

# Medication Absorption in Bariatric Surgery



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## Outline

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## Introduction

Bariatric surgeries have become common due to the high rates of obesity worldwide and successful weight loss demonstrated from the procedures. These surgeries are categorized as either restrictive, malabsorptive, or a combination of the two. Restrictive surgeries involve the creation of a small gastric pouch with a goal of increasing early satiety and a reduction of nutritional intake.<sup>1</sup> These procedures delay gastric emptying but have no effect on the size of the absorptive area of the intestines. Weight loss is due to increased early satiety and decreased nutritional intake. Examples of restrictive surgeries include laparoscopic gastric banding or a gastric sleeve.<sup>1</sup> Malabsorptive surgeries involve the reduction of the size of the absorptive area of the intestines, leading to less time and area for nutrient absorption to occur.<sup>1</sup> The weight loss in these procedures is believed to be due to decreased nutrient absorption rather than decreased nutritional intake. Procedures such as Roux-en-Y gastric bypass (RYGB) were originally classified as malabsorptive surgeries but are now believed to be a combination of restrictive and malabsorptive in nature.<sup>1</sup>

Laparoscopic RYGB is considered one of the more successful weight-loss surgeries and is the most frequently performed bariatric surgery, accounting for about 80% to 90% of all weight-loss procedures performed in the United States.<sup>2,3</sup> This type of bariatric procedure is categorized as both

restrictive and malabsorptive.<sup>4</sup> The RYGB procedure involves the creation of a small pouch ( $\leq 50$  mL) at the stomach along with the creation of the Roux limb attaching the proximal portion of the stomach to the central portion of the small intestine, delaying the exposure of food to bile and pancreatic juices.<sup>2,3</sup> This procedure completely bypasses the duodenum and reduces the stomach capacity by 95%, leaving the majority of the jejunum intact.<sup>2,3,5</sup> Unlike biliopancreatic diversion and jejunoileal bypass, RYGB leaves approximately 4 meters of the small intestine still intact.<sup>5</sup>

Jejunoileal bypass is a procedure similar to that of RYGB in that it is a restrictive and malabsorptive in nature, although this procedure is no longer recommended due to significant adverse events and mortality. In this procedure, approximately 90% to 95% of the small intestine is bypassed with no reduction in stomach size.<sup>1</sup> Very few patients retain this surgery due to the mortality rates or because they have undergone conversion via a different procedure.<sup>1</sup>

Laparoscopic adjustable gastric banding is a procedure in which a band is placed near the gastroesophageal junction restricting oral intake by limiting the size of the stomach.<sup>1</sup> This creates a pouch of approximately 30 mL, although the size of this pouch can be modified through injection of saline into the balloon that surrounds the band.<sup>1</sup> The procedure for a sleeve gastrectomy involves stapling of the stomach, resecting a significant portion of the stomach.<sup>1</sup> Laparoscopic banding and sleeve gastrectomy are considered to be restrictive surgeries, although sleeve gastrectomy may have some malabsorptive properties. Restrictive procedures are hypothesized to have minimal effect on overall drug absorption; however, changes in gastric mixing and possibly pH have been noted.<sup>6</sup>

## Roux-en-Y Gastric Bypass

The overall effect of the RYGB procedure on pharmacokinetics (PK) is unknown. Multiple implications on drug absorption have been hypothesized, including the effect on surface area for absorption, gastrointestinal (GI) transit time, pH of the stomach, rate of gastric emptying, gastric mixing, changes in metabolism, and alteration of drug transporters. These factors are discussed in **Table 10-1**.

Recommendations on medication therapy in patients post-RYGB are limited. In general, due to the changes discussed in Table 10-1, liquid formulations or those that can be crushed or chewed are recommended when available.<sup>6</sup> Due to changes in pH and GI transit time, extended- or controlled-release products are not recommended after RYGB.<sup>5</sup> Studies on RYGB are relatively small and often do not include clinical outcomes or clinical correlation. Therapeutic recommendations below are therefore limited based on minimal published evidence.

### **Antibiotics**

#### *Amoxicillin*

A case report of a pregnant female, who had previously undergone RYGB, failed amoxicillin therapy for treatment of a urinary tract infection that was susceptible to amoxicillin.<sup>7</sup> The authors questioned adequate absorption of the medication. This report states that the patient was compliant with therapy when treatment failure occurred. No PK parameters were provided in this report.