Ten Year Comparative Analysis of Three Primary Bariatric Operations Performed in Patients with BMI ≥ 50

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Abstract

Introduction: Bariatric surgery is the most effective modality to stably reduce weight and related comorbidities in patients suffering from class II and III obesity. Data comparing long term safety and efficacy of the three most effective bariatric operations is limited in patients with BMI ≥ 50 kg/m2, which complicates shared surgeon-patient decision-making regarding optimal procedure selection.

Methods: A retrospective analysis was performed on all patients with BMI ≥ 50 kg/m2 who underwent biliopancreatic diversion with duodenal switch (BPD/DS), Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) at our institution between 2009 and 2019. Data collected from patients' electronic medical records included operative details as well as BMI and presence and resolution of obesity-related comorbidities at 0, 6, 12, 24, 48 and 60 months post-operatively.

Results: Among 537 patients with BMI ≥ 50 kg/m2 who had a primary bariatric procedure, 93 patients underwent BPD/DS (17.3%), 341 patients underwent RYGB (63.5%), 103 patients underwent SG (19.2%). BMI decreased by 23.7 kg/m^2 in BPD/DS, 14.7 kg/m2 in RYGB and 13.6 kg/m2 in SG cohorts at 60 months post-operatively (p<0.0001). The greatest %TWL occurred in BPD/DS cohort (38.4%) followed by the RYGB (26.3%) and SG (23.6%) cohorts (p<0.0001). The thirty-day complication rate was 12.9% for BPD/DS, 4.7% for RYGB and 8.7% for SG (p=0.015)..

Operative Characteristics

	BPD/DS (N=93)	RYGB (N=341)	SG (N=103)	P-value
Operative time (hrs)				
Mean (SD)	3.44(1.37)	2.99(1.20)	2.16(0.89)	<0.0001[1]
ASA				
2	7(7.5%)	50(14.7%)	8 (7.8%)	.00036[2]
3	76(81.7%)	264(77.4%)	72 (69.9%)	
4	10(10.6%)	27(7.9%)	23(22.3%)	
EBL (mls)				
Mean (SD)	76.16(73.7)	65.16 (109.7)	72.66 (129.6)	0.6220[1]

Table 1: Key operative characteristics including operative times, American Society of Anesthesiology (ASA) score and estimated blood loss (EBL)

Weight Loss

	BPD/DS (N=93)	RYGB (N=341)	SG (N=103)	Total (N=537)	P-value
6 Months					
N	87	317	81	485	
Δ BMI (SD)	15.0 (4.8)	13.4 (4.2)	12.6 (5.1)	13.5 (4.5)	0.0015[1]
%TWL (SD)	24.3 (7.3)	23.8 (7.1)	21.7 (8.4)	23.5 (7.4)	0.0678[1]
12 Months					
N	83	280	79	442	
Δ BMI (SD)	22.1 (6.5)	18.0 (5.4)	16.0 (6.6)	18.4 (6.1)	<0.0001[1]
%TWL (SD)	35.6 (9.8)	31.9 (8.6)	27.3 (10.5)	31.8 (9.5)	<0.0001[1]
24 Months					
N	76	210	65	351	
Δ BMI (SD)	25.0 (8.7)	18.0 (6.5)	15.1 (7.1)	19.0 (7.9)	<0.0001[1]
%TWL (SD)	40.5 (12.4)	31.8 (10.5)	26.1 (11.6)	32.6 (12.0)	<0.0001[1]
60 Months					
N	53	116	32	201	
Δ BMI (SD)	23.7 (7.6)	14.7 (7.3)	13.6 (8.1)	16.9 (8.5)	<0.0001[1]
%TWL (SD)	38.4 (11.1)	26.3 (12.9)	23.6 (13.8)	29.1 (13.8)	<0.0001[1]

Table 2: Average change in BMI and total percent weight loss from baseline at 6, 12, 24, and 60 months post-op

Demographics

	BPD/DS (N=93)	RYGB (N=341)	SG (N=103)	Total (N=537)	P-value
Age					
Mean (SD)	44.6 (10.7)	45.1 (13.1)	45.9 (12.6)	45.2 (12.6)	0.6650[1]
Sex					
Female (%)	66 (71.0)	252 (73.9)	65 (63.1)	383 (71.3)	0.1047[2]
BMI					
Mean (SD)	62.4 (8.3)	56.4 (6.1)	58.1 (7.3)	57.7 (7.1)	<0.0001[1]
Median	61.4	54.7	56.1	56.0	

Table 3: Patient demographic in terms of age, sex and pre-surgical BMI by procedure (BPD/DS, RYGB, SG). [1]Kruskal Wallis and [2]Chi Square tests were used

Weight Loss from Baseline

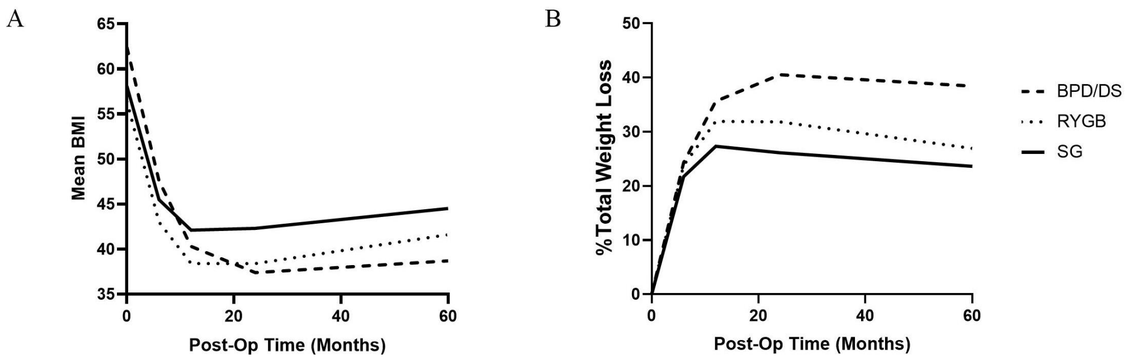


Figure 1: Weight loss post bariatric surgery over time A) mean BMI. Pairwise comparison between each procedural type at 60 months post-op: BPD/DS vs. RYGB (p < 0.0001), BPD/DS vs. SG (p < 0.0001), RYGB vs. SG (p = 0.4031). B) Percent total weight loss. Pairwise comparison between each procedural type at 60 months post-op: BPD/DS vs. RYGB (p < 0.0001), BPD/DS vs. SG (p < 0.0001), RYGB vs. SG (p = 0.2696). Kruskal Wallis test was used.

Early Complications

	BPD/DS (N=93)	RYGB (N=341)	SG (N=103)	Total (N=537)	P_{value}
No	81 (87.1%)	325 (95.3%)	94 (91.3%)	500 (93.1%)	0.0153[1]
Yes	12 (12.9%)	16 (4.7%)	9 (8.7%)	37 (6.9%)	
Pairwise Comparison	81 (87.1%)	325 (95.3%)			0.0043[1]
		325 (95.3%)	94 (91.3%)		0.3465[1]
	81 (87.1%)		94 (91.3%)		0.1185[1]

Specific Complication	BPD/DS	RYGB	SG
Anastomotic Leak	1	3	1
GI Bleed	0	0	1
Obstruction	1	2	2
Surg Site Infection	3	4	3
Other Infection	3	3	0
Cardiac/Resp[2]	4	4	2

Table 4: Early complication rate (less than 30 days post-op) for each procedure. Pairwise comparison between each procedural type: BPD/DS vs. RYGB (p = 0.0043), BPD/DS vs. SG (p = 0.3465), RYGB vs. SG (p = 0.1185). [1]Chi-Square, [2]Arrythmia, Resp distress after extubating

Late Complications

Operation	Overall P_{value}	P_{value}	Hazard Ration (95% CI)
BPD/DS		0.0174	4.545 (1.305-15.825)
RYGB		0.0385	0.092 (0.010-0.881)
SG	<0.0001		1.0 (Reference)

Table 5: Univariate Cox model for complications using SG as reference operation

Conclusions

Weight Loss: Our study demonstrated that the BPD/DS was the most effective operation at long term reduction of BMI and achieved highest %TWL. SG and RYGB lead to similar BMI reduction and %TWL at 60 months.

Complications: The SG cohort had the highest percentage of patients at ASA class 4 at 22.3% compared to RNYGB and BPD/DS at 7.9% and 10.6% respectively. EBL was not significantly. BPD/DS is associated with significantly increased early and late surgical complications compared to RYGB and SG

Conclusions: BPD/DS was the most effective operation at long term reduction of BMI and achieved highest %TWL while SG and RYGB lead to similar BMI reduction and %TWL at 60 months. BPD/DS associated with increased early and late surgical complications.

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