



Metabolic Consequences of Restorative Surgery After Gastric Bypass

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Roux-en-Y gastric bypass (RYGB) improves the metabolic profile of patients with type 2 diabetes mellitus (T2DM). Surgical weight loss can improve insulin sensitivity and β -cell function. Furthermore, there is a growing body of evidence explaining improvement of T2DM after bariatric surgery by weight-independent neurohormonal mechanisms, including changes in gut hormones, bile acids, and gut microbiota. Changes to gastrointestinal anatomy (for example, exclusion of the duodenum in RYGB) can directly influence glucose homeostasis, independent of weight loss (1–3).

Bariatric and metabolic surgery is not without some risk, though, and reoperation is sometimes necessary to manage long-term complications. Metabolic consequences of reoperative bariatric procedures have not been well characterized (4,5). The aim of this report is to present examples of how reoperative surgery can impact the metabolic effects of these operations.

The first patient was a 47-year-old woman with a BMI of 38 kg/m². She had a history of T2DM for 30 years and was on insulin and exenatide with good glycemic control. Six months after laparoscopic RYGB surgery at our center, her BMI decreased to 25 kg/m² and she was able to discontinue her antidiabetes medications. However, her chronic abdominal pain and diarrhea were refractory to medical management and her nutritional

status continued to decline, so the decision was made to reverse her RYGB after 2 years (Fig. 1A). Within 2 months after the reversal surgery, she gained about 10 lb and her HbA_{1c} started to increase, reaching 8.2% (66 mmol/mol) at 1 year. We observed early relapse of T2DM after reversal surgery when she had gained only 10–15 lb. Interestingly, her weight 6 months after RYGB surgery was relatively similar to her weight at 2 years after reversal surgery. However, her glycemic and antidiabetes medication status was significantly different at these time

points. Relapse of T2DM after reversal of RYGB in this case might not be solely dependent on weight gain.

The second patient was a 60-year-old woman who had undergone RYGB 15 years earlier and was referred to us with complaints of epigastric pain and food intolerance. Our imaging and endoscopic investigations showed the presence of a fistula between the gastric pouch and the excluded stomach. The gastrogastic fistula resulted in high gastric acid exposure (originating from the excluded stomach), and the patient

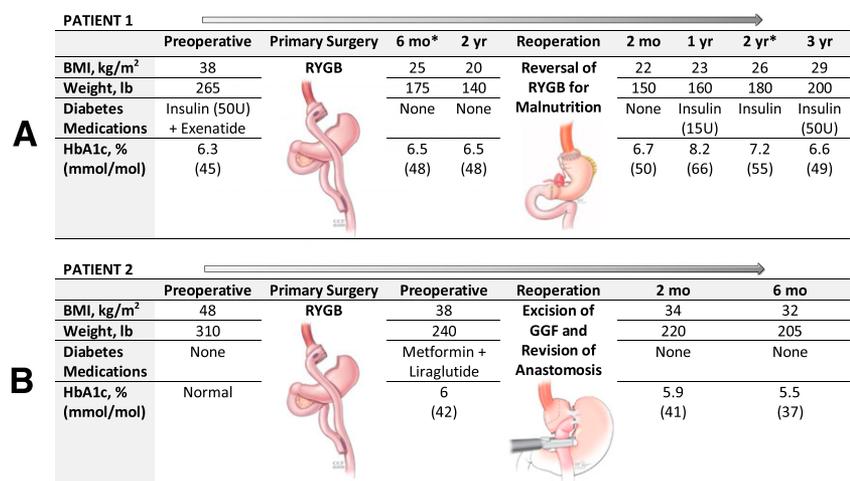


Figure 1—Metabolic consequences of restorative surgery after RYGB in two patients. **A:** Effect of RYGB reversal in a 47-year-old woman. **B:** Effect of gastrogastic fistula (GGF) closure in a 60-year-old woman. *Relatively similar body weight but significantly different glycemic status at two time points.

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suffered from a chronic, nonhealing anastomotic ulcer and stricture. Although she had not been diagnosed with diabetes prior to her RYGB, she developed T2DM 3 years prior to presenting to our program. Prior to revisional surgery, her body weight and BMI were 240 lb and 38 kg/m². She underwent reoperative surgery for excision of the gastrogastic fistula and revision of gastrojejunal anastomosis (Fig. 1B). After the revisional procedure, she did not need diabetes medications. Her weight at 2 and 6 months after revisional surgery was 220 and 205 lb, respectively. The observed favorable metabolic benefit after revisional surgery on this patient might be related to exclusion of the distal part of stomach and duodenum and perhaps was not exclusively dependent on weight loss.

In conclusion, long-term adverse events, including gastrointestinal and nutritional complications of RYGB, may necessitate surgical intervention. To our knowledge, this is the first report to show metabolic

consequences following revisional and reversal surgery for complications of RYGB. The first case (reversal of RYGB) shows the effect of altered gastrointestinal anatomy on glycemic status. The second case (closure of gastrogastic fistula) specifically highlights the metabolic significance of duodenal exclusion. Further research is needed to better delineate the role of weight-independent mechanisms on glycemic changes after reoperative bariatric surgery.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.

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responsibility for the integrity of the data and the accuracy of the data analysis.

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