Metabolische Veränderungen nach bariatrischen Eingriffen

Michael Trauner

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Gastroenterologie und Hepatologie

Univ. Klinik für Innere Medizin III

MEDIZINISCHE UNIVERSITÄT WIEN

Wiener Gesundheitsverbund
Universitätsklinikum AKH Wien

Offenlegung potentieller Interessenkonflikte

Beratungstätigkeit

Abbvie, Albireo, BiomX, Boehringer Ingelheim, Falk, Gilead, Genfit, Hightide, Intercept, Novartis, Pliant, Regulus, Siemens, Shire

Honorare (Vortragender)

Albireo, Falk, Gilead, Intercept, Madrigal

Finanzierung von Kongressteilnahmen

AbbVie, Falk, Gilead, Intercept, Jannsen

Finanzierung wissenschaftlicher Forschungsprojekte

Albireo, Alnylam, Cymabay, Falk, Gilead, Intercept, MSD, Takeda, Ultragenyx

Andere finanzielle Beziehungen

Miterfinder *nor*UDCA Patente (Diensterfindungen)

Metabolische Veränderungen nach bariatrischen Eingriffen

Zentrale Aspekte der nächsten 15 min

- **Intestinale Maladaptation bei Adipositas & Diabetes**
  - Diabetische Duodenopathie
  - Diabetes als eine Erkrankung des Duodenums?
- **Ergebnisse der metabolischen Endoskopie (EBMT)**
  - Fokus auf MASLD
- **Ergebnisse der bariatrischen/metabolischen Chirurgie (BMS)**

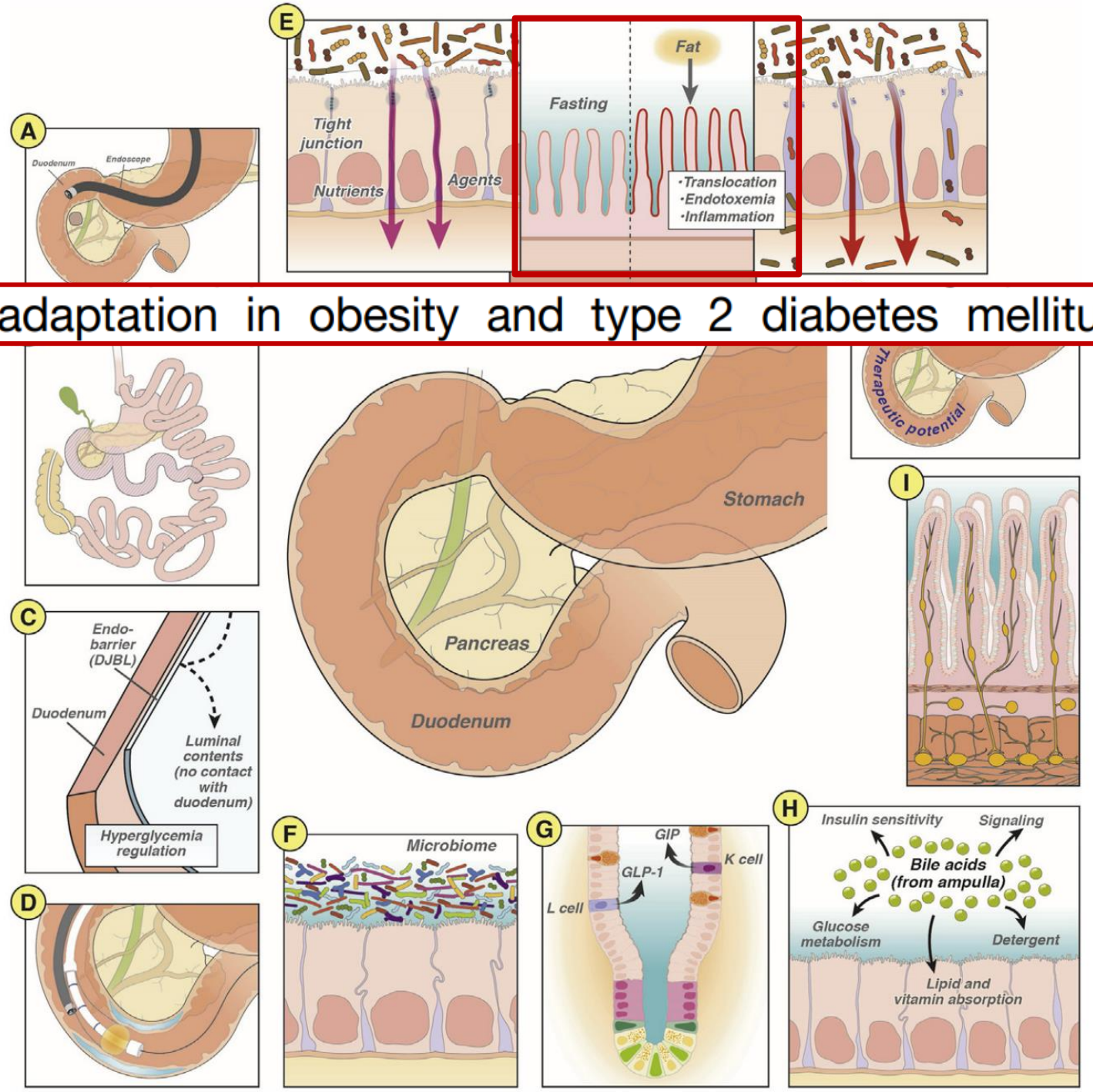
Intestinale Maladaptation & Duodenum

COMMENTARIES

The duodenum harbors a broad untapped therapeutic potential

JACQUES J. G. H. M. BERGMAN
Academic Medical Center
Amsterdam, the Netherlands

Gastroenterology 2018;154:773–777



(*E*) Intestinal mucosal maladaptation in obesity and type 2 diabetes mellitus.

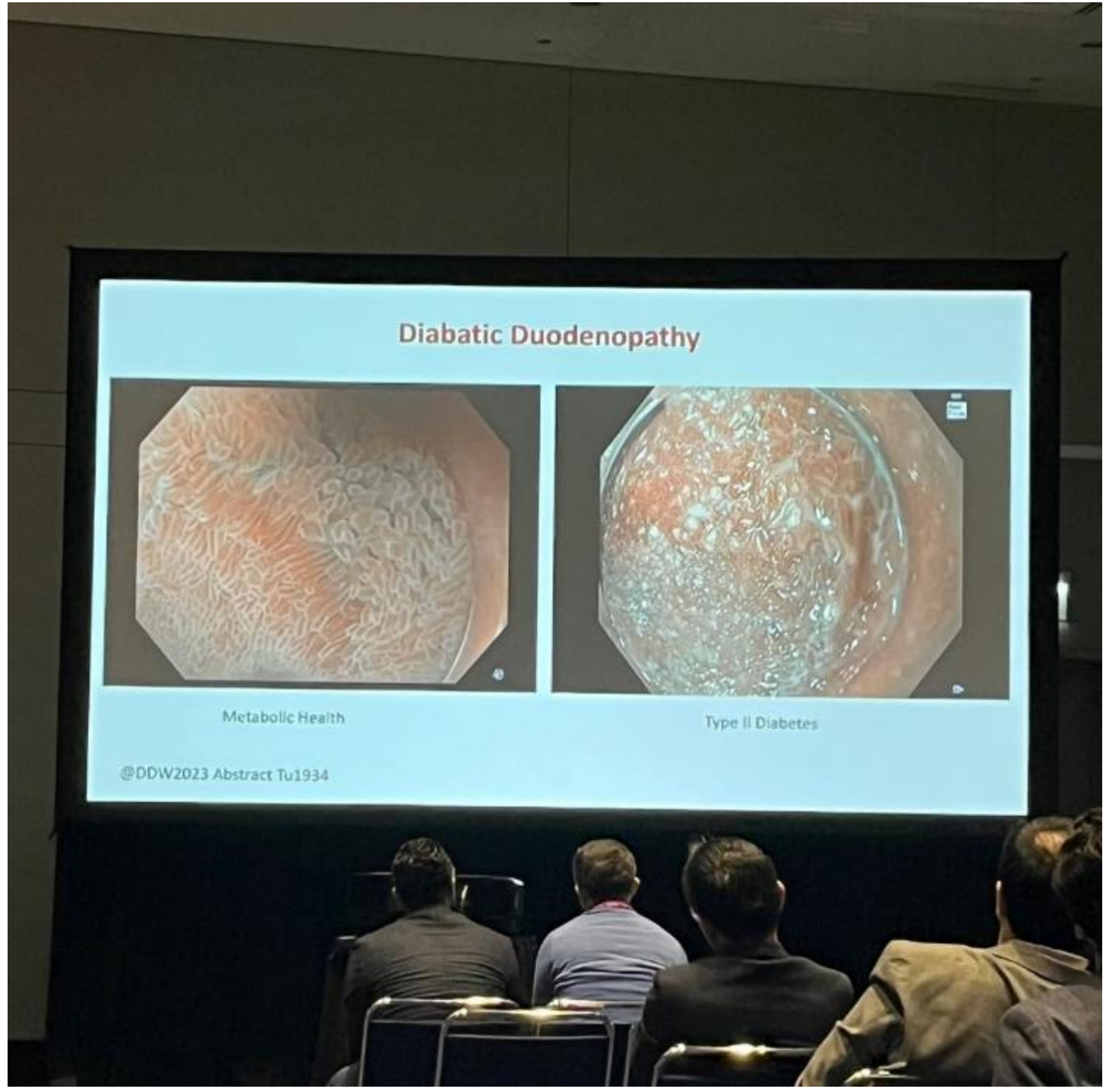
Tu1934

ASGE New Technology IV

INNOVATIVE DETECTION OF DIABETIC DUODENOPATHY USING ARTIFICIAL INTELLIGENCE: A LARGE FEASIBILITY STUDY

Farah Abdul Razzak, gary yao, Jean Clemenceau, Roger Moreira, Minji Kim, Donna Maria Abboud, Anthony Kerbage, Karim Al Annan, Rudy Mrad, Vitor Brunaldi, Khushboo Gala, Babusai Rapaka, Jacques Bergman, Annieke Van Baar, hannah gilliam-vigh, Rabih Ghazi, Eric Vargas, Andrew Storm, Serge Baroud, Adrian Sartortetto, Tae Hyun Hwang, Barham Abu Dayyeh

Institutions: Mayo Clinic Minnesota, USA; Mayo Foundation for Medical Education

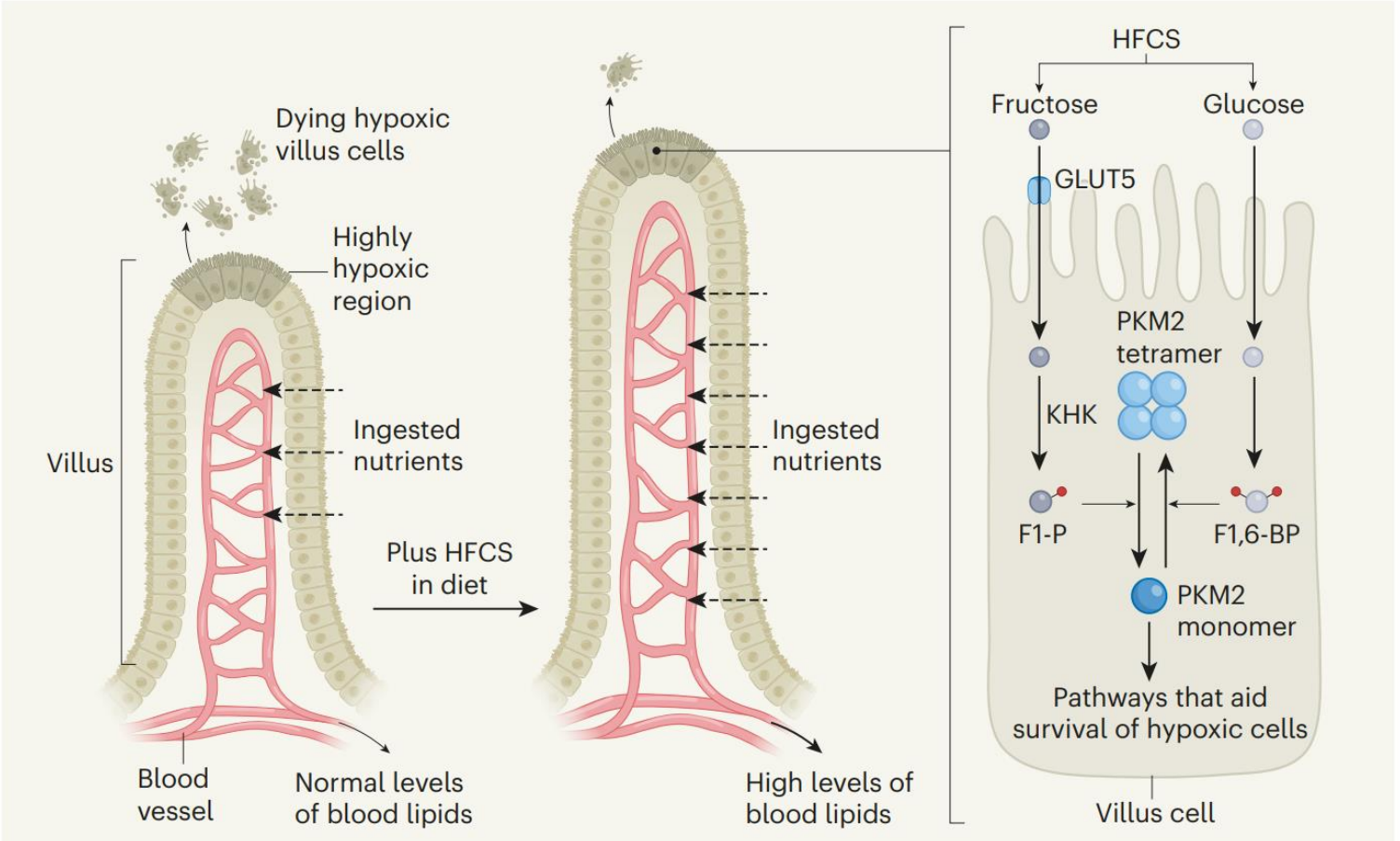

Diabatic Duodenopathy
Metabolic Health
Type II Diabetes
@DDW2023 Abstract Tu1934

Metabolism

Dietary fructose expands the gut and aids fat uptake

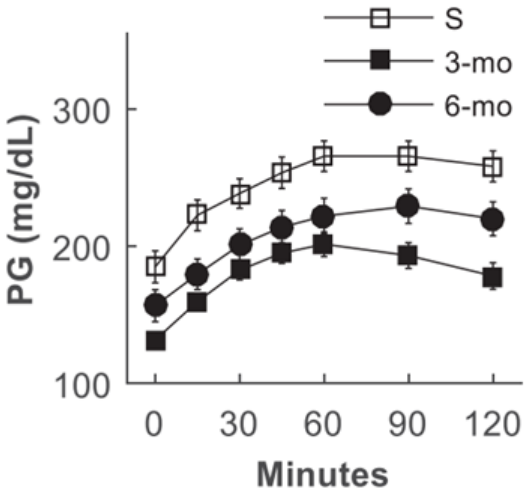
Patrícia M. Nunes & Dimitrios Anastasiou

Feeding mice high-fructose corn syrup, a widely used sweetener in human diets, has been found to drive an increase in the surface area of the gut that is associated with enhanced absorption of dietary nutrients and weight gain. **See p.263**



Endoscopic Duodenal Mucosal Resurfacing for the Treatment of Type 2 Diabetes: 6-Month Interim Analysis From the First-in-Human Proof-of-Concept Study

Diabetes Care 2016;39:2254–2261 | DOI: 10.2337/dc16-0383

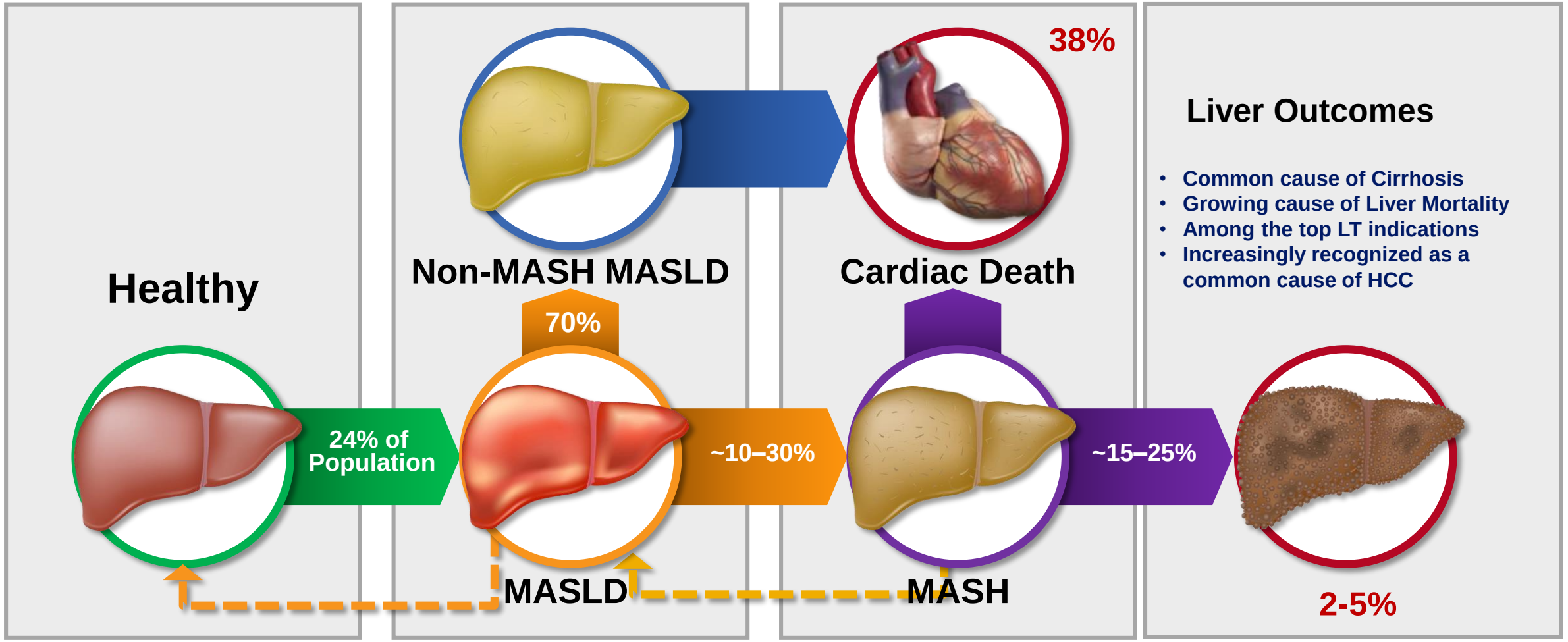


Metabolische Endoskopie - Endobariatrics

EBMT: endoscopic bariatric and metabolic therapies

MASLD: metabolic dysfunction-associated steatotic liver disease

Liver and Non-Liver Outcomes of NAFLD / MASLD



1. Fazel Y, et al. *Metab Clin Exp*. 2016;65(8):1017-1025; 2. Sayiner M, et al. *Clin Liver Dis.* 2016;20(2):205-214;
3. Younossi ZM, et al. *Hepatology.* 2016; 64(5):1577-1586

Slide Courtesy Z. Younossi

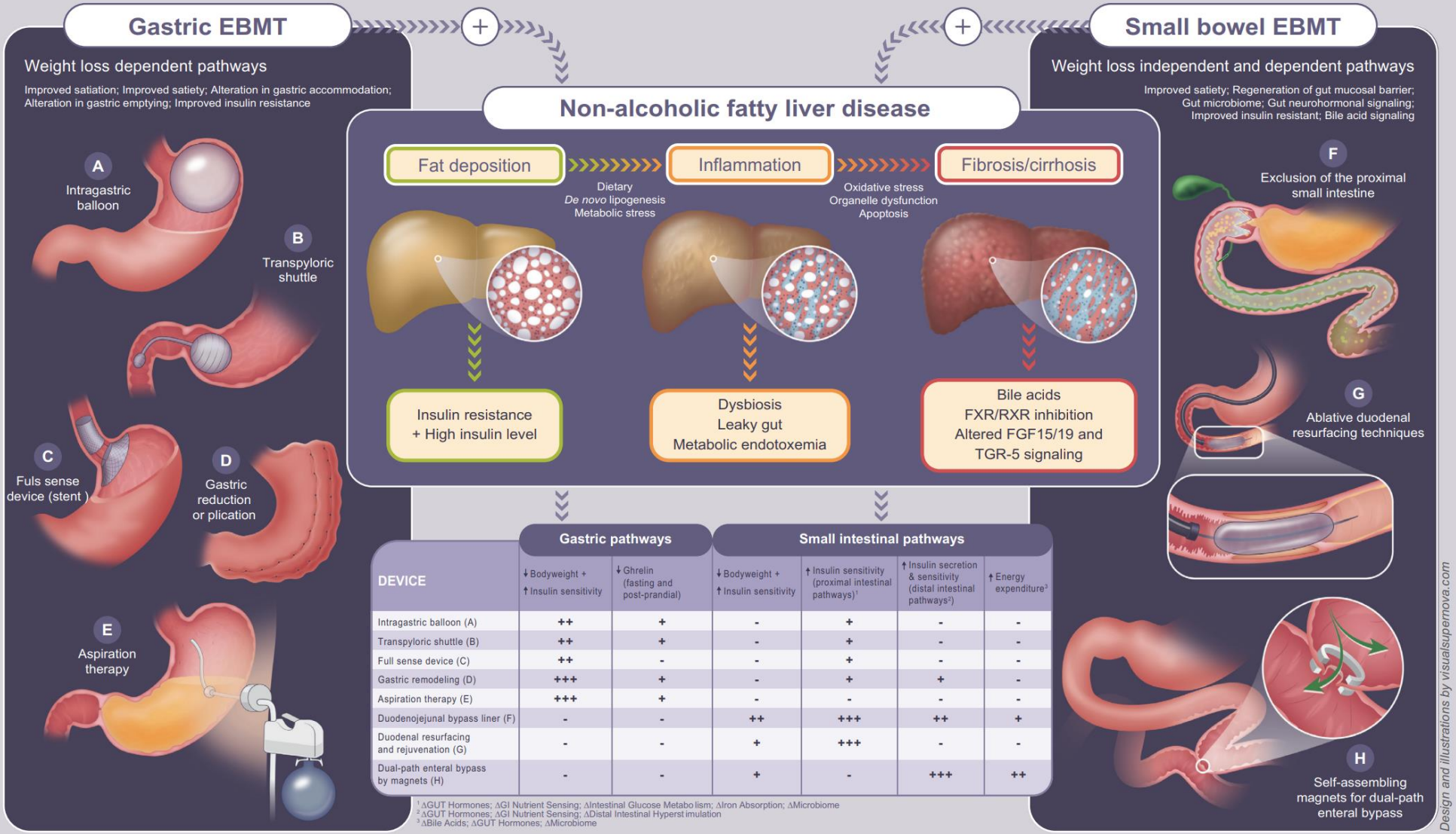
JOURNAL OF HEPATOLOGY

Hepatology Snapshot:

Endoscopic bariatric and metabolic therapies for non-alcoholic fatty liver disease

Barham K. Abu Dayyeh[1], Fateh Bazerbachi[2], Isabel Graupera[3], Andres Cardenas[3]

[1]Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, Minnesota, USA;
[2]Division of Gastroenterology, Interventional Endoscopy Program, Harvard Medical School and Massachusetts General Hospital, Boston, Massachusetts, USA;
[3]GI & Liver Unit, Institute of Digestive Diseases and Metabolism at Hospital Clinic and University of Barcelona Spain



	Gastric pathways		Small intestinal pathways			
DEVICE	↓ Bodyweight + ↑ Insulin sensitivity	↓ Ghrelin (fasting and post-prandial)	↓ Bodyweight + ↑ Insulin sensitivity	↑ Insulin sensitivity (proximal intestinal pathways)[1]	↑ Insulin secretion & sensitivity (distal intestinal pathways[2])	↑ Energy expenditure[3]
Intragastric balloon (A)	++	+	-	+	-	-
Transpyloric shuttle (B)	++	+	-	+	-	-
Full sense device (C)	++	-	-	+	-	-
Gastric remodeling (D)	+++	+	-	+	+	-
Aspiration therapy (E)	+++	+	-	-	-	-
Duodenojejunal bypass liner (F)	-	-	++	+++	++	+
Duodenal resurfacing and rejuvenation (G)	-	-	+	+++	-	-
Dual-path enteral bypass by magnets (H)	-	-	+	-	+++	++

[1] ΔGUT Hormones; ΔGI Nutrient Sensing; ΔIntestinal Glucose Metabolism; ΔIron Absorption; ΔMicrobiome
[2] ΔGUT Hormones; ΔGI Nutrient Sensing; ΔDistal Intestinal Hyperstimulation
[3] ΔBile Acids; ΔGUT Hormones; ΔMicrobiome

Keywords: endoscopy; bariatric; NASH; cirrhosis; obesity; diabetes; NAFLD; endoscopic bariatric ; metabolic therapies.
Received 15 March 2019; received in revised form 17 June 2019; accepted 12 July 2019

EBMTs for MASLD/NAFLD

DEVICE	Gastric pathways		Small intestinal pathways			
	↓ Bodyweight + ↑ Insulin sensitivity	↓ Ghrelin (fasting and post-prandial)	↓ Bodyweight + ↑ Insulin sensitivity	↑ Insulin sensitivity (proximal intestinal pathways)[1]	↑ Insulin secretion & sensitivity (distal intestinal pathways[2])	↑ Energy expenditure[3]
Intragastric balloon (A)	++	+	-	+	-	-
Transpyloric shuttle (B)	++	+	-	+	-	-
Full sense device (C)	++	-	-	+	-	-
Gastric remodeling (D)	+++	+	-	+	+	-
Aspiration therapy (E)	+++	+	-	-	-	-
Duodenojejunal bypass liner (F)	-	-	++	+++	++	+
Duodenal resurfacing and rejuvenation (G)	-	-	+	+++	-	-
Dual-path enteral bypass by magnets (H)	-	-	+	-	+++	++

[1] ΔGUT Hormones; ΔGI Nutrient Sensing; ΔIntestinal Glucose Metabo lism; ΔIron Absorption; ΔMicrobiome
[2] ΔGUT Hormones; ΔGI Nutrient Sensing; ΔDistal Intestinal Hyperst imulation
[3] ΔBile Acids; ΔGUT Hormones; ΔMicrobiome

Abu Dayyeh et al., *J Hepatol* 2019;71:1246-48

Effect of EBMTs on metabolic outcomes

EBMT	Time of follow-up	HbA1c (%)	HOMA-IR	HDL (mg/dL)	LDL (mg/dL)	Triglyceride (mg/dL)	Total cholesterol (mg/dL)	SBP (mm Hg)	ALT (IU/L)	Hepatic steatosis	Hepatic fibrosis
IGB[8–11]	3 mo										
	6 mo	−0.6[a]	Improved in 64.5% of patients with NAFLD			−30.8[a]		−9.1[a] −8.3[a]	−10.02[a]	Significant decrease in fat fraction (16.7 at baseline, 7.6 post-IGB	−3 points in NAS. Improvement in 90% of patient
	12 mo										
TPS[13]	3 mo	–	–	–	–	–	–	–	–	–	–
	6 mo	–	–	–	–	–	–	–	–	–	–
	12 mo	–	−0.6[a]		−15.2[a]	−47.9[a]	−13.5[a]	−8.0[a]	–	–	–
POSE[16]	3 mo	–	–	–	–	–	–	–	–	–	–
	6 mo	−0.09	+1.72		−5.51	−10.9	−5.95	−8.64	–	–	–
	12 mo	−0.07	+3.15		−6.81[a]	−11.5	−7.07	−4.78	–	–	–
ESG[25,31,32]	3 mo	–	–	–	–	–	–	–	–	–	–
	6 mo	–	–	–	–	–	–	–	−10.04[a]	–	−0.43[a] NFS
	12 mo	−1.0[a]	−1.7/year[a]			−39.48[a]	–	−6.79[a]	−11.6[a]	−4 points/ year in HSI[a]	−0.78[a] NFS −0.3 points/ year in NAS
DMR[38,39]	3 mo	−1.72[a]	–	–	–	–	–	–	−10.48[a]	−6.59[a] HSI	–
	6 mo	−0.94[a]	–	–	–	–	–	–	−16.84[a]	–	–
	12 mo	−0.9[a]	−2.9[a]	–	–	–	–	–	−10	–	–
DJBL[40,41]	3 mo	–	–	–	–	–	–	–	–	–	–
	6 mo	−1.3[a]	−4.6[a]	−0.73	−11.6[a]	−11.6	−27.1[a]	−15.0	–	–	–
	12 mo	–	–	0.0	+3.9	+7.7	0.0	−17.0	–	–	–
PJD[42]	3 mo	–	–	–	–	–	–	–	–	–	–
	6 mo	–	–	–	–	–	–	–	–	–	–
	12 mo	−1.9[a]	–	–	–	–	–	–	–	–	–

Ghazi … Abu Dayyeh, *J Digest Endosc* 2022;13:170–178

Effect of EBMTs on metabolic outcomes

HbA1c (%)	HOMA-IR	HDL (mg/dL)	LDL (mg/dL)	Triglyceride (mg/dL)	Total cholesterol (mg/dL)	SBP (mm Hg)	ALT (IU/L)	Hepatic steatosis	Hepatic fibrosis

Variable improvements

Obesity Surgery (2023) 33:725–732
https://doi.org/10.1007/s11695-022-06437-7

ORIGINAL CONTRIBUTIONS

Intragastric Balloon Significantly Improves Metabolic Parameters at 6 Months: a Meta-Analysis

Obesity Surgery (2023) 33:2917–2926
https://doi.org/10.1007/s11695-023-06747-4

REVIEW

Impact of Endoscopic Sleeve Gastroplasty in Non-alcoholic Fatty Liver Disease: a Systematic Review and Meta-analysis

Clinical Gastroenterology and Hepatology 2020;18:1043–1053

SYSTEMATIC REVIEWS AND META-ANALYSES

Siddharth Singh, Section Editor

Efficacy and Safety of Endoscopic Sleeve Gastroplasty: A Systematic Review and Meta-Analysis

Obesity Surgery (2021) 31:1304–1312
https://doi.org/10.1007/s11695-020-05170-3

REVIEW

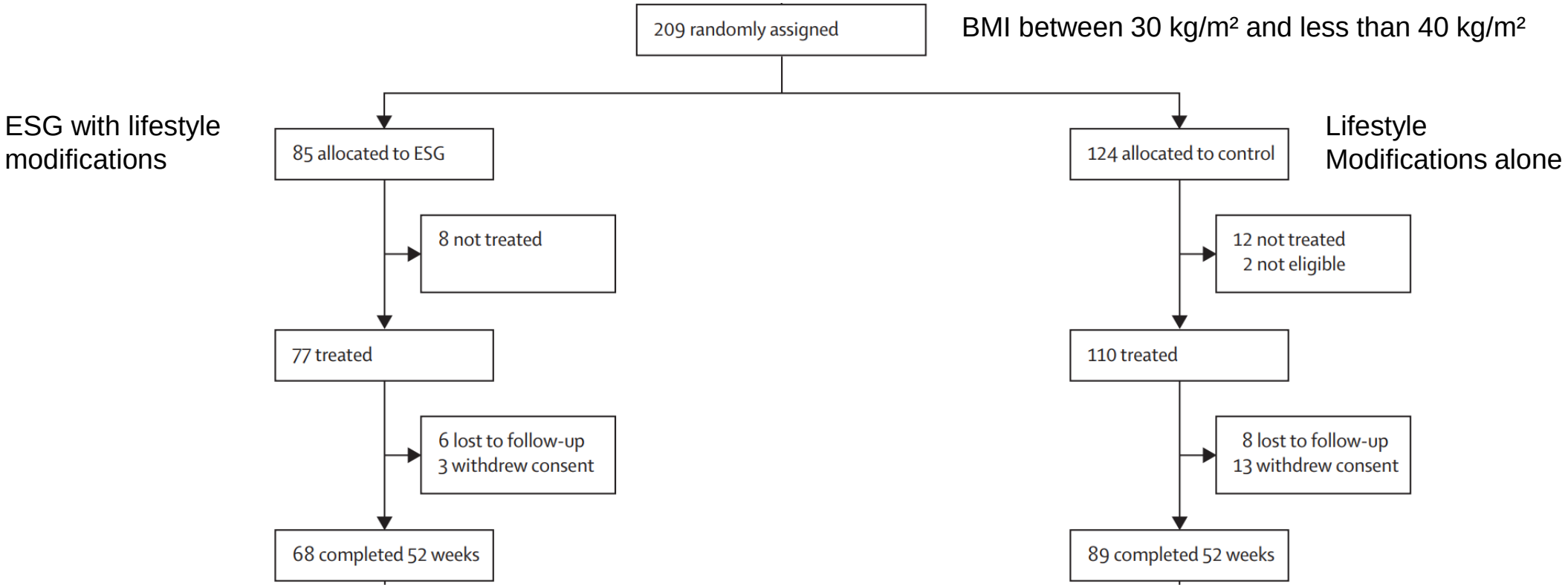
Metabolic Effects of Endoscopic Duodenal Mucosal Resurfacing: a Systematic Review and Meta-analysis

Ghazi … Abu Dayyeh, *J Digest Endosc* 2022;13:170–178

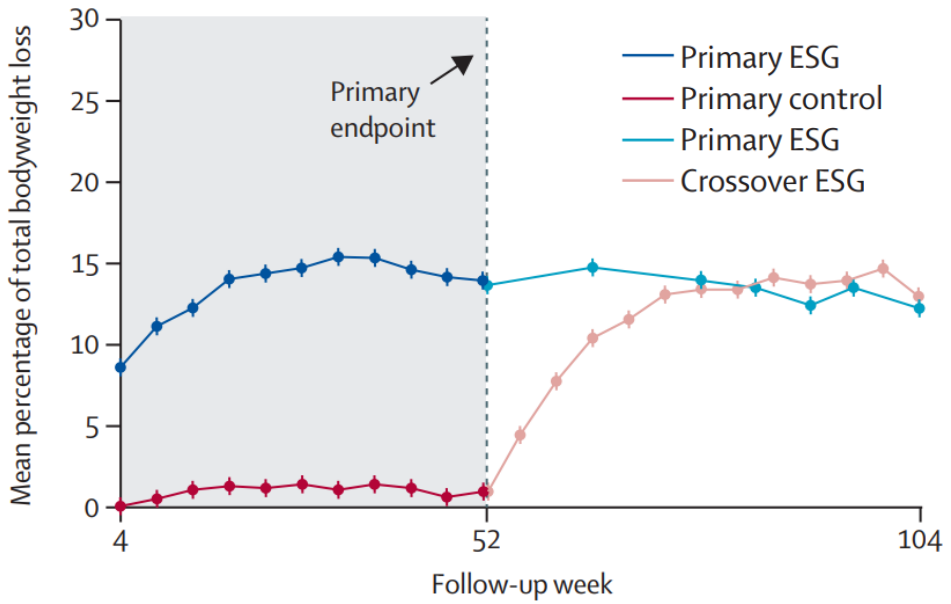
Endoscopic sleeve gastroplasty for treatment of class 1 and 2 obesity (MERIT): a prospective, multicentre, randomised trial

Lancet 2022; 400: 441–51

Barham K Abu Dayyeh, Fateh Bazerbachi, Eric J Vargas, Reem Z Sharaiha, Christopher C Thompson, Bradley C Thaemert, Andre F Teixeira, Christopher G Chapman, Vivek Kumbhari, Michael B Ujiki, Jeanette Ahrens, Courtney Day, the MERIT Study Group, Manoel Galvao Neto, Natan Zundel, Erik B Wilson



Endoscopic sleeve gastroplasty for treatment of class 1 and 2 obesity (MERIT): a prospective, multicentre, randomised trial



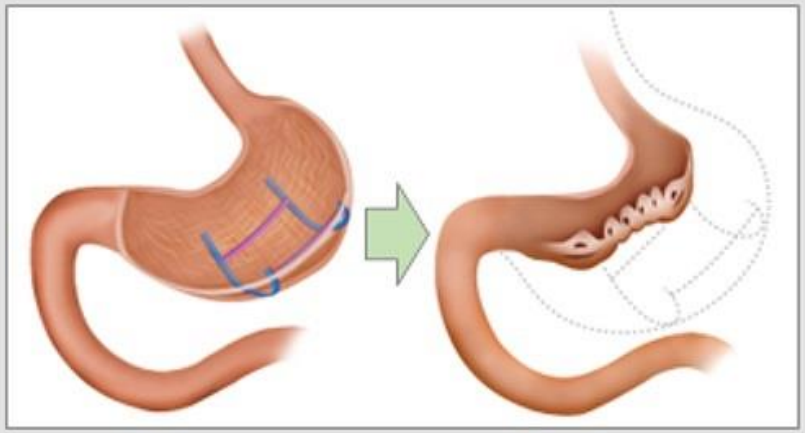
At 52 weeks, ESG achieved an average of 12,6% decrease in percentage of total bodyweight compared with controls

	ESG (primary)	Control
Diabetes		
Improving	92% (12/13; 65 to 100)	15% (4/27; 5 to 33)
Worsening	0% (0/13; 0 to 27)	44% (12/27; 28 to 63)
Hyperlipidaemia		
Improving	40% (6/15; 20 to 64)	32% (8/25; 17 to 52)
Worsening	27% (4/15; 11 to 52)	28% (7/25; 14 to 48)
Hypertension		
Improving	67% (24/36; 50 to 80)	40% (19/48; 27 to 54)
Worsening	6% (2/36; 1 to 19)	23% (11/48; 13 to 37)
Metabolic syndrome		
Improving	83% (24/29; 65 to 93)	35% (10/29; 20 to 53)
Worsening	0% (0/29; 0 to 14)	38% (11/29; 23 to 56)
Effect on multiple comorbid conditions		
Improved at least 1 condition	41 (80%; n=51)	28 (45%; n=62)
Worsened at least 1 condition	6 (12%; n=51)	31 (50%; n=62)

80% in the ESG group with baseline comorbidities had an improvement in one or more metabolic comorbidities

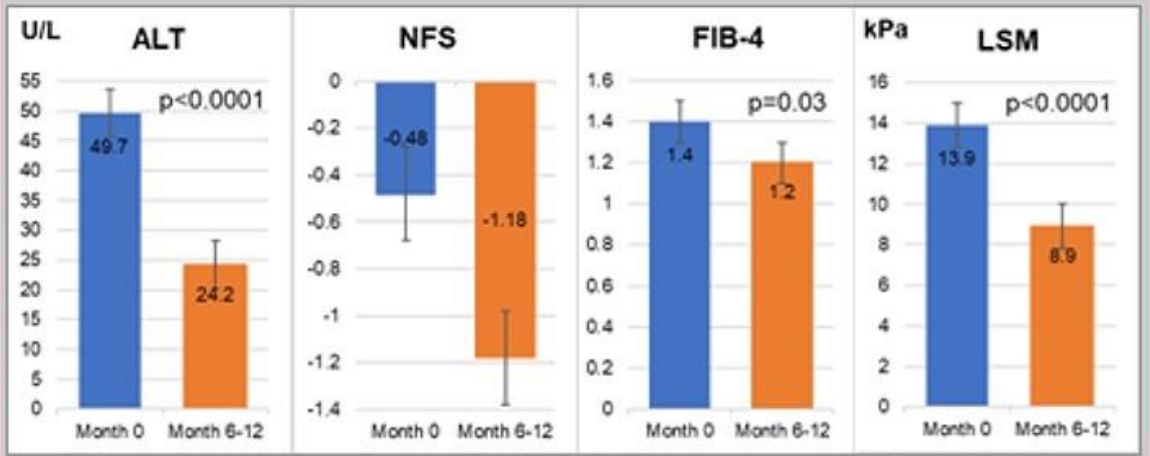
Effect of Endoscopic Gastric Plication on Hepatic Fibrosis in Patients with Nonalcoholic Fatty Liver Disease

Endoscopic Gastric Plication



- 45 patients with obesity and NAFLD and F2-F4 fibrosis
- All underwent endoscopic gastric plication to reduce gastric volume

Significant improvements in non-invasive tests for hepatic fibrosis



ALT: alanine aminotransferase, NFS: NAFLD fibrosis score, FIB-4: fibrosis-4 index, LSM: liver stiffness measurement on vibration-controlled transient elastography

- At 12 months, patients experienced 15.5% total weight loss and improvements in insulin resistance and hemoglobin A1c

Jirapinyo et al. *Am J Gastroenterol.* 2022. doi:10.14309/ajg.0000000000002087

AJG The American Journal of GASTROENTEROLOGY

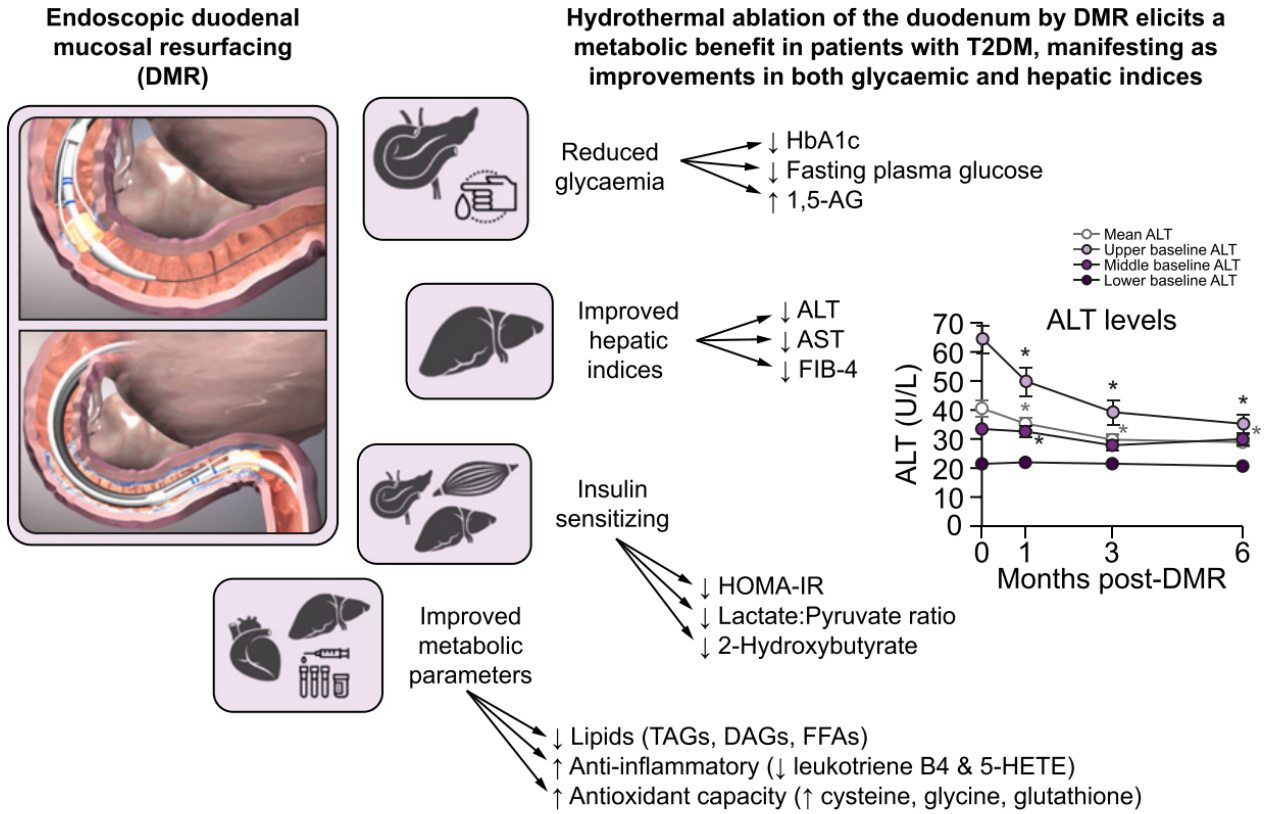
OFFICIAL JOURNAL OF THE AMERICAN COLLEGE OF GASTROENTEROLOGY | ACG

Research Article JHEP|Reports

Endoscopic duodenal mucosal resurfacing improves glycaemic and hepatic indices in type 2 diabetes: 6-month multicentre results

Highlights

- Duodenal mucosal resurfacing elicits a metabolic benefit in patients with T2DM.
- At 6 months post-duodenal mucosal resurfacing, HbA1c decreases by 1.0-1.5%.
- In patients with high ALT baseline levels, duodenal mucosal resurfacing elicits an ALT reduction of ~40–50%.
- FIB-4 scores decrease significantly after duodenal mucosal resurfacing.
- Duodenal mucosal resurfacing elicits insulin-sensitizing, lipid-lowering, anti-inflammatory, and antioxidant effects



Van Baar et al., *JHEP Reports* 2019; 1: 429-436

ORIGINAL RESEARCH

Endoscopic duodenal mucosal resurfacing for the treatment of type 2 diabetes mellitus: one year results from the first international, open-label, prospective, multicentre study

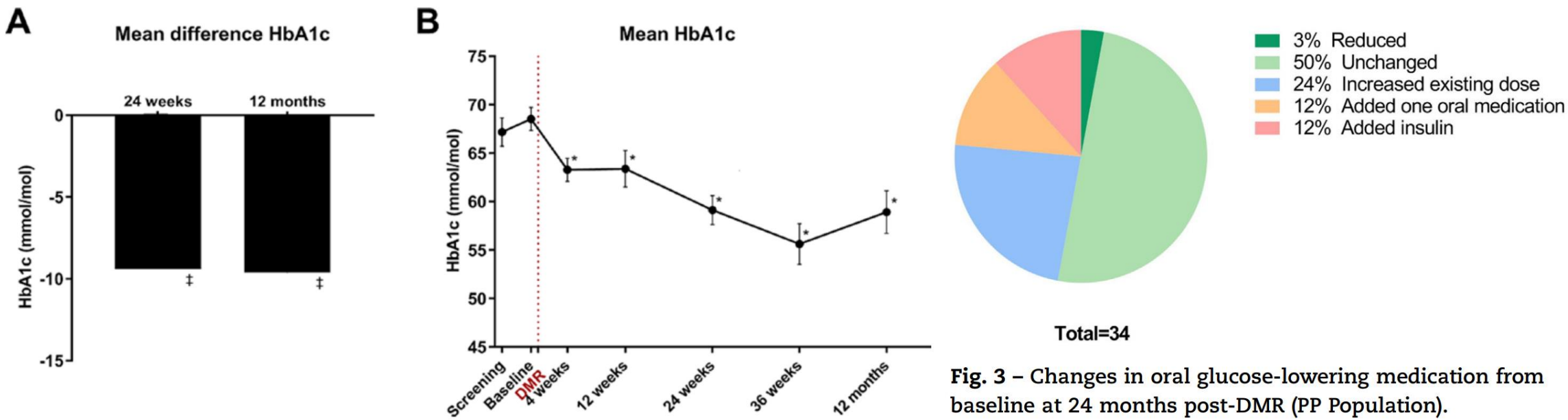


Fig. 3 – Changes in oral glucose-lowering medication from baseline at 24 months post-DMR (PP Population).

Van Baar et al., *Diabetes Res Clin Pract* 2022

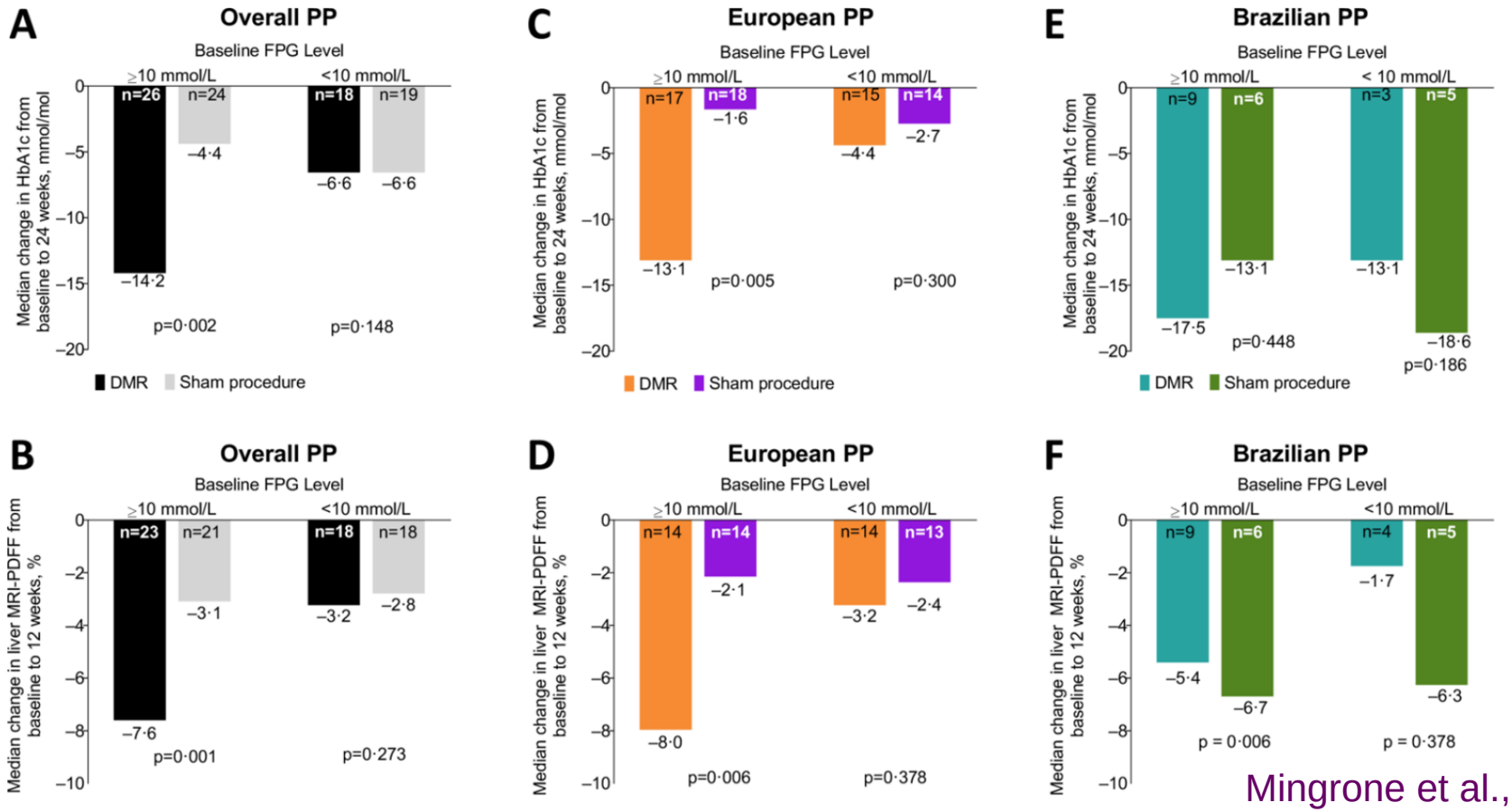
Van Baar et al., *Gut* 2020;69:295-303

Original research

Safety and efficacy of hydrothermal duodenal mucosal resurfacing in patients with type 2 diabetes: the randomised, double-blind, sham-controlled, multicentre REVITA-2 feasibility trial

HbA1c

MRI-PDFF



Mingrone et al., *Gut* 2022;71:254-264

Bariatrische / Metabolische Chirurgie (BMS)

Fokus auf MASLD / MASH

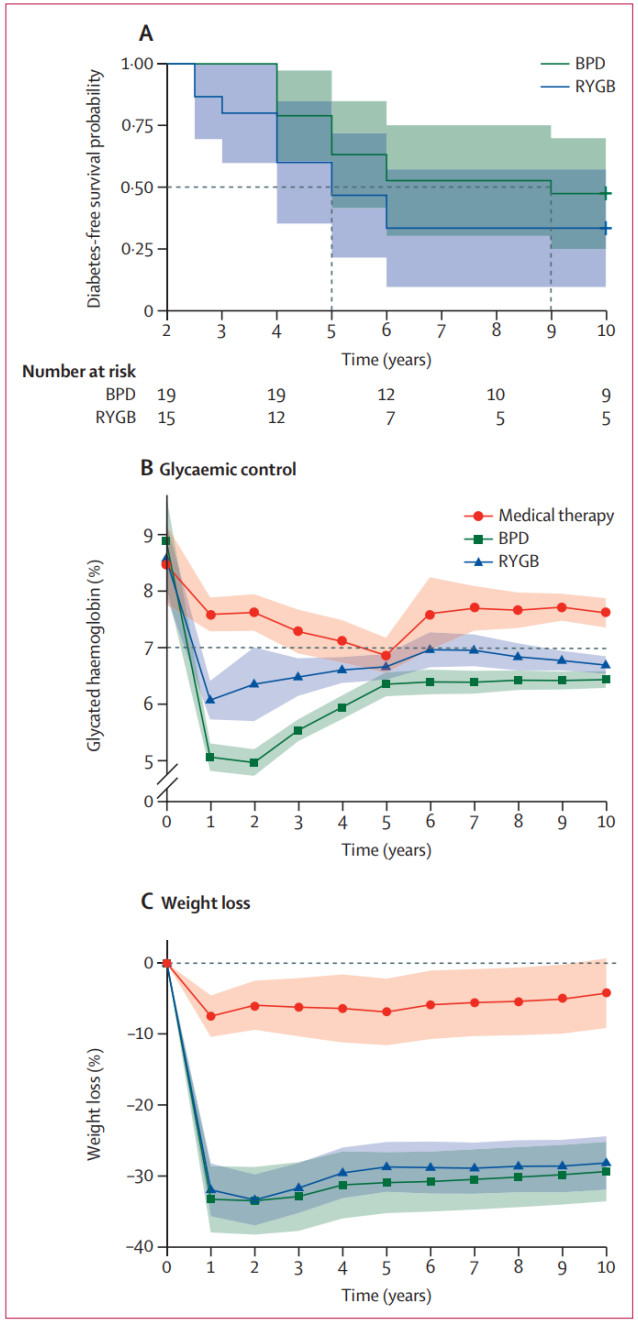
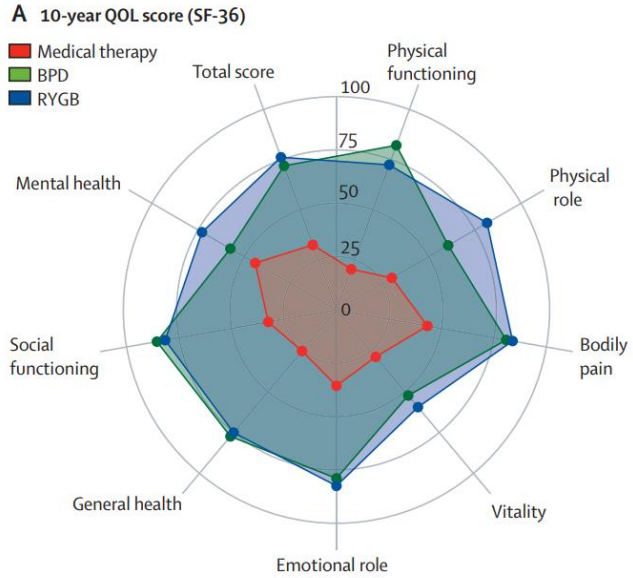
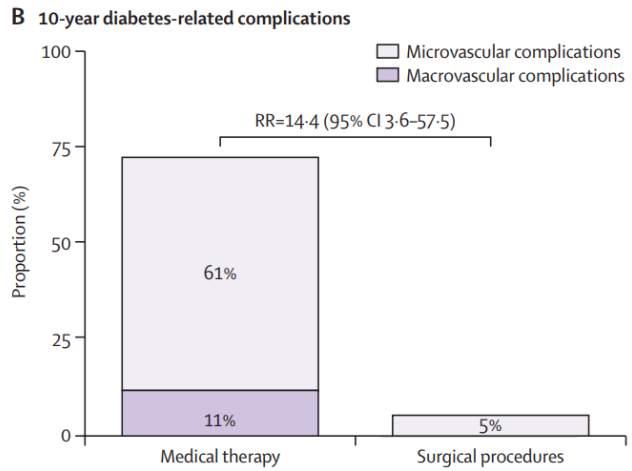


Figure 2: Remission, glycaemic control, and weight loss

Metabolic surgery versus conventional medical therapy in patients with type 2 diabetes: 10-year follow-up of an open-label, single-centre, randomised controlled trial

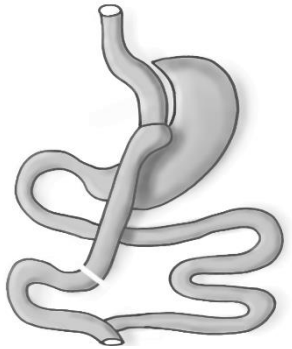
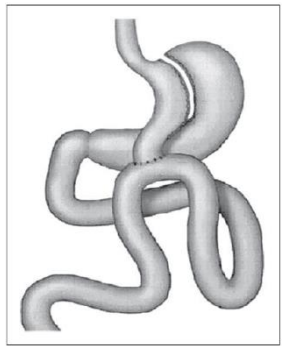
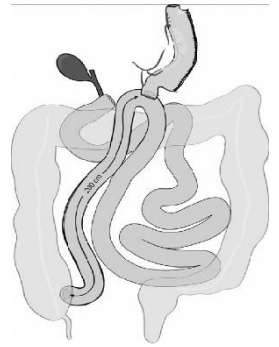
Geltrude Mingrone, Simona Panunzi, Andrea De Gaetano, Caterina Guidone, Amerigo Iaconelli, Esmeralda Capristo, Ghassan Chamseddine, Stefan R Bornstein, Francesco Rubino





Surgery induced continued 10-year remission of diabetes (HbA1c<6,5%) without the need for ongoing pharmacological treatment in 37% of patients with advanced type 2 diabetes at baseline

Lancet 2021; 397: 293–304

	Sleeve	RYGB	OAGB	SADI-S
TWL (2a)	25-35%	25-35%	35-45%	35-50%
Diabetes Remission (2a)	60-80%	60-80%	75-90%	80-95%
Need for supplementation				

Slide Courtesy Gerhard Prager

Evidence for effect of bariatric endoscopic and surgical procedures in MASLD/NAFLD outcomes

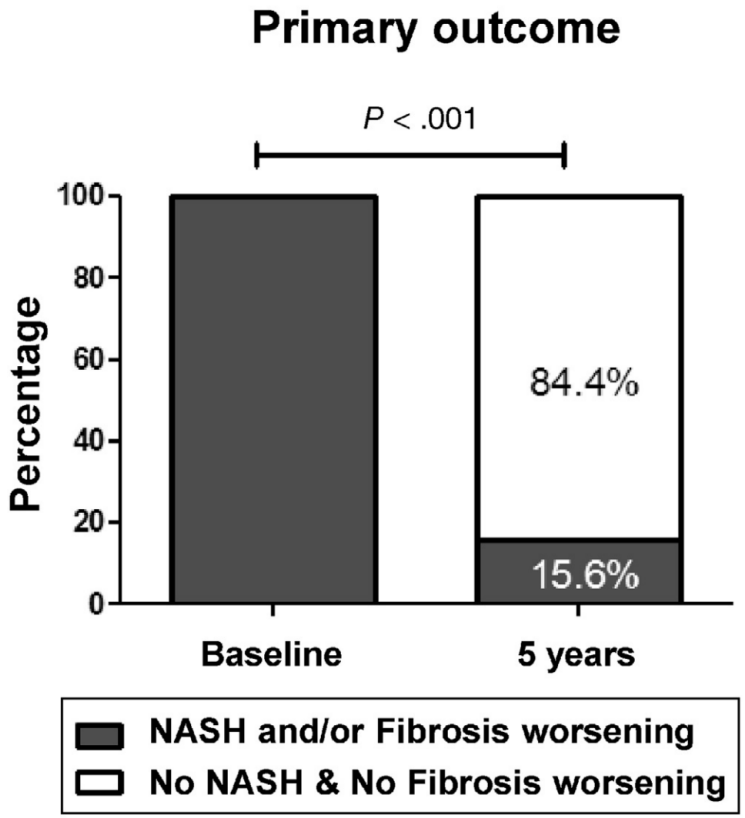
Technique	Improvement of liver outcomes			
	Histological	Serum LFT	Image/non-invasive	Type of evidence
RYGB 	% Steatosis Ballooning Inflammation Fibrosis improvement - resolution	AST ALT GGT ALP		Systematic review & Meta analysis (48) 5 year controlled longitudinal study (41) 1 year follow-up prospective study (44) Prospective observational trial (42)
SG/LSG 	% Steatosis Amielorate ballooning - fibrosis	AST ALT GGT	Fibrosis	Systematic review & Meta analysis (48) 5 year controlled longitudinal study (41) 1 year follow-up prospective study (50) Longitudinal prospective study (43) Prospective observational trial (42)
AGB 	% Steatosis Inflammation	AST ALT GGT ALP		5 year controlled longitudinal study (41)
IGB 	NAS	AST ALT GGT		Prospective case-control study (57) Prospective study (56)
ESG 		AST ALT	Fibrosis	Prospective open-table study (58)
DMR 		AST ALT	% Steatosis	Prospective single-arm open-label multicenter study (63) Single-arm, single-center feasibility study (62)
DJBL 		ALT GGT	% Steatosis	Comprehensive systematic review & Meta analysis (64)
OAGB* 	Ballooning Inflammation	AST ALT GGT		1 year follow-up study (51) Prospective study (53) Case report (52)

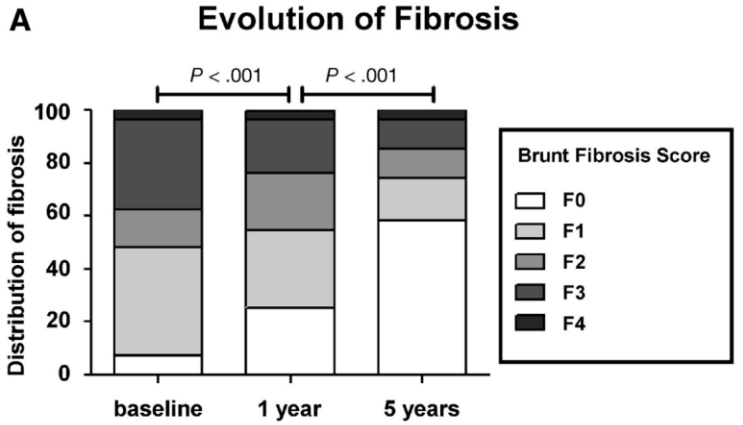
Juarez-Hernandez et al., *Frontiers in Endocrinology* 2022

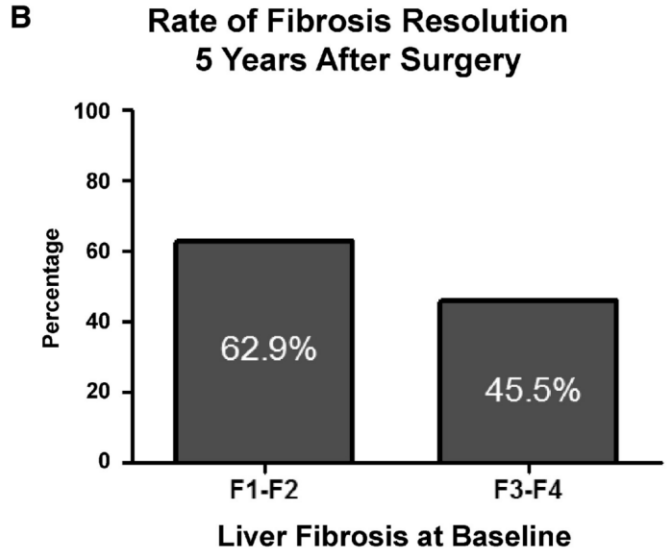
Bariatric Surgery Provides Long-term Resolution of Nonalcoholic Steatohepatitis and Regression of Fibrosis

Gastroenterology 2020;159:1290–1301

Guillaume Lassailly,[1,2] Robert Caiazzo,[3,4] Line-Carolle Ntandja-Wandji,[1] Viviane Gnemmi,[5] Gregory Baud,[3,4] Helene Verkindt,[3] Massih Ningarhari,[1,2] Alexandre Louvet,[1,2] Emmanuelle Leteurtre,[5] Violeta Raverdy,[3,4] Sébastien Dharancy,[1,2] François Pattou,[3,4] and Philippe Mathurin[1,2]

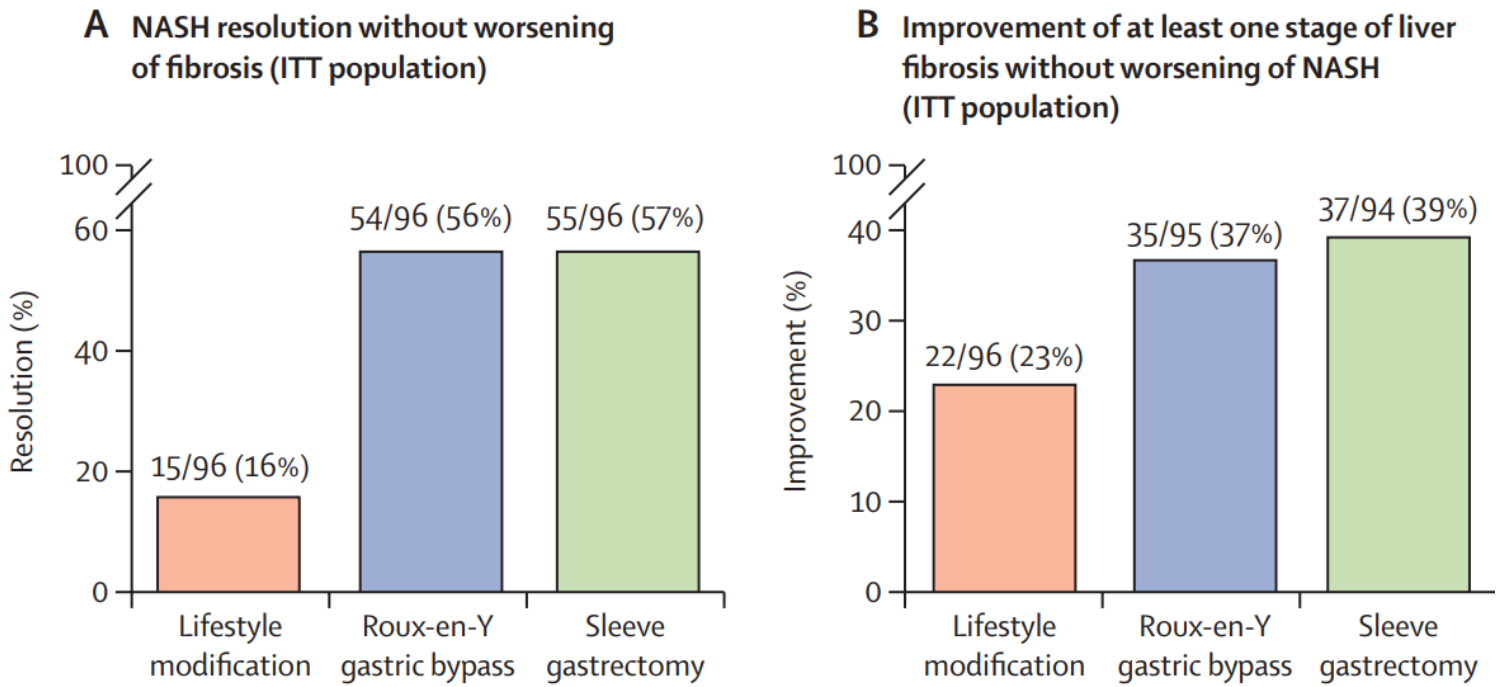






Bariatric–metabolic surgery versus lifestyle intervention plus best medical care in non-alcoholic steatohepatitis (BRAVES): a multicentre, open-label, randomised trial

Ornella Verrastro, Simona Panunzi*, Lidia Castagneto-Gissey, Andrea De Gaetano, Erminia Lembo, Esmeralda Capristo, Caterina Guidone, Giulia Angelini, Francesco Pennestrì, Luca Sessa, Fabio Maria Vecchio, Laura Riccardi, Maria Assunta Zocco, Ivo Boskoski, James R Casella-Mariolo, Pierluigi Marini, Maurizio Pompili, Giovanni Casella, Enrico Fiori, Francesco Rubino, Stefan R Bornstein, Marco Raffaelli, Geltrude Mingrone*

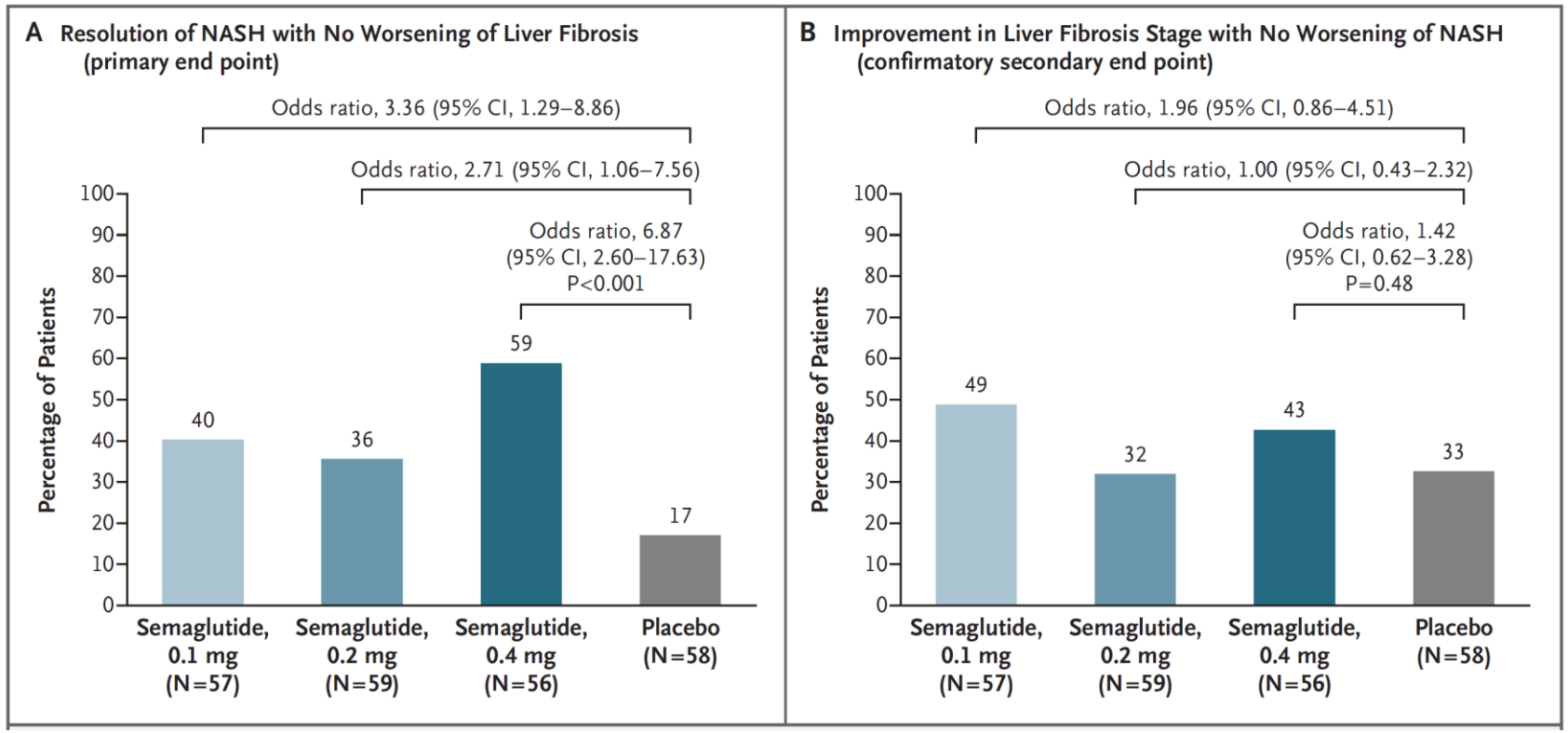


Lancet 2023; 401: 1786–97

ORIGINAL ARTICLE

A Placebo-Controlled Trial of Subcutaneous Semaglutide in Nonalcoholic Steatohepatitis

P.N. Newsome, K. Buchholtz, K. Cusi, M. Linder, T. Okanoue, V. Ratziu, A.J. Sanyal, A.-S. Sejling, and S.A. Harrison, for the NN9931-4296 Investigators*



- 72-week, phase 2 trial
- NASH & F1, F2, or F3
- Once-daily s.c. semaglutide vs. PBO
- Primary end point: resolution of NASH with no worsening of fibrosis

Newsome et al., *New Engl J Med* 2021; 384: 1113-24

Gut Factors Mediating the Physiological Impact of Bariatric Surgery

Maigen Bethea[1,2] · Darleen A. Sandoval

Current Diabetes Reports (2022) 22:371–383

Roux-en-Y gastric bypass

- Is one of the most efficient methods for losing weight
- RYGB achieves its physiological benefits through "**BRAVE**" effects:
  - **B**ile flow alteration,
  - **R**eduction in gastric size,
  - **A**natomical rearrangement,
  - **V**agal manipulation and subsequent
  - **E**nteric gut hormone modulation
- Bariatric surgery is a powerful treatment for insulin resistance, with a remission in 42% of cases after RYGB

Journal of Hepatology **2013** vol 58 | 1249–1251

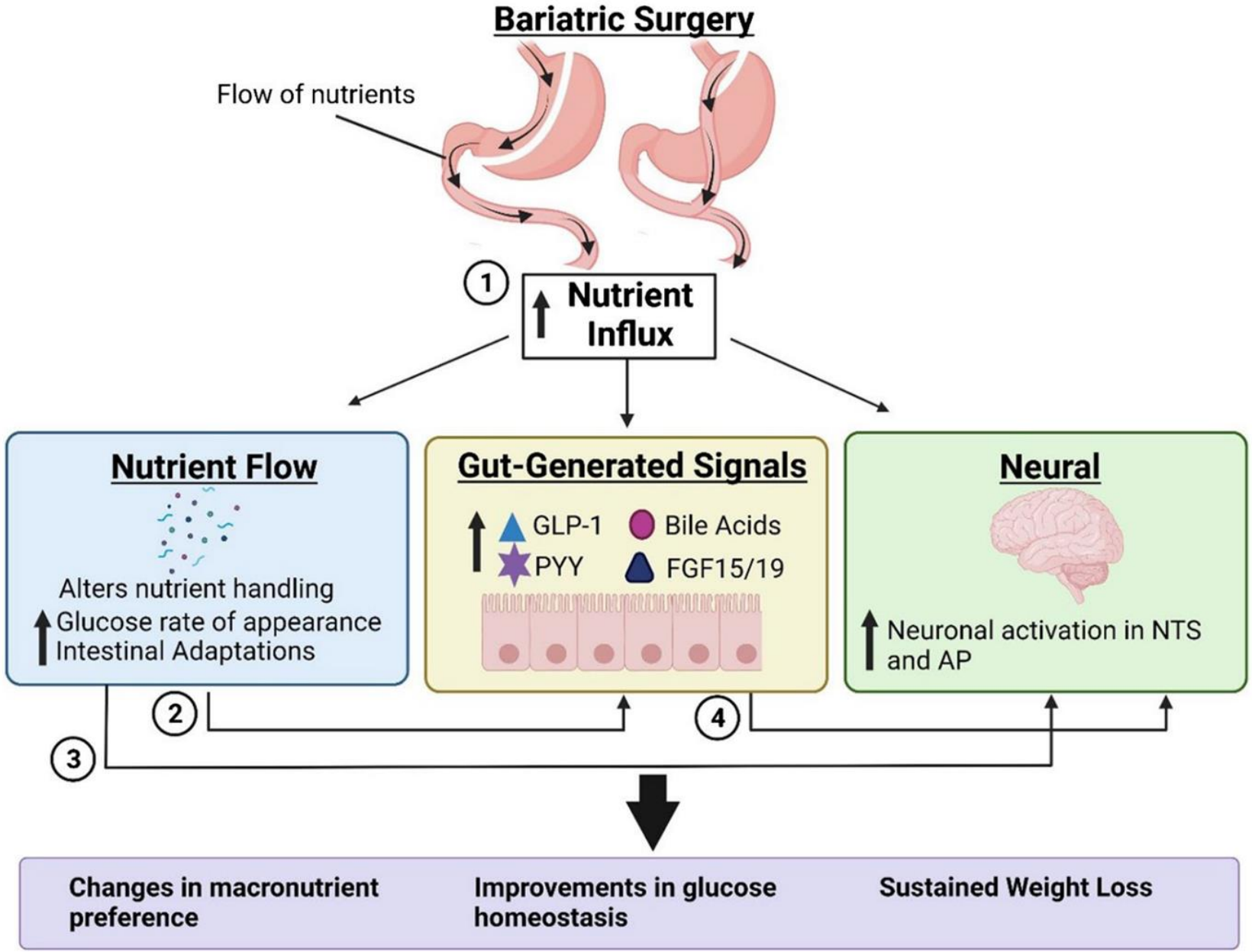


Table 1 | Mechanisms of weight loss after bariatric surgery*

Parameter	RYGB	AGB	VSG
Food intake	↓	↓	↓
Gastric emptying	↑/↓	↔	↑
Macronutrient malabsorption	Minimal fat malabsorption	NA	NA
Hypothalamic peptide expression levels	NA	NA	↔
Vagal signalling	Implicated	Implicated	NA
Plasma GLP-1 levels	↑	↔	↑
Plasma PYY levels	↑	↔	↑
Plasma ghrelin levels	↑/↓/↔	↑	↓
Plasma CCK levels	↔	NA	↔
Plasma leptin levels	↓	↓	↓
Plasma bile acid levels	↑	↔	↑
Gut microbiota	Altered	NA	NA
Energy expenditure	↑/↓/↔	NA	↔
Food preferences	↓ consumption of fat and sugar	↔ or ↑ consumption of fat and sugar	↔ or ↓ consumption of fat and sugar
Meal frequency	↑	↓/↔	NA
Food reward	↓	↔/↑	↔/↓
Condition taste aversion	Demonstrated for fat	NA	Demonstrated for fat

Nat. Rev. Gastroenterol. Hepatol. **10**, 575–584 (2013)

	LAGB	VSG	RYGB
GLP-1	→ ↓	↑	↑
Peptide YY	→	↑	↑
Oxyntomodulin	No data	No data	↑
GIP	→	↑ →	↓ → ↑
Cholecystokinin	No data	↑	↑
Ghrelin	↓ → ↑	↓ → ↑	↓ → ↑
Leptin	↓	No data	↓
Energy expenditure	↓	↓	↓
Food intake	↓	↓	↓
Bile acids	→	→	↑
Gut microbiota	Altered	Altered	Altered
Insulin secretion	↓ →	↑	↑
Hepatic insulin sensitivity	↑	↑	↑
Muscle insulin sensitivity	↑	↑	↑
Gastric emptying	→	↑	↑

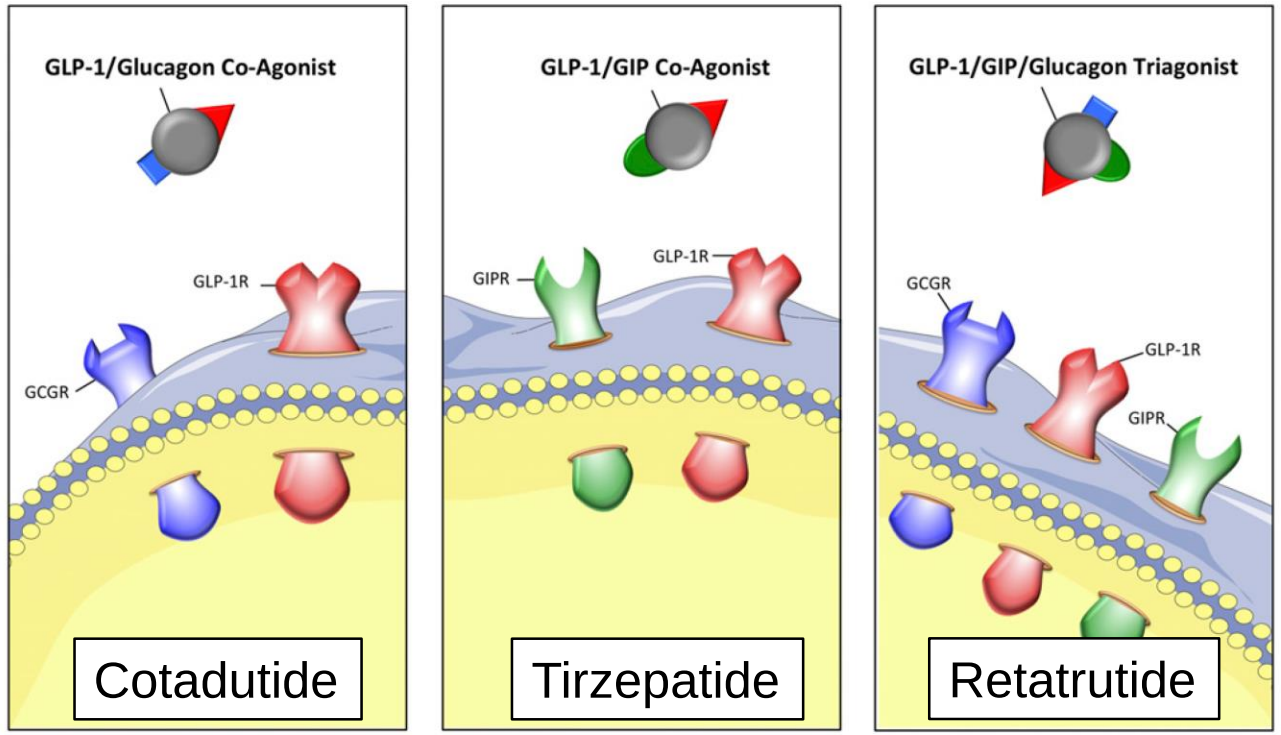
Table: **Mechanisms of weight loss and remission of type 2 diabetes after bariatric surgery**

Lancet Diabetes Endocrinol
2014; 2: 152–64

Brauchen wir in Zukunft noch EBMT & BMS?

Rolle der neuen Dualen und Triple Agonisten?

Dual / triple agonists targeting receptors for GLP-1, GIP, & glucagon



Improves

Body weight
Energy Expenditure
Glycemic control
Cholesterol

Improves

Glycemic control
Body weight
Lipolysis
Cholesterol

Improves

Body weight
Glycemic control
Hepatosteatosis
Cholesterol
Energy Expenditure
Lipolysis

GLP-1: Glucagon-like Peptide-1 (GLP-1)
GIP: Glucose-dependent Insulinotropic Polypeptide

Müller et al., *Pharmacol Rev* 2018; 70: 712–746

Contemporary medical, device, and surgical therapies for obesity in adults

Lancet 2023; 401: 1116–30

Carolina M Perdomo, Ricardo V Cohen, Priya Sumithran, Karine Clément, Gema Frühbeck

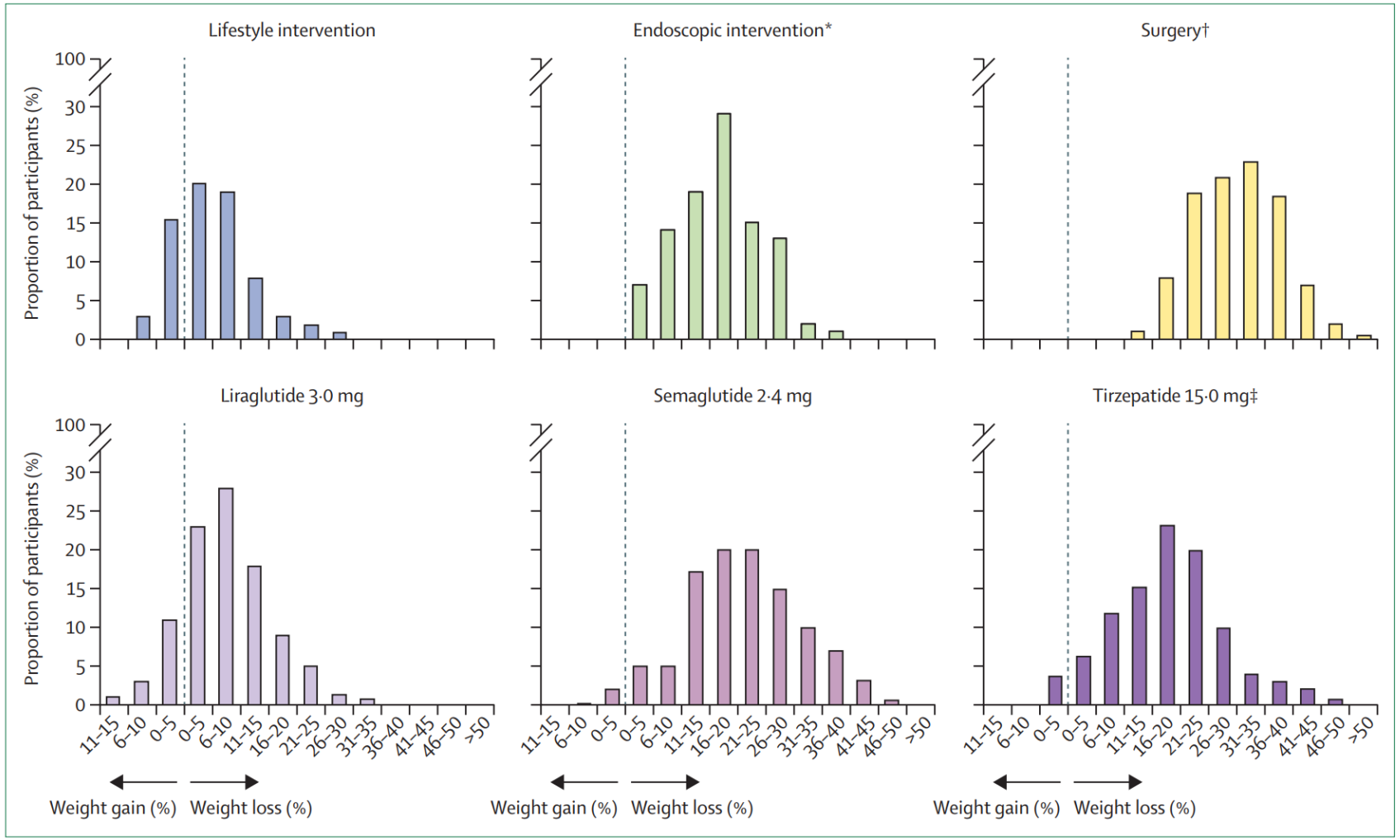


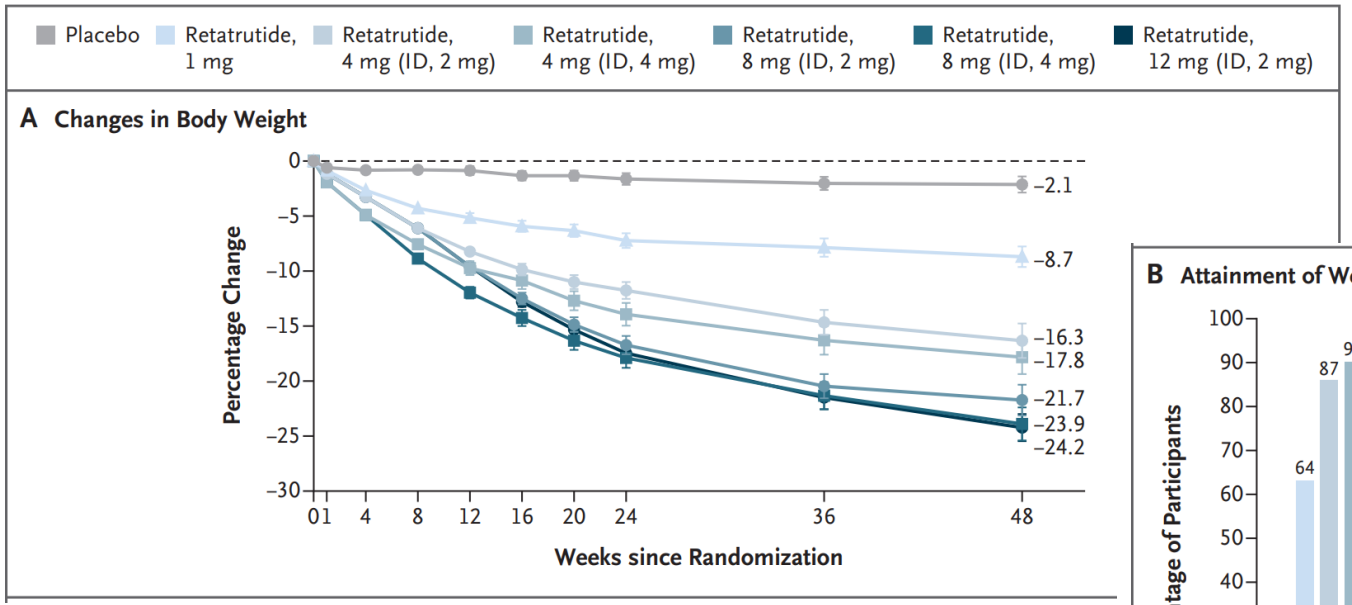
Figure 1: **Heterogeneity in weight loss response after approximately 12 months with several therapeutic approaches currently available**

The NEW ENGLAND JOURNAL of MEDICINE

Triple–Hormone-Receptor Agonist Retatrutide for Obesity — A Phase 2 Trial

Ania M. Jastreboff, M.D., Ph.D., Lee M. Kaplan, M.D., Ph.D., Juan P. Frías, M.D., Qiwei Wu, Ph.D., Yu Du, Ph.D., Sirel Gurbuz, M.D., Tamer Coskun, M.D., Ph.D., Axel Haupt, M.D., Ph.D., Zvonko Milicevic, M.D., and Mark L. Hartman, M.D., for the Retatrutide Phase 2 Obesity Trial Investigators*

N Engl J Med 2023;389:514-26.



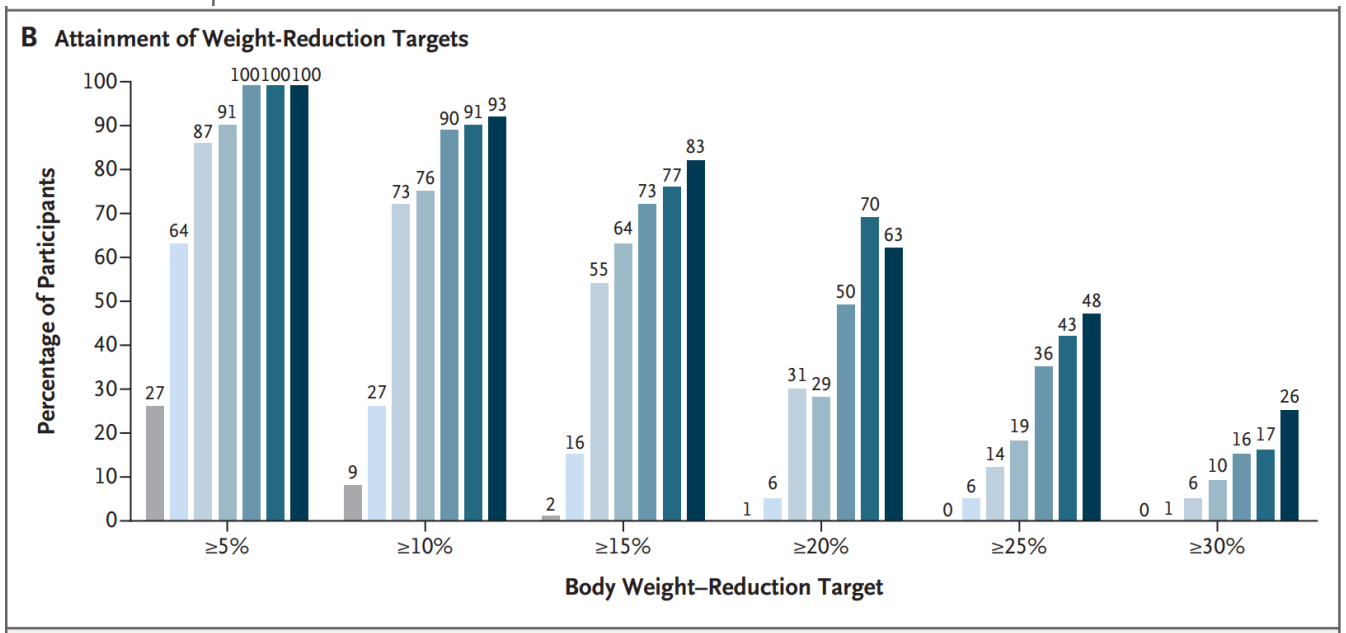
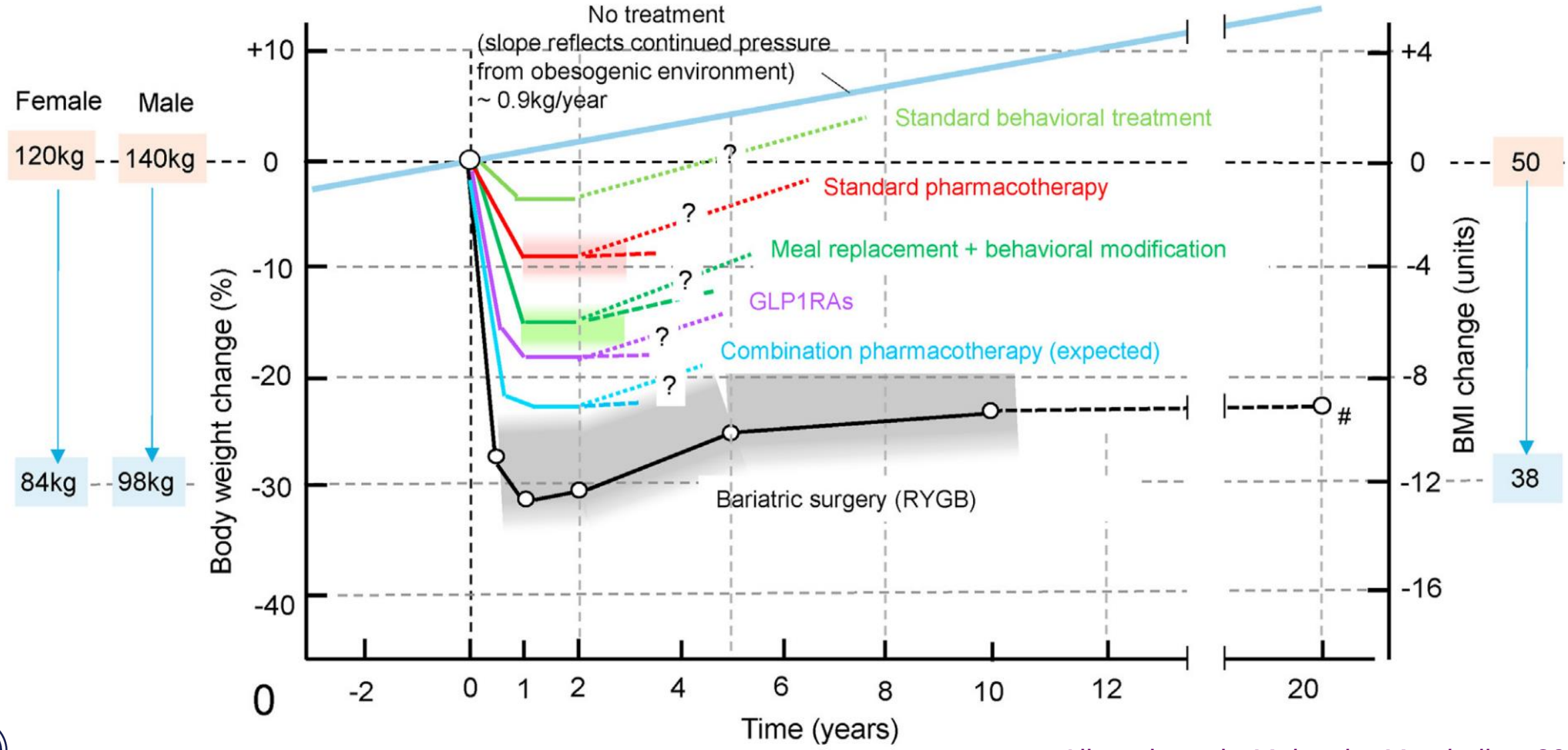


Figure 1. Changes in Body Weight with Retatrutide as Compared with Placebo.

Closing the gap?



Albaugh et al., *Molecular Metabolism* 2023

Role of endobariatrics in the spectrum of obesity treatments?

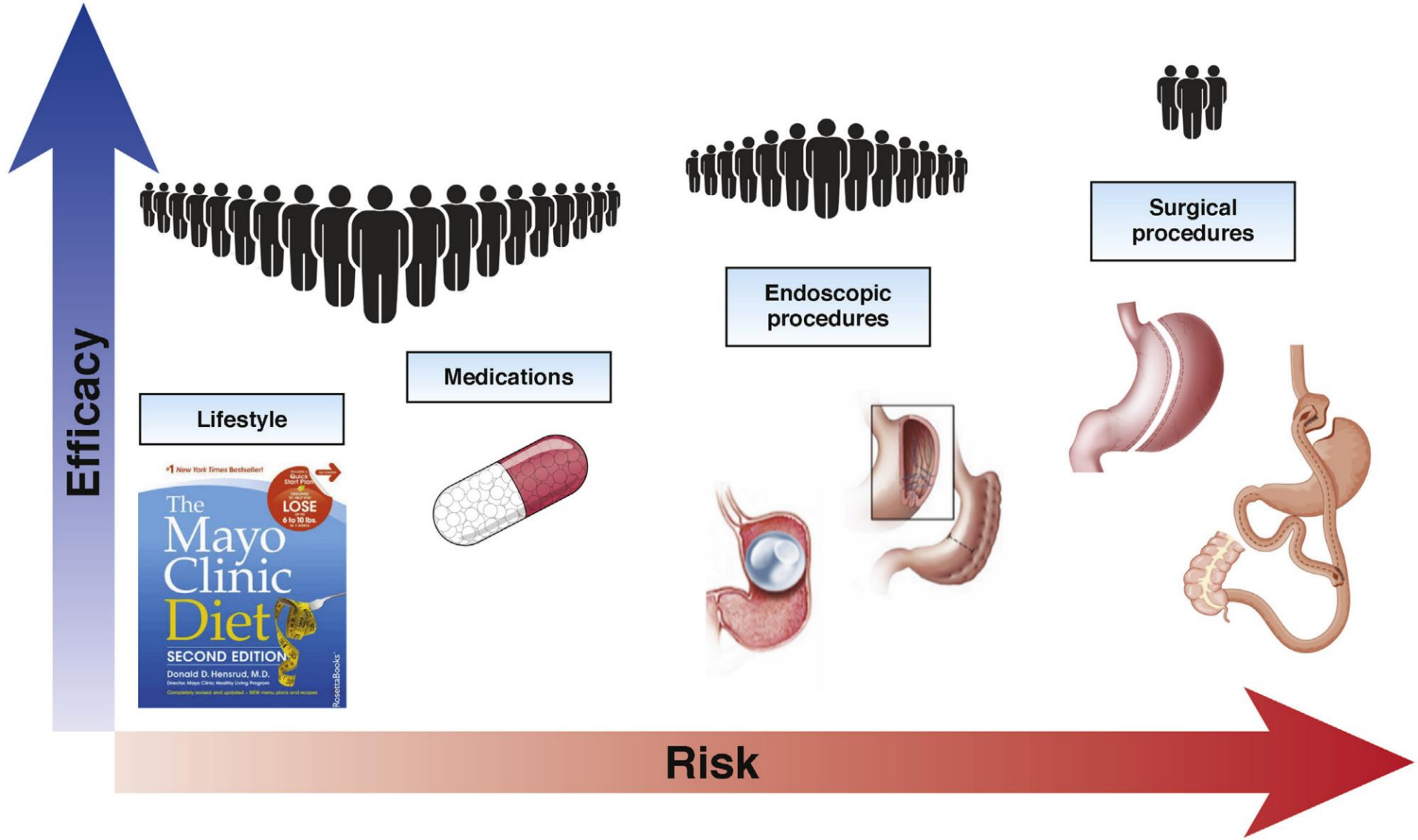


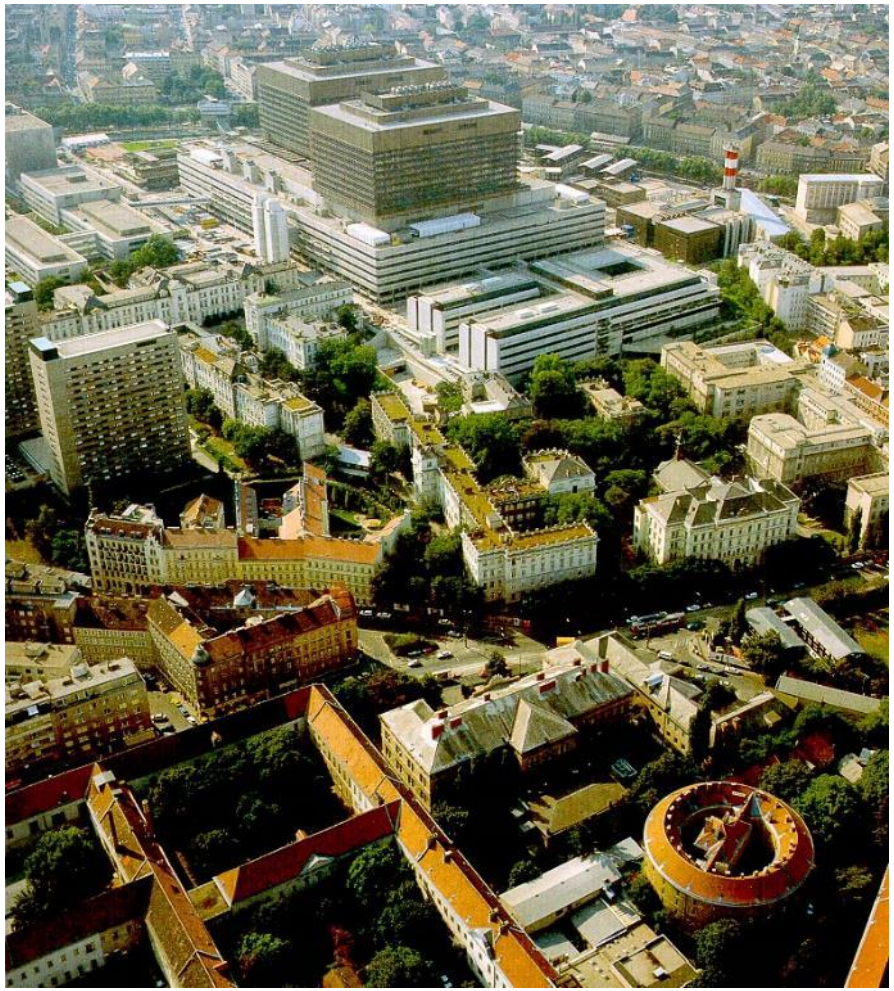
Figure 1. The spectrum of obesity treatments. Endobariatric techniques fill a middle zone between pharmacotherapy and maximally invasive surgical options. Hensrud D. The Mayo Clinic Diet, Second Edition. New York, NY: Rosetta Books LLC,

Storm, Abu Dayyeh & Topazian, *Clin Gastro Hepatol* 2018;16:1701–1704

Metabolische Veränderungen nach bariatrischen Eingriffen

Take Home Messages

- **Intestinale Maladaptation bei Adipositas & Diabetes**
  - Diabetes als eine Erkrankung des Duodenums?
- **Bariatrische / metabolische Chirurgie (BMS) ist eine effektive Therapie der MASLD/MASH**
  - MASH als metabolische Komorbidität
- **Ergebnisse der metabolischen Endoskopie (EBMT) vielversprechend (Positionierung?)**
- **Zukunftsperspektive: Duale / Triple Agonisten**



Danke für Ihre Aufmerksamkeit!

michael.trauner@meduniwien.ac.at