Selected Endoscopic Gastric Devices for Obesity

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KEYWORDS

• Obesity • Stomach • Bariatric endoscopy • Therapeutic endoscopy • Devices

KEY POINTS

- Endoscopic devices can treat obesity and its related metabolic conditions by targeting key gastric anatomic and physiologic mechanisms.
- Recognizing the effect of the bariatric surgical interventions on gastric anatomy and physiology will contribute to the development of minimally invasive devices that can mimic these effects.
- There are many bariatric endoscopic devices, in various stages of development, targeting the stomach to promote caloric restriction and early satiety through anatomic and physiologic effects.
- The Transpyloric Shuttle involves several mechanisms of action, including occupying space, blocking the gastric exit, delaying gastric emptying, and potentially altering hormonal signaling.
- Gastric sclerotherapy, Botulinum toxin A injection, and radiofrequency ablation likely change gastric or postoperative stomal compliance or motility and emptying physiology and have been shown to produce weight loss. The ACE stapler represents a novel gastric volume-reducing device; further clinical study is needed.
- The Gelesis100 device and the Magnetic Weight Loss Capsule represent applications of material science and mechanical engineering, and with further study, can open avenues of clinical application.
- Randomized, blinded controlled trials are needed to determine the true effect of these unique devices beyond sham.

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SELECTED STOMACH TARGET DEVICES

Introduction

The obesity epidemic refers to the rising incidence of obesity worldwide and its impact on global health.[1] Bariatric surgery remains the most effective therapeutic option for obesity. At present, the overwhelming demand far exceeds the health care infrastructure capable of providing bariatric surgical services. Endoscopic therapy for obesity represents a potentially cost-effective, accessible, minimally invasive alternative that can function as both a primary therapeutic intervention and a bridge to bariatric surgery.

Endoscopic devices that target the stomach directly alter gastric physiology and promote weight loss by altering functional gastric volume, gastric emptying, gastric wall compliance, neurohormonal signaling, and satiety. Intragastric balloons (IGBs) and the endoscopic sleeve gastroplasty (ESG) procedure restrict functional gastric volume, which causes decreased caloric intake, increased satiety, and eventual weight loss. Aspiration therapy (AT) removes excess caloric ingestion directly from the stomach via an aspiration tube upon initial food bolus ingestion. These devices, in particular, are discussed extensively in separate respective articles. This article focuses on the non-IGB, non-ESG, non-AT stomach target devices that are currently in various stages of development and offer promise for future weight loss therapies.

It is important to understand the basic gastric physiology and motility, and the physiologic alterations of the bariatric surgical procedures, when evaluating the role and utility of current and future bariatric devices that target the stomach. With food ingestion, gastric accommodation initially produces fundic and corpus relaxation, with concurrent pyloric contraction and closure. The result is food bolus accumulation in the stomach. The mixing stage represents vagal nerve–mediated gastric antral contractions, which churn the food bolus against a contracted pylorus, with trituration of the ingesta. The emptying phase refers to pyloric relaxation with continued antral pump contraction. The food bolus then passes into the duodenum for further digestion and absorption. Neurohormonal signaling plays an instrumental role during the entire gastric digestive process. The integrated signaling that occurs with the act of eating, and through the process of gastric accommodation and emptying, has a complex interplay for the sensation of satiety and hunger and regulates processes that relate to energy balance, obesity, and related metabolic disorders. Understanding how medical and surgical bariatric interventions affect these mechanisms can direct the development of effective endoscopic devices. These devices may target anatomic processes and result in restriction of caloric intake or produce mal-digestion. It is likely that devices that will be most effective and durable will be ones that alter physiologic mechanisms, and much study is still needed to identify the changes that these devices may produce and which ones will be efficacious and safe. With other contributions detailing what is known about the currently approved gastric devices and techniques, and additional ones highlighting emerging new therapies, the authors focus on the remaining devices or techniques not covered elsewhere in this issue.

Devices/Techniques Affecting Gastric Emptying

Gastric botulinum toxin A injection

Botulinum toxin A (BTA) is an acetylcholinesterase inhibitor that functions as a long-acting inhibitor of both voluntary and smooth muscle contraction leading to a reversible paralytic-type effect. Direct injection into the gastric antral smooth muscle offers the potential to delay gastric emptying by moderating the propulsive contraction effect of the antral pump. In theory, pump inhibition leads to impaired gastric