



Disclosures

- Apollo Endosurgery – Consultant, speaker
- Boston Scientific – Consultant, speaker
- Medtronic – Consultant, speaker
- Neptune Medical - Consultant

Objectives

- Review the current status of endoscopic bariatric therapies (EBT)
- Highlight the recent data on EBT and put into context
- Highlight novel therapies

Recent Surgical Volume

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|-----------|---------|---------|---------|---------|----------|---------|
| Total | 158,000 | 173,000 | 179,000 | 193,000 | 196,000 | 216,000 |
| RNY | 36.7% | 37.5% | 34.2% | 26.6% | 23.1% | 18.7% |
| Band | 35.4% | 20.2% | 14% | 9.5% | 5.7% | 3.4% |
| Sleeve | 17.8% | 33% | 42.1% | 51.7% | 53.8% | 58.1% |
| BPD/DS | 0.9% | 1% | 1% | 0.4% | 0.6% | 0.6% |
| Revisions | 6% | 6% | 6% | 11.5% | 13.6% | 13.9% |
| Other | 3.2% | 2.3% | 2.7% | 0.1% | 3.2% | 2.6% |
| Balloons | | | | | .03% | 2.7% |
| V-Bloc | | | | | 18 cases | |

> 200,000 Operations per year

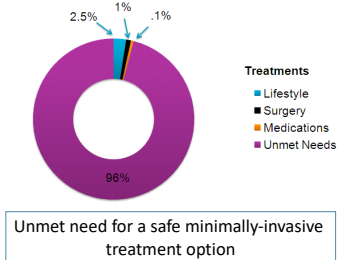
ASMBS.org

Patient Reticence

| Not interested in bariatric surgery (n = 284) | |
|---|------------|
| Fear of other complications from surgery, % | 145 (51.1) |
| Do not need surgery to lose weight, % | 91 (32.0) |
| Fear of dying, % | 70 (24.6) |
| Fear of surgery in general, % | 68 (23.9) |
| Cost, % | 58 (20.4) |
| Pain, % | 39 (13.7) |
| Do not believe it will work, % | 22 (7.7) |
| Fear of judgment, % | 9 (3.2) |
| Religious or cultural reasons, % | 2 (0.7) |

Fung M, et al. Journal of Obesity 2016

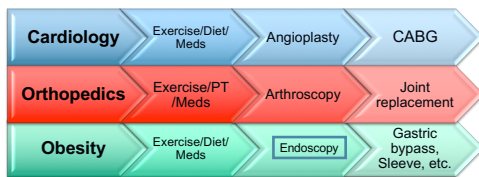
Unmet Need



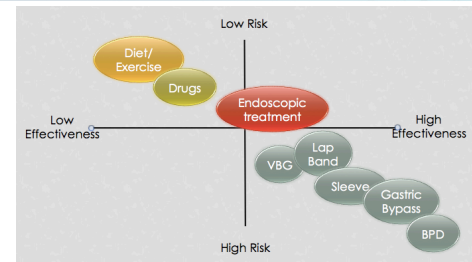
Why the Endoscopic Approach?

- The “99%”
- Vulnerable populations: 33% of US population overweight (BMI 25-29.9)
- Medical approach is ineffective (for now)
- Surgical approach is invasive, expensive, higher complication rate
- Patient demand for minimally invasive approach
 - Cosmesis
 - Reversibility

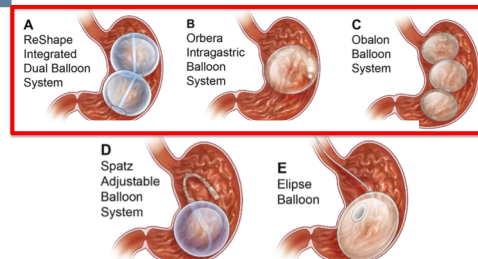
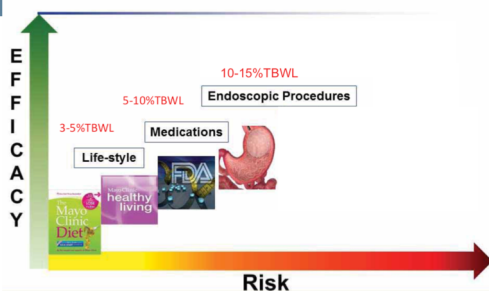
A New Treatment Paradigm



A New Treatment Paradigm



Intragastric Balloons



Intragastric Balloons

UPDATE: Potential Risks with Liquid-filled Intragastric Balloons - Letter to Health Care Providers

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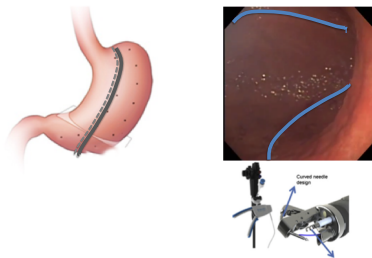
June 4, 2018

- 12 deaths since 2016
- Perforations, MVA, pancreatitis

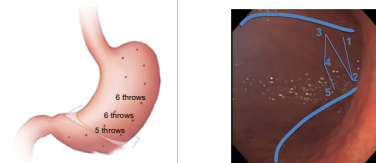
FDA Approves Updated Labeling for Two Obesity Treatments

- The global rate of occurrence was found to be <0.01% for Orbera patients (as of March 31 2018) and 0.06% for ReShape patients (as of April 30 2018)

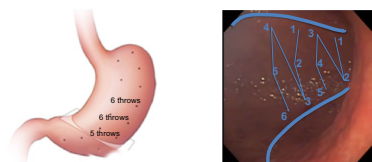
Endoscopic Sleeve Gastroplasty



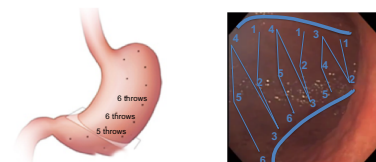
Endoscopic Sleeve Gastroplasty



Endoscopic Sleeve Gastroplasty



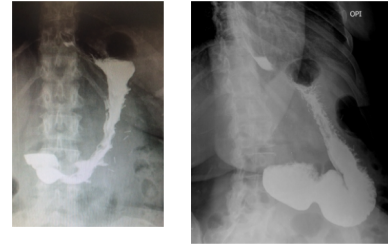
Endoscopic Sleeve Gastroplasty



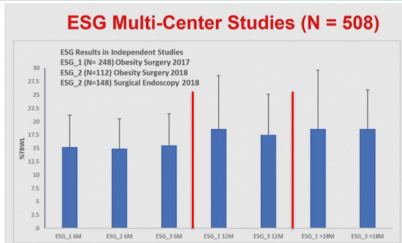
Endoscopic Sleeve Gastroplasty



Endoscopic Sleeve Gastroplasty



Endoscopic Sleeve Gastroplasty



Lopez-Navas G, et al. Obes Surg 2017
 Sartoretto et al. Obes Surg 2018
 Morales et al. Surg Endosc 2018

ESG Improves Metabolic Parameters

- Single center study 91 pts
- Mean preop BMI $40.7 \pm 7.0 \text{ kg/m}^2$
- %TBWL 20.9% at 24 months
- Statistically significant reductions in:
 - hemoglobin A1c ($P = .01$),
 - systolic blood pressure ($P = .02$),
 - waist circumference ($P < .001$),
 - alanine aminotransferase ($P < .001$),
 - serum triglycerides ($P = .02$)



Sharaiha R, et al. Clin Gastro Hep 2017

ESG v LSG v LAGB

- Single center study 278 pts
- ESG, lap sleeve gastrectomy, lap band

| | ESG | LSG | LAGB | p value |
|-----------|-----------------|-----------------|-----------------|-------------|
| %TBWL | 17.57% | 29.28% | 13.30% | $P < 0.001$ |
| Morbidity | 2.2%* | 9.17% | 8.96% | $P < 0.05$ |
| LOS | 0.34 ± 0.73 | 3.09 ± 1.47 | 1.66 ± 3.07 | $P < 0.01$ |

*migraine HA, leak d/t dietary noncompliance

Sharaiha R, et al. J Gastro Surg 2018

COST-EFFECTIVENESS ANALYSIS OF TWO ENDOSCOPIC BARIATRIC AND METABOLIC THERAPEUTIC APPROACHES: INTRAGASTRIC BALLOONS VS. ENDOSCOPIC SLEEVE GASTROPLASTY

- Monte Carlo simulation of intragastric balloon vs ESG from healthcare system perspective
- 100,000 pts age 35, BMI 32.5 kg/m^2 without obesity-related comorbidities followed for their lifetime
- If patients remained obese after EBT, may undergo surgery
- Willingness-to-pay (WTP) threshold was defined at \$150,000 per QALY gained

Bazerachi F, et al. DDW 2018

COST-EFFECTIVENESS ANALYSIS OF TWO ENDOSCOPIC BARIATRIC AND METABOLIC THERAPEUTIC APPROACHES: INTRAGASTRIC BALLOONS VS. ENDOSCOPIC SLEEVE GASTROPLASTY

- At 120 years:
 - Cumulative costs per person, QALYs:
 - IGB: \$17,227, 31.82
 - ESG \$20,227, 31.84
 - ESG > IGB at ICER \$131,671 per QALY gained
 - ESG remained superior up to \$15,050

Bazerbachi F, et al. DDW 2018

BARIATRIC ENDOSCOPY EFFECTIVENESS IN HEALTH RELATED QUALITY OF LIFE

- 107 pts treated with IGB (n=79) and ESG (n=28)
- Health Related Quality of Life (HRQL) measured with the 8 scales of the questionnaire SF-36 at baseline and at follow up (8-12 months)

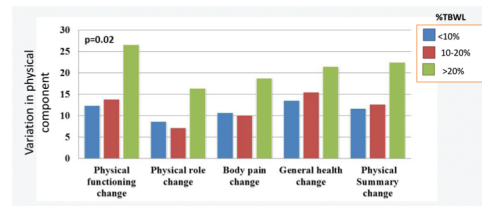
Lopez-Navas G, et al. DDW 2018

| | VARIABLE | SPANISH AVERAGE HRQL | PATIENTS BASE LINE HRQL | POST PROCEDURE HRQL | HRQL IMPROVEMENT |
|----------|----------------------------|----------------------|-------------------------|---------------------|------------------|
| PHYSICAL | Physical Function | 84,7 | 73,5 | 90,5** | 23,13% |
| | Physical Rol | 83,2 | 77,8 | 88,7* | 14,01% |
| | Body Pain | 79,0 | 69,7 | 82,9** | 18,94% |
| | General Health | 58,3 | 57,0 | 74,3** | 30,35% |
| | Vitality | 66,9 | 48,9 | 66,5** | 35,99% |
| MENTAL | Social Function | 90,1 | 74,5 | 88,0** | 18,12% |
| | Emotional Role | 86,6 | 73,2 | 85,3** | 16,53% |
| | Mental Health | 73,3 | 63,3 | 61,5 | -2,84% |
| | Change in health over time | --- | 40,1 | 80,3** | |

Note: *p<0.05, **p<0.01

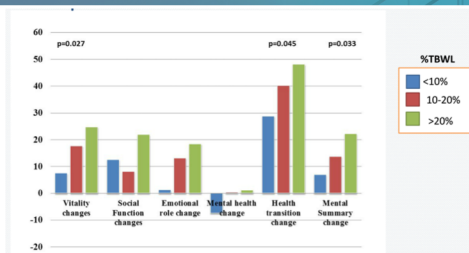
Lopez-Navas G, et al. DDW 2018

BARIATRIC ENDOSCOPY EFFECTIVENESS IN HEALTH RELATED QUALITY OF LIFE



Lopez-Navas G, et al. DDW 2018

BARIATRIC ENDOSCOPY EFFECTIVENESS IN HEALTH RELATED QUALITY OF LIFE

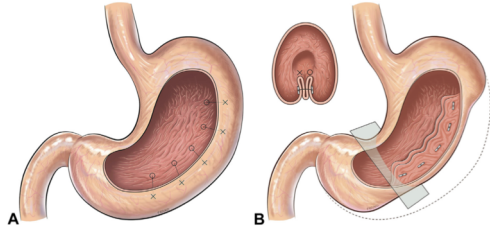


Lopez-Navas G, et al. DDW 2018

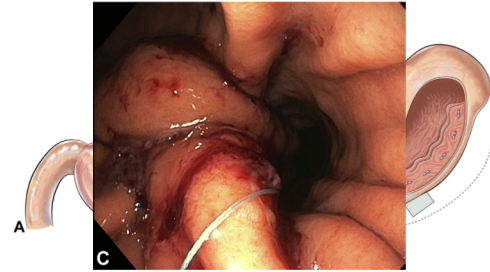
Endomina



Endomina



Endomina



Endomina

| Parameter | Baseline | 1 m | 3 mo | 6 mo | 9 mo | 12 mo |
|--------------------------|----------|------|------|------|------|-------|
| n | 51 | 50 | 49 | 49 | 48 | 45 |
| BMI (kg/m ²) | 35.1 | 33.2 | 32.5 | 32.2 | 32.3 | 32.6 |
| Weight loss (kg) | - | 5.3 | 7.4 | 8.1 | 8.2 | 7.1 |
| %EWL | - | 20 | 28 | 31 | 33 | 29 |
| %TBWL | - | 5 | 8 | 8 | 8 | 7 |

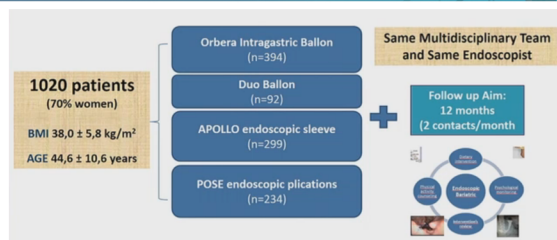
Huberty V, et al Endoscopy 2018

Comparison of 4 Different EBTs – ASGE Plenary

- Single Center (Madrid), 4 EBTs:
 - Orbera – 394 pts
 - ReShape Duo – 92 pts
 - ESG – 299 pts
 - POSE – 234 pts
- 400 (40.1%) pts completed 1 year f/u

Lopez-Navas G, et al. DDW 2018

Comparison of 4 Different EBTs – ASGE Plenary



Lopez-Navas G, et al. DDW 2018

Comparison of 4 Different EBTs – ASGE Plenary

Initial characteristics and weight changes after bariatric endoscopy procedures

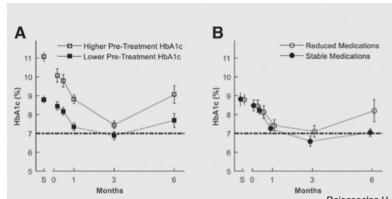
| | Orbera IGB | Duo IGB | APOLLO | POSE | p |
|----------------------------------|------------|---------|--------|--------|------|
| Initial BMI (kg/m ²) | 37.49 | 38.46 | 38.17 | 37.63 | n.s. |
| Final BMI (kg/m ²) | 32.28 | 32.43 | 31.84 | 32.39 | n.s. |
| TBWL | 17.87 | 16.35 | 19.53 | 16.76 | n.s. |
| % TBWL | 16.13% | 15.39% | 17.51% | 15.38% | n.s. |
| >10% TBWL | 74.4% | 75.4% | 81.1% | 72.3% | n.s. |
| >20% TBWL | 34.4% | 24.5% | 36.1% | 26.6% | n.s. |

Lopez-Navas G, et al. DDW 2018

Cherrington A, WCITT2D 2015

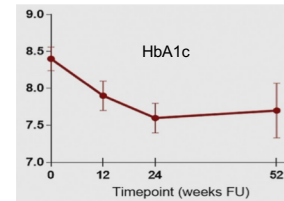
Duodenal Mucosal Resurfacing

- Metabolic improvements in diabetic patients with DMR (n=28)



Duodenal Mucosal Resurfacing

- Durable effects to 12 months



Overview of Change in Metabolic Parameters: LS Cohort

| | Screening | 1 Month | 3 Month | 6 Month | Normal* |
|-------------|-----------|---------|---------|---------|---------|
| HbA1c - % | 9.6±1.4 | 7.9±1.1 | 7.1±0.9 | 8.2±1.6 | 4.0-6.0 |
| Weight - kg | 86±11 | 82±11 | 83±12 | 85±11 | -- |
| ALT - IU/L | 40±23 | 32±17 | 27±14 | 27±12 | ≤ 38 |
| AST - IU/L | 32±17 | 27±11 | 23±8 | 22±6 | ≤ 40 |

*Normal range based on ranges reported by lab that processed the samples.
All numbers reported as mean ± SD.

Rajagopalan H, et al. Diabetes Care 2016

Overview of Change in Metabolic Parameters: LS Cohort

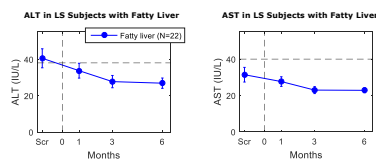
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All numbers reported as mean ± SD.

Rajagopalan H, et al. Diabetes Care 2016

DMR Reduced ALT & AST in Patients with Radiological Evidence of NAFLD

- Patients with incidental finding of fatty liver identified on ultrasound



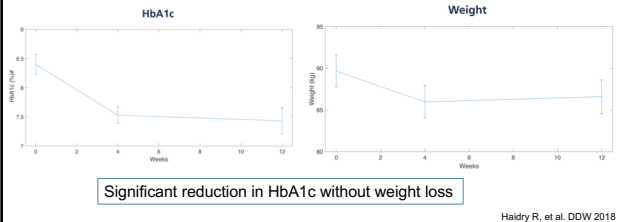
Duodenal Mucosal Resurfacing

- Revita 2 Multicenter RCT
- 24 pts, mean age 58, DM2 x 8 yrs
- Open-label training phase
- Medications held stable ≥ 6 months

Haidry R, et al. DDW 2018

Duodenal Mucosal Resurfacing

- 12 wk f/u



| Indices | Baseline | 12 weeks | P value |
|---------------------|-----------|-----------|---------|
| HbA1C (%) | 8.4±0.17 | 7.4±0.22 | <0.001 |
| FPG (mg/dl) | 186±8 | 160±10 | <0.002 |
| F-TGs (mg/dl) | 209±32 | 150±20 | =0.008 |
| F-HDL (mg/dl) | 45.7±2.8 | 49.2±3.2 | =0.02 |
| FPI* (μU/ml) | 13.6±1.8 | 9.8±1.1 | =0.03 |
| F-C-peptide (ng/ml) | 3.22±0.29 | 2.63±0.17 | =0.01 |
| ALT (U/L) | 35.8±4.1 | 26.8±2.4 | <0.001 |
| Ferritin** (ng/ml) | 98.1±20.9 | 72.0±18.7 | <0.001 |
| Body weight (kg) | 89.7±1.9 | 86.6±2.0 | <0.001 |

Values are all mean (±SEM); n = 24 except where indicated; * n=22; ** n=18; HbA1c: Glycated Hemoglobin A1c; FPG: Fasting Plasma Glucose; FPI: Fasting Plasma Insulin; HOMA-IR: F-TGs: Fasting Triglycerides; F-HDL: Fasting HDL; ALT: Alanine Aminotransferase

Haidry R, et al. DDW 2018

No Significant Adverse Events

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Haidry R, et al. DDW 2018

Duodenal Mucosal Resurfacing

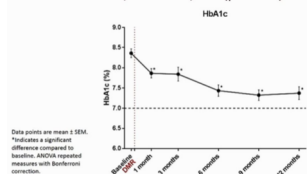
- Revita-1 study – multicenter, safety, efficacy, dosimetry
- Complete DMR in 37/47 (79%) defined as 9-10 cm in length
- 1 significant AE: Fever to 38, elevated CRP, discharged next day

Van Baar A, et al DDW 2018

Duodenal Mucosal Resurfacing

Efficacy at 12 months:

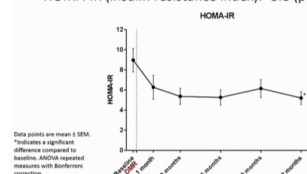
- HbA1c: -1.0%, -11 mmol/mol (p<0.001)



Duodenal Mucosal Resurfacing

Efficacy at 12 months

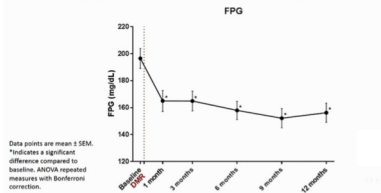
- HOMA-IR (insulin resistance index): -3.8 (p=0.020)



Duodenal Mucosal Resurfacing

Efficacy at 12 months

- Fasting glucose: -40 mg/dL, -2.2 mmol/L ($p < 0.001$)

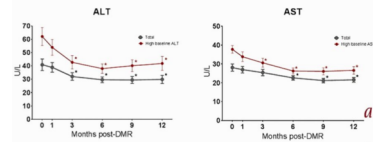


Van Baar A, et al DDW 2018

Duodenal Mucosal Resurfacing

Efficacy at 12 months

- Decreased transaminase levels
- More pronounced in high baseline tertiles



Van Baar A, et al DDW 2018

Duodenal Mucosal Resurfacing

- Metabolic improvements sustained to 12 months
- Possibly improvements in fatty liver disease
- Well-tolerated, no implant, no patient participation (+/-)

Van Baar A, et al DDW 2018

Treatment of Weight Regain After Gastric Bypass Surgery

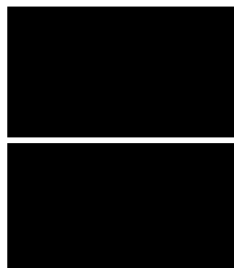
Transoral Outlet Reduction (TORe)

- Endoscopic Suturing



Argon Plasma Coagulation

- Application to circumference of GJA results in cicatrization
- Widely available, standard skillset, time
- Repeated until desired GJA diameter
- Contact or non-contact methods
- Various settings:
 - 45-90 Watts
 - 0.8 – 2 L/min



APC or Suturing?

- Single center retrospective study
- Weight regain + GJA 10 – 30 mm
- APC: Contact 0.8 L/min 55 W, q8-12 weeks, mean 1.8 sessions/pt
- TORe: interrupted or pursestring

Jirapinyo P, et al. DDW

APC or Suturing?

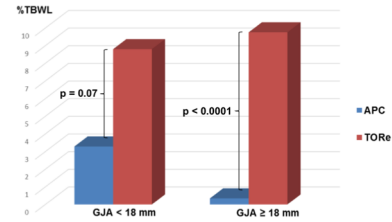
| | APC (N = 68) | TORe (N = 244) | P-value |
|--|-----------------|-------------------|---------|
| Absolute weight loss (kg) (mean ± SD) | 3.3 ± 15.2 | 10.9 ± 11.4 | <0.0001 |
| % TBWL (%) (mean ± SD) | 1.9 ± 7.5 | 9.7 ± 9.3 | <0.0001 |



Jirapinyo P, et al. DDW

APC or Suturing?

6 Month Efficacy of APC versus TORe at Different GJA Sizes



Jirapinyo P, et al. DDW

Novel Therapy

- NozNoz
- 12 hours/day x 2 weeks then discard
- Inhibits smell without compromising breathing
- Wellness device not medical
- 65 obese pts on hypocaloric diet
 - Significant reduction in weight, BMI c/w controls
 - Reduced insulin levels
 - Reduced consumption of sweets



Dicker D, et al. ECO 2018

Conclusions

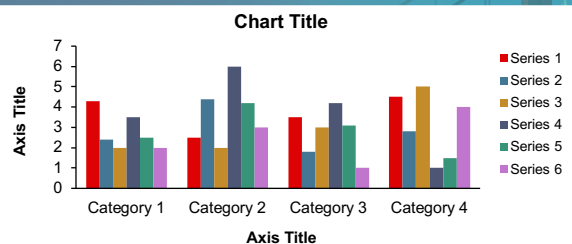
- EBTs are established as viable weight loss/metabolic therapies
- IGB, ESG, Aspiration therapy currently available as part of a multidisciplinary approach
- DMR, adjustable balloon, plication devices coming soon
- Stay tuned for more novel devices/techniques!

Sample Table

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Sample Footer

Sample Chart



Sample Footer