

Revisional Surgery After Sleeve Gastrectomy

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Indications for LSG Revision

Box 1

Indications for revision following laparoscopic sleeve gastrectomy

Issues

Insufficient weight loss

Weight recidivism

Technical reasons

Anastomotic leaks

Sleeve stricture

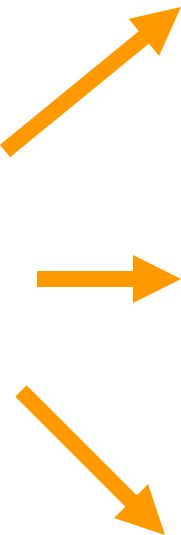
Sleeve dilation

Miscellaneous

GERD

Data from Brethauer SA, Kothari S, Sudan R, et al. Systematic review on reoperative bariatric surgery: American Society for Metabolic and Bariatric Surgery Revision Task Force. *Surg Obes Relat Dis* 2014;10(5):952–72.

Revision Options after LSG



Gastric bypass



Duodenal switch



Re-Sleeve



Systematic Review LSG to RYGB


Cheung et al Obes Surg 2014

11 studies (218 patients)

BMI 42 to 33 (12mo) and 35 (24 mo)

60% EWL at 12 mo and 48% EWL at 24 mo

Conversion of Sleeve Gastrectomy to Roux-en-Y Gastric Bypass

Joshua P. Landreneau¹  · Andrew T. Strong^{1,2} · John H. Rodriguez^{1,2} · Feres M. Alaseca¹ · Ali Aminian^{1,2} · Stacy Brethauer^{1,2} · Phillip R. Schauer^{1,2} · Matthew D. Kroh^{1,2,3} *Obesity Surgery (2018) 28:3843–3850*

N=89	
Demographics and Indication for Revision	
Age (mean +/- SD)	47.2 +/- 11.4 years
BMI (median, kg/m ²) (IQR)	43.2 (31.0 - 51.2)
Indications:	
Weight recidivism/ Failure to lose weight	11 (12.4%)
Refractory GERD	17 (40.5%)
Gastrocutaneous fistula	7 (16.7%)
Helical twist of gastric sleeve	2 (4.8%)
Diabetes mellitus	16 (18.0%)
Dyslipidemia	23 (25.8%)
Obstructive sleep apnea	37 (41.6%)
History of pulmonary embolism	8 (9.0%)

Perioperative Complications and Readmissions by Indication for Revision

Indication	Planned 2-stage bariatric operation (n=36)	Weight Recidivism (n=11)	Complication from SG (n=42)	Total (n=89)
Total patients with complications	13 (36.1%)	5 (45.5%)	10 (23.8%)	28 (31.5%)
Superficial SSI	6 (16.7%)	1 (9.1%)	2 (4.8%)	9 (10.1%)
Organ space SSI	2 (5.6%)	1 (9.1%)	4 (9.5%)	7 (7.9%)
Gastrojejunal anastomotic stricture	1 (2.8%)	2 (18.2%)	0 (0.0%)	3 (3.4%)
Urinary tract infection	0 (0.0%)	1 (9.1%)	0 (0.0%)	1 (1.1%)
Pulmonary embolism	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)
Reoperation	2 (5.6%)	0 (0.0%)	4 (9.5%)	6 (6.7%)
Negative diagnostic laparoscopy	0 (0.0%)	0 (0.0%)	2 (4.8%)	2 (2.2%)
Open repair of GJ leak	1 (2.8%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
Open resection of SB enterotomy	1 (2.8%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
Large bowel obstruction requiring right hemicolectomy	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)
Open repair of remnant gastrostomy staple line leak	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)
Readmission within 30 days	5 (13.9%)	4 (36.4%)	5 (11.9%)	14 (15.7%)
Dehydration requiring IV fluid resuscitation	3 (8.3%)	0 (0.0%)	2 (4.8%)	5 (5.6%)
Endoscopic dilation of anastomotic stricture	1 (2.8%)	2 (18.2%)	0 (0.0%)	3 (3.4%)
Contained anastomotic leak, no intervention	0 (0.0%)	1 (9.1%)	0 (0.0%)	1 (1.1%)
Anastomotic leak, percutaneous drainage	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)
Abdominal pain	1 (2.8%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
Large bowel obstruction	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)
Superficial SSI	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.1%)

Conversion of Sleeve Gastrectomy to Roux-en-Y Gastric Bypass

Joshua P. Landreneau¹  · Andrew T. Strong^{1,2} · John H. Rodriguez^{1,2} · Essa M. Aleassa¹ · Ali Aminian^{1,2} · Stacy Brethauer^{1,2} · Philip R. Schauer^{1,2} · Matthew D. Kroh^{1,2,3}

Obesity Surgery (2018) 28:3843–3850

Patients with pre-conversion diabetes mellitus	16 (18.0%)
12-month follow-up available	11 (61.1%)
Pre-conversion hemoglobin A1c (mean ± SD)	7.0 ± 0.4%
12 months post-conversion hemoglobin A1c (mean ± SD)	6.1 ± 0.2%
Decrease in post-conversion hemoglobin A1c	0.8 ± 0.4%
Patients with hemoglobin A1c ≤ 6.0% pre-conversion	2 (18.2%)
Patients with hemoglobin A1c ≤ 6.0% post-conversion	6 (54.5%)
Diabetes status at 12 months post-conversion	
Remission (complete)	4 (36.4%)
Remission (partial)	0 (0.0%)
Improvement	2 (18.2%)
Unchanged	5 (45.5%)


Conversion of Sleeve Gastrectomy to Roux-en-Y Gastric Bypass

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Patients who underwent revision for refractory GERD	17 (40.5%)
12 month follow-up available	12 (70.6%)
Reflux symptoms resolved at 12 months	9 (75.0%)

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3848

OBES SURG (2018) 28:3843–3850

Table 5 Weight-related outcomes stratified by indication

	Pre-revision <i>n</i> = 89	12 months post-SG to RYGB conversion <i>n</i> = 61 (68.5%)		
	BMI (kg/m ²)	ΔBMI	%TWL	%EWL
Overall	42.6 (31.0–51.2)	5.9 kg/m ² (2.5–8.2)	13.2% (7.3–19.4%)	32.7% (20.4–47.3%)
Planned 2-stage bariatric operation	52.3 (46.8–57.0)	7.8 kg/m ² (5.2–10.6)	13.3% (10.7–19.6%)	27.1% (18.4–36.5%)
Weight recidivism	48.6 (39.3–50.2)	7.9 kg/m ² (3.3–9.8)	16.1% (8.2–20.2%)	32.7% (22.8–41.7%)
Complication from SG	30.4 (27.2–35.0)	4.5 kg/m ² (1.3–5.9)	11.9% (4.1–18.8%)	44.5% (24.8–91.9%)

One Anastomosis/Mini-Gastric Bypass (OAGB/MGB) as Revisional Surgery Following Primary Restrictive Bariatric Procedures: a Systematic Review and Meta-Analysis

Mohammad Kermansaravi ¹, Shahab Shahabi Shahmiri ², Amir Hossein DavarpanahJazi ², Rohollah Valizadeh ³, Giovanna Berardi ⁴, Antonio Vitiello ⁴, Mario Musella ⁵, Miguel Carbajo ⁶

One anastomosis gastric bypass (OAGB/MGB) has gained popularity in the past decade. International databases were searched for articles published by September 10, 2020, on OAGB/MGB as a revisional procedure after restrictive procedures. Twenty-six studies examining a total of 1771 patients were included. The mean initial BMI was 45.70 kg/m², which decreased to 31.52, 31.40, and 30.54 kg/m² at 1, 3, and 5-year follow-ups, respectively. Remission of type-2 diabetes mellitus (T2DM) following OAGB/MGB at 1-, 3-, and 5-year follow-up was 65.16 ± 24.43, 65.37 ± 36.07, and 78.10 ± 14.19%, respectively. Remission/improvement rate from gastroesophageal reflux disease (GERD). Also, 7.4% of the patients developed de novo GERD following OAGB/MGB. Leakage was the most common major complication. OAGB/MGB appears to be feasible and effective as a revisional procedure after failed restrictive bariatric procedures.

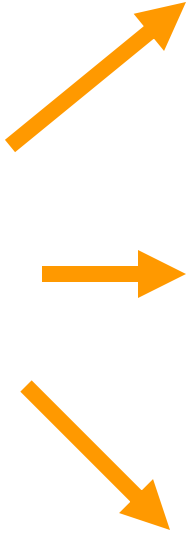
One anastomosis gastric bypass vs. Roux-en-Y gastric bypass, remedy for insufficient weight loss and weight regain after failed restrictive bariatric surgery

Nathan Poublon¹, Ibtissam Chidi², Martijn Bethlehem³, Ellen Kuipers⁴, Ralph Gadiot², Marloes Emous³, Marc van Det⁴, Martin Dunkelgrun², Ulas Biter², Jan Apers²

Results: %TWL was significantly larger in the OAGB group at 12 months (mean 24.1±9.8 vs. 21.9±9.7, $p = 0.023$) and 24 months (mean 23.9±11.7 vs. 20.5±11.2, $p = 0.023$) of follow-up. %EBMIL was significantly larger in the OAGB group at 12 months (mean 69.0±44.6 vs. 60.0±30.1, $p = 0.014$) and 24 months (mean 68.6±51.6 vs. 56.4±35.4, $p = 0.025$) of follow-up. Intra-abdominal complications (leakage, bleeding, intra-abdominal abscess and perforation) occurred less frequently after revisional OAGB (1.1% vs. 4.9%, $p = 0.025$). Surgical intervention for biliary reflux (5.4% vs. 0.3%, $p < 0.001$) was more prevalent in the OAGB group. Surgical intervention for internal herniation (0.0% vs. 4.9%, $p = 0.002$) was more prevalent in the RYGB group.

Conclusions: This study suggests that OAGB is superior to RYGB as a remedy for insufficient weight loss and weight regain after failed restrictive surgery with more weight loss and a lower early complication rate. To substantiate these findings, further research from prospective randomized controlled trials is needed.

Revision Options after LSG



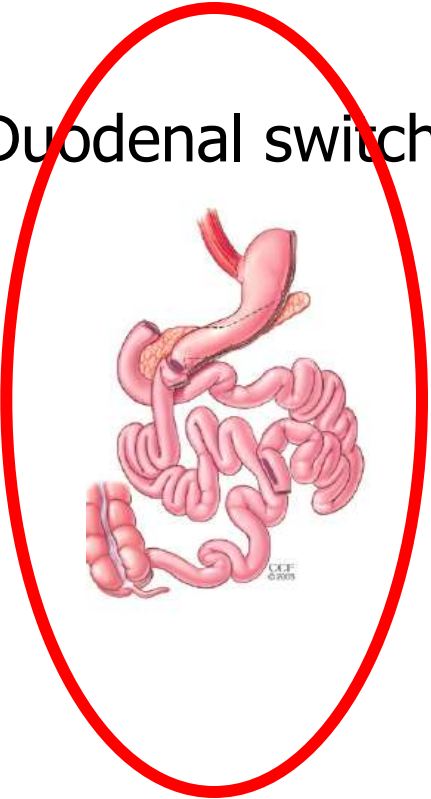
Gastric bypass



Re-Sleeve



Duodenal switch



Postoperative morbidity and weight loss after revisional bariatric surgery for primary failed restrictive procedure: A systematic review and network meta-analysis

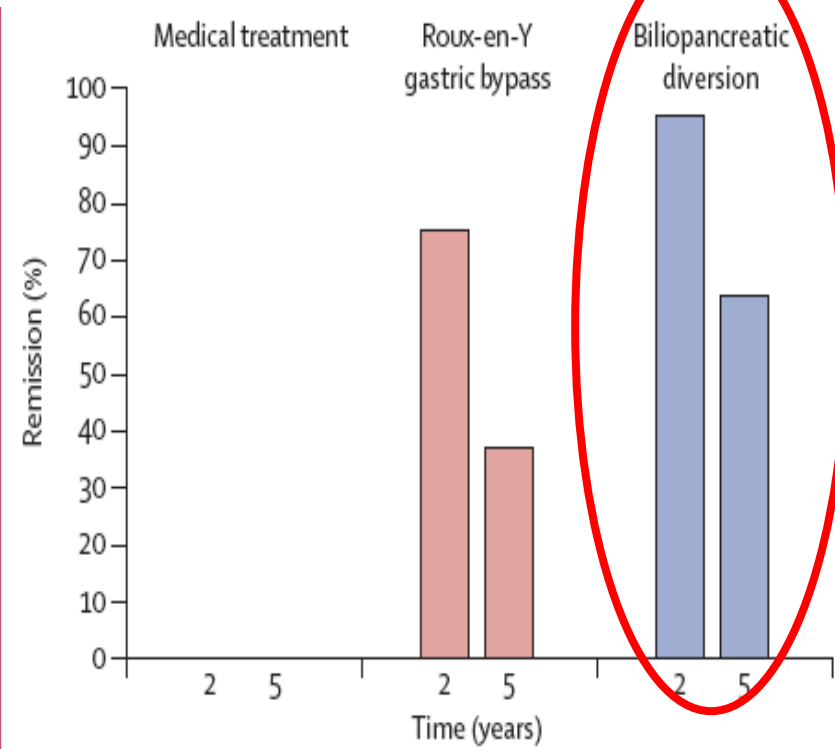
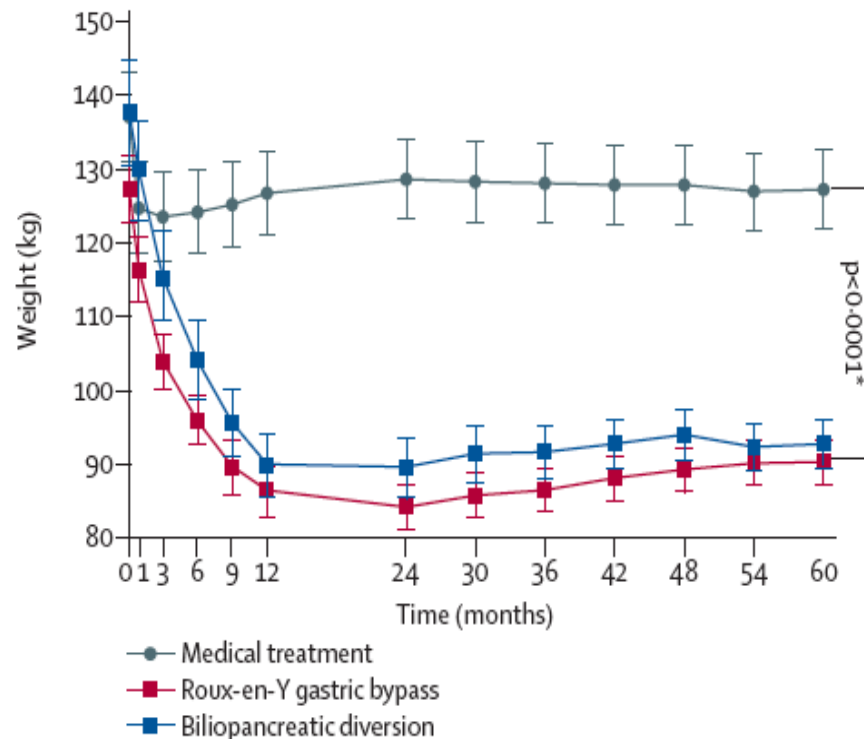
Chierici A ¹, Chevalier N ², Iannelli A ³

Methods: a systematic review and network meta-analysis of 39 studies was conducted following the PRISMA guidelines and the Cochrane protocol.

Results: biliopancreatic diversion with duodenal switch guarantees the best results in terms of weight loss (1 and 3-years %TWL MD: 12.38 and 28.42) followed by single-anastomosis duodenoileal bypass (9.24 and 19.13), one-anastomosis gastric bypass (7.16 and 13.1), and Roux-en-Y gastric bypass (4.68 and 7.3) compared to re-sleeve gastrectomy. Duodenal switch and Roux-en-Y gastric bypass are associated to an increased risk of late major morbidity (OR: 3.07 and 2.11 respectively) compared to re-sleeve gastrectomy while no significant difference was highlighted for the other procedures. Re-sleeve gastrectomy is the revisional intervention most frequently burdened by weight recidivism; compared to it, patients undergoing single-anastomosis duodenoileal bypass have the lowest risk of weight regain (OR: 0.07).

Bariatric-metabolic surgery versus conventional medical treatment in obese patients with type 2 diabetes: **5 year** follow-up of an open-label, single-centre, randomised controlled trial

Geltrude Mingrone, Simona Panunzi, Andrea De Gaetano, Caterina Guidone, Amerigo Iaconelli, Giuseppe Nanni, Marco Castagneto, Stefan Bornstein, Francesco Rubino
Lancet 2015; 386: 964-73



	Medical treatment group (n=15)	Roux-en-Y gastric bypass group (n=19)	Biliopancreatic diversion group (n=19)
Surgical complications			
Intestinal occlusion	0	1 (5%)	0
Incisional hernia	0	0	1 (5%)
Metabolic complications			
Iron-deficiency anaemia	0	3 (16%)	5 (26%)
Hypoalbuminaemia (albumin <35 g/L)	0	0	3 (16%)
Osteopenia (BMD T-score of -2*)	1 (7%)	1 (5%)	3 (16%)
Osteoporosis (BMD T-score of -2.7*)	0	0	1 (5%)
Transient nyctalopia	0	0	1 (5%)
Renal calculus	0	1 (5%)	2 (11%)
Coronary heart disease			
Myocardial infarction†	1 (7%)	0	0
Retinopathy	1 (7%)‡	0	0
Nephropathy (proteinuria >0.5 g/24 h)	1 (7%)	1 (5%)	0
Neuropathy	2 (13%)§	0	0
Symptomatic hypoglycaemia	0	2 (11%)¶	0
Albumin to creatinine ratio >30 mg/g pre-treatment	4 (27%)	3	2 (11%)
Albumin to creatinine ratio >30 mg/g at 5 years follow-up	4 (27%)	0	0

*Geltrude Mingrone, Simona Panunzi, Andrea De Gaetano, Caterina Guidone, Amerigo Iaconelli, Giuseppe Nanni, Marco Castagneto,
Stefan Bornstein, Francesco Rubino*

Lancet 2015; 386: 964-73

Biertho L, Lebel S, Marceau S, Hould FS, Lescelleur O, Moustarah F, et al. *Perioperative complications in a consecutive series of 1000 duodenal switches.*

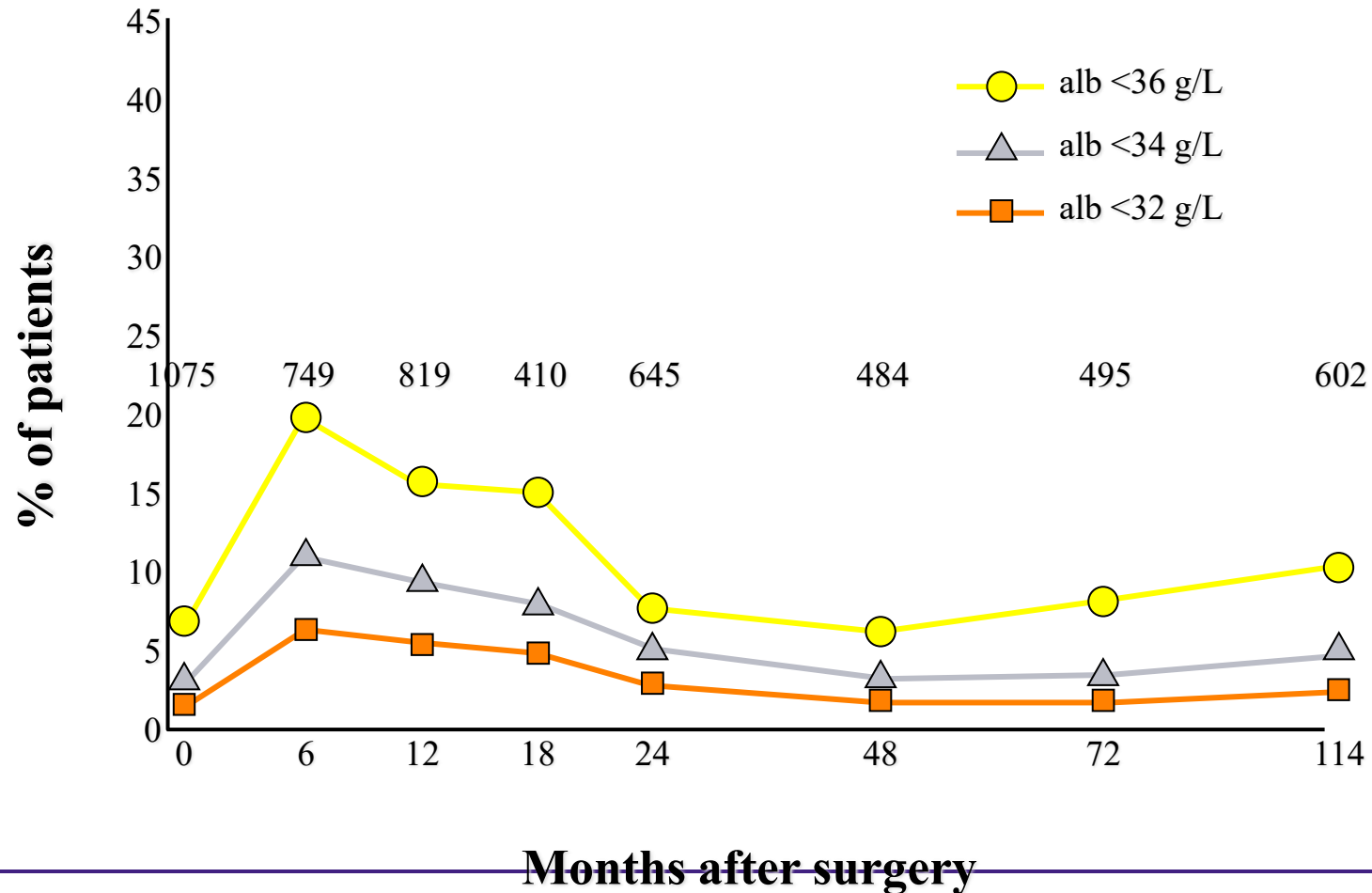
Surg Obes Relat Dis. 2013;9(1):63-8.

1000 BPD-DS since the introduction of laparoscopic DS at our institute (11/2006):

- 228 laparoscopic DS
- 772 open DS
- Mean BMI= 51 ± 8 kg/m²

Protein metabolism

Albumin deficiency



Changes in Serum Biochemistry on Follow-up: Decreases

Table 2. Blood elements decreased after surgery: comparison between before and after surgery

		Before	After	Relation/Time
Albumin mean (N >36 g/l) (n 1,028)		41.1 ± 3.8	40.3 ± 3.8*	Stable
	Insufficiency (36-30)	4.6%	8.5%	
	Deficiency (<30)	0.9%	0.9%	
Hemoglobin mean (N > 120 g/l) (n 1,142)		138.3 ± 12.7	132.1 ± 12.3*	Stable
	Insufficiency (120-100)	5.7%	14%	
	Deficiency (<100)	0.2%	0.8%	
Calcium mean (N > 2.15 g/l) (n 1,000)		2.29 ± 0.11	2.23 ± 0.12*	Stable
	Insufficiency (2.15-2)	6.4%	20.7%	
	Deficiency (<2)	0.4%	1.3%	
Vitamin A mean (N > 1.4) (n 807)		2.48 ± 0.84	1.89 ± 0.70*	Decrease*
	Insufficiency (1.4-0.7)	7.6%	21.2%	
	Deficiency (<0.7)	0.1%	1.9%	

*P <0.001

Obes Surg. 2007 Nov;17(11):1421-30.

Bone Related Serum Measurements

Table 5. Markers of bone metabolism: comparison between before and after surgery

		Before	After	Relation/Time
PTH mean (N< 75ng/l)**	n 720	45.7	66.8	Increase
	moderate increase (75-100)	11.3%	31.9%	
	marked increase (>100)	5.0%	16.8%	
ALP mean (N<130 u/l)*	n 1,032	89.2	95.1	Increase
	moderate increase (130-150)	2.4%	7.6%	
	marked increase (>150)	4.2%	5.3%	

* $P<0.02$ ** $P<0.001$

Obes Surg. 2007 Nov;17(11):1421-30.

Revision of Primary Bariatric Procedures to RYGB

LAGB, VBG, LSG all have significant failure rates requiring revision

Revision of LSG to RYGB or OAGB is associated with higher complication rates compared to primary RYGB; but are reasonable

Weight loss outcomes and co-morbidity improvements are similar to primary RYGB

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