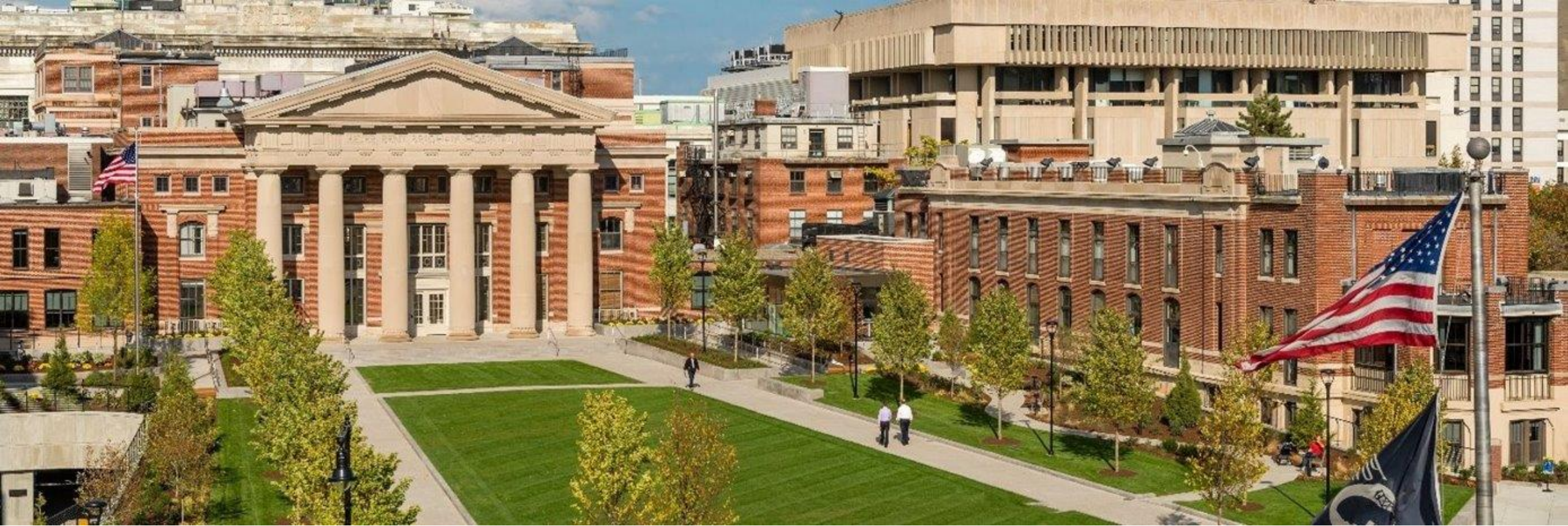




The value of BPL, CC and TALL in MBS

Abdelrahman A. Nimeri, MD, FACS, FASMBS Dipl ABOM
Director, Metabolic & Bariatric Surgery, Mass General Brigham
Associate Professor of Surgery, Harvard Medical School
Associate editor, Obesity Surgery J

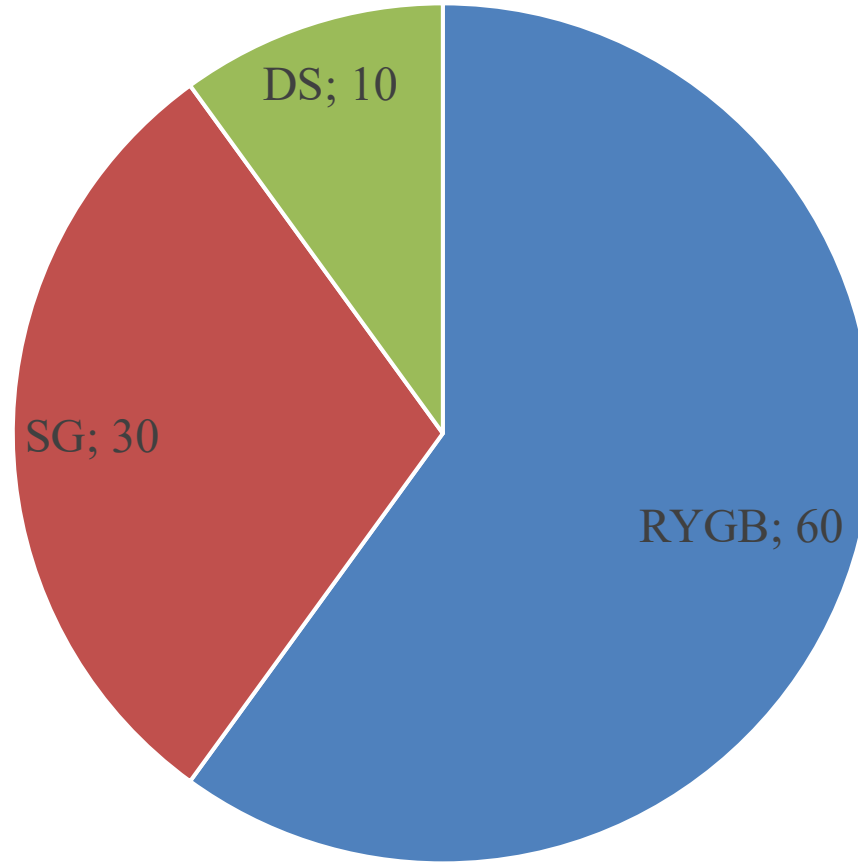


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 **Mass General Brigham**

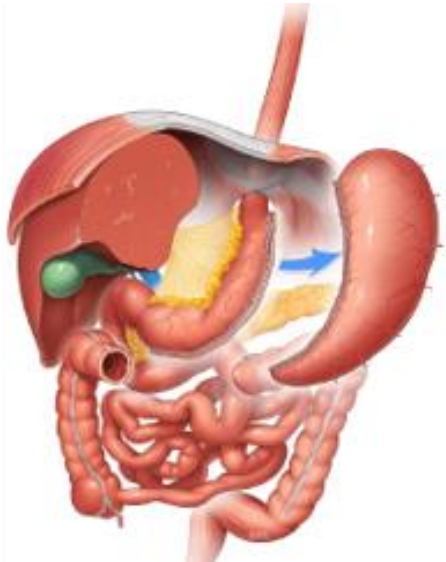
Honorarium, Medtronic, Ethicon, Intuitive

Procedure disclosure



>5000 cases Primary 80% Revisions 20% Robotic 20%

■ RYGB ■ SG ■ DS



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Take home messages

- *How the small bowel length variability affects BPL, TALL & Roux limb length.*
- *Jejunal bypass [RYGB/OAGB/SASJ may cause RWG] & ileal bypass [SADI-S/DS/SASI may cause PCM].*
- *Ileal bypasses SADI-S/DS/SASI have a long BPL length.*
- *Test your assumption of the SB length when you do ileal bypasses.*
- *The importance of the CC & TALL to prevent protein calorie malnutrition.*



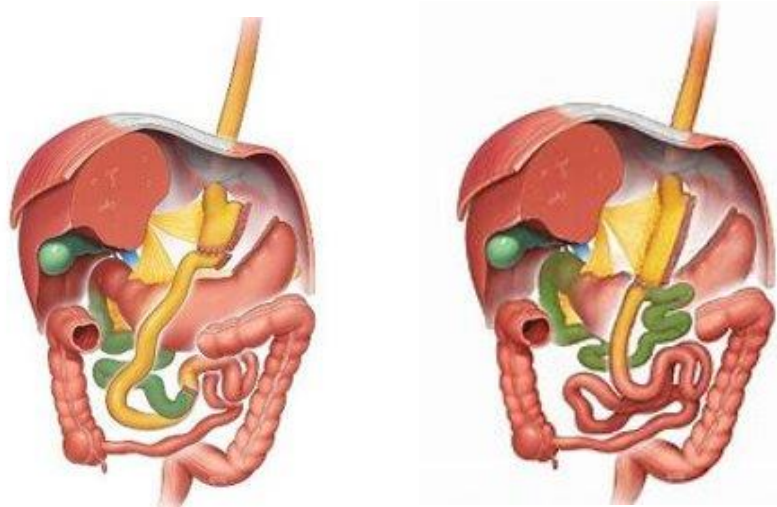
Test your assumption about the SB length

- The mean SBL of 443 patients undergoing laparotomy (78% female) was 690 ± 93.7 cm (**range 350-1049 cm**).
- **Sex was correlated with SBL**, as men had a longer small bowel than women (729 ± 85 versus 678 ± 92 , $P < .0001$) and were significantly taller (173 ± 8.2 versus 161 ± 6.9 , $P < .001$).
- **Age did not correlate with SBL.**
- In a multivariate linear regression analysis **only height was significantly correlated with SBL ($P < .00001$) and explained 12% of the variance in SBL.**

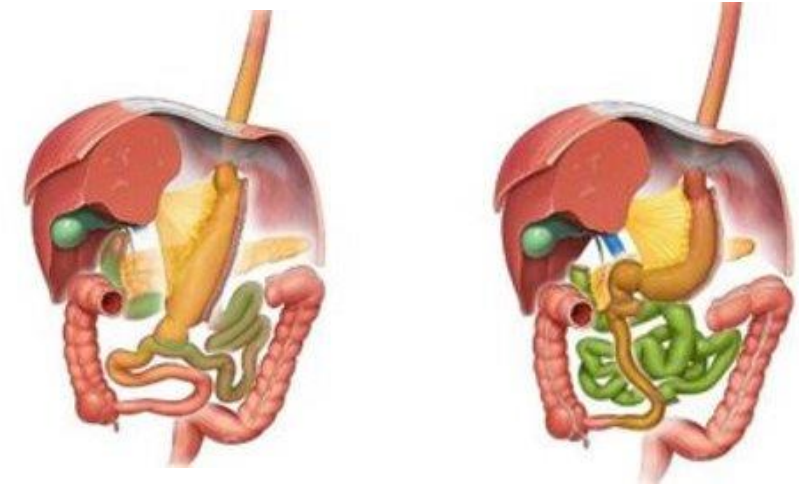
Roberto M Tacchino Surg Obes Relat Dis 2015;11(2):328-34. 2014 Sep 30



Variable common channel (CC) length



Variable biliopancreatic limb BPL length



- The small bowel length in humans is variable [<400 cm to as long as >1000 cm].
- Surgeons performing (RYGB & OAGB) do not measure the *common channel (CC) length* and most surgeons performing BPD-DS & SADI-S do not measure the (*BPL*) length.

Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

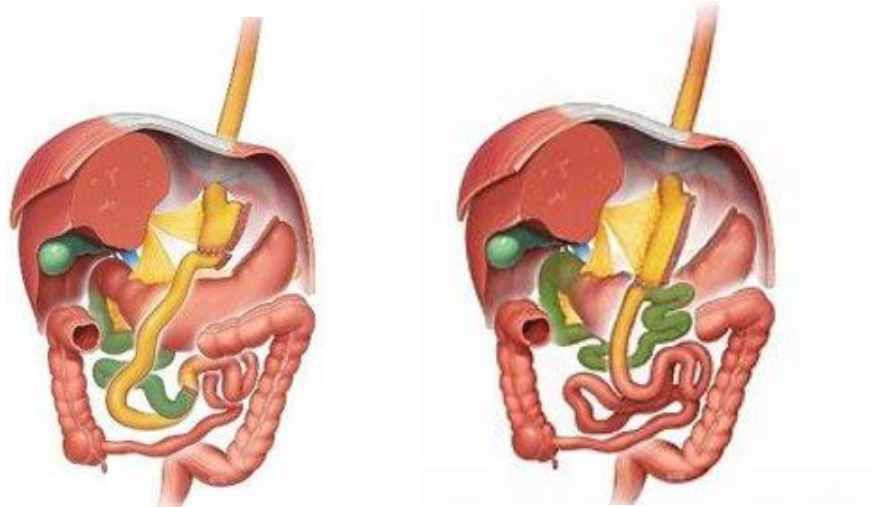
Current Obesity Reports
<https://doi.org/10.1007/s13679-023-00513-4>

Justin Eagleston¹ · Abdelrahman Nimeri^{2,3} 

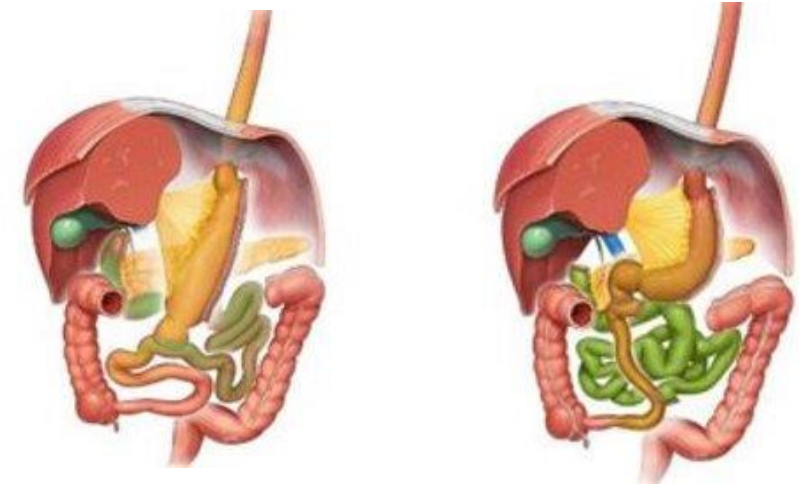
Accepted: 18 May 2023

REVIEW

Variable common channel (CC) length



Variable biliopancreatic limb BPL length



If we make the same limb lengths, we will have different outcomes due to different limb lengths.



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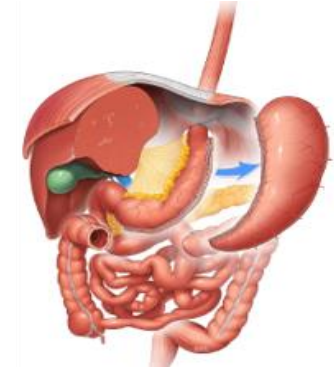
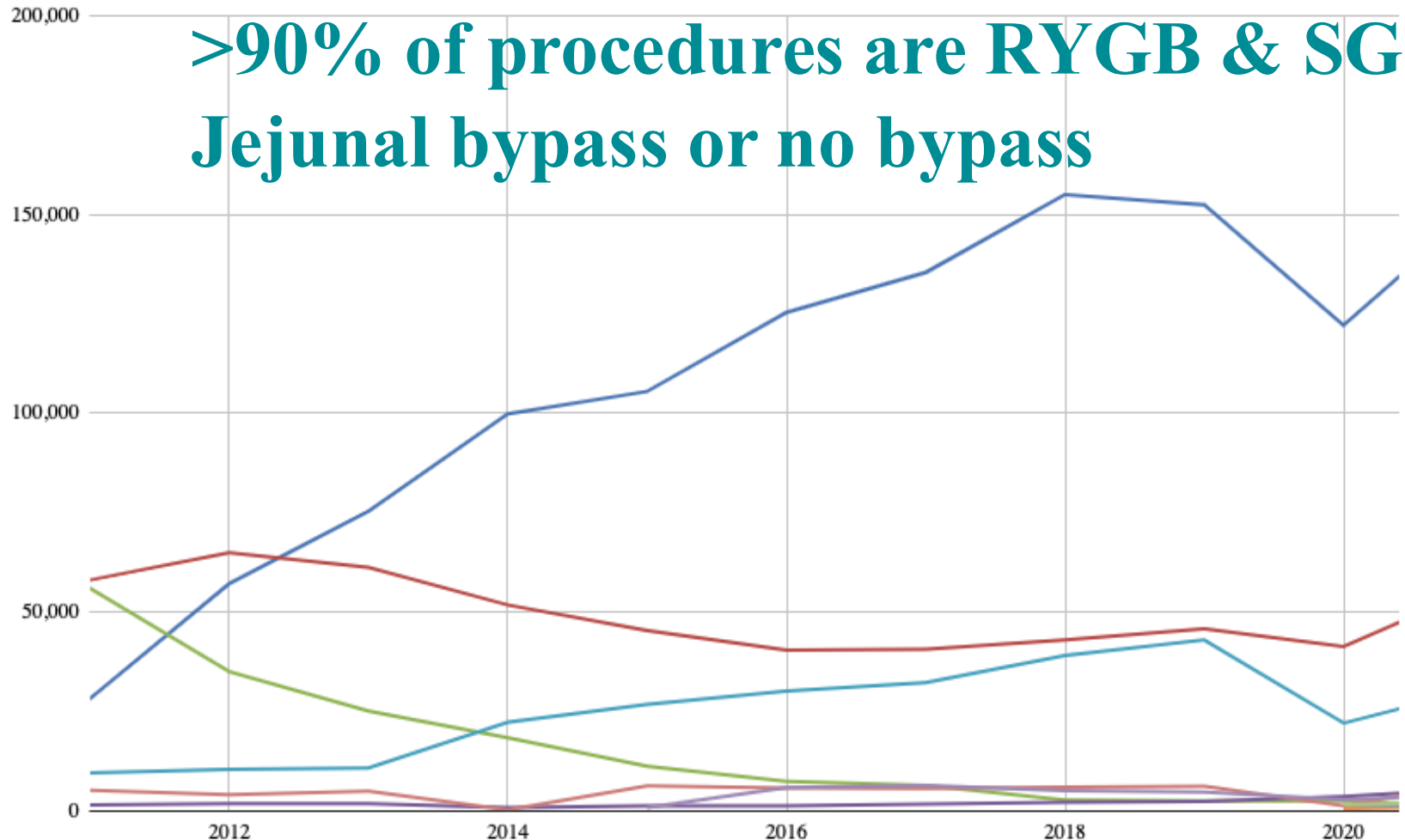
Take home messages

- *The Small bowel length is variable, so if we make the same Roux & BPL limb lengths in RYGB, we will have different outcomes due to different common channel & TALL.*
- ***RYGB/OAGB/SASJ are jejunal bypass [may cause RWG] SADI-S/DS/SASI are ileal bypass [may cause PCM].***
- *Ileal bypasses SADI-S/DS/SASI have a long BPL length.*
- *The importance of the CC & TALL to prevent protein calorie malnutrition.*



American Society for Metabolic and Bariatric Surgery 2022 estimate of metabolic and bariatric procedures performed in the United States

Sleeve RYGB Band BPD-DS Revision SADI OAGB Other ESG Balloons



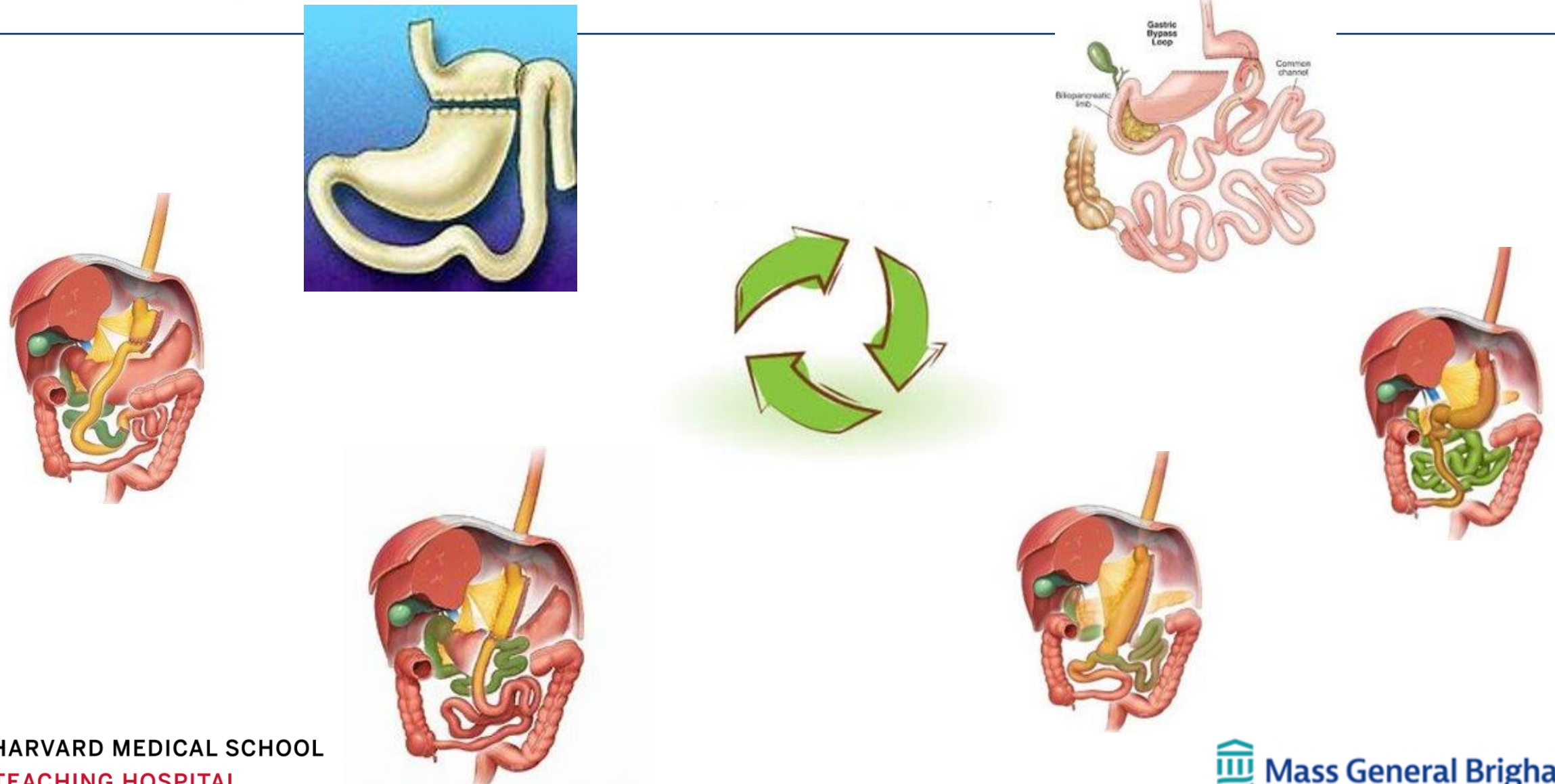
Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

Current Obesity Reports
<https://doi.org/10.1007/s13679-023-00513-4>

Justin Eagleston¹ · Abdelrahman Nimeri^{2,3} 

Accepted: 18 May 2023

REVIEW



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Jejunal bypasses OAGB vs SASJ 10 studies [4 RCTs] 842 patients				
Weight Loss	Studies	SASJ (events/total)	OAGB (events/total)	<i>p</i> -value
%TWL at 6 months	Elrefai, Hasan, Kang, Salem	30.8 ± 11.4% (range 21.6–44.7)	31.5 ± 11.0% (range 21.2–43.6)	0.38
%TWL at 12 months	Elrefai, Elbanna, Hasan, Salem, Kang	42.0 ± 17.0% (range 27.5–67.6)	43.5 ± 16.5% (range 27.9–67.9)	0.06
Comorbidities Resolution	Studies	SASJ (events/total)	OAGB (events/total)	<i>p</i> -value
T2DM remission	Kang, Hasan, Elrefai, Farrag, Salem	89/104 (85.6%)	82/99 (82.8%)	0.55
Hypertension resolution	5 studies	164/216 (75.9%)	170/218 (78.0%)	0.93
OSA resolution	Elrefai, Hasan, Kang	16/16 (100%)	24/24 (100%)	1.00
GERD resolution	Kang, Salem	26/32 (81.3%)	16/20 (80.0%)	0.90

Roux-en-Y gastric bypass versus duodenal switch in patients with body mass index ≥ 50 kg/m²: a systematic review and meta-analysis

RYGB vs RYDS **Jejunal vs Ileal**

Ali Esparham, M.D.^a, Samira Roohi, M.D.^a, Ali Mehri, M.D.^b, Abolfazl Ghahramani, M.D.^b,
Hengameh Anari Moghadam, M.D.^a, Zhamak Khorgami, M.D., F.A.C.S.^{c,d,*}

Meta analysis of *12 articles were included (2678 patients, FU: 1-15 years).*

DS compared to RYGB patients had *7.3 kg/m² higher BMI loss* (95% CI: 5.59-9.03, $P < .001$) & *9.9% more TWL%* (95% CI: 4.47-15.28%, $P < .001$).

DS & RYGB patients had similar complications, reoperation, mortality, & remission of T2DM, HTN, HLD, and OSA.

Rate of malnutrition was 8.3% in the DS group compared with 1.2% in RYGB (OR: 5.53, 95% CI: 1.35-22.44, $P = .02$).

***Revision for malnutrition in 5.4% DS vs 0% in RYGB* (OR: 6.1, 95% CI: 1.03-36.33, $P = .05$), & *24.6% of DS patients developed gallbladder disease needed cholecystectomy versus 4.5% after RYGB* (OR: 6.36, 95% CI: 1.70-23.82, $P = .01$).**



Ten-Year Outcomes Following Roux-en-Y Gastric Bypass vs Duodenal Switch for High Body Mass Index

A Randomized Clinical Trial

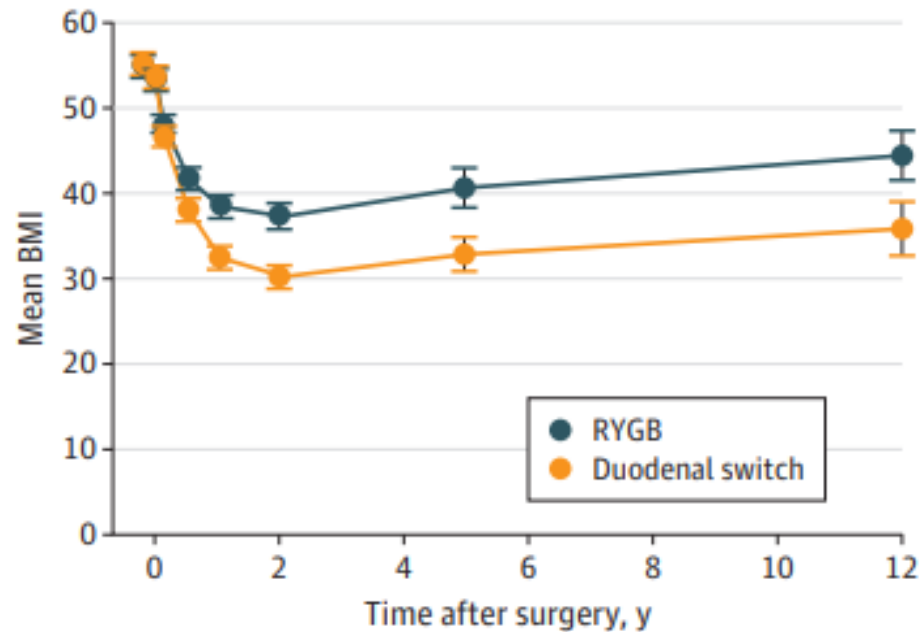
JAMA Network Open. 2024;7(6):e2414340. doi:10.1001/jamanetworkopen.2024.14340

Odd Bjørn Kjeldaa Salte, MD; Torsten Olbers, MD, PhD; Hilde Rissstad, MD, PhD; Morten Wang Fagerland, MSc, PhD; Torgeir Thorson Søvik, MD, PhD; Ingvild Kristine Blom-Høgestøl, MD, PhD; Jon A. Kristinsson, MD, PhD; My Engström, RN, PhD; Tom Malla, MD, PhD

RYGB vs RYDS

Jejunal vs Ileal

Figure 2. Body Mass Index (BMI) for 60 Patients Undergoing Roux-en-Y Gastric Bypass (RYGB) and Duodenal Switch From Baseline to 10 Years After Surgery



More patients in the DS group developed vitamin deficiencies DS group (14%) developed severe PCM, of whom 3 (10%) underwent revisional surgery.

Bone mass was reduced for both groups from 5 to 10 years, with lower bone mass after DS at 10 years.

Quality-of-life scores (Obesity-Related Problem Scale and the 36-Item

Short Form Health Survey) were comparable across groups at 10 years.

The total number of adverse events was higher after DS (135 vs 97 for RYGB; P = .02).

Ten-Year Outcomes Following Roux-en-Y Gastric Bypass vs Duodenal Switch for High Body Mass Index

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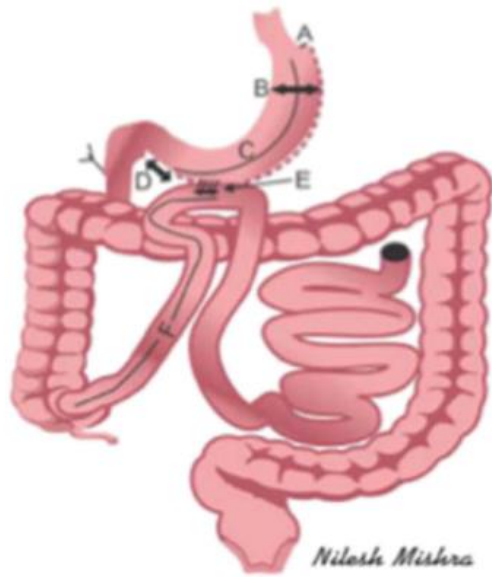
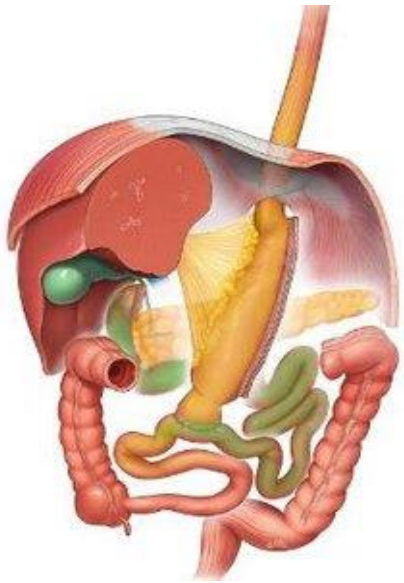
Conclusions

Although DS enables a greater BMI reduction over time and some cardiometabolic benefits, this comes at a cost regarding nutritional deficiencies and adverse effects. The balance between potential benefits and potential adverse effects is delicate, and a larger weight loss per se may not justify an increased risk. Despite the initial hypothesis in this randomized clinical trial that DS was a superior option to RYGB in patients with a BMI of greater than 50, we have ultimately concluded with the opposite, and DS with a short common channel (<200 cm) is currently no longer used in our institutions. For strictly selected patients with particularly high BMI and related comorbidity, the risk and benefit balance may justify the use of DS in experienced centers. The developing landscape of



Loop Ileal bypass

SADI-S 2007	SASI	SASJ	OAGB
SG 50-60 Fr Bougie	SG 50-60 Fr Bougie	SG 50-60 Fr Bougie	Narrow long pouch
CC/TALL 300 cm	CC/TALL 300 cm	CC/TALL Variable	CC/TALL Variable
BPL variable	BPL variable	BPL 200 cm	BPL 150-200 cm

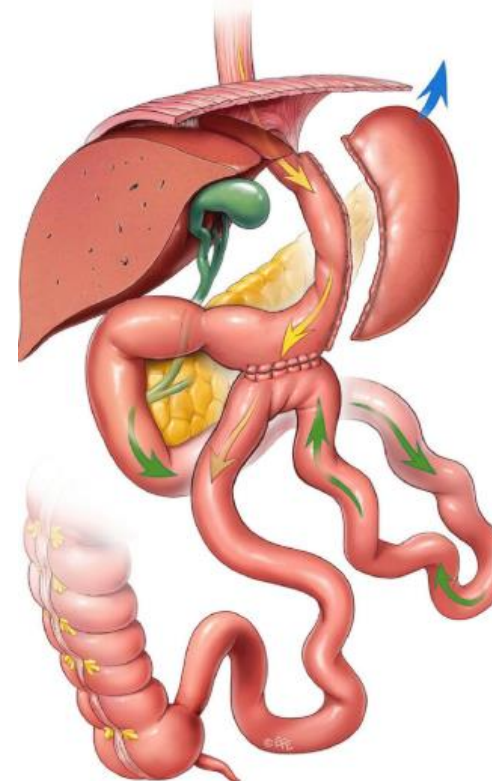


Single-Anastomosis Sleeve with
Ileal Bypass (SASI)



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Loop Jejunal bypass



Mass General Brigham

Take home messages

- *The Small bowel length is variable, so if we make the same Roux & BPL limb lengths in RYGB, we will have different outcomes due to different common channel & TALL.*
- *RYGB/OAGB/SASJ are jejunal bypass [may cause RWG] SADI-S/DS/SASI are ileal bypass [may cause PCM].*
- ***Ileal bypasses SADI-S/DS/SASI have a long BPL length.***
- ***The importance of the CC & TALL to prevent protein calorie malnutrition.***



Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

Justin Eagleston¹ · Abdelrahman Nimeri^{2,3}  Accepted: 18 May 2023



Small bowel length 700 cm	BPD	BPD-DS	SADI	OAGB	RYGB
BPL	450	450	400	200	50
CC	50	100	300	500	550
TALL	250	250	300	500	650
RL	200	150	-	-	100

Efficacy

Weight regain

Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

Justin Eagleston¹ · Abdelrahman Nimeri^{2,3} 

Accepted: 18 May 2023



Small bowel
length 500 cm

BPD

BPD-DS

SADI

OAGB

RYGB

BPL

250

250

200

200

50

CC

50

100

300

300

350

TALL

250

250

300

300

450

RL

200

150

-

-

100

Efficacy

Malnutrition



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Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

Justin Eagleston¹ · Abdelrahman Nimeri^{2,3}  Accepted: 18 May 2023



Small bowel length 900 cm	BPD	BPD-DS	SADI	OAGB	RYGB
BPL	650	650	600	200	50
CC	50	100	300	700	750
TALL	250	250	300	700	850
RL	200	150	-	-	100

Efficacy

Weight regain

The importance of the biliopancreatic limb length in gastric bypass: A systematic review

- Thirteen articles were identified and analyzed. Most of the articles are prospective studies.
- **Weight loss was superior in longer Biliopancreatic limbs.**
- Conclusion: Based on our review of the subject, we can conclude that the release of enterohormones in response to a food load in the distal small bowel seems to play an important role in the remission of co-morbidities & hence **the length of the biliopancreatic limb might affect this process.**

Surgery for Obesity and Related Diseases 15 (2019) 43–50



- *A total of 28 articles were included for data extraction & glycemic outcomes after RYGB were assessed on two definitions: remission and improvement.*
- We categorized the studies into 4 groups according to the BP & Roux limb lengths.
- **The type 2 diabetes remission/improvement rates were as follows:**
- **Long BP-long Roux group 0.80 (95% CI 0.70-0.90)/0.81 (0.73-0.89).**
- **Long BP-short Roux group 0.76 (0.66-0.87)/0.82 (0.75-0.89).**
- **Short BP-long Roux group 0.57 (0.36-0.78)/0.64 (0.53-0.75).**
- **Short BP-short Roux group 0.62 (0.43-0.80)/0.53 (0.45-0.61).**
- **Meta-regression analysis also showed that a longer BP limb resulted in higher postoperative type 2 diabetes remission and improvement rates, whereas a longer Roux limb did not.**
- There was no significant difference or heterogeneity in baseline characteristics, including diabetes-related variables, among the four groups.

American Society for Metabolic and Bariatric Surgery literature review on the effect of Roux-en-Y gastric bypass limb lengths on outcomes

Essa M. Aleassa, M.D.^{a,*}, Pavlos Papasavas, M.D.^b, Toms Augustin, M.D.^c,
Zhamak Khorgami, M.D.^d, Sue Benson-Davies, Ph.D.^e, Saber Ghiassi, M.D.^f,
Jonathan Carter, M.D.^g, Abdelrahman Nimeri, M.D.^h, Clinical Issues Committee of the
American Society for Metabolic and Bariatric Surgery

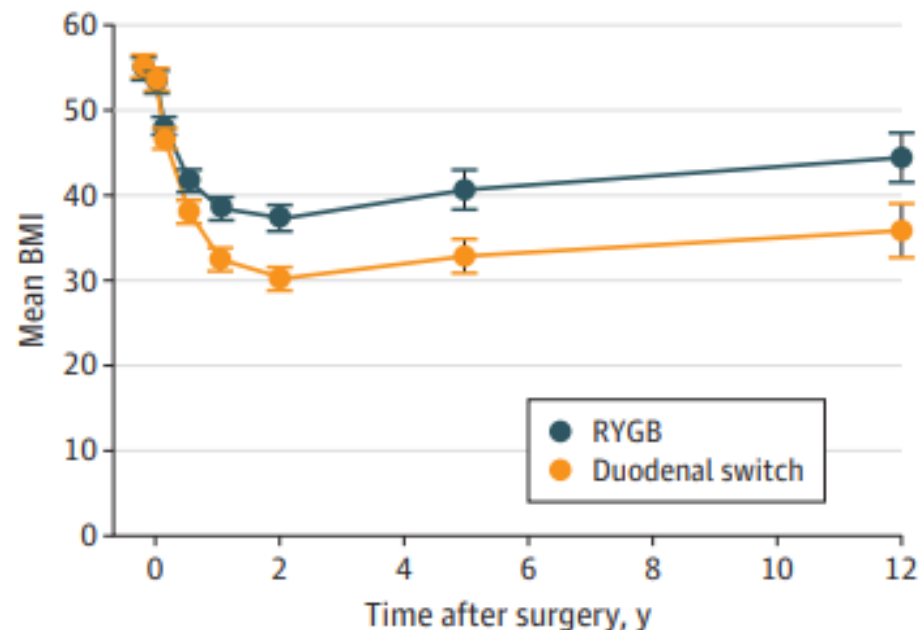
- *There is **no consensus on optimal RYGB limb lengths in the bariatric community**, and there is wide variation in practice among surgeons [US surgeons **RL 114 BPL 48** International surgeons [RL 126-150 BPL 76-100cm].*
- **Lengthening the Roux limb is not effective & may lead to PCM with very long RLs.**
- **Lengthening the *BPL up to 200 cm* in a primary gastric bypass, with or without shortening the *AL to 60–75 cm*, may result in *greater long-term weight loss and improved glycemic control for patients with diabetes* but at an increased risk of micronutrient deficiencies.**

Ten-Year Outcomes Following Roux-en-Y Gastric Bypass vs Duodenal Switch for High Body Mass Index A Randomized Clinical Trial

JAMA Network Open. 2024;7(6):e2414340. doi:10.1001/jamanetworkopen.2024.14340

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Figure 2. Body Mass Index (BMI) for 60 Patients Undergoing Roux-en-Y Gastric Bypass (RYGB) and Duodenal Switch From Baseline to 10 Years After Surgery



No. at risk				
RYGB	31	31	27	23
Duodenal switch	28-29	27	28	25

Bone mass was reduced for both groups from 5 to 10 years, with lower bone mass after DS at 10 years.

Quality-of-life scores (Obesity-Related Problem Scale and the 36-Item Short Form Health Survey) **were comparable across groups at 10 years.**

The total number of adverse events was **higher after DS** (135 vs 97 for RYGB; $P = .02$).



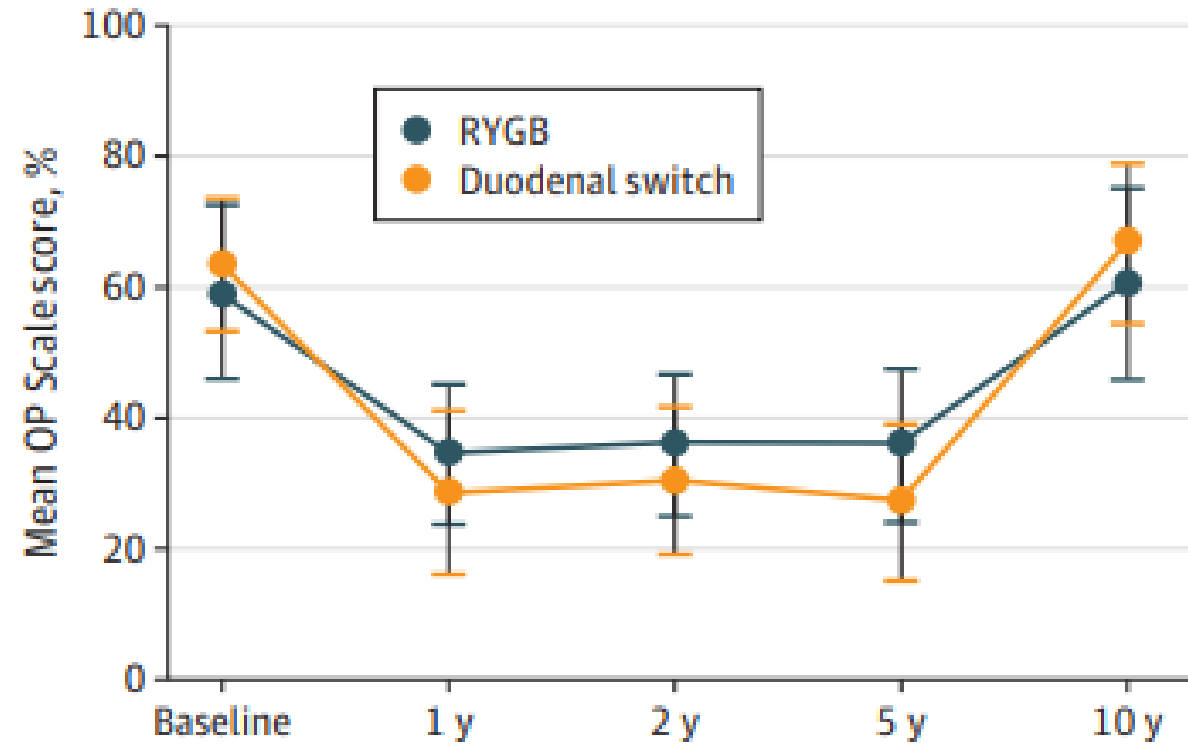
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Figure 3. Obesity-Related Problem (OP) Scale for 60 Patients



More patients in the DS group developed vitamin deficiencies (21 vs 11 for RYGB; $P = .008$) including 25-hydroxyvitamin D deficiency (19 for DS vs 9 for RYGB; $P = .005$).

Four of 29 patients in the DS group (14%) developed severe PCM, of whom 3 (10%) underwent revisional surgery.



Ten-Year Outcomes Following Roux-en-Y Gastric Bypass vs Duodenal Switch for High Body Mass Index

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Conclusions

Although DS enables a greater BMI reduction over time and some cardiometabolic benefits, this comes at a cost regarding nutritional deficiencies and adverse effects. The balance between potential benefits and potential adverse effects is delicate, and a larger weight loss per se may not justify an increased risk. Despite the initial hypothesis in this randomized clinical trial that DS was a superior option to RYGB in patients with a BMI of greater than 50, we have ultimately concluded with the opposite, and DS with a short common channel (<200 cm) is currently no longer used in our institutions. For strictly selected patients with particularly high BMI and related comorbidity, the risk and benefit balance may justify the use of DS in experienced centers. The developing landscape of



Take home messages

- *The Small bowel length is variable, so if we make the same Roux & BPL limb lengths in RYGB, we will have different outcomes due to different common channel & TALL.*
- *OAGB, BPD-DS, SADI-S & type I distalization RYGB all have a long BPL length.*
- *RYGB/OAGB/SASJ are jejunal bypass [may cause RWG] SADI-S/DS/SASI are ileal bypass [may cause PCM].*
- ***The importance of the CC & TALL to prevent protein calorie malnutrition.***



The Role of the Total Alimentary Limb Length in Roux-en-Y gastric bypass – A systematic Review

Biliopancreatic limb



Common Channel

Roux limb

$$\text{TALL} = \text{Roux limb} + \text{Common Channel}$$

1993-2020
Ovid Medline and
Pubmed databases

21 studies
measured
TALL



↓ Tall = ↑ Weight loss

TALL $\leq 400\text{cm}$ + CC < 200
= 3.4-63.6% limb lengthening

TALL $\leq 400\text{cm}$
+ CC < 200 =



American Society for Metabolic and Bariatric Surgery literature review on the effect of Roux-en-Y gastric bypass limb lengths on outcomes

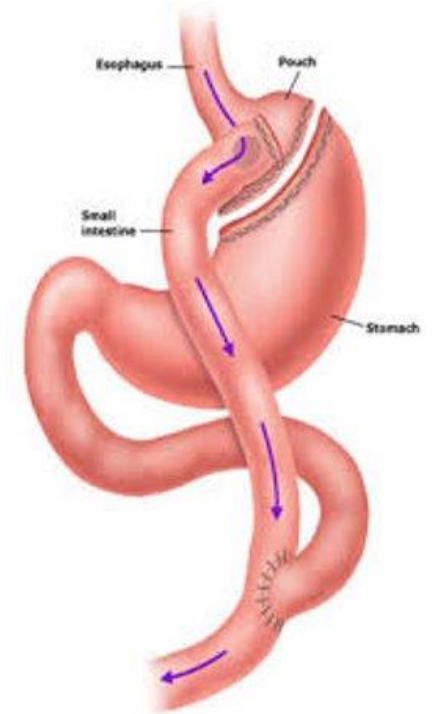
Essa M. Aleassa, M.D.^{a,*}, Pavlos Papasavas, M.D.^b, Toms Augustin, M.D.^c,
Zhamak Khorgami, M.D.^d, Sue Benson-Davies, Ph.D.^e, Saber Ghiassi, M.D.^f,
Jonathan Carter, M.D.^g, Abdelrahman Nimeri, M.D.^h, Clinical Issues Committee of the
American Society for Metabolic and Bariatric Surgery

- **Type I distalization [lengthening the BPL length and shortening the CC], results in significant weight loss but carries a risk of severe macro- and micronutrient deficiencies, especially if the CC is 200 cm and a TALL (AL plus CC) is 400 cm.**
- **Patients who undergo distalization of an RYGB as a revisional procedure should adhere to aggressive vitamin supplementation and regular nutritional monitoring to avoid nutritional complications.**

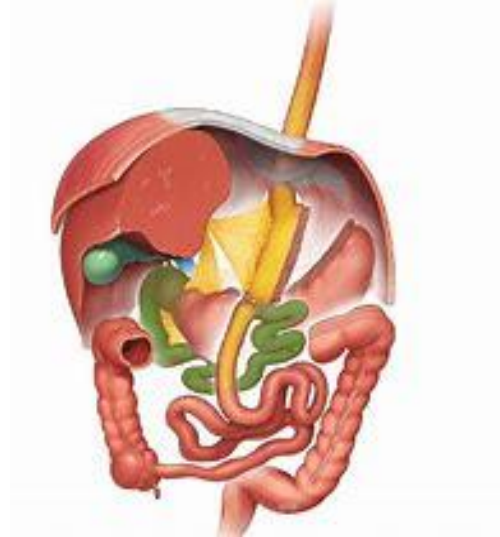
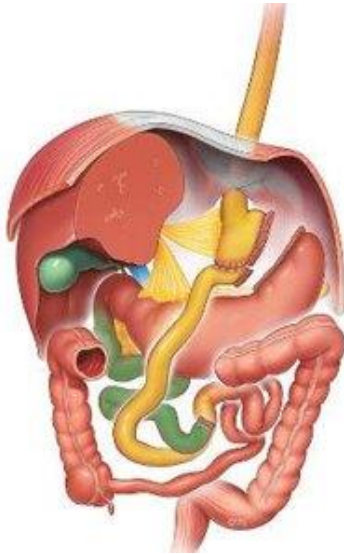


Should we abandon type I distalization/CC shortening for weight recidivism after RYGB?

- Surgerman et al 50 CC EWL 69+/-5% at 5 years *PCM 100%*.
- Sugerman et al 150 CC EWL 69+/-5% at 5 years *PCM 43.7%*
- Caruana et al (7>0% BPL+CC) *PCM 40%*.
- Fobi et al banded (50% BPL+CC) *PCM 23%*.
- Caruana et al (<70% BPL+CC) *PCM 0%*.
- Higa 11 patients TALL 250-300 *PCM 67%*.
- Higa 85 patients TALL 400-450 *PCM 21%*.
- Shikora 22 patients TALL 200-300 *PCM 13%*.



To prevent protein calorie malnutrition, it is a balance of stomach pouch size vs TALL



TALL

400 cm

???

300 cm

250 cm



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- *Thirteen relevant studies were identified with CLLs varying from 76 to >600 cm.*
- **No significant difference in total body weight loss or excess weight loss was observed.**
- **Significant metabolic improvements occurred with shorter CLLs.**
- *Nutritional deficiencies were more severe when the CLL was <400 cm.*
- **Conclusion: The data from this systematic review suggests that reasonable weight loss and positive impacts on metabolic outcomes can be achieved with CLLs of >400 cm.**

A Hort ANZ J Surg 2023 Apr;93(4):851-858.



Distal gastric bypass: 2-m biliopancreatic limb construction with varying lengths of common channel

Kamran Shah, M.D.^{a,*}, Bent Johnny Nergård, M.D.^a, Morten Wang Fagerland, M.Sc., Ph.D.^b,
Hjörtur Gislason, M.D., Ph.D.^a

^a*Aleris Obesity Clinic and Department of Surgery, Aleris Hospital, Oslo, Norway*

- **Retrospective study of 3 groups RYGB (187) patients:**
 - Group 1** (69; Roux limb 150 cm, BPL 60 cm) **BPL 60.**
 - Group 2** (88; BPL 200 cm, CL 150 cm) **BPL 200.**
 - Group 3** (30; BPL 200 cm, CL 5 200 cm) **BPL 200.**
- **Weight & Preoperative BMI was higher** in group 2 (58.5, $P < 0.001$) & 3 (57.4) vs group 1 (54.6, $P = 0.011$).
- **FU rate was 95% at year 2, 74% at year 5, & 52% at year 10.**

Group 1

Group 2

Group 3

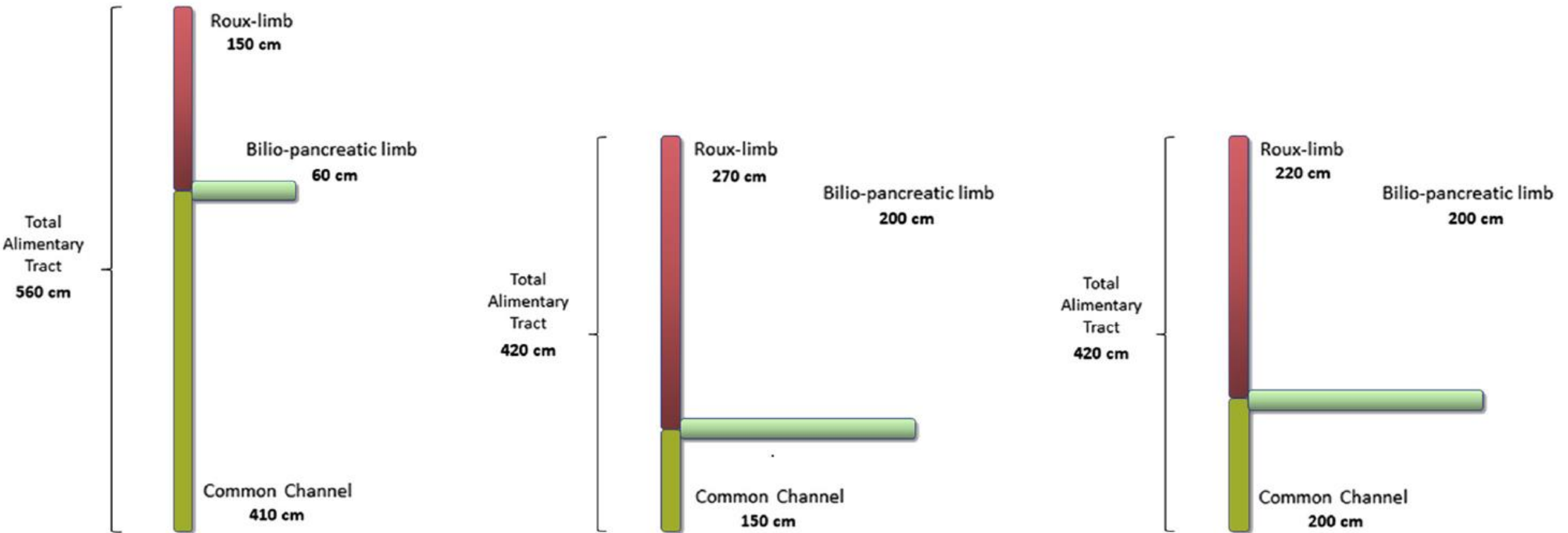


Fig. 1. Schematic drawing of limb lengths in the included groups.

Distal gastric bypass: 2-m biliopancreatic limb construction with varying lengths of common channel

Kamran Shah, M.D.^{a,*}, Bent Johnny Nergård, M.D.^a, Morten Wang Fagerland, M.Sc., Ph.D.^b,
Hjörtur Gislason, M.D., Ph.D.^a

^a*Aleris Obesity Clinic and Department of Surgery, Aleris Hospital, Oslo, Norway*

Length of different intestinal limbs in centimeters

Groups	Number of patients	R limb	BP limb	C limb	TALL
1	69	150	60	410	560
2	88	270	200	150	420
3	30	220	200	200	420

Instruction with

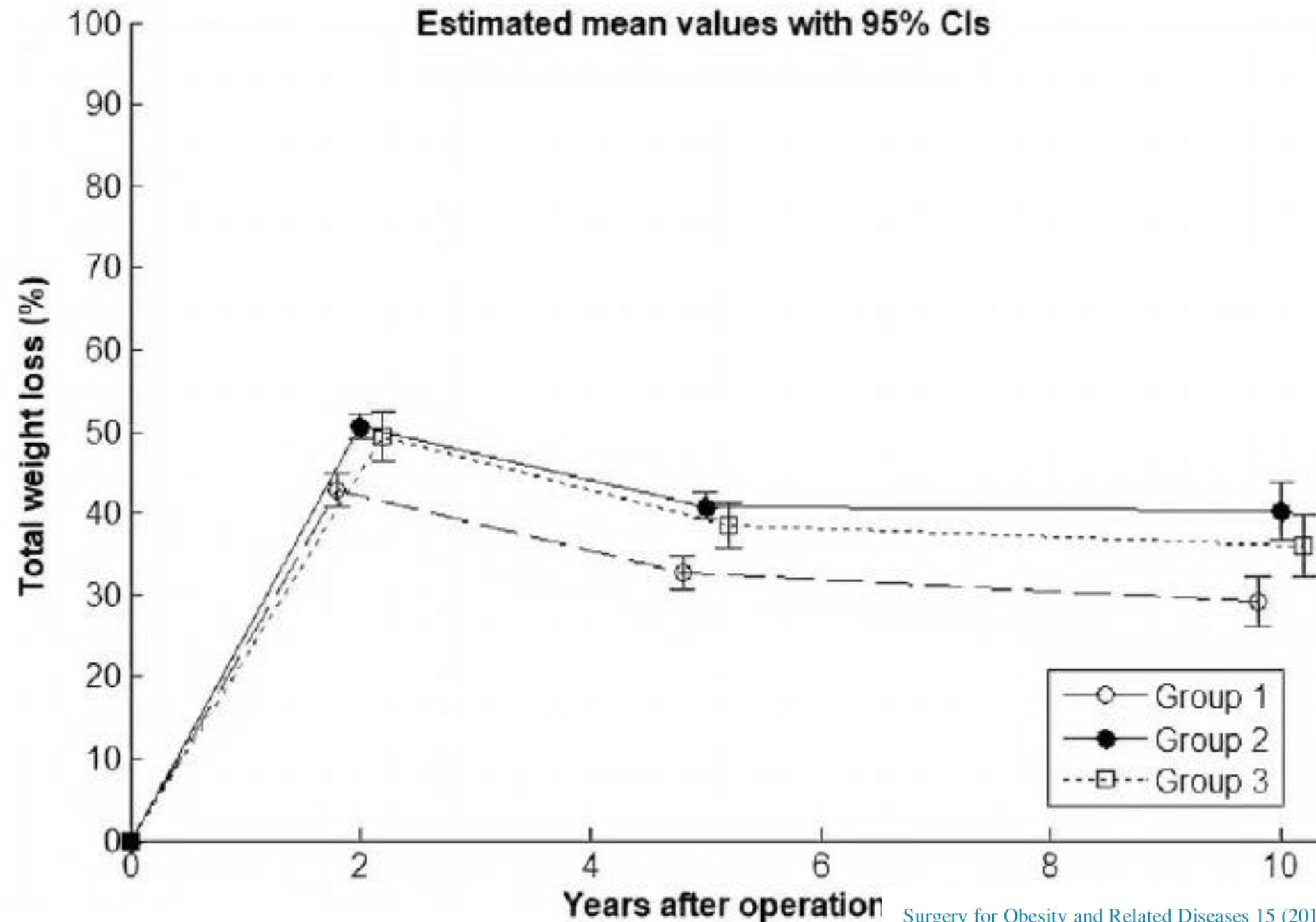
erland, M.Sc., Ph.D.^b,

ty

BPL 200 TALL 420

BPL 200 TALL 420

BPL 60 TALL 560



Distal gastric bypass: 2-m biliopancreatic limb construction with varying lengths of common channel

	Group 1 (n = 69)	Group 2 (n = 88)	<i>P</i> value	Group 3 (n = 30)	<i>P</i> value
Late (>30 d)					
Internal hernia	2 (2.9)	10 (11.4)	.0475	2 (6.7)	.5894
Ulcers	4 (5.8)	1 (1.1)	.1697	2 (6.7)	1.000
Hypoglycaemic attacks	0 (0)	1 (1.1)	1.000	0 (0)	1.000
Stenosis in GE-junction	2 (2.9)	4 (4.5)	.6955	0 (0)	1.000
Hypoalbuminemia	0 (0)	1 (1.1)	1.000	2 (6.7)	.0897
Nutritional deficiency	1 (1.4)	8 (9.1)	.04092	1 (3.3)	.5121
Deaths	0 (0)	0 (0)	1.000	0 (0)	1.000
Other bowel obstructions	1 (1.4)	1 (1.1)	1.000	1 (3.3)	.5164
Cholecystectomy due to gallstone attacks	3 (4.3)	9 (9.1)	.2305	2 (6.7)	.6374
Negative laparoscopies	1 (1.4)	4 (4.5)	.3856	3 (10)	.0795

Higher occurrence of internal hernia in distal RYGB groups (11.4% & 6.7% vs 2.9%) & Vitamin/mineral deficiencies occurred more frequently the shorter CL 9.1% & 3.3% vs 1.4%

BPD, DS, SADI-S, OAGB all have a much longer BPL length than RYGB.



When a patient with RYGB has weight recurrence we perform lengthening of the BPL [type I distalization.

Small bowel length 700 cm	BPD	BPD-DS	SADI	OAGB	RYGB
BPL	450	450	400	200	50
CC	50	100	300	500	550
TALL	250	250	300	500	650
RL	200	150	-	-	100

How does the BPL improve weight loss & DM resolution ?

Optimal Small Bowel Limb Lengths of Roux-en-Y Gastric Bypass

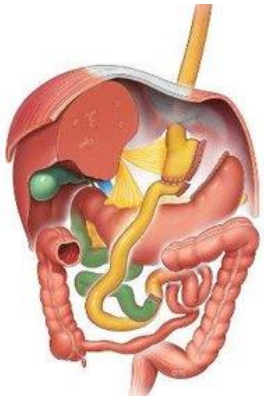
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REVIEW



MBS is neither restrictive
or malabsorptive



MBS works through *multiple complex mechanisms* leading to **metabolic changes**. These complex mechanisms include *distal delivery of nutrients and bile acids to the L cells of the ileum*, release of incretins, higher serum level of systemic bile acids, and changes in the gut microbiome.



Take home messages

- *The Small bowel length is variable, so if we make the same Roux & BPL limb lengths in RYGB, we will have different outcomes due to different common channel & TALL.*
- *RYGB/OAGB/SASJ are jejunal bypass [may cause RWG] SADI-S/DS/SASI are ileal bypass [may cause PCM].*
- *Ileal bypasses SADI-S/DS/SASI have a long BPL length.*
- *CC is more important than TALL to prevent protein calorie malnutrition.*

