

Table S1. Baseline Participant Characteristics.

	Surgical Intervention N=195	Medical/Lifestyle Intervention N=121	P Value
Age – yr	48.9 ± 8.8	51.8 ± 7.1	0.003
Female sex – no. (%)	137 (70.3)	75 (62.0)	0.13
White race – no. (%)	143 (73.3)	81 (66.9)	0.22
Body mass index, kg/m ²			
Value	36.5 ± 3.5	36.5 ± 3.4	0.98
<35 – no. (%)	66 (33.8)	45 (37.2)	0.55
Body weight, kg	103.7 ± 15.0	106.5 ± 15.9	0.13
Waist circumference, cm	115.3 ± 9.9	114.9 ± 10.2	0.79
Duration of diabetes – yr	8.9 ± 5.7	8.6 ± 5.7	0.72
Use of insulin – no. (%)	102 (52.3)	49 (40.5)	0.04
Type of bariatric/metabolic surgical procedure			
Gastric bypass	107 (54.9)	NA	NA
Sleeve gastrectomy	49 (25.1)	NA	NA
Adjustable gastric banding	39 (20.0)	NA	NA
Metabolic syndrome	167 (85.6)	96 (81.4)	0.32
Systolic blood pressure, mmHg	134 ± 17.7	130 ± 15.6	0.01
Diastolic blood pressure, mmHg	81 ± 9.8	79 ± 9.9	0.16
Laboratory measurements			
HbA _{1c} , %	8.8 ± 1.7	8.2 ± 1.4	0.001
Fasting plasma glucose, mg/dL, median (Q1, Q3)	163 (119, 223)	146 (122, 180)	0.06 ^a
LDL, mg/dL	98.9 ± 33.7	95.5 ± 32.1	0.38
HDL, mg/dL	43.2 ± 11.6	43.9 ± 13.2	0.64
Triglycerides, mg/dL, median (Q1, Q3)	144 (103, 226)	152 (94, 231)	0.63 ^a
Albumin/creatinine ratio, median (Q1, Q3)	8 (4, 23)	6 (3, 12)	0.04 ^a

^a Wilcoxon rank-sum test**Table S2. Medications at Baseline and Three Years**

	Surgical Interventio n N=195	Medical/ Lifestyle Interventio n N=121	P Valu e	Surgical Interventio n N=159	Medical/ Lifestyle Interventio n N=78	P Value
	Baseline			Three Years		
Medications for glycemic control, n (%)						
Biguanides	157 (80.5)	101 (83.5)	0.51	59 (37.1) [‡]	63 (80.8)	<0.001
Thiazolidinediones	47 (24.1)	23 (19.0)	0.29	2 (1.3) [‡]	8 (10.3) [€]	0.003
Secretagogues	58 (29.7)	47 (38.8)	0.10	19 (11.9) [‡]	21 (26.9) [€]	0.004
Incretin mimetics	56 (28.7)	38 (31.4)	0.61	17 (10.7) [‡]	33 (42.3) [€]	<0.001
Average number of diabetes medications	2.2 ± 1.1	2.2 ± 1.1	0.95	0.8 ± 1.0 [‡]	2.2 ± 1.0	<0.001
Number of diabetes medications, n (%)						
None	5 (2.6)	2 (1.7)	0.87	83 (52.2) [‡]	2 (2.6)	<0.001
Insulin (±other DM meds)	102 (52.3)	49 (40.5)	0.04	29 (18.2) [‡]	38 (48.7)	<0.001
Monotherapy	41 (21.0)	27 (22.3)	0.82	24 (15.1)	14 (17.9)	0.51
Dual Therapy	25 (12.8)	28 (23.1)	0.07	19 (11.9)	17 (21.8)	0.02
≥Triple Therapy	22 (11.3)	15 (12.4)	0.85	4 (2.5)	7 (9.0)	0.01
Medications for cardiovascular risk control, n (%)						
Statins	145 (74.4)	92 (76.0)	0.74	64 (40.3) [‡]	56 (71.8)	<0.001
Beta-blockers	34 (17.5)	25 (20.7)	0.49	17 (10.7) [‡]	19 (24.4)	0.006
ACE-inhibitor or ARB	129 (66.2)	80 (66.1)	0.99	47 (29.6) [‡]	49 (62.8)	<0.001
Anticoagulants	37 (19.0)	22 (18.2)	0.86	12 (7.5) [‡]	18 (23.1)	0.001
Diuretics	53 (27.2)	40 (33.1)	0.27	32 (20.1) [‡]	26 (33.3)	0.03
Calcium channel blockers	16 (8.2)	23 (19.0)	0.01	9 (5.7)	12 (15.4)	0.01

DM: diabetes mellitus; ACE: angiotensin-converting-enzyme; ARB: angiotensin receptor blocker

‡ Indicates significant difference from baseline in the surgical intervention group

€ Indicates significant difference from baseline in the medical/lifestyle intervention group

Table S3. Demographics and Baseline Characteristics by Surgical Type

	Gastric Bypass N=107	SG N=49	AGB N=39	Medical/Lifestyle Intervention N=121
Duration of diabetes - yr	9.4 ± 6.3	8.3 ± 4.5	8.1 ± 5.3	8.6 ± 5.7
Use of Insulin – no. (%)	59 (55.1)	22 (44.9)	21 (53.8)	49 (40.5)
Age – yr	49.4 ± 8.7	47.8 ± 8.1	49.3 ± 10.0	51.8 ± 7.1
Female gender – no. (%)	73 (73.8)	38 (77.6)	26 (66.7)	75 (62.0)
Body Mass Index, kg/m ²				
Value	36.9 ± 3.5	36.1 ± 3.9	35.9 ± 3.2	36.5 ± 3.4
<35 – no. (%)	32 (29.9)	18 (36.7)	16 (41.0)	45 (37.2)
Body weight, kg	105.4 ± 14.9	100.6 ± 16.5	103.3 ± 12.8	106.5 ± 15.9
Waist, cm	116.0 ± 9.7	113.6 ± 10.2	115.2 ± 9.9	114.9 ± 10.2
Metabolic syndrome	91 (85.0)	42 (85.7)	34 (87.2)	96 (81.4)
White race – no. (%)	79 (73.8)	36 (73.5)	28 (71.8)	81 (66.9)
Systolic blood pressure, mmHg	135 ± 18.5	136 ± 18.8	132 ± 13.7	130 ± 15.6
Diastolic blood pressure, mmHg	81 ± 9.6	82 ± 11.6	78 ± 7.2	79 ± 9.9
Laboratory Measurements				
HbA _{1c} , %	8.7 ± 1.6	9.5 ± 1.7	8.1 ± 1.8	8.2 ± 1.4
Fasting Plasma Glucose, mg/dL, median (Q1, Q3)	158 (119, 218)	164 (132, 224)	155 (115, 228)	146 (122, 180)
LDL cholesterol, mg/dL	97.4 ± 33.0	105.8 ± 39.5	96.7 ± 28.6	95.5 ± 32.1
HDL cholesterol, mg/dL	44.4 ± 11.7	44.5 ± 12.0	38.4 ± 9.4	43.9 ± 13.2
Triglycerides, mg/dL, median (Q1, Q3)	141 (98, 226)	160 (120, 211)	142 (95, 251)	152 (94, 231)
Albumin/creatinine ratio, median (Q1, Q3)	7 (3, 25)	12 (7, 23)	5.5 (3, 11)	6 (3, 12)

SG: sleeve gastrectomy; AGB: adjustable gastric banding; HbA_{1c}: glycated hemoglobin; LDL: low density lipoprotein; HDL: high density lipoprotein.

Table S4. Demographics and Baseline Characteristics for Participants Included in the Three-Year Analysis Compared to Participants Not Included

	Included N=256	Not Included N=60	P-Value
Duration of diabetes – yr	8.4 ± 5.4	10.3 ± 6.7	0.02
Use of Insulin – no. (%)	123 (48.0)	28 (46.7)	0.85
Age – yr	49.9 ± 8.2	50.6 ± 8.8	0.55
Female gender – no. (%)	174 (68.0)	38 (63.3)	0.49
Body Mass Index, kg/m ²			
Value	36.3 ± 3.4	37.2 ± 3.5	0.07
<35 – no. (%)	95 (37.1)	16 (26.7)	0.13
Body weight, kg	103.9 ± 15.4	108.6 ± 14.9	0.03
Waist, cm	114.8 ± 9.9	116.8 ± 10.3	0.17
Metabolic syndrome	218 (85.2)	45 (78.9)	0.25
White race – no. (%)	184 (71.9)	40 (66.7)	0.42
Systolic blood pressure, mmHg	133 ± 16.8	131 ± 18.5	0.42
Diastolic blood pressure, mmHg	80 ± 9.7	80 ± 10.6	0.70
Type of Intervention			
Medical/Lifestyle	85 (33.2)	36 (60.0)	<0.001
Gastric bypass	89 (34.8)	18 (30.0)	0.47
Sleeve gastrectomy	46 (18.0)	3 (5.0)	0.09
Adjustable gastric banding	36 (14.1)	3 (5.0)	0.04
Laboratory Measurements			
HbA _{1c} , %	8.7 ± 1.7	8.2 ± 1.4	0.04
Fasting Plasma Glucose, mg/dL, median (Q1, Q3)	159 (120, 207)	144 (129, 188)	0.28 ^a
LDL cholesterol, mg/dL	98.3 ± 33.5	96.3 ± 33.1	0.68
HDL cholesterol, mg/dL	43.6 ± 12.3	43.0 ± 11.6	0.72
Triglycerides, mg/dL, median (Q1, Q3)	147 (100, 232)	141 (95, 202)	0.27 ^a
Albumin:creatinine ratio, median (Q1, Q3)	7 (4, 17)	7 (3, 28)	0.84 ^a

^a Wilcoxon rank-sum test.

Table S5. Primary and Secondary Endpoint by Surgical Procedure

	Gastric Bypass (N=89)	SG (N=46)	AGB (N=36)	Medical/Lifestyle Intervention (N=85)
Primary Endpoint, n/N (%)				
Glycated hemoglobin ≤ 6.5 off diabetes medications	41/84 (48.8)	11/42 (26.2)	8/34 (23.5)	2/76 (2.6)
Secondary Endpoints, n/N (%)				
≤ 7.0 with or without diabetes medications	61/89 (68.5)	29/46 (63.0)	19/36 (52.8)	28/85 (32.9)
≤ 6.5 with or without diabetes medications	49/89 (55.1)	20/46 (43.5)	12/36 (33.3)	15/85 (17.6)
≤ 6.0 without diabetes medications	26/84 (31.0)	7/42 (16.7)	8/34 (23.5)	2/76 (2.6)
Glycated hemoglobin level, %				
No. with 3-year glycated hemoglobin	89	46	36	85
At 3 yr	6.7 $\pm$ 1.3	7.0 $\pm$ 1.3	7.3 $\pm$ 1.5	8.2 $\pm$ 1.9
Change from baseline	-2.1 $\pm$ 1.9	-2.5 $\pm$ 2.1	-0.9 $\pm$ 2.0	-0.1 $\pm$ 2.0
Fasting plasma glucose, mg/dL , median (Q1,Q3)				
No. with 3-year fasting plasma glucose	86	45	35	75
At 3 yr	102 (87, 131)	109 (88, 139)	115 (99, 160)	129 (97, 170)
Change from baseline	-69 (-109, -9)	-46 (-96, -17)	-30 (-77, 6)	-12 (-48, 26)
Body weight, kg				
No. with 3-year body weight	86	40	35	82
At 3 yr	78.4 $\pm$ 14.7	78.0 $\pm$ 15.4	89.0 $\pm$ 15.2	100.0 $\pm$ 17.5
Change from baseline	-26.7 $\pm$ 9.8	-22.0 $\pm$ 8.6	-13.6 $\pm$ 8.2	-5.0 $\pm$ 8.7
Body mass index, kg/m ²				
No. with 3-year BMI	86	40	35	82
At 3 yr	27.4 $\pm$ 3.6	28.1 $\pm$ 4.4	31.3 $\pm$ 4.3	34.5 $\pm$ 4.1
Change from baseline	-9.4 $\pm$ 3.4	-7.9 $\pm$ 2.9	-4.8 $\pm$ 2.9	-1.8 $\pm$ 3.0
Waist circumference, cm				
No. with 3-year waist circumference	71	37	34	67
At 3 yr	94.1 $\pm$ 10.2	97.6 $\pm$ 9.8	104.0 $\pm$ 13.3	111.1 $\pm$ 13.0
Change from baseline	-21.5 $\pm$ 7.9	-16.0 $\pm$ 10.8	-10.7 $\pm$ 10.0	-2.1 $\pm$ 9.6
LDL cholesterol, mg/dL				
No. with 3-year LDL	89	43	33	80
At 3 yr	95.3 $\pm$ 27.2	106.6 $\pm$ 33.5	105.1 $\pm$ 30.6	95.0 $\pm$ 35.9
Change from baseline	-0.2 $\pm$ 35.6	3.7 $\pm$ 47.9	7.5 $\pm$ 31.5	-0.2 $\pm$ 26.3

HDL cholesterol, mg/dL				
No. with 3-year HDL	89	43	35	83
At 3 yr	59.5 ± 17.4	57.1 ± 16.7	51.4 ± 12.2	46.8 ± 12.4
Change from baseline	16.1 ± 11.8	13.4 ± 11.0	11.7 ± 8.4	2.3 ± 10.1
Triglycerides, mg/dL, median (Q1,Q3)				
No. with 3-year Triglycerides	89	43	35	84
At 3 yr	97 (74, 132)	103 (74, 138)	104 (86, 169)	124 (93, 160)
Change from baseline	-49 (-116, -6)	-53 (-102, -4)	-20 (-82, 6)	-10 (-70, 15)
Percentage with HbA _{1c} <7%, SBP <130/80 mmHg and LDL-C <100 mg/dL	14/84 (16.7)	5/38 (13.2)	5/33 (15.2)	8/77 (10.4)
Metabolic syndrome, n/N (%)	17/73 (23.3)	19/37 (51.4)	20/34 (58.8)	46/67 (68.7)
Albumin:creatinine ratio, median (Q1,Q3)				
No. with 3-year ratio	63	43	15	62
At 3 yr	5 (3, 14)	5 (3, 10)	5 (4, 11)	7 (4, 13)
Change from baseline	-2 (-18, 2)	-5 (-13, -2)	0 (-5, 2)	0 (-4, 4)
CKD-EPI eGFR mL/min/1.73 m ²				
No. with 3-year eGFR	87	43	36	84
At 3 yr	99.5 ± 19.6	100.2 ± 14.5	99 ± 19.4	98.7 ± 20.9
Change from baseline	-5.6 ± 19.2	-5.6 ± 11.7	-1.2 ± 18.4	-5.6 ± 17.5

SG: sleeve gastrectomy; AGB: adjustable gastric banding

Table S6. New Cancers Through Three Years after Randomization

	Gastric Bypass (n=107)	SG (n=49)	AGB (n=39)	Medical/Lifestyle Intervention (n=121)
Prostate	0	0	0	1
Breast	1	1	0	0
Skin Cancer	1	0	1	2
Ovarian	0	0	0	1
Papillary Thyroid Cancer	1	0	0	0

Table S7: Surgical and Endoscopic Procedures through Three Years after Randomization.

	RYGB (n=107)	SG (n=49)	AGB (n=39)	Medical/Lifestyle Intervention (n=121)
Gastrointestinal Procedures				
Lysis of adhesions for bowel obstruction	2	0	0	0
Laparoscopic gastric band removal/revision	0	0	2	0
Laparoscopic cholecystectomy	3	1	0	0
Laparoscopic feeding tube placement	0	1	0	0
Laparoscopy	2	0	0	0
Conversion of LAGB to RYGB	0	0	1	0
Cross-over from Medical/Lifestyle to SG	0	0	0	2
Endoscopic revision for weight-regain	2	0	3	0
Endoscopic clipping of marginal ulcer	2	0	0	0
Cardiac Procedures				
Coronary artery bypass graft	1	0	0	2
Angioplasty/stent	0	0	0	6*
Orthopedic Procedures				
Hip replacement	1	0	0	0
C4-5 osteophyte removal	1	0	0	0
C4 disectomy and fusion for syringomyelia	0	0	1	0
C2-7 laminectomy for syringomyelia	0	0	1	0
L4-5 laminectomy	0	0	0	1
Other Procedures				
Pelvic surgery for stress incontinence	0	0	0	1
Panniculectomy	2	0	0	0
Prostatectomy for cancer	0	0	0	1
Total	16 (15.0%)	2 (4.1%)	8 (20.5%)	13 (10.7%)

Cardiac procedures are also represented in Table 2 listing SAE, and these events are not additional

*6 stents in 2 patients