How bariatric surgery affects psychotropic drug absorption

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Ms. B, age 60, presents to the clinic with high blood pressure, hyperlipidemia, type 2 diabetes mellitus, depression, and anxiety. Her blood pressure is 138/82 mm Hg and pulse is 70 beats per minute. Her body mass index (BMI) is 41, which indicates she is obese. She has always struggled with her weight and has tried diet and lifestyle modifications, as well as medications, for the past 5 years with no success. Her current medication regimen includes lisinopril 40 mg daily, amlodipine 5 mg daily, atorvastatin 40 mg daily, metformin 500 mg twice daily, dulaglutide 0.75 mg weekly, lithium 600 mg daily, venlafaxine extended-release (XR) 150 mg daily, and alprazolam 0.5 mg as needed up to twice daily. Due to Ms. B's BMI and because she has ≥1 comorbid health condition, her primary care physician refers her to a gastroenterologist to discuss gastric bypass surgery options.

Ms. B is scheduled for Roux-en-Y gastric bypass surgery. You need to determine if any changes should be made to her psychotropic medications after she undergoes this surgery.

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There are multiple types of bariatric surgeries, including Roux-en-Y gastric bypass, sleeve gastrectomy, laparoscopic adjustable gastric band, and biliopancreatic diversion with duodenal switch (BPD/DS) (***Figure***,[1-4] ***page 40***). These procedures all restrict the stomach's capacity to hold food. In most cases, they also bypass areas of absorption in the intestine and cause increased secretion of hormones in the gut, including (but not limited to) peptide-YY (PYY) and glucagon-like peptide 1 (GLP-1). These hormonal changes impact several factors, including satiety, hunger, and blood sugar levels.[5]

Roux-en-Y is commonly referred to as the gold standard of weight loss surgery. It divides the top of the stomach into a smaller stomach pouch that connects

Practice Points

- **Antidepressants are commonly prescribed** to patients interested in bariatric surgery.
- About one-quarter to one-half of **patients undergoing bariatric surgery in the United States have a history of a mood disorder.**
- It is generally recommended to **switch from an extended-release to an immediate-release or solution formulation** of a psychotropic medication to improve absorption following surgery.
- Because patients are at **increased risk of self-harm and suicide** following bariatric surgery, **more frequent patient contact** after surgery is important.

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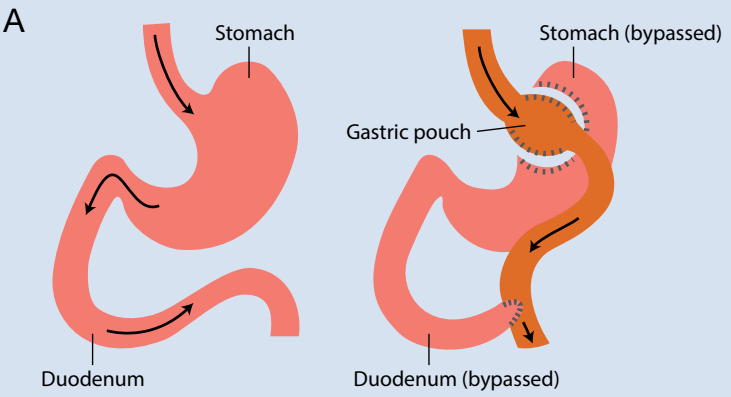
Clinical Point

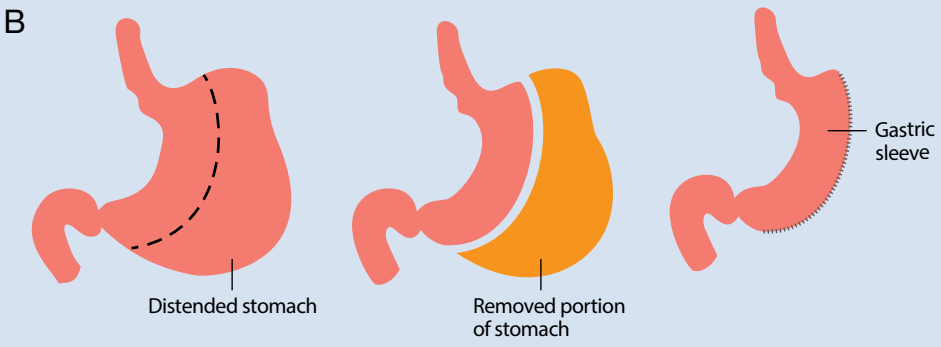
How bariatric surgery affects drug absorption varies based on the mechanism by which the stomach is restricted

Figure

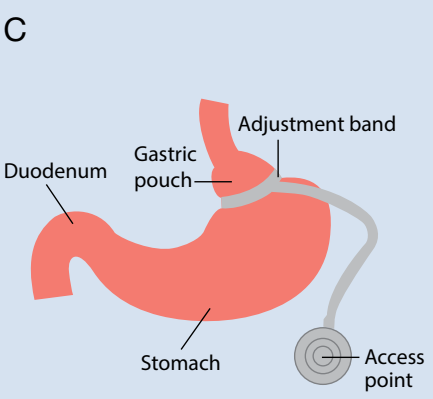
Types of bariatric surgeries



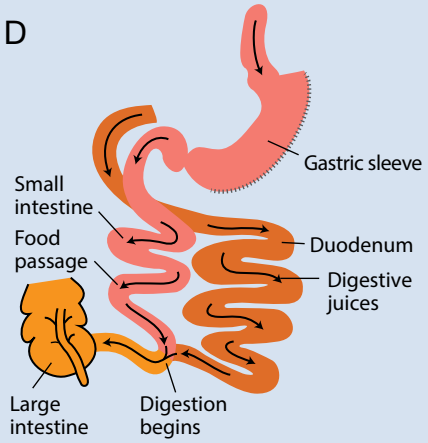
Gastric bypass: Roux-en-Y gastric surgery pre- (left) and postoperative (right)[1]



Sleeve gastrectomy: removal of distended stomach creates gastric sleeve (right)[2]



Adjustable gastric band: inflation or deflation through access point adjusts band to create stomach pouch[3]



Biliopancreatic diversion with duodenal switch: small intestine is rearranged to separate the flow of food from digestive juices[4]

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directly to the small intestine to facilitate smaller meals and alters the release of gut hormones. Additionally, a segment of the small intestine that normally absorbs nutrients and medications is completely bypassed. In contrast, the sleeve gastrectomy removes approximately 80% of the stomach, consequently reducing the amount of food that can be consumed. The greatest impact of the sleeve gastrectomy procedure appears to result from changes in gut hormones. The adjustable gastric band procedure works by placing a band around the upper portion of the stomach to create a small pouch above the band to satisfy hunger with a smaller amount of food. Lastly, BPD/DS is a procedure that creates a tubular stomach pouch and bypasses a large portion of the small intestine. Like the gastric bypass and sleeve gastrectomy, BPD/DS affects gut hormones impacting hunger, satiety, and blood sugar control.

How bariatric surgery can affect drug absorption

As illustrated in the ***Table***[6-19] (***page 42***), each type of bariatric surgery may impact drug absorption differently depending on the mechanism by which the stomach is restricted.

Drug malabsorption is a concern for clinicians with patients who have undergone bariatric surgery. There is limited research measuring changes in psychotropic exposure and outcomes following bariatric surgery. A 2009 literature review by Padwal et al[7] found that one-third of the 26 studies evaluated provided evidence of decreased absorption following bariatric surgery in patients taking medications that had intrinsic poor absorption, high lipophilicity, and/or undergo enterohepatic recirculation. In a review that included a small study of patients taking selective serotonin reuptake inhibitors or venlafaxine, Godini et al[8] demonstrated that although there was a notable decrease in drug absorption closely following the surgery, drug absorption recovered for some patients 1 month after Roux-en-Y surgery. These reviews suggest patients who have undergone any form of bariatric surgery must be observed closely because drug absorption may vary based on the individual, the medication administered, and the amount of time postprocedure.

Until more research becomes available, current evidence supports recommendations to assist patients who have a decreased ability to absorb medications after gastric bypass surgery by switching from an extended-release formulation to an immediate-release or solution formulation. This allows patients to rely less on gastric mixing and unpredictable changes in drug release from extended- or controlled-release formulations.

Aside from altered pharmacokinetics after bariatric surgery, many patients experience an increased risk of self-harm and suicide.[20] Therefore, a continued emphasis on and reinforcement of proper antidepressant use and adjustment in these patients is important. This can be facilitated through frequent follow-up visits, either in-person or via telehealth.

Understanding the effect of bariatric surgery on drug absorption is critical to identifying a potential need to adjust a medication dose or formulation after the surgery. Available evidence and data suggest it is reasonable to switch from an extended- or sustained-release formulation to an immediate-release formulation, and to monitor patients more frequently immediately following the surgery.

CASE CONTINUED

Immediately following surgery, Ms. B's care team adjusts her medication regimen. To account for the change in her stomach size and composition, and therefore its absorption process, the team changes the venlafaxine dosage from venlafaxine XR 150 mg daily to venlafaxine immediate-release 75 mg twice daily. Ms. B is also monitored more frequently following the procedure to determine if additional adjustments to her medication dosage or therapy frequency are necessary. Eight weeks following surgery, Ms. B has lost 16 pounds and is reintroducing more solid foods into her diet. She

Clinical Point

One study found drug absorption recovered for some patients 1 month after Roux-en-Y surgery

Clinical Point

Drug absorption may vary based on the individual, medication administered, or time since the bariatric surgery

Table

Drug absorption considerations for common bariatric surgeries

Bariatric surgery	Surgery description[6]	Effect on drug absorption
Roux-en-Y gastric bypass	Small pouch is created from top portion of stomach First portion of small intestine is divided and connected to newly created small stomach pouch	Decrease in effective surface area for drug absorption[9] Increase in gastric pH[10] Decrease in gastric and distribution volume[10] Shorter absorption time[10] Shortened passage through intestine[10] Reduction in drug concentration absorbed[10] Reduced gastric mixing limiting drug disintegration[7] SSRI AUC levels 1 month after surgery drop and return to baseline for most patients by 6 months[11] No change in AUC, C_{max}, or T_{max} for venlafaxine[12] Potentially less significant reductions in bioavailability of SNRIs than SSRIs due to solubility characteristics[8]
Sleeve gastrectomy (vertical sleeve gastrectomy; gastric sleeve procedure)[13]	Removes approximately 80% of stomach[6] Performed by making 5 to 6 small incisions in the abdomen; procedure completed laparoscopically[14] Procedure results in a narrow, tubular stomach pouch or "sleeve"[6] Reduces amount of food that can be consumed due to smaller volume of stomach pouch[6]	Increased transit time of drugs[15] Increased gastric pH leads to decreased absorption of weakly acidic drugs and increased absorption of basic drugs[16] Reduced bioavailability with extended-release formulations[16] Reduced gastric mixing limits drug disintegration[7] Reduced gastric emptying (reduced rate but not reduced overall magnitude of drug absorption)[7] Lithium: decreased stomach surface area, impaired gastric motility, decreased gastric volume, and reduced GI transit time lead to potential decreased drug dissolution and absorption, which has a significant impact on serum drug levels[17,18]
Laparoscopic adjustable gastric band	Band is implanted around top part of stomach[6] Creates 2-compartment stomach with food only filling top portion upon eating[6] Reduces hunger, ultimately decreasing calorie intake[6] Least invasive weight loss surgery[6] No reduction in intestines or other absorptive surface area[6]	Accelerated gastric emptying[15] Increased gastric pH[7] Reduced gastric mixing may limit drug disintegration[7]
Biliopancreatic diversion with duodenal switch	Smaller, tubular stomach pouch is created, and large portion of small intestine is bypassed[6] Reduces amount of food that can be consumed and affects gut hormones[6] Results in significant decrease in absorption of calories, nutrients, and vitamins[6]	Lower bioavailability of psychoactive medications[16] Altered T_{max}[16] Decrease in effective surface area for drug absorption[9] Shortened passage through intestine[10]

AUC: area under the curve; GI: gastrointestinal; SNRI: serotonin-norepinephrine reuptake inhibitor; SSRI: selective serotonin reuptake inhibitor

Psychotropic dose adjustment
Closely monitor responses to drugs absorbed primarily in proximal gut, highly acidic environments, drugs with intrinsically poor absorption, and weakly basic and acidic drugs (ie, olanzapine)[10] Closely monitor patients and have a low threshold for considering higher dose of SSRIs immediately following surgery; SNRIs may be less likely to require dose adjustments, but this is based on a small number of study participants[8]
There is a lack of studies to guide recommendations; however, based on changes in pH, gastric mixing, and emptying, it is reasonable to predict decreased drug absorption following surgery Closely monitor responses to drugs absorbed primarily in proximal gut, highly acidic environments, drugs with intrinsically poor absorption, and weakly basic and acidic drugs (ie, olanzapine)[10]
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Closely monitor responses to drugs absorbed primarily in proximal gut, highly acidic environments, drugs with intrinsically poor absorption, and weakly basic and acidic drugs (ie, olanzapine),[10] close dose adjustments[19]

Related Resources

- Colvin C, Tsia W, Silverman AL, et al. Nothing up his sleeve: decompensation after bariatric surgery. Current Psychiatry. 2021;20(4):15-19. doi:10.12788/cp.010

Drug Brand Names

Alprazolam • Xanax
Amlodipine • Norvasc
Atorvastatin • Lipitor
Dulaglutide • Trulicity
Lisinopril • Zestril, Prinivil
Lithium • Eskalith, Lithobid
Metformin • Glucophage
Olanzapine • Zyprexa
Venlafaxine • Effexor

struggles with some increased anxiety and depression approximately 1 month after surgery, but that improves after her clinicians decide to increase the venlafaxine dose to 75 mg 3 times a day. Her lithium level was also monitored more closely for the first month after the procedure to decrease the risk of lithium toxicity.

Clinical Point

It is reasonable to switch patients from an extended-release to an immediate-release drug formulation to assist with absorption

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Clinical Point

Monitor patients more frequently following bariatric surgery, either in-person or via telehealth