

Diabetes and Gut Hormone

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Type 2 diabetes mellitus (T2DM) and obesity are considered the new world epidemics. The effects of traditional treatment of T2DM and obesity, including lifestyle modification and medications, but, however, are limited. Recently, metabolic surgery has emerged as an effective intervention for patients with T2DM and morbid obesity (body mass index >35 kg/m²). Our previous studies found that Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) were effective in the treatment of Asian, non-morbidly obese, T2DM patients. To date, metabolic surgery is the only way to remit T2DM, and has been advocated as one of the treatment options in T2DM and obesity.

The gastrointestinal tract is a fantastic exocrine and endocrine system. Circulating gut hormones not only influence appetite, digestion, but also affect glycemic homeostasis. Whether the changes in these gut hormones after metabolic surgery are responsible for the improved glucose homeostasis and weight loss is an interesting question. On the other hand, the hypothalamus has long been known to modulate food intake and energy expenditure. All peripheral signals are transmitted to two neuronal groups in the arcuate nucleus, one acting as orexigenic, and the other counteracting those actions promoting anorexigenic properties. Both neuronal populations innervate the paraventricular nucleus, which, in turn, sends signals to other areas of the brain to regulate overall body energy balance. Metabolic surgery not only permanently resets strong counter-regulatory responses such as hunger and craving by re-sensitizing homeostatic regulatory circuits in the hypothalamus and hedonic-motivational processing in corticolimbic systems through changes in gut-brain signaling, but also leads to differential nutrient handling and energy partition after operation

From previous studies, we found that ghrelin levels were increased after RYGB due to weight loss, but were decreased after SG from gastric resection. More studies reported that gastric inhibitory peptide (GIP) and glucagon-like peptide-1 (GLP-1) levels were increased after surgery, suggesting incretin effects from RYGB and SG. The peptide YY concentrations were shown in most studies to be increased, demonstrating hindgut effect. However, recently, duodenal-jejunal bypass liner (DJBL) exhibited opposite effects on GIP or GLP-1 values.

In conclusion, the effects of metabolic surgery highlight the crucial role of the small intestine in glucose homeostasis, and those of DJBL implantation confirm this point. Therefore, duodenal exclusion using laparoscopic and/or endoscopic techniques in interventional diabetology is a promising method for inducing remission in human T2DM.