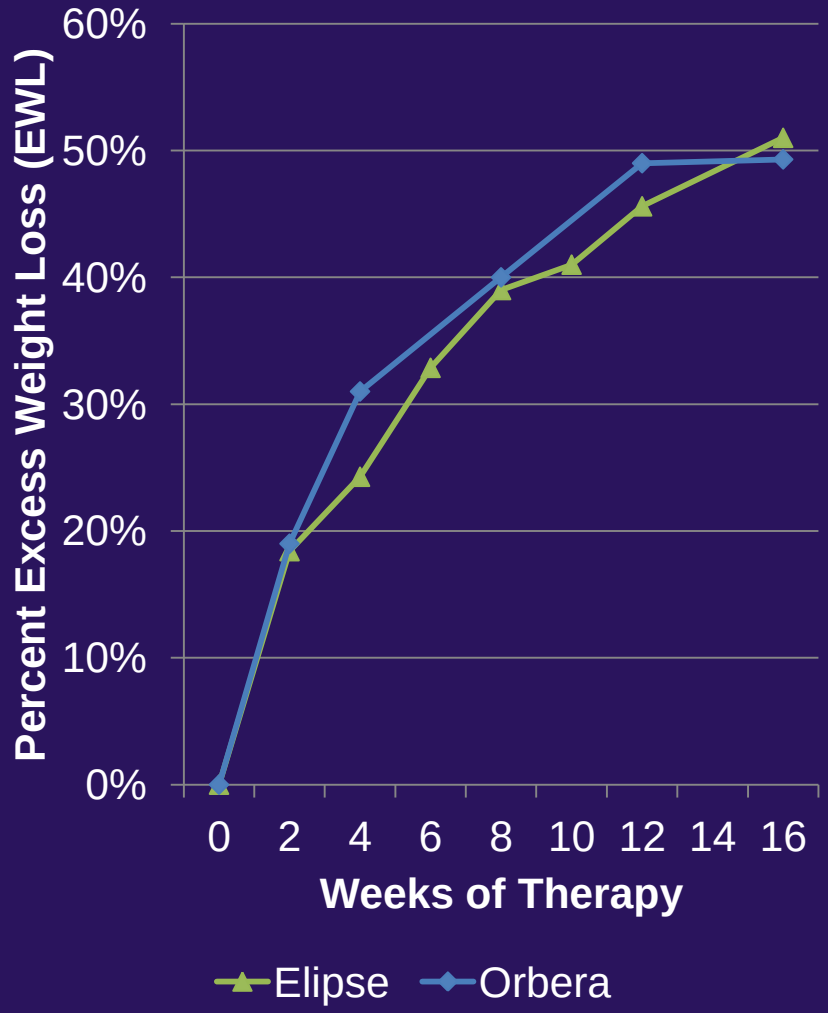
Post-Excretion Follow-Up

- After excretion, patients (Greek cohort *n*=11) were asked to return approximately every month to be weighed
- No dietary or nutritional follow-up was provided
- **At 6-month follow-up: 92% of weight loss was sustained**
- Follow-up is on-going

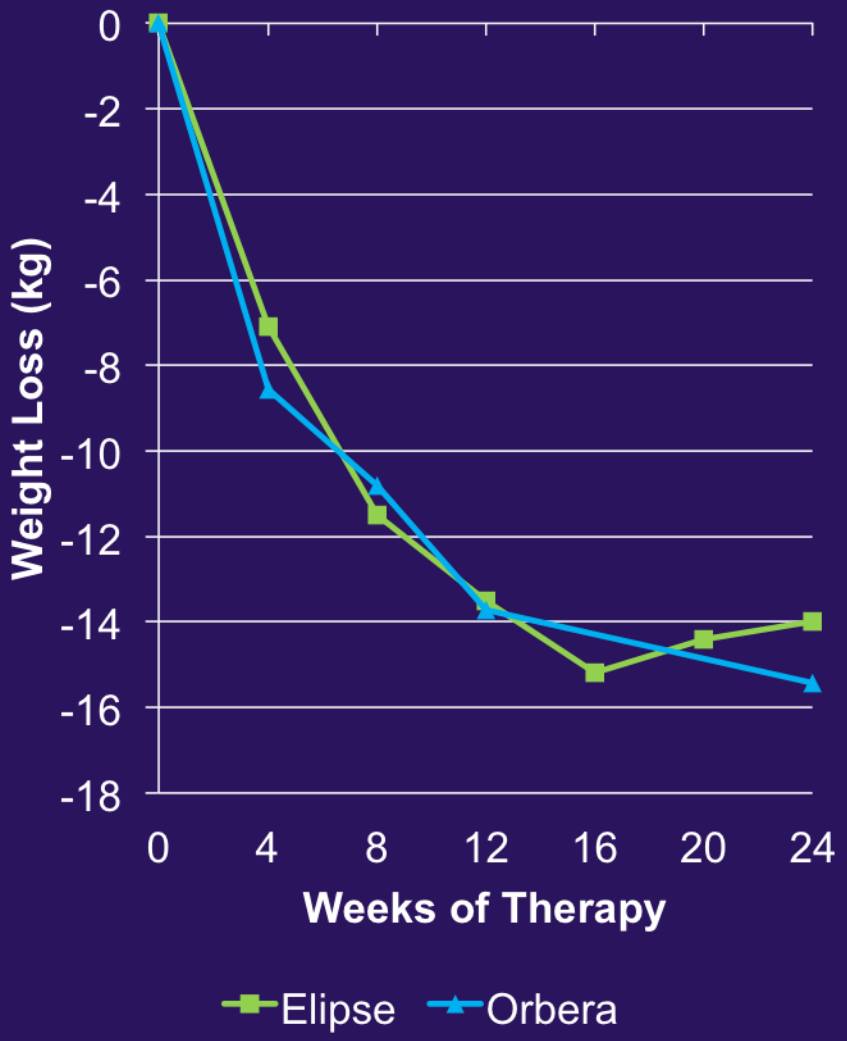
Elipse™ Weight Loss: on par with Orbera®*

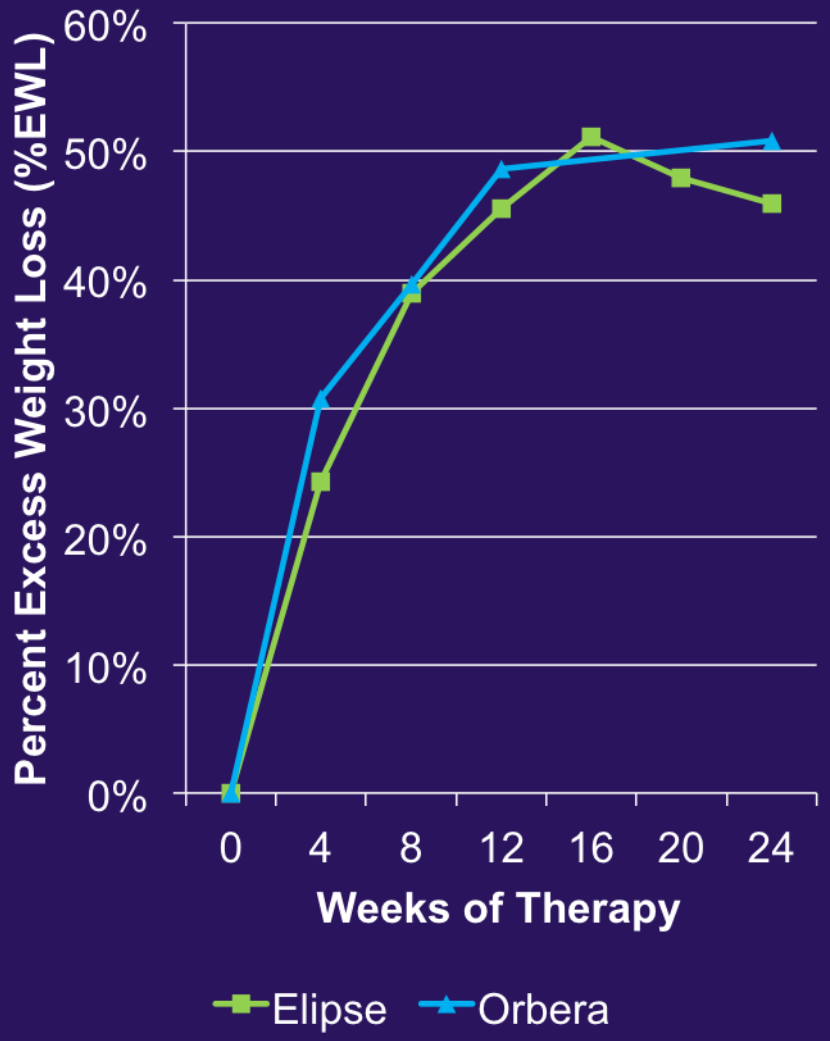




*Elipse™ (Athens Cohort; n=11); Totte et al. *Obes Surg.* 2001. Orbera 16-week weight loss interpolated

Post-Excretion Follow-Up*

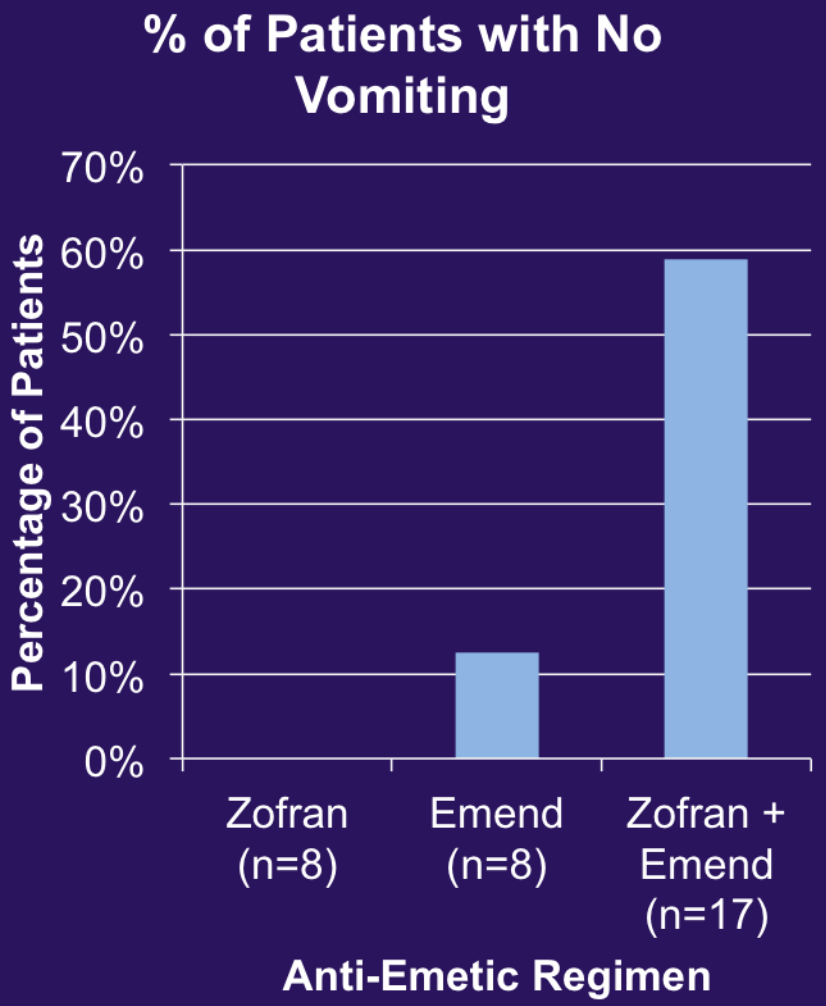


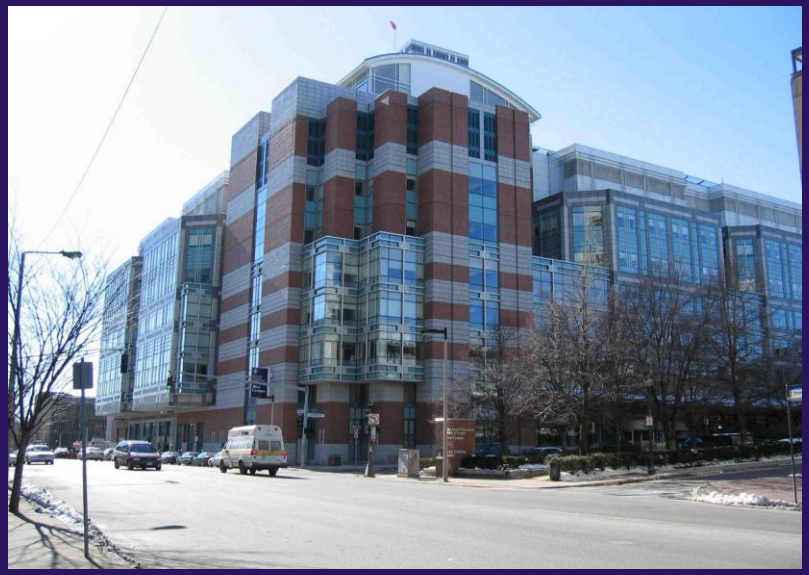


*Elipse™ (Athens Cohort; n=11); Totte et al. *Obes Surg.* 2001.

Results: Incidence of Vomiting

- Three different anti-emetic regimens were tested
  1. Zofran (ondansetron) alone
     - 8mg PO TID x 3-5 days
  2. Emend (aprepitant) alone
     - 125mg PO night before or day of
     - 80mg PO daily x 2 days
  3. Zofran + Emend
- Zofran + Emend led to significantly less nausea and vomiting
- No voluntary withdrawals in all patients treated with Zofran + Emend





Thank you!

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Setting Up a Successful Gastric Balloon Program

Sheryl Smith RN, BSN, M.Ed

Clinical Nurse Coordinator
Bariatric Endoscopy
Beth Israel Deaconess Medical Center

No Disclosures

Obesity

- Frequently subdivided into categories

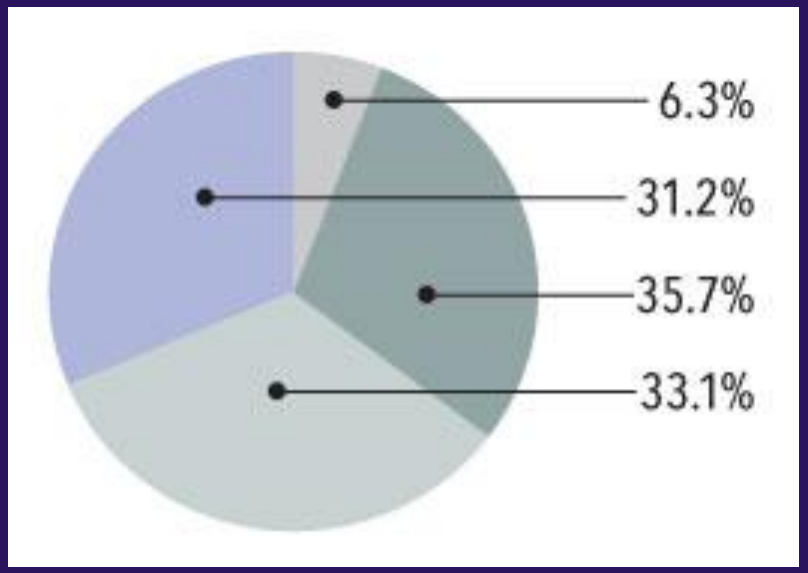
- Class 1: BMI of 30 to < 35
- Class 2: BMI of 35-40
- Class 3: BMI of 40 or higher

•cdc.gov

Obesity Statistics in the US

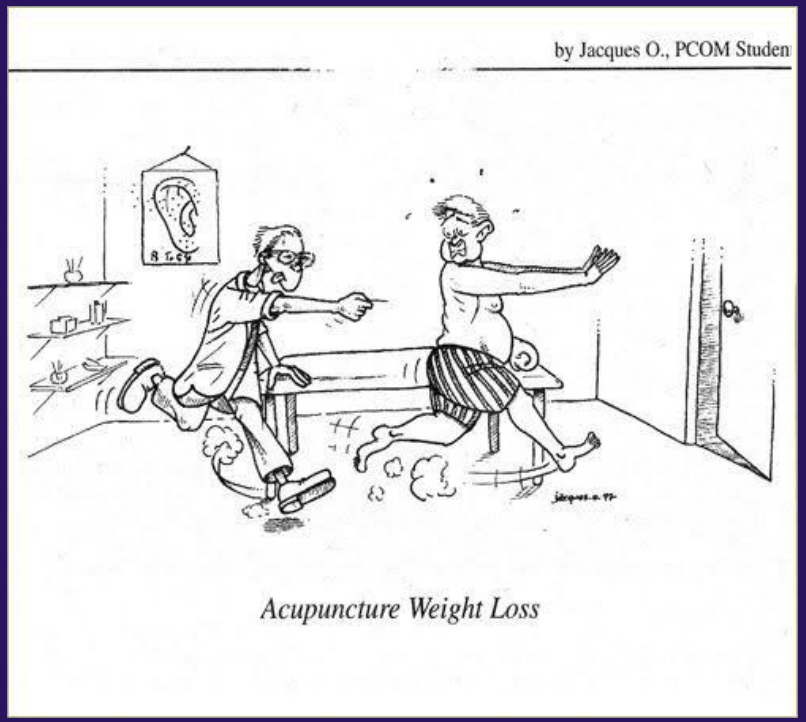
- Overweight and Obesity among Adults Age 20 and Older, United
- States, 2009–2010* Estimated Percentage by BMI

- Normal weight or underweight (BMI under 24.9)
- Overweight (BMI of 25 to 29.9)
- Obesity (BMI of 30+)
- Extreme obesity (BMI of 40+)



Weight Loss Options

- Diet & Exercise
- Pharmaceuticals
- Gastric Balloon
- Surgery



Acupuncture Weight Loss

Gastric Balloons offer an option for patients who:

- Have not had long term success with ther weight loss attempts
- Do not qualify for bariatric surgical options
- Do not want surgery to achieve weight loss.
- Want to “jump start” my long term weight loss

Who Can Receive Gastric Balloon (IGB)?

- Adults
- BMI 30-40
- Must be willing to commit to a year long program
- Failed other weight loss programs

Who Should Not Receive IGB?

- Previous bariatric/gastric Surgery
- Structural abnormality of the esophagus
- Under 21
- On blood thinners
- Pregnant or planning to become pregnant
- Liver disease*

The Team

- Gastroenterologists
- Registered Dietitian
- Registered Nurse/Clinical Coordinator
- Program Coordinator
- Personal Trainer
- Psychologist
- Nutritionist

Things Prospective Patients Need to Know

- Self-pay
- Side effects of balloon
- No magic bullet
- Average weight loss ~10.7% at 6 months
- Requires a one year commitment

One or more of these things may be a deal breaker

Side Effects of Balloon Placement

- Nausea
- Vomiting
- Abdominal pain
- Cramping
- Acid reflux
- Anxiety

Symptoms typically last a few days, but can last up to several weeks. Patients receive prescription medications to help manage symptoms

Medication Protocol

- Begin taking a multi-vitamin and calcium with vitamin D
- PPIs starting 2 weeks before balloon placement until 1 week after balloon removal
- Emend and Zofran qd x 3 days
- Hycosamine (Levsin) bid prn
- Ativan q 4-6 hours prn

Balloon Placement

- NPO for 12 hours pre-procedure
- Patient pre-medicates with anti-emetics and PPI
- Given IV hydration pre/post procedure
- EGD with MAC
- Patient typically discharged with little discomfort

Patient Education on Discharge

- You are not going to feel well later
- Take all Medications as prescribed
- Clear liquids only today. Will have to experiment with either sips or 4oz at a time…temperature of fluids
- A member of your team will be checking in with you later today

Patient Education on Discharge-contd

- Rest with head elevated on extra pillows
- Some people feel more comfortable resting on their left side
- No restrictions on activity after today, but only advance when symptoms have subsided
- Keep the card identifying you as someone with an IGB with you whenever you are not at home

Nutrition

- Clear liquids until symptoms subside, typically about 48 hours
- Advanced to full liquids (protein shakes, drinkable yogurt…) typically several days
- Advanced to soft solids (cottage cheese, eggs, yogurt…) can be up to 2 weeks
- Reintroduction of solid food, one at a time
- Goal is for ~60-80 gms protein/day, ~1200-1800 cal/day

Tips for Success

- Protein first
- Eat slowly
- Chew and then chew some more
- Put your fork down between bites
- Don’t eat and drink at the same time*
- Stop eating when you start to feel full
- Use a smaller plate

Physical Activity

- The CDC recommends at least 150 minutes of moderate-intensity aerobic activity every week

AND

- Muscle strengthening activities on 2 or more days per week

- In addition, adding lifestyle activities can increase energy expenditure

A 12 Month Program

- Balloon placement
- Daily phone contact with RN until feeling well
- Phone contact with RD ~day 3
- Phone contact with RN Week 1
- Office visit with MD/RD week 2
- Bi-monthly contact with RD/RN months 2-6
- Balloon removal
- Office visit with MD 2-4 weeks after
- Continued bi-monthly contact with RD/RN months 6-12

•*Contact with Team Can Be in the Office or Over the Phone

Our Experience

- Out of approximately 200 Inquiries:

- ~73% No…because of cost
- ~10% Did not follow through
- ~5% Did not qualify
- ~12% Came for RN/RD consultation

(All but one has gone on to have IGB placed)

Results

Since February 2016:

- 21 Balloons placed to date
- 11 Balloons removed to Date (2 not our patients)

At 6 Months:

- Average TWL: 10.7%
- Maximum total weight loss: 23.6%
- 2 Patients with no weight loss- both lost weight initially, then regained.
- One patient who lost 13.9% with first balloon and wanted a second one…lost an additional 4.3% for a total weight loss of 18.2%

What We Have Learned

- The majority of our patients verbalize improving health as the number one reason for the procedure
- The greatest success stories have come through hard work
- Sometimes there is more to weight-loss than "calories out must be more than calories in" (This is a whole separate lecture!)
- We are committed to helping our patients attain and maintain weight-loss, but we can’t do it for them
- We are still learning and adapting our program to help our patients achieve success


Thank You for Your Kind Attention,
Namaste!