


Revisional surgery in severe nutritional complications after bariatric surgical procedures: report of four cases from a single institution and review of the literature

Cirurgia revisional em complicações nutricionais graves após cirurgia bariátrica: relato de 4 casos de uma única instituição e revisão da literatura

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ABSTRACT

Introduction: bariatric surgery is currently the only treatment that leads to long-term and sustained weight loss and decreased morbidity and mortality in morbidly obese individuals. Roux-en-Y bypass causes weight loss by restricting food intake associated with reduced intestinal absorption, in addition to multiple endocrine and satiogenic effects. Biliopancreatic diversion promotes weight loss mainly due to poor absorption of the nutrients ingested. Both procedures exclude parts of the gastrointestinal tract. **Objective:** to describe four cases of revisional surgery after primary bariatric surgery, due to serious nutritional complications, and to review the literature regarding this subject. **Methods:** a retrospective analysis of patients of Unicamps bariatric center database and review of the literatures were performed. **Results:** four patients were identified, 2 women and 2 men, with a mean age of 48 years. The mean body mass index before revisional surgery was 23.7 kg/m². Three patients underwent Scopinaro biliopancreatic diversion, and one patient underwent Roux-en-Y gastric bypass. The revisional surgeries were revision, conversion, and reversion. One patient died. For the review of the literature 12 articles remained (11 case reports and 1 case series). Another five important original articles were included. **Conclusion:** fortunately, revision surgery is rarely necessary, but when indicated it has increased morbidity, it can be revision, reversion or conversion according to the severity of the patient and the primary surgery performed.

Keywords: *Bariatric Surgery. Reoperation. Malnutrition.*

INTRODUCTION

In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese¹. Bariatric surgery is currently the only treatment that leads to long-term and sustained weight loss and decreased morbidity and mortality in morbidly obese individuals². However, lifestyle modifications that include changes in diet and increased physical activity usually result in inefficient weight loss and inadequate maintenance of weight in the long-term³.

Roux-en-Y bypass causes weight loss by restricting food intake associated with reduced intestinal absorption, in addition to multiple endocrine and satiogenic

effects. Biliopancreatic diversion (BPD) promotes weight loss mainly because of poor absorption of nutrients. Both procedures exclude parts of the gastrointestinal tract, which cause potential development of metabolic deficiencies and malabsorption of certain nutrients, including proteins and certain minerals and vitamins⁴.

Clinically relevant malabsorption should be considered if a patient shows one or more of the following symptoms/signs after the bariatric surgical procedure: gastrointestinal symptoms/signs, including diarrhea, abdominal distention, flatulence, abdominal pain and ascites, and other general symptoms, such as persistent weight loss, anemia, amenorrhea, impotence, infertility, night blindness, xerophthalmia, peripheral neuropathy,

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tiredness, fatigue, and weakness⁵. After the malabsorption procedure, a blood test panel must be requested, together with a regular postoperative follow-up, from the preoperative period, then in between the 3rd and 6th -month in the first two years, and annually thereafter⁶.

The present study aims to report the clinical aspects and treatment of four patients who underwent revisonal surgery after primary bariatric surgery due to serious nutritional complications and to review the literature on this subject.

METHODS

Based on a retrospective analysis of data collected from the medical records in Unicamp's bariatric surgery center database, four cases of malnutrition revisonal surgery were reported. The collected variables were age, sex, body mass index (BMI) before revisonal surgery, bariatric surgery, and revisonal surgery, follow-up before and after revisonal surgery, outcomes, and reasons for revision.

Literature published in the last 10 years was reviewed through an online search for MeSH terms "Bariatric surgery" and "Malnutrition" in Medline (via PubMed) and Lilacs (via Bireme). Inclusion criteria were original studies, case reports, or case series of patients who underwent bariatric surgery, developed malnutrition or related conditions, and required revisonal surgery. Articles reporting in vitro or animal studies, articles wherein participant characteristics did not meet the inclusion criteria, abstracts from poster presentations, review articles, and duplicate publications were excluded. Other articles were used for contextualization and discussion. Finally, four cases are presented from this bariatric center.

Based on a retrospective analysis of data

collected from medical records, 4 cases of malnutrition revisonal surgery reported in this bariatric center were added to the total number of cases reviewed in the literature over a 10-year period.

The study protocol was approved by the institutional research ethics board (reference number: Unicamp 4.018.799/CAAE: 30636620.3.0000.5404).

RESULTS

Four patients, 2 women and 2 men with a mean and standard deviation age of 48 ± 15.7 years, who underwent revisonal surgery for severe nutritional complications were reviewed (Table 1). The mean and standard deviation BMI before bariatric surgery was 48 ± 3.49 kg/m². The mean and standard deviation BMI before revisonal surgery was 23.7 ± 2.86 kg/m². The time between the first surgery and the revision surgery was 11 ± 2.34 years. Regarding comorbidities, 2 patients did not have any, 1 had a depressive disorder and another had high blood pressure, hypothyroidism and depression disorder.

Three patients underwent Scopinaro BPD⁷, and one patient underwent Roux-en-Y bypass. The revisonal operations were conversion in one case, revision in another, and reversion in two patients.

All patients did not undergo regular postoperative follow-up and did not use the recommended supplementation. After revisonal surgery, one patient died because of septic complications due to an enteric fistula and liver failure. He underwent 2 procedures to control the fistula, but he died 45 days after the initial surgical approach. The other 3 patients had regular follow-up, with a mean and standard deviation of 31.3 ± 13.2 months.

Table 1. Main characteristics of the four patients who underwent revisonal surgery for malnutrition.

Case	Age/ Sex	BMI (kg/m ²) before revisonal surgery	Bariatric surgery	Revisonal surgery	Follow-up before revisonal surgery	Follow-up after revisonal surgery	Outcomes	Reasons for revision
Case 1	50 / M	26	Scopinaro BDP	Reversion	No	–	Enteric fistula	Liver failure

Case 2	71 / F	22	Scopinaro BDP	Reversion	No	20 months	Satisfactory	Malnutrition, hydroelectrolytic disorders, acute renal failure and anasarca
Case 3	27 / F	18	Roux-en-Y bypass	Reversion	No	24 months	Satisfactory	Progressive weight loss, Malnutrition and BMI of 18
Case 4	44 / M	23.1	Scopinaro BDP	Conversion	No	50 months	Satisfactory	Hypoalbuminemia, anemia, deficiencies of all fat-soluble vitamins and anasarca

BMI - body mass index; BDP - Biliopancreatic diversion.

For the review of the literature, the total number of articles by database search was 156 and 13 in PubMed and Lilacs, respectively. After excluding duplicates and screening by title and abstract, 12 articles remained (11 case reports and 1 case series). Another five important original articles were included. Eventually, 92 patients were found (Table 2), and a cumulative sample size of 96 patients from 9 different countries was evaluated. Of these patients, 15 died (16.3%). Patients underwent revision surgery for findings indicating

severe malnutrition, such as anemia, hypoalbuminemia, anasarca, renal failure, and liver failure. The performed operations were characterized by revision procedures to elongation of the common limb; conversion operations, when a more disabsorptive procedure was converted into a less disabsorptive; and reversal operations, when a mechanism was used to establish normal anatomy. In this study, 11 (11.45%), 31 (32.29%), and 54 (56.25%) patients underwent conversion, reversion, and revision procedures, respectively.

Table 2. Reported cases of patients who underwent revisional surgery for malnutrition.

Author	N Bariatric/ N Revisional	N Revisional Surgery for Malnutrition	Age	BMI (kg/m ²) Before	Bariatric Surgery	Revisional	Follow-up (months)	Outcomes	Revisional Cause
Willaert et al.	–	17	36.2 ± 8.3	45.5 ± 8.4	BPD (11) BPD-DS (4) RYGB (2)	Conver- sion (8) Revision (9)	28 ± 29	Satisfactory 14/17	Persistent diarrhea, BMI under 20 kg/m ² , TPN
Pires Sou- to et al.	810/67	28	41.6 ± 10.4	51.4 ± 9.0	BPD-DS (25) JIB (2) RYGB (1)	Revision (25) Reversion (3)	19 ± 4.2	Satisfactory 58/67	–
Patel et al.	384/151	11	–	18 to 80	JIB (4) RYGB (4) MGB (1) VGB (2)	Reversion (9) Conver- sion (2)	–	Satisfactory 10/11	Severe chro- nic diarrhea, renal failure
Sampaio Neto et al.	–	2	–	38.61 and 51.92	RYGB (n=2)	Reversion (2)	–	Satisfactory 2/2	Severe undernu- trition and electrolyte imbalance.

Caris F. et al.	1	1	43	32.2	RYGB (1)	Reversion (1)	4	Satisfactory 1/1	Anemia, Vitamin deficiency and severe malnutrition
Chousleb et al.	3726/259	6	51.2	–	RYGB (2) JIB (4)	Reversion (6)	1 to 36	Satisfactory 6/6	Anemia, renal failure, electrolyte imbalance
Spyropoulos et al.	1161/56	15	–	–	BPD-RY-GBP (15)	Revision (15)	65 ± 7	Satisfactory 15/15	TPN and hypoalbuminemia
Tong et al.	1	1	58	53.2	BPD-DS (1)	Revision (1)	96	Satisfactory 1/1	Diarrhea that did not respond to dietary and medical therapy
Pitt et al.	1	1	38	42	Distal RYGB (1)	Revision (1)	48	Satisfactory 1/1	Kwashiorkor
Ceneviva et al.	1	1	55	60	RYGB (1)	Reversion (1)	36	Satisfactory 1/1	Steatorrhea, hypoalbuminemia, anemia
Motamedi et al.	1	1	37	44	MGB (1)	Reversion (1)	–	Satisfactory 0/1	Liver failure
Halawani et al.	1	1	37	49	BPD-DS (1)	Reversion (1)	6	Satisfactory 1/1	BMI under 20 kg/m ² , hypoalbuminemia, deficiencies vitamins
Zubiaga et al.	1	1	47	48	MGB (1)	Revision (1)	3	Satisfactory 1/1	Diarrhea, steatorrhea, hypoalbuminemia and Wipple's disease

Appresai et al.	1	1	60	65	Distal RYGB (1)	Revision + Gastrostomy (1)	6	Satisfactory 1/1	Diarrhea, steatorrhea, hypoalbuminemia
Beghdadi et al.	1	1	36	50.1	Distal RYGB (1)	Reversion (1)	12	Satisfactory 1/1	Diarrhea, anasarca, hypoalbuminemia, neuropathy, liver failure
Martins et al.	1	1	47	52.9	RYGB (1)	Reversion (1)	18	Satisfactory 1/1	Anasarca, hypoalbuminemia, anemia, diarrhea
Akusoba et al.	–	3	56 ± 7.84	36.9 and 42.4 and 46.4	RYGB (1)	Reversion (3)	12	Satisfactory 3/3	BMI under 20kg/m ² , hypoalbuminemia
Braga et al.	–	4	48 ± 15.7	48 ± 3.49	RYGB (1) BPD (3)	Conversion (1) Revision (1) Reversion (2)	31.3 ± 13.2	Satisfactory 3/4	Liver failure, acute renal failure and anasarca

NR - not reported - BMI: body mass index; BPD - biliopancreatic diversion; BPD-DS - biliopancreatic diversion with duodenal switch; RYGB - Roux-en-Y gastric bypass; JIB - jejunoileal bypass; MGB - mini-gastric bypass; VBG - vertical banded gastroplasty; TPN - total parenteral nutrition.

DISCUSSION

Revisional bariatric operations are associated with higher complication rates than the initial procedures, regardless of the used technique, and according to the literature, rates vary from 13% to 55% in different studies⁸. Out of the 96 reviewed cases, 81 patients had successful outcomes, whereas 15 patients died, accounting for a mortality rate of 16.3%, which shows the complexity of a

revisional operation for malnutrition.

Low adherence to follow-up has detrimental effects on patient safety due to the delay in diagnosing complications. Most bariatric surgery centers have standardized protocols for postoperative care; nevertheless, the literature reports that the follow-up of these patients can reach only 50% after 1 year of the operation⁹.

Indications for revisional procedures are

most often related to protein malabsorption, which is the most serious and potentially fatal side effect¹⁰. In addition to postoperative follow-up, monitoring these patients preoperatively is extremely important to identify signs of malnutrition. A study conducted in this bariatric center compared individuals who underwent a preoperative interdisciplinary bariatric surgery program with those who did not. The major outcomes included decreased length of hospital stay, wound dehiscence, wound infection, pulmonary complications, fistulas, pulmonary thromboembolism, sepsis, incisional hernias, reoperations, and mortality¹¹.

With regard to the clinical presentation, patients with severe malnutrition requiring revisional operations, usually have hypoalbuminemia, anemia, renal failure, liver failure, ascites, anasarca, and they require preoperative parenteral nutrition^{8,12-27}.

No randomized studies have evaluated the best revisional approach, and a consensus has not been reached to date. These procedures can be classified into revisions, conversions, and reversals. Revision procedures (elongation of the common channel) and conversion techniques are mostly associated with malabsorption, such as BPD, BPD with duodenal switch, and distal gastric bypass, into conventional gastric bypass are widely used techniques and they also maintain a metabolic component to prevent obesity relapse. Reversals are obviously chosen in patients with severe malnutrition or those who underwent revisional surgery^{8,12-27}.

Several options can be considered, including proximal side-to-side anastomosis between the alimentary and biliopancreatic limbs or the alimentary limb that can be sectioned above the interstitial anastomosis as close as possible to the angle of Treitz¹⁰.

Akusoba et al.²⁷ proposed an algorithm for managing patients with excessive weight loss. A gastrostomy must be performed in the excluded stomach for patients without strictures in the gastrointestinal tract, without psychiatric disorders, and with good caloric intake. However, a reversal procedure should be performed if the patient does not improve. A gastrostomy can be a good option for clinical and nutritional improvement, and precede the definitive treatment. Appesai and Murr²⁴ described the use of gastrostomy with revision surgery as a way to nourish the patient in the postoperative

period. The gastrostomy tube was removed eight weeks postoperatively.

Sampaio-Neto et al.¹⁴ described a revisional procedure and were successful in two cases. It consists of anastomosis between the alimentary limb 10 cm from the anterior gastroenterostomy and the gastric antrum 4 cm from the pylorus; the alimentary limb is sectioned distally to the new anastomosis, following the resection of the original enteroanastomosis. Ceneviva et al.²⁰ described another type of revisional surgery, wherein the duodenum and proximal jejunum were reconnected to the alimentary tract. The alimentary limb was sectioned and stapled close to the jejunojejunal anastomosis and then anastomosed to the second part of the duodenum with a linear-stapled side-to-side suture. Akusoba et al.²⁷ described a reversion technique with transection of the gastric pouch proximal to the gastrojejunostomy, creation of a gastrogastrostomy, transection of the biliopancreatic limb off the jejunojejunosomy, and creation of an anastomosis between the biliopancreatic and Roux limbs transected from the gastrojejunostomy.

This study evaluated 96 patients (4 in our bariatric center and 92 in the literature review). Even after an extensive review, the descriptions of patients who were reoperated for malnutrition after bariatric surgery were scarce; hence, new publications, consensus, and clinical trials are necessary to define a follow-up model for these patients and the best surgical approach to be adopted.

CONCLUSION

Severe malnutrition after bariatric surgery requiring surgical intervention is uncommon, but when present, it is associated with high mortality that is not negligible. Therefore, bariatric surgeons must be prepared to manage these difficult cases.

After bariatric surgery, patients should be assessed nutritionally on a regular basis. Malnutrition cases can be manifested in a drastic way, such as chronic diarrhea, acute renal failure, liver failure. Revision surgery is rarely necessary, but when indicated it is associated with increased morbidity. The revision procedure can be revision, reversion or conversion according to the severity of the patient and the primary performed operation.

R E S U M O

Introdução: atualmente, a cirurgia bariátrica é o único tratamento que leva à perda de peso prolongada e sustentada e diminuição da morbimortalidade em indivíduos obesos mórbidos. O bypass em Y-de-Roux causa perda de peso restringindo a ingestão de alimentos associada à redução da absorção intestinal, além de múltiplos efeitos endócrinos e sacietógenos. O desvio biliopancreático promove a perda de peso principalmente devido à diminuição da absorção dos nutrientes ingeridos. Ambos os procedimentos excluem partes do trato gastrointestinal. **Objetivo:** descrever 4 casos de cirurgia revisional após cirurgia bariátrica primária, devido a graves complicações nutricionais, bem como realizar uma revisão da literatura sobre esse assunto. **Métodos:** foi realizada uma análise retrospectiva dos pacientes do banco de dados do serviço de cirurgia bariátrica da Unicamp e revisão da literatura. **Resultados:** foram identificados 4 pacientes, 2 mulheres e 2 homens, com média de idade de 48 anos, o IMC antes da cirurgia revisional eram em média 23,7. Os pacientes haviam sido submetidos em 3 casos a cirurgia de Scopinaro e 1 caso ao bypass gástrico em Y-de-Roux. As cirurgias revisionais foram de revisão, conversão e reversão. Um paciente evoluiu a óbito. Em relação a revisão da literatura, foram selecionados 12 artigos (11 relatos de casos e 1 série de casos). Outros cinco artigos originais importantes foram incluídos. **Conclusão:** felizmente, a cirurgia revisional raramente é necessária, mas, quando indicada, apresenta alta morbidade. São cirurgias de revisão, reversão ou conversão, de acordo com a gravidade do paciente e a cirurgia primária realizada.

Palavras chave: Cirurgia Bariátrica. Reoperação. Desnutrição.

REFERENCES

1. World Health Organization. Obesity and overweight Updated June 2016. Geneva: WHO; 2016.
2. Buchwald H, Avidor Y, Eugene Braunwald, Jensen MD, Pories W, Kyle F, et al. Bariatric surgery: a systematic review and meta-analysis. *JAMA*. 2004;292(14):1724–37.
3. Bal BS, Finelli FC, Shope TR, Koch TR. Nutritional deficiencies after bariatric surgery. *Nat Rev Endocrinol*. 2012;8(9):544–56.
4. Skroubis G, Sakellaropoulos G, Pougouras K, Mead N, Nikiforidis G, Kalfarentzos F. Comparison of nutritional deficiencies after Roux-en-Y gastric bypass and after biliopancreatic diversion with Roux-en-Y gastric bypass. *Obes Surg*. 2002;12(4):551–8.
5. Hammer HF. Medical complications of bariatric surgery: Focus on malabsorption and dumping syndrome. *Dig Dis*. 2012;30(2):182–6.
6. Tack J, Deloose E. Complications of bariatric surgery: Dumping syndrome, reflux and vitamin deficiencies. *Best Pract Res Clin Gastroenterol*. 2014;28(4):741–9.
7. Scopinaro N, Adami GF, Marinari GM, Gianetta E, Traverso E, Friedman D, et al. Biliopancreatic diversion. *World J Surg*. 1998;22(9):936–46.
8. Pires Souto K, Meinhardt NG, de Azevedo Dossin I, Ramos MJ, Carnellos G, Mazzaferro C, et al. Revisional Malabsorptive Bariatric Surgery: 29-Year Follow-up in a Brazilian Public Hospital. *Obes Surg*. 2018;28(6):1504–10.
9. Khorgami Z, Zhang C, Messiah SE, de la Cruz-Munõz N. Predictors of postoperative aftercare attrition among gastric bypass patients. *Bariatric Surg Pract Patient Care*. 2015;10(2):79–83.
10. Topart PA, Becouarn G. Revision and reversal after biliopancreatic diversion for excessive side effects or ineffective weight loss: A review of the current literature on indications and procedures. *Surg Obes Relat Dis*. 2015;11(4):965–72.
11. Chaim EA, Pareja JC, Gestic MA, Utrini MP, Cazzo E. Preoperative multidisciplinary program for bariatric surgery: a proposal for the Brazilian Public Health System. *Arq Gastroenterol*. 2017;54(1):70–4.
12. Willaert W, Henckens T, Van De Putte D, Van Renterghem K, Ceelen W, Pattyn P, et al. Life-threatening side effects of malabsorptive procedures in obese patients necessitating conversion surgery: A review of 17 cases. *Acta Clin Belg*. 2012;67(4):268–74.
13. Patel S, Szomstein S, Rosenthal RJ. Reasons and outcomes of reoperative bariatric surgery for failed and complicated procedures (excluding adjustable gastric banding). *Obes Surg*. 2011;21(8):1209–19.
14. Sampaio-Neto J, Branco-Filho AJ, Nassif LS, Nassif AT, Masi FDJ de, Gasperin G. Proposal of a revisional surgery to treat severe nutritional deficiency post-gastric bypass. *ABCD Arq Bras Cir Dig*. 2016;29(1):98–101.
15. Caris FG, Almarza TR, Canales TC, Sabra JD. Reversión laparoscópica de bypass gástrico con Y de Roux a

- anatomía normal, en paciente con malnutrición severa y diarrea. Reporte de un caso. *Rev Chil Cir.* 2017;69(2):162–6.
16. Chousleb E, Patel S, Szomstein S, Rosenthal R. Reasons and operative outcomes after reversal of gastric bypass and jejunioileal bypass. *Obes Surg.* 2012;22(10):1611–6.
 17. Spyropoulos C, Kehagias I, Panagiotopoulos S, Mead N, Kalfarentzos F. Revisional Bariatric Surgery. 13-Year Experience From a Tertiary Institution. *Arch Surg.* 2010;145(2):173–7.
 18. Tong W, Grams J, Herron D. Laparoscopic revision of biliopancreatic diversion with duodenal switch and management of postoperative complications. *Surg Obes Relat Dis.* 2010;6(1):96–8.
 19. Pitt R, Labib PLZ, Wolinski A, Labib MH. Iatrogenic kwashiorkor after distal gastric bypass surgery: The consequences of receiving multinational treatment. *Eur J Clin Nutr.* 2016;70(5):635–6.
 20. Ceneviva R, Júnior WS, Marchini JS. A new revisional surgery for severe protein-calorie malnutrition after Roux-en-Y gastric bypass: Successful duodenojejunal reconstruction using jejunal interposition. *Surg Obes Relat Dis.* 2016;12(2):e21–3.
 21. Motamedi MAK, Barzin M, Ebrahimi M, Ebrahimi R, Khalaj A. Severe fatal protein malnutrition and liver failure in a morbidly obese patient after mini-gastric bypass surgery: Case report. *Int J Surg Case Rep.* 2017;33:71–4.
 22. Halawani HM, Antanavicius G. Laparoscopic Reversal of the Biliopancreatic Diversion with Duodenal Switch: a Step by Step Video Case. *Obes Surg.* 2017;27(12):3327–9.
 23. Zubiaga L, Ruiz-Tovar J, Castro MJ, Ortiz-de-Solózano FJ, Luque-deLeón E, Jiménez JM, et al. Whipple disease after bariatric surgery: From malabsorption to malnutrition status. *Nutr Hosp.* 2019;36(1):238–41.
 24. Appesai O, Murr M. Laparoscopic revision of common channel length for chronic diarrhea and malnutrition complicating distal gastric bypass. *Surg Obes Relat Dis.* 2012;8(1):119–20.
 25. Beghdadi N, Soprani A, Kraemer A, Bucur P, Barrat C, Genser L. Roux- en-Y Gastric Bypass Reversal for Severe Malnutrition and Cirrhosis. *Obes Surg.* 2019;29(4):1442–4.
 26. Martins T de CP, Duarte TC, Mosca ERT, Pinheiro C de F, Marçola MA, De-Souza DA. Severe protein malnutrition in a morbidly obese patient after bariatric surgery. *Nutrition.* 2015;31(3):535–8.
 27. Akusoba I, Birriel TJ, El Chaar M. Management of Excessive Weight Loss Following Laparoscopic Roux-en-Y Gastric Bypass: Clinical Algorithm and Surgical Techniques. *Obes Surg.* 2016;26(1):5–11.

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