



Bariatric Embolization (BAE)

Bernhard Gebauer
Klinik für Radiologie
Charité
Berlin, DE
bernhard.gebauer@charite.de



Disclosure

Speaker name:

Prof. Bernhard Gebauer, Berlin

I have the following potential conflicts of interest to report:

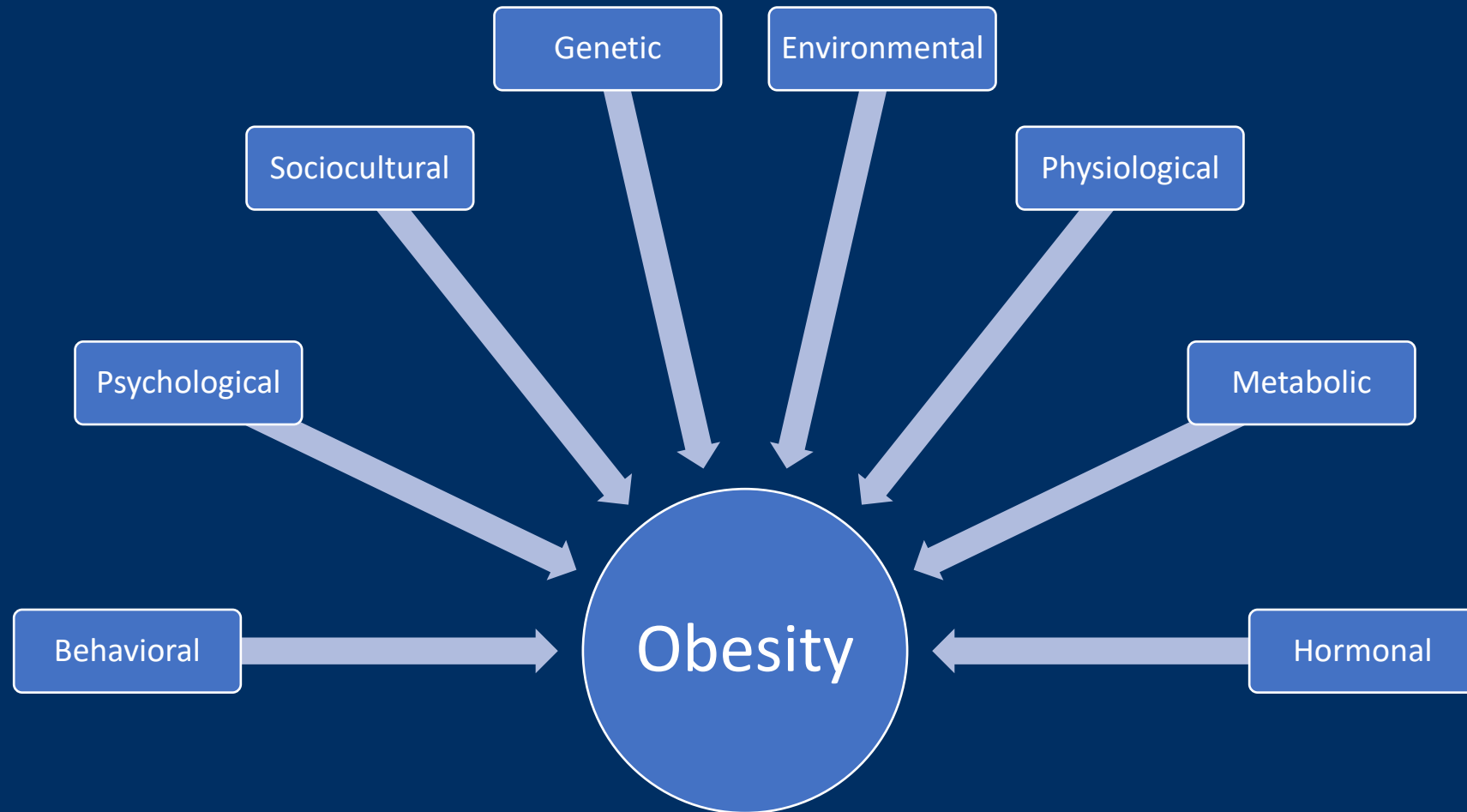
- Consulting
- Employment in industry
- Stockholder of a healthcare company
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- Other(s): (Honarium) C.R. BARD, SIRTex Medical, St. Jude Medical, COOK, AngioDynamics, Pharmcept, Guerbet, Ewimed, Roche, Merck, 3M, Beacon Bioscience/ICON, IPSEN, Bayer, Pfizer, Elsay, MSD
- I do not have any potential conflict of interest

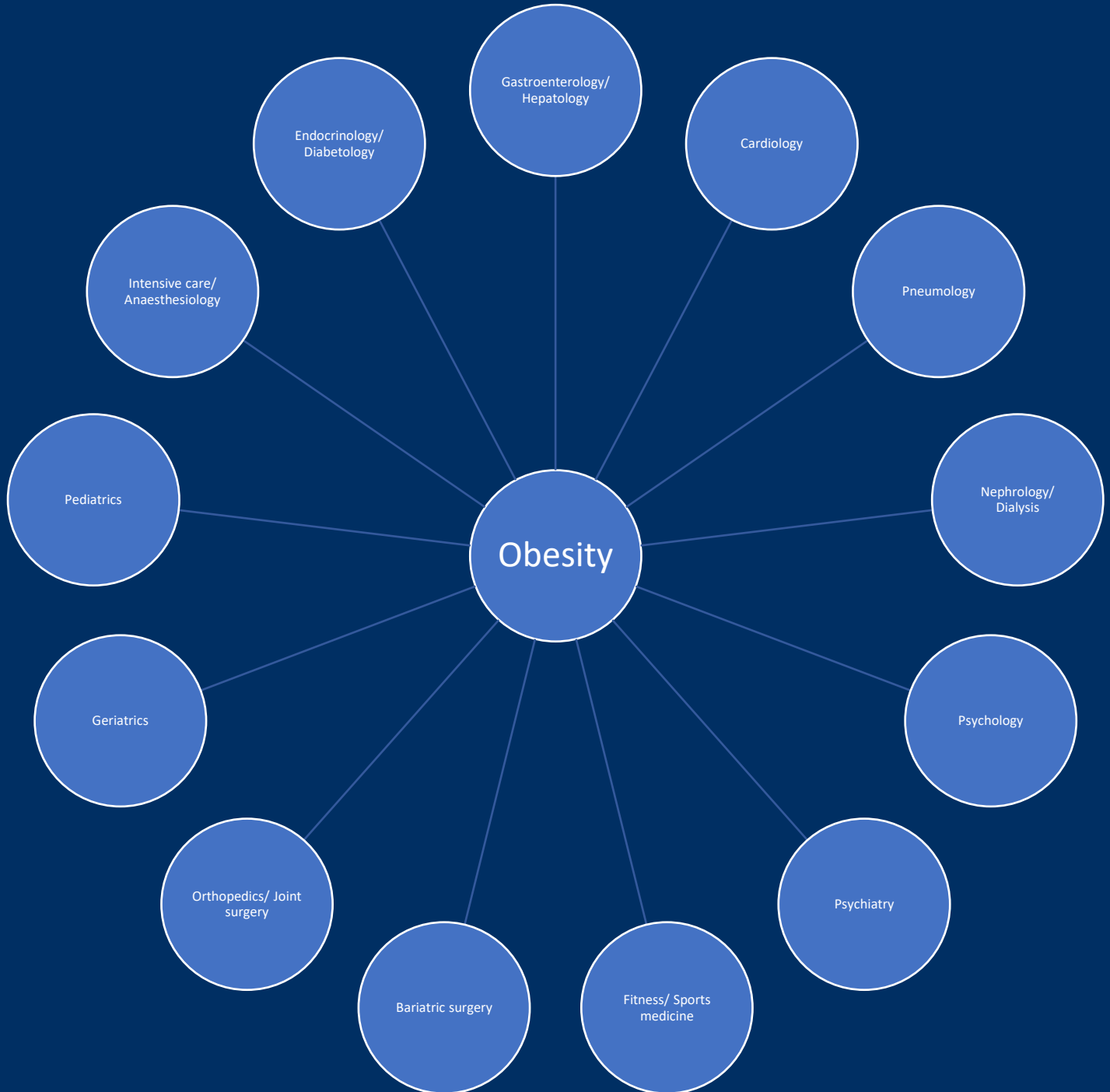
Obesity

- Definition: BMI > 30 kg/m² (Overweight: BMI > 25 kg/m²)
- CDC: 39.4% of US-Citizens are obese
- obesity-related comorbid conditions
 - diabetes mellitus type 2
 - hypertension
 - hyperlipidemia
 - long-term cardiovascular events
 - obstructive sleep apnea

Overweight	BMI 25-29.9 kg/m ²
Obesity	BMI > 30 kg/m ²
Obesity grade I	BMI 30-34.9 kg/m ²
Obesity grade II	BMI 35-39.9 kg/m ²
Obesity grade III	BMI ≥ 40 kg/m ²

Management of weight loss





Intervention	Effect
Nutritional therapy, physical activity behavioral therapy as single interventions	1-2 kg or RWL <5%
Nutritional therapy, physical activity behavioral therapy in combination over at least 6 month ("multidisciplinary therapy")	4-5 kg or RWL 5-10%
Multidisciplinary therapy and initial usage of formula diet for 12 week	10-30 kg or RWL 15-26%
Bariatric surgery	20-50 kg or RWL 20-40%

Effectiveness of different weight reduction means; RWL: relative weight loss

Bariatric surgery



Roux-en-Y gastric bypass



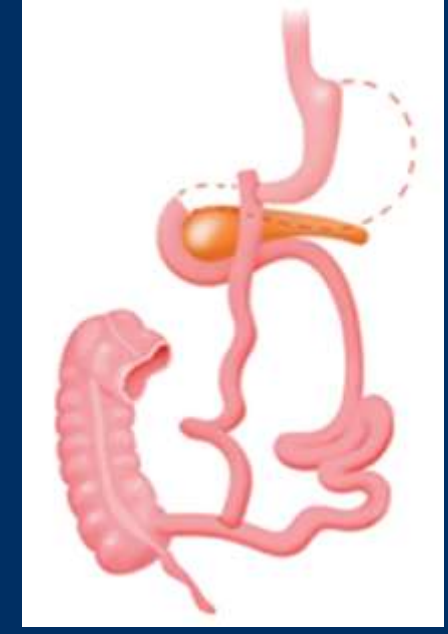
Adjustable gastric banding



Vertical sleeve gastrectomy



Biliopancreatic diversion

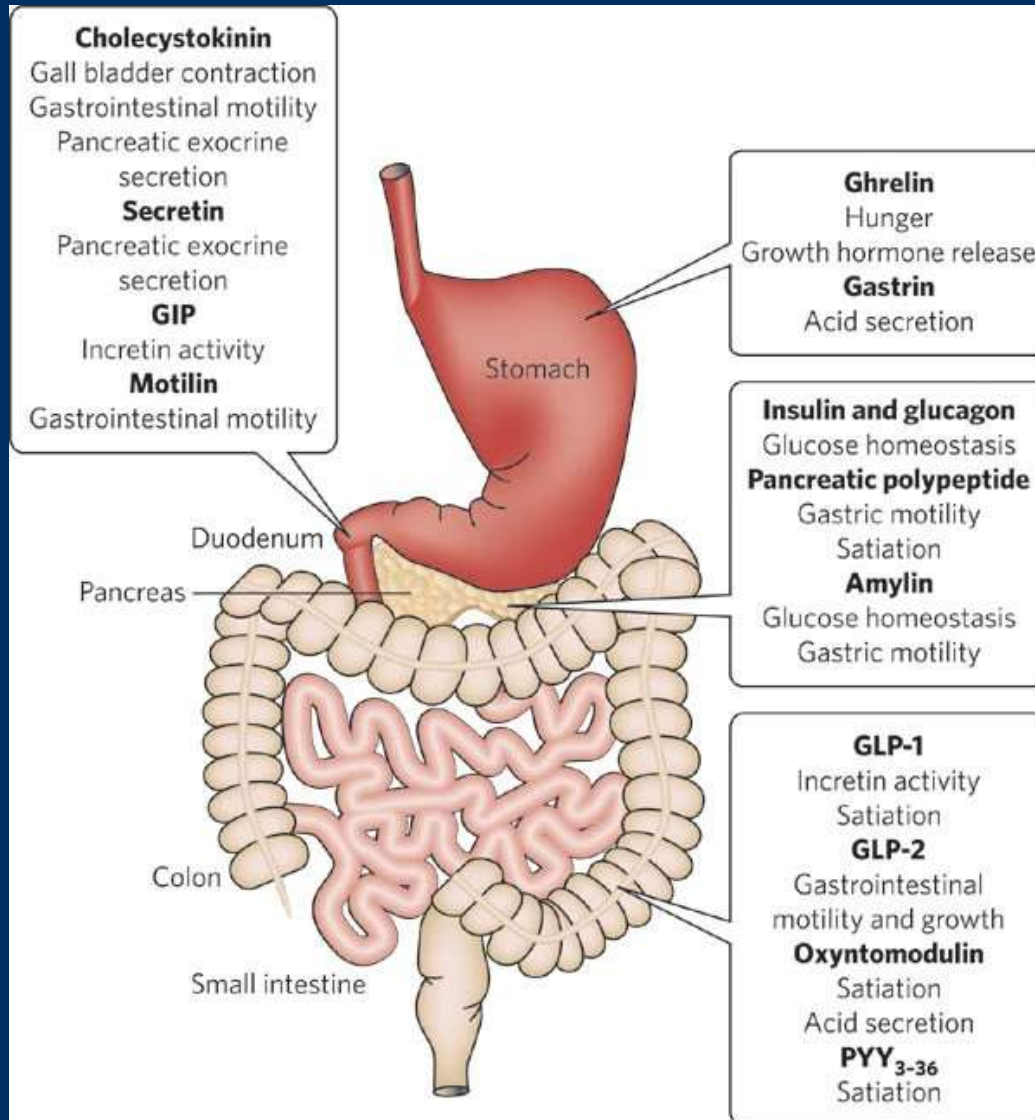


Biliopancreatic diversion with duodenal switch

Short term complications: Bleeding, infection, postoperative development of deep venous thrombosis, internal leaks at the incision site, respiratory problems, and death

Longer-term complications: malnutrition, vitamin and protein deficiencies, gastric dumping syndrome, anastomotic stricture, staple-line failure, internal hernia, adhesions, pouch dilatation, and failure to lose a sufficient amount of weight

Rationale for BAE



Ghrelin: Growth Hormone Release Inducing

produced in GI-Tract, specially in the stomach (75-90% in the gastric fundus)

„hunger hormone“

→ gastric motility

→ gastric acid secretion

→ initiates appetite via anterior pituitary gland and hypothalamic arcuate nucleus

→ influences regulation of reward cognition, learning and memory, the sleep-wake cycle, taste sensation, reward behavior, and glucose metabolism

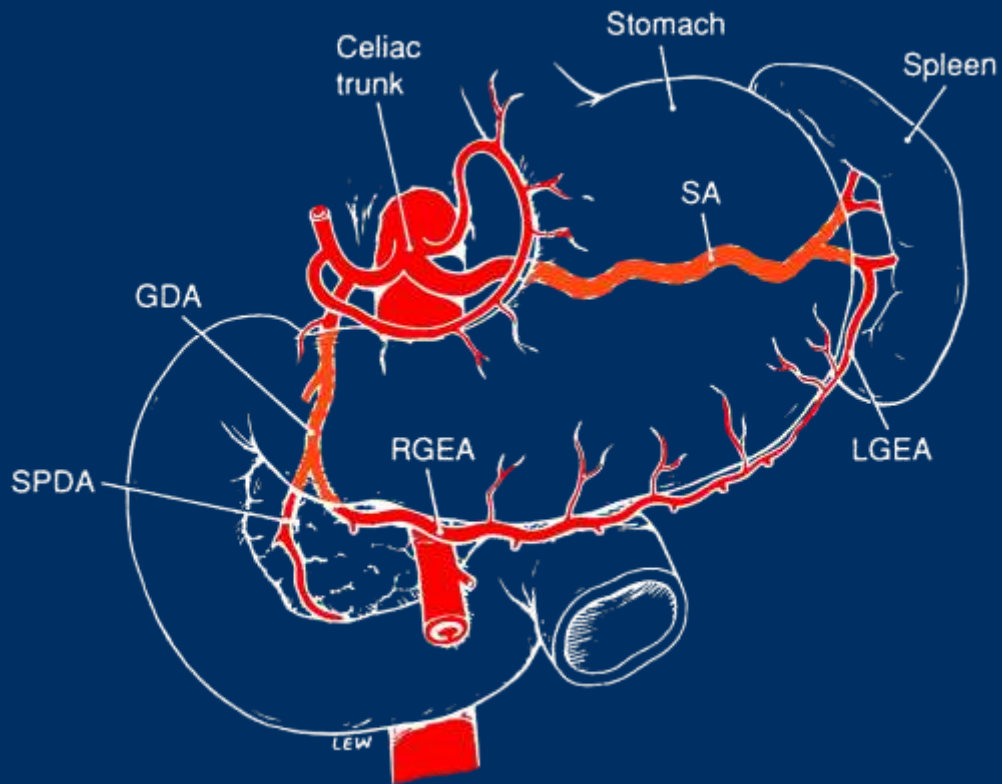
Murphy-KG, Nature 2006

BAE Technique

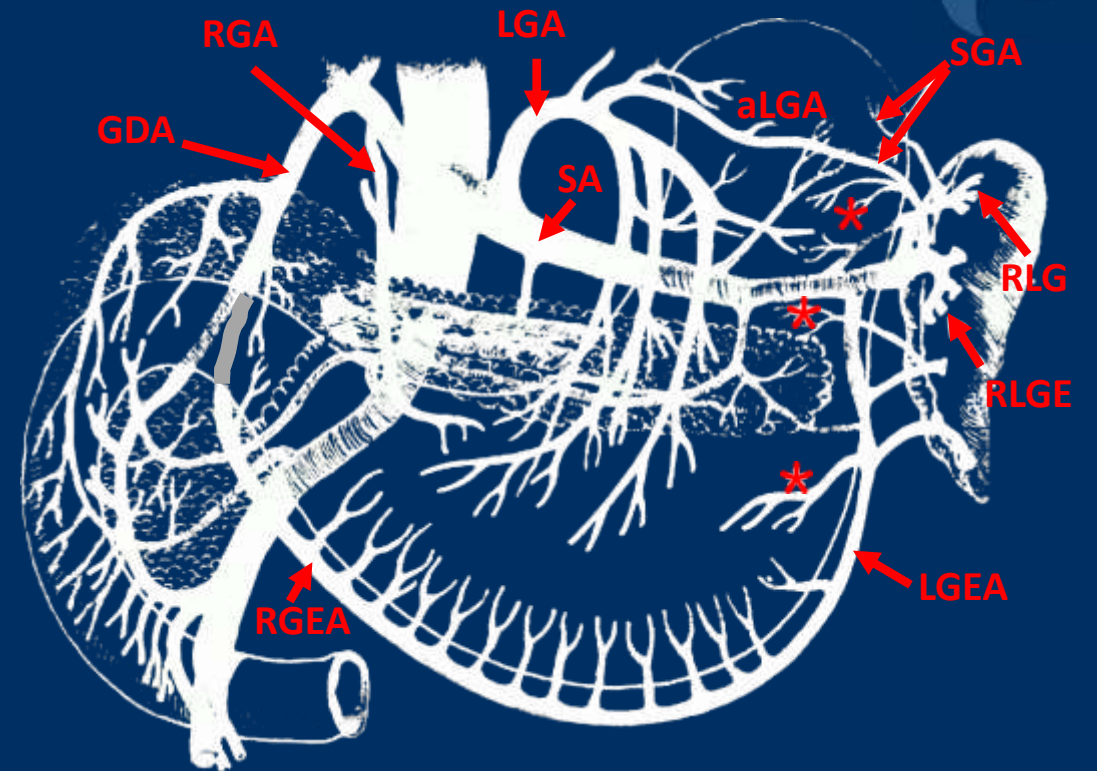
- angiography of coeliac trunc*
- selective angiography of left gastric artery (LGA)*
- selective spasmolysis via LGA: 2.5 mg Verapamil, 0.200 mg Nitroglycerine, 300 I.U. Heparin
- LGA embolization with Particles (300-500 μm , z.B. Embosphere[®]) upto 5 beats stasis
- selective angiography of gastroduodenal and gastroepiploic artery (GDA/GEA) and selective embolization of GEA, if GEA is feeding gastric fundus
- completion angiography*

* auxiliary CBCT possible CAVEAT: radiation dose

BAE Technique



SA: splenic artery; RGEA: right gastroepiploic artery; LGEA: left gastroepiploic artery; GDA: gastroduodenal artery; SPDA: superior pancreaticoduodenal artery



SA: splenic artery; LGA: left gastric artery; aLGA: accessory LGA; RGEA: right gastroepiploic artery; LGEA: left gastroepiploic artery; GDA: gastroduodenal artery; RLG: Ramus lieno-gastricus; SGA and asterisks: short gastric arteries

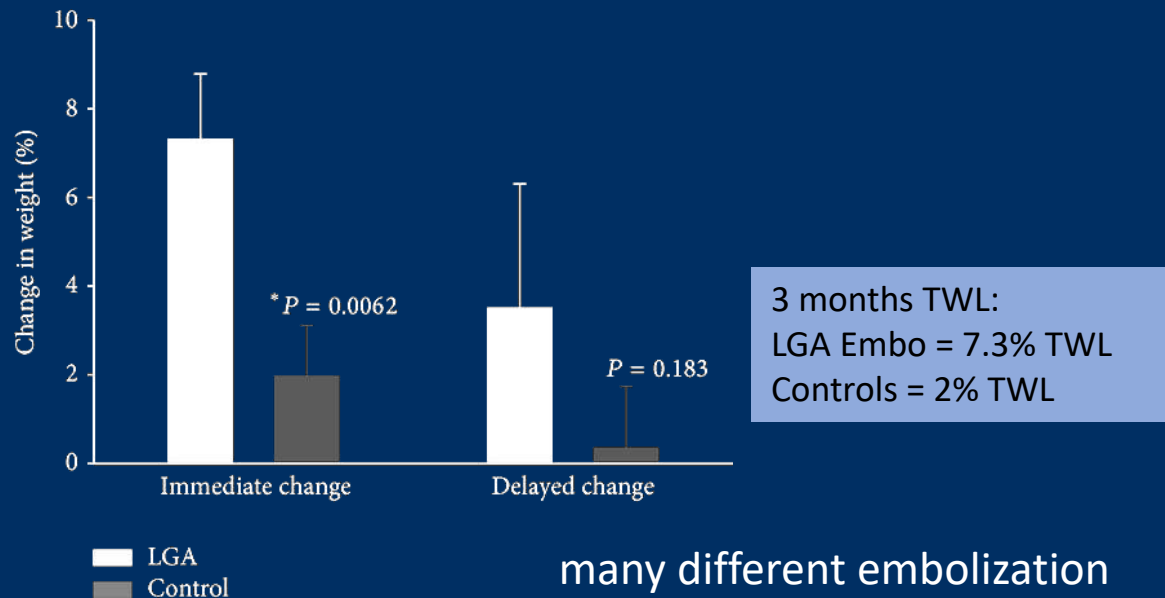
LGA and LGEA

LGA with filling defect in fundus

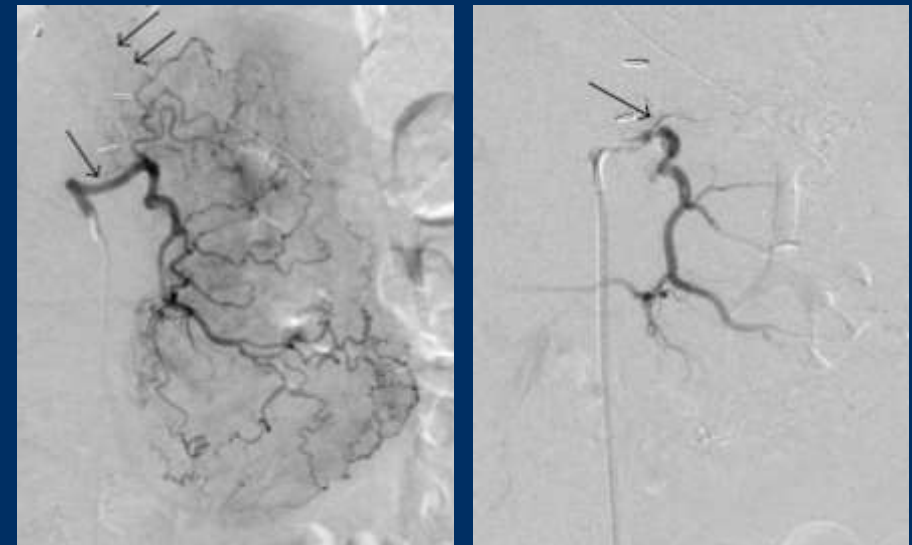


1st retrospective review

- retrospective review of patients with embolization of LGA because of endoscopically uncontrollable bleeding between 2000 and 2012 (n= 19)
- control group: embolisation of another coeliac trunc artery (n=28)
- underlying malignancy: LGA group 11/19; control group 14/28



many different embolization materials, mainly gelatine sponge



Gunn-AJ, J Obes 2014

Studies I

	Kipshidze-N, JACC 2015, doi: 10.1016/j.jcin.2015.07.016	Syed-MI, JVIR 2016 „Get lean“, doi: 10.1016/j.jvir.2016.07.010	Bai-ZB, Obes Surg 2018; doi: 10.1007/s11695-017-2979-9	Weiss-CR, Radiology 2019, „BEAT Obesity“; doi: 10.1148/radiol.2019182354	Summary
Patients	5	4	5	20	34
Follow-up	24 m	6 m	9 m	12 m	6-24 m
Average BMI	42.2 ± 6.8	42.4± 2.6	38.1± 3.8	45.1 ± 4.1	43.1
Embolic	300-500 µm BB	300-500 µm BB	500-710 µm PVA	300-500 µm ES	?
Total weight loss	17% @ 12 m	8.5% @ 6 m	12.6% @ 9 m	6%	8.8%
Minor AE	0	3	2	8*	13/34 (38%)
Major AE	0	0	0	0	0

m months
 BMI body mass index
 BB BeadBlock
 ES EmboSpheres
 PVA polyvinyl alcohol
 AE adverse events

* ulcers (small and superficial and healed at 3 months) (8/20); pancreatitis (subclinical and transient) (1/20); delayed gastric emptying @ 1 month (1/20)

Studies II

	Elens-S, CVIR 2019	Pirlet-C, Catheter Cardiovasc Interv 2019
Patients	19	7
Follow-up	12 m	12 m
Average BMI	28.9 ± 2.5	52 ± 8
Embolic	500-700 μm ES	300-500 μm PVA
Total weight loss	10%	6.8%
Minor AE	1*	3
Major AE	1*	0

m months
 BMI body mass index
 BB BeadBlock
 ES EmboSpheres
 PVA polyvinyl alcohol
 AE adverse events

* one gastric ulcer and one pancreatitis with gastric perforation

Complications

- ulcers
- gastric perforation
- puncture site bleeding
- non-target embolization
 - pancreatitis
- radiation exposure (obese patients)

Treatment gap?



RWL: relative weight loss

Target effectiveness levels for obesity (%TBL)

Level 1	Level 2	Level 3	Level 4
5 % observed mean TBL and statistical superiority to diet and exercise control	8 % observed mean TBL over sham and 50 % patients with 5 % TBL in treatment group	10 % observed mean TBL over sham and 50 % patients with 7 % TBL in treatment group	13 % observed mean TBL over sham and 50 % patients with 10 % TBL in treatment group
Measured at 6 months	Measured at 1 year	Measured at 2 years	Measured at 3 years

%TBL: percentage of total body loss

Proposal for a formal risked-based assessment to the FDA Gastroenterology and Urology Advisory Panel, 2011/12

Lerner-H, Surg Endosc 2013

Summary

- Bariatric Embolization (BAE)
 - new treatment method
 - animal studies & retrospective or single arm studies
 - no randomized study data
 - up to 10% total weight loss possible
 - durability of weight loss unclear

Thank you

Ideal body weight (IBW)

- **Devine formula**

- The Devine formula for calculating ideal body weight in adults is as follows:[8]

- Male ideal body weight = 50 kilograms (110 lb) + 0.9 kilograms (2.0 lb) × (height (cm) – 152)

- Female ideal body weight = 45.5 kilograms (100 lb) + 0.9 kilograms (2.0 lb) × (height (cm) – 152)

- **Hamwi method**

- The Hamwi method is used to calculate the ideal body weight of the general adult:[9]

- Male ideal body weight = 48 kilograms (106 lb) + 1.1 kilograms (2.4 lb) × (height (cm) – 152)

- Female ideal body weight = 45.4 kilograms (100 lb) + 0.9 kilograms (2.0 lb) × (height (cm) – 152)