The influence of total bowel length on gastric bypass outcomes

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Bariatric surgery is the only long-term solution to obesity-related comorbidities when other conservative measures have failed.¹,² Diversional surgeries often offer the highest success rates when compared to restrictive procedures such as sleeve gastrectomies or gastric banding.³ Of these, the Roux-en-Y gastric bypass (RYGBP) is the commonest diversional procedure because though it does not achieve quite the same amount of weight loss as the biliopancreatic diversion and duodenal switch, it does offer a better complication rate and mortality.⁴,⁵

Gastric bypass achieves weight loss not only by restriction of gastric capacity and therefore earlier patient satiety but also by the diversion of digestion leading to malabsorption of nutrients and modulation of the metabolic system. It is a combination of these effects that contribute to its success rate in both weight loss and reversal of comorbidities.⁶

There are variations between the constructed limb lengths of RYGBPs described in the literature, and these are designed by the surgeon’s preference.⁷,⁸ Most surgeons create a restricted gastric pouch from which the alimentary limb (AL) (100-150 cm) follows to join the biliopancreatic limb (BPL) (usually 50-100 cm in length) to form the common limb. The remaining common limb (CL) length is of an indeterminate
length based on the length of small bowel left, and the patient’s anatomy, and this configuration is known as the proximal or standard gastric bypass\(^{[21,32,33]}\). A distal gastric bypass differs by having a fixed CL length of 100-150 cm which leaves a variable AL and BPL length that may end up being very long or conversely very short.

The hypothesis is that a distal bypass can lead to better weight loss outcomes due to a longer diversion of the digestive tract and a shorter section of common bowel for absorption.\(^{[21]}\) The small intestine has a huge variability in length among patients and can vary between 300 to 1,000 cm.\(^{[12]}\) Because of this, the CL length can theoretically range from 50 to 850 cm in a proximal gastric bypass as intestinal lengths are not routinely measured before reconstruction of the digestive continuity.

Despite the RYGBP’s success rate in reversing obesity and its comorbidities, the outcomes can be variable. An RYGBP may fail when it’s primary outcome is not achieved, whether this is resultant from either an insufficient weight loss from what is predicted\(^{[13-15]}\) or the patient regains weight shortly after the procedure is performed.\(^{[16-18]}\) Conversely, other patients may develop significant malnutrition when there is not enough absorption of key nutrients\(^{[19-21]}\) which may even lead to a functional short bowel syndrome which despite its rarity is a far more severe complication and can occur more frequently the shorter the CL length is.\(^{[22-24]}\)

Studies have assessed the effect of the limb lengths on weight loss, while others have addressed the malnutrition effect. Many studies concur that the CL length and AL length do not affect the amount of potential weight loss that a patient can achieve\(^{[25-28]}\) though Tran et al.\(^{[29]}\) has suggested the use of a distal bypass is an effective revision for a failed loss of weight on a standard bypass. There is certainly a range of results on whether proximal or distal bypasses have more pronounced effects on the metabolic and endocrine systems as reported by Risstad et al.\(^{[30]}\) and Ramos et al.\(^{[30]}\) Distal bypasses may also be related to increased rates of complication.\(^{[10,31]}\) Longer BPL lengths have been found to result in both higher weight loss and malnutrition rates with the two are often correlating.\(^{[21,32,33]}\)

The reasons for failure may have a technical component and could be related to constructed bowel length from diversion, but studies by Maleckas et al.\(^{[16]}\) Shantavasinkul et al.\(^{[34]}\) and Perrone et al.\(^{[35]}\) allude to a more complex etiology and suggest patient factors play a significant role in determining the outcome. What is currently unknown is whether there is an impact of the total/bypassed bowel length on the incidence of complications and failure. A patient’s preoperative total bowel length may indeed have an effect on the potential weight loss achievable with an RYGBP and also whether they are at risk of regaining weight with a very long bowel that minimizes the effect of the diversion or developing malnutrition with a very short one that has the very limited absorptive capacity. As such knowing a patient’s total bowel length may be useful in the future as a predictor of outcomes and would be useful in patient selection when choosing diversional options and limb lengths to maximize benefit and minimize adverse outcomes.

Future studies aim to set a standard into intestinal lengths for optimal outcomes,\(^{[11]}\) but very few studies seek to examine the patients’ total bowel length and whether this has an influence on the success rates of proximal and distal bypasses.\(^{[28]}\) Navez et al.\(^{[28]}\) and Savassi-Rossa et al.\(^{[36]}\) show that there may be no relation between CL length and weight loss though there is a small sample size and follow-up time to assess weight regain or the occurrence of malnutrition is short.

Further studies are required to assess if bowel length has a long-term influence on outcomes and whether routine measurement of bowel length can optimize this. Several studies have mentioned the technical challenges in measuring bowel length\(^{[37-39]}\) and in the superobese patient, a high level of visceral fat will only complicate this further. A standardized method of bowel measurement should, therefore, be agreed upon to make accurate comparisons possible, and this could be a combination of preoperative radiographic bowel measurements and intraoperative laparoscopic measurements.

These studies have the potential to answer a fundamental question on the way we perform diversional surgeries in an attempt to optimize the outcome. There is no doubt that there are several other variables that might influence the outcome - such as genetic factors. However, we believe that the question raised - which cannot be ignored - is at the core of understanding the pathophysiology of the procedure, which is not fully understood until now.

**Authors’ contributions**

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