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Emerging Endoscopic Strategies in Obesity Management: Innovations and Future Perspectives

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ABSTRACT

Emerging endoscopic strategies are revolutionizing the treatment of obesity by offering a less invasive alternative to traditional bariatric surgery. Conventional approaches, including lifestyle modifications and pharmacotherapy, often result in only moderate weight loss, while surgical interventions, despite their high efficacy, carry a significant risk of short- and long-term complications. This paper provides a comprehensive overview of current endoscopic modalities, such as various intragastric balloons (Orbera, ReShape, Obalon, Spatz3, Ellipse, Heliosphere), endoscopic sleeve gastroplasty, aspiration therapies, and duodenal–jejunal bypass sleeves. These techniques work by reducing gastric volume, modulating gut hormone secretion, and delaying gastric emptying, thereby enhancing satiety and promoting sustained weight loss. The review emphasizes that while early results are promising, demonstrating significant weight reduction and metabolic improvements with lower complication rates than surgical methods, further long-term studies are required to fully establish their efficacy and safety profile. Endoscopic bariatric interventions are positioned as a valuable addition to the obesity treatment armamentarium, particularly for patients who are not ideal candidates for surgery or who seek reversible treatment options.

Purpose: The aim of this study is to critically analyze the mechanisms, efficacy, and safety of emerging endoscopic methods for obesity treatment as a minimally invasive alternative to conventional bariatric surgery.

Material and Methods: The review is based on a comprehensive analysis of current literature, including clinical trials and meta-analyses, which evaluate the performance of various endoscopic interventions such as intragastric balloons, endoscopic sleeve gastroplasty, aspiration therapies, and duodenal–jejunal bypass devices.

Findings: The data indicate that endoscopic procedures are capable of achieving significant weight loss and metabolic improvements with a more favorable safety profile compared to traditional surgical approaches, although long-term outcomes still require further investigation. **Value**: This work underscores the potential of endoscopic bariatric treatments to expand the therapeutic options for obesity management, offering a less invasive, reversible, and personalized approach that may reduce the risks associated with conventional bariatric surgery.
Keywords: aspiration therapies, endoscopic treatment of obesity, ESG, IGB, DJBS

1. Obesity – Definition and Therapeutic Approach

The World Health Organization (WHO) defines overweight and obesity as an abnormal and excessive accumulation of body fat that poses a risk to health [1]. Obesity was recognized as a disease as early as 1966 and was included in the International Classification of Diseases (code E66 in ICD-10). Thus, physicians have an ethical duty to diagnose and treat obesity. The etiology of this condition is multifactorial, comprising environmental, psychological, genetic, hormonal, iatrogenic, and other factors (secondary obesity). Given the multifactorial etiology of obesity, therapy should be comprehensive, focusing on several key potentially disrupted aspects. A complex and holistic therapeutic approach to pathologically excessive body weight includes caloric restrictions, physical exercise, pharmacological support, and bariatric surgery [2].

2. Classical Methods of Bariatric Surgery

Experts claim that the overly strict criteria included in the 1991 statement contributed to the limited use of the "proven, safe, and effective treatment method – bariatric surgery." Therefore, the latest (2022) ASMBS/IFSO (American Society for Metabolic and Bariatric Surgery/International Federation for the Surgery of Obesity) guidelines increase the number of patients eligible for this procedure. Currently, metabolic and bariatric surgery is recommended for individuals with a BMI of at least 35 "regardless of the presence or severity of obesity-related comorbidities," and it is also considered as a possible option for individuals suffering from metabolic disease with a BMI of 30–34.9. According to the new stance, bariatric surgery should also be considered in individuals without metabolic disease with a BMI of 30 or higher in whom non-surgical methods have failed to achieve a significant or lasting reduction in body

weight or improvement in obesity-related conditions [3]. Bariatric surgery is undoubtedly the most effective among the available methods for treating obesity. For this reason, in 2018, 696,191 individuals worldwide underwent this procedure [4, 5].

Currently, the most commonly performed bariatric techniques are:

- placement of an adjustable gastric band,
- sleeve gastrectomy,
- gastric bypass,
- biliopancreatic diversion.

However, bariatric interventions are also the most invasive therapeutic option for obesity. Although the safety of surgical techniques has improved, these procedures still carry the risk of significant complications. Approximately 9%–12% of patients undergoing bariatric surgery experience at least one adverse event within the first five years after the operation [6]. The most common complications of classical bariatric procedures include: anastomotic ulceration, anastomotic stricture, gastro-gastric fistulas, surgical leaks, intestinal obstruction, and gallstone formation [6]. Additionally, the process of undergoing such surgery is complex and requires many medical visits over an extended period. As a result, only < 1% of all eligible patients opt for this obesity treatment strategy [9].

3. New Methods of Endoscopic Treatment of Morbid Obesity

Patients show a clear reluctance and fear towards undergoing invasive (but exceptionally effective) bariatric surgery methods. On the other hand, safer methods such as lifestyle modifications and pharmacotherapy have very limited effectiveness. Bariatric endoscopy is a developing field designed to combat the obesity epidemic using minimally invasive techniques that are as effective as classical surgical methods. Below, various endoscopic bariatric options are presented along with their advantages and disadvantages compared to classical bariatric surgery.

3.1. Intragastric Balloon

The FDA has approved the use of several variants of intragastric balloons (IGB). These balloons function as space-occupying devices. They induce early satiety and alter gut neuroendocrinology, ultimately leading to weight reduction [7]. Each of the currently available balloons has been approved for use for 6 months in individuals with a BMI between 30 and 40 kg/m², in whom lifestyle modification therapy has failed [8]. IGB has several advantages. Firstly, it is a relatively simple procedure that can be adopted within general gastroenterology

with minimal additional training. The procedure can be performed on an outpatient basis, which helps reduce costs. It is minimally invasive and carries a low risk compared to classical bariatric surgical strategies. Moreover, IGB is a repeatable and reversible procedure. IGB is a promising and increasingly utilized option in obesity treatment. However, further evidence regarding its safety, efficacy, and established usage guidelines is still needed [9].

3.1.1. Orbera Balloon

The Orbera Balloon is a flexible, spherical balloon made of silicone. It is inserted using a special catheter through the mouth into the stomach (Figure 1). To confirm proper placement of the balloon, an endoscopic examination is performed, after which the balloon is filled with 450–700 ml of saline mixed with methylene blue. Methylene blue serves as an indicator of balloon malfunction. If the balloon ruptures, the methylene blue is systemically absorbed and changes the color of the urine to blue, prompting the patient to seek medical assistance. Pain and nausea are common adverse effects following the implantation of the Orbera IGB product, occurring in approximately 33.7% of patients. The most serious adverse events are balloon migration and gastric perforation, occurring in 1.4% and 0.1% of patients, respectively [9]. The Orbera Balloon has demonstrated efficacy in several important studies. Before being approved by the FDA for use in the United States in 2015, it had been successfully used for many years in other countries. Based on a large meta-analysis of 17 studies, the percentage of excess weight loss (%EWL) with Orbera IGB at 12 months was 25.44% [10, 11]. In a recently conducted multicenter, randomized, open-label clinical trial, 255 adults with a BMI of 30–40 kg/m² were treated with the Orbera balloon, and outcomes were assessed up to 12 months. Patients were randomized to IGB (Orbera) plus lifestyle modification versus lifestyle modification alone. Balloons were removed after 6 months, and the lifestyle intervention was continued in both groups until 12 months. At 6 months, the average weight loss was –3.3% (–3.2 kg) in the lifestyle modification group versus –10.2% (–9.9 kg) in the group with the balloon plus lifestyle modification. At 9 months (3 months after balloon removal), weight loss was –3.4% (–3.2 kg) versus –9.1% (–8.8 kg). At 12 months, it was –3.1% (–2.9 kg) versus –7.6% (–7.4 kg). The authors concluded that the IGB method was more effective than lifestyle modification alone in achieving short-term weight loss at 9 months (3 months after balloon removal) and 12 months (6 months after balloon removal). Currently, IGBs are being studied in combination with bariatric surgery, and the latest study demonstrated that the Orbera Balloon in combination with bariatric surgery is more effective in treating obese individuals (BMI > 50 kg/m²) than either method alone [12]. According to the manufacturer, the Orbera Balloon can be safely implanted

for a maximum of 6 months due to an increasing risk of perforation and intestinal obstruction [8, 13]. However, for the past three years, a balloon that can remain in situ for 12 months—the second generation "Orbera365," with nearly the same properties as the original model—has also been available [14].

Figure 1. The Orbera intragastric balloon is presented in the figure. [19]

3.1.2. ReShape Duo

ReShape Duo is another type of IGB. It consists of two balloons connected by a flexible tube. Each balloon requires approximately 450 ml of saline solution (mixed with methylene blue). This unique design allows one balloon to continue functioning as a space-occupying device even if the other balloon deflates spontaneously [9]. The available data on the efficacy of the ReShape Duo balloon are promising. The REDUCE study was the first large, multicenter, prospective study assessing the efficacy and safety of the dual ReShape balloon. In this study, 326 participants with a BMI between 30–40 kg/m² were randomized to endoscopic placement of the ReShape Duo balloon along with a diet and exercise regimen versus a sham endoscopy with diet and exercise alone. A twofold higher %EWL was observed with the balloon compared to lifestyle modification alone. Additionally, the innovative technique was associated with a low incidence of adverse events (such as balloon deflation or gastric ulceration) [15]. The latest data were published in 2018 by Johns Hopkins, where 202 adult patients who underwent ReShape Duo implantation were analyzed, and the %TBWL (Total Body Weight Loss) and %EWL were determined over a 12-month period. The average %TBWL at 1, 3, 6, 9, and 12 months was 4.8%, 8.8%, 11.4%, 13.3%, and 14.7%, respectively. According to the available data, 60.4% of patients achieved more than 10% TBWL, and 55.4% achieved more than 25% EWL. Common adverse effects included nausea, vomiting, and abdominal pain. The most serious (rare, one case) adverse event was small bowel obstruction. Secondary endpoints, such

as blood pressure, glycated hemoglobin, fasting glucose, and lipid profile, were statistically significantly lower at the time of balloon removal compared to baseline [16]. As of December 2018, Apollo Endosurgery, the manufacturer of Orbera balloons, acquired ReShape Medical and will in the future focus exclusively on its own Orbera balloon. With this transaction, the ReShape balloon will be gradually phased out [17]. It is worth mentioning here an updated FDA warning issued in 2020, which informs of a potential increased risk of acute pancreatitis with the use of Orbera and ReShape balloons. Therefore, the FDA mandates strict monitoring of patients in this regard [18].

3.1.3. Obalon

Obalon is the first and only swallowable, FDA-approved balloon system used for weight loss. Obalon is packaged in a gelatin capsule. The patient swallows the capsule, which is attached to a small catheter. Fluoroscopy is used to confirm the intragastric location. The gelatin capsule dissolves, allowing the balloon to be deployed in the stomach. The catheter is then used to inflate the balloon using a gas-filled syringe, after which the catheter is detached and removed. The procedure is relatively simple and can be performed by a single operator. Obalon consists of a series of three individual balloons, corresponding to a total volume of 750 mL, which can be consecutively swallowed over the course of one month, allowing for modification of the occupied space [9]. Recently, the FDA also approved the Obalon Navigation System. It uses magnetic resonance imaging instead of fluoroscopy to display the deployed Obalon in real time to confirm the proper location of the balloon. This technology, in addition to minimizing the exposure of the patient and staff to radiation and reducing radiography costs, makes the procedure even more advantageous [19]. The advantage of the Obalon mechanism is that it does not require endoscopic placement of the IGB (with all the associated procedural risks and the need for anesthesia), although it must be removed endoscopically after 6 months. The latest data indicating the efficacy of this system were published in 2018, in which the authors conducted a double-blind, randomized controlled trial. The authors concluded that, compared to lifestyle modification alone, the Obalon IGB resulted in twice as much weight loss as the control, with minimal adverse effects [20].

3.1.4. Spatz3

The Spatz adjustable balloon system is an endoscopically placed IGB filled with saline, featuring a unique design that allows volume adjustment throughout the treatment period—not just at the initial filling (Figure 2). Consequently, increasing or decreasing the balloon's volume can result in better patient tolerance, as it allows the balloon size to be adjusted according to

the patient's preferences [19]. Additionally, it is the first balloon that can safely remain in the stomach for 12 months, facilitating sustained weight loss by giving the patient more time for nutritional re-education and lifestyle modification. However, it has a significant drawback in that it does not have a completely smooth surface, as the location of the filling valve creates a sort of "tail" [21, 22]. On the other hand, according to the manufacturers, this "tail" may prevent or delay the passage of the deflated balloon through the duodenum, causing obstruction. In a clinical study, the adjustable Spatz3 balloon was implanted in 187 patients for up to eight months. Ninety-two percent of the patients who received the device observed at least a 5% reduction in total body weight, with an average weight loss of 15.0% of body weight. In comparison, patients who did not receive Spatz3 treatment lost only an average of 3.3% of body weight. All patients (both the experimental and control groups) in this clinical study received a moderately intensive lifestyle counseling program. Spatz3 received FDA approval in 2021 [23].

Figure 2. The Spatz3 intragastric system is depicted in the figure. [19]

3.1.5. Ellipse Balloon

Another IGB, the Ellipse Balloon, is an FDA unapproved IGB similar in size, shape, and function to the most commonly used and endoscopically placed Orbera balloon [19]. However, it is the first intragastric device that does not require anesthesia or an invasive endoscopic procedure for both its placement and subsequent removal [24, 25, 26]. Therefore, it represents an innovative weight loss option by minimizing the costs and risks of complications associated with an endoscopic procedure, offering an alternative for obese individuals who experience discomfort related to endoscopy and/or the risks of anesthesia [24, 27]. However, by forgoing pre-implantation endoscopic examination of the stomach, the opportunity to detect mucosal changes (such as erosions or ulcers) or anatomical abnormalities (e.g., hiatal hernia) that could potentially lead to complications while the balloon remains in the stomach is lost [25]. The

balloon is made of a thin polymer film and is devoid of rigid parts. It is enclosed within an easily swallowable vegan capsule, attached to a thin catheter 75 cm in length and 1.3 mm in diameter, via a self-sealing valve. After swallowing, the correct placement of the balloon in the stomach is confirmed by X-ray visualization of the radiopaque ring marker on the balloon. The balloon is then filled with 550 ml of a solution consisting of distilled water with potassium sorbate as a preservative, through the catheter, which is subsequently removed by simple pulling [26, 28, 29]. The device is deployed during a 20-minute outpatient visit. The balloon remains in the stomach for approximately 4 months, after which the valve opens spontaneously, emptying the balloon and allowing it to be naturally expelled through the gastrointestinal tract.

3.1.6. Heliosphere Balloon

Over the years, it has become evident that the excessive weight of fluid-filled balloons is the cause of an increased incidence of nausea, vomiting, and epigastric pain in the days immediately following balloon placement. Therefore, to reduce this troublesome drawback, the air-filled Heliosphere Balloon was developed, which was introduced into clinical practice in 2004 [24, 30]. It is a single, spherical balloon of large volume, filled with air, made of polyurethane, weighing less than 30 g, and enclosed in a silicone casing. It requires endoscopy for positioning. It is filled using a simple inflation system, allowing 900–1000 ml of air to be administered over 12 minutes [31–35]. The balloon is generally well tolerated during the 6 months following implantation. However, its use raises several concerns regarding complications associated with the procedure, stemming from technical difficulties in passing the balloon through the upper esophageal sphincter. The large size and low flexibility of the balloon result in a high rate of positioning failures and spontaneous deflation [24, 33, 36]. Similar difficulties have also been reported during the endoscopic removal of the balloon, which in some cases led to the need for surgical removal [30]. The entire procedure generally takes longer than with other balloons and causes greater discomfort. Deep sedation is a prerequisite for the proper course of the procedure – both for the patient and the endoscopist [37]. A serious warning for candidates for air-filled balloons—Heliosphere—is the absolute avoidance of diving and traveling in aircraft with low-pressure cabins.

3.1.7. Other Techniques for Occupying Gastric Space in Obesity Treatment

Other non-balloon devices that occupy gastric space have also been introduced. The TransPyloric Shuttle consists of a large, spherical silicone balloon connected via a flexible catheter to a smaller, cylindrical silicone balloon. This unique design allows the device to assume a transpyloric position, creating intermittent sealing, which results in delayed gastric

emptying and early satiety. Meanwhile, the Full Sense device is a modified, fully covered esophageal stent. Once the device is placed, its unique design causes an element of a gastric disk to exert pressure on a specific part of the stomach, resulting in a continuous sensation of satiety [9].

2. Endoscopic Sleeve Gastroplasty (ESG)

This procedure aims to reduce the volume of the stomach in a manner analogous to sleeve gastrectomy. An endoscopic suturing system is used to perform this procedure. It involves placing a continuous internal suture, which when tightened and secured, constricts the stomach. In this way, the stomach volume is reduced by approximately 70%, leading to early satiety and weight loss. Additionally, it has been shown that this method alters insulin sensitivity, delays gastric emptying, and affects appetite-regulating hormones [38]. The latest study results on the efficacy and overall effects of ESG were published in 2022. A randomized clinical trial was conducted in nine centers in the USA. The study involved 209 individuals aged 21–65 with class 1 or class 2 obesity. Participants were randomly assigned to ESG with lifestyle modifications (ESG group) or to lifestyle modifications alone (control group), with a potential crossover to ESG at 52 weeks. Participants in the initial ESG group were followed for 104 weeks. The primary endpoint at 52 weeks was the percentage of excess weight loss (EWL). Secondary endpoints included changes in the severity of obesity-related metabolic comorbidities between the groups. At 52 weeks, the primary endpoint – the average %EWL – was 49.2% for the ESG group and 3.2% for the control group. The average total body weight loss (TBWL) was 13.6% for the ESG group and 0–8% for the control group. Seventy-seven percent of participants in the ESG group achieved 25% or more EWL at 52 weeks compared to 12% in the control group. At 52 weeks, 80% of ESG group participants showed improvement in one or more obesity-related metabolic diseases, whereas 12% worsened, compared to the control group. In the group that did not receive the endoscopic intervention, 45% of participants showed similar improvement, while 50% worsened. At 104 weeks, 68% of participants in the ESG group maintained 25% or more EWL. Serious adverse events related to ESG occurred in three (2%) out of 131 participants, without the need for intensive therapy, surgical intervention, or resulting in death. These results indicate that ESG is a safe endoscopic intervention capable of achieving significant weight loss maintained at 104 weeks, with a notable improvement in obesity-related metabolic comorbidities [39]. Current evidence suggests that ESG results in greater weight loss compared to the intragastric balloon, but not as much as bariatric surgery (although high-quality head-to-head studies are ongoing to evaluate this hypothesis) [9].

3.2.1. POSE Method

Another method similar to ESG, Primary Obesity Surgery Endoluminal (POSE), utilizes a transoral, incisionless operating platform to place transmural tissue anchors that reduce the accommodation of the gastric fundus. Additional anchors are placed in the distal part of the stomach to delay gastric emptying. In a pivotal multicenter, randomized, blinded clinical trial conducted in the United States, the %TBWL at 12 months in the POSE group was 4.94% ± 7% compared to 1.38% ± 5.6% in the control group. The rate of serious adverse events was 4.7%. Further studies of this method are ongoing [40].

4.3. Aspiration Therapies

AspireAssist is an FDA-approved device for the treatment of patients with a BMI of 35–55 kg/m². It is a large-bore tube that is inserted percutaneously through the stomach [41]. Two weeks after placement, the external portion of the tube is shortened and a port with a valve is attached to the skin. The AspireAssist device, connected to the skin port, facilitates aspiration. A special water reservoir delivers water into the stomach to aid aspiration. Aspiration is performed approximately 20–30 minutes after each meal and lasts about 5–10 minutes. This allows for the effective removal of up to one-third of the ingested meal. The PATHWAY study was the largest multicenter randomized controlled trial involving 207 patients. One hundred and thirty-seven patients underwent AspireAssist therapy, while 70 patients received lifestyle advice only. A total of 111 patients were included in the final analysis (26 dropped out). At 52 weeks, participants in the AspireAssist group lost an average (± SD) of 31.5 ± 26.7% of excess weight (12.1 ± 9.6% of total body weight), while participants in the control group lost an average of 9.8 ± 15.5% of excess weight (3.5 ± 6.0% of total body weight). In total, 58.6% of participants in the AspireAssist group and 15.3% in the control group lost at least 25% of excess weight. Each of these results reached statistical significance. The AspireAssist group also demonstrated a significant decrease in glycated hemoglobin levels [42]. The advantages of aspiration therapy include the simple reversibility of the procedure, its high safety profile, the absence of alterations in internal organ anatomy, and the possibility of long-term use.

4.4. Endoscopic Bariatric Therapies on the Small Intestine – DJBS (Duodenal–Jejunal Bypass Sleeve)

The gold standard of bariatric surgery remains the Roux-en-Y gastric bypass (RYGB). It enables a reduction in excess weight of about 70% within one year and the remission of diabetes in 80–90% of patients, mostly immediately after the procedure. To date, several types of endoscopically implanted sleeves have been described, designed to activate a hormonal mechanism analogous to that responsible for the efficacy of gastric bypass.

This mechanism involves an increased secretion of hormones—glucagon-like peptide-1 (GLP-1) and peptide YY (PYY)—as a result of food bypassing the stomach and directly entering the jejunum without prior processing [43].

4.4.1. EndoBarrier

EndoBarrier is a thin, flexible, tubular implant that is introduced into the small intestine via an endoscope. It is made of Teflon and takes the form of a sleeve 60 cm in length. Its purpose is to create conditions similar to those following a duodenal–jejunal bypass. The procedure is performed entirely endoscopically. Using a guidewire, the sleeve is placed in the appropriate segment of the gastrointestinal tract, released from the distal end, and secured in the duodenal bulb using a nitinol stent-anchor (Figure 3). The sleeve is designed to induce malabsorption by allowing food to pass from the stomach to the small intestine while bypassing the first 65 cm of the small intestine [43]. Due to the physical barrier created by the sleeve, contact between food and pancreatic enzymes as well as bile secretions in the duodenum is eliminated. This results in poor absorption of nutrients and, consequently, weight loss. The implant is covered with a polymer layer, which further prevents the absorption of fats and sugars from food. This method is particularly interesting because it is intended to mimic RYGB without the associated morbidity (14.9% at 1 year) and 30-day mortality (0.5%). The sleeve is removed endoscopically within 12 months [44]. Although this technology has not yet been approved by the FDA, numerous clinical studies have demonstrated promising results for this device. In a large meta-analysis by Force et al., published in 2015, EndoBarrier resulted in a 35.3% reduction in excess weight [45]. An interesting finding related to this innovation was that patients' glycated hemoglobin levels decreased significantly (from 8.4% ± 0.2 to 7%) with the use of this device in as little as 24 weeks of treatment [46]. This is likely due to increased glucagon synthesis following the exclusion of the proximal small intestine, as well as increased secretion of incretins such as GLP-1 in response to the delivery of nutrients to the distal small intestine [47]. A multicenter open randomized trial showed that the implantation time of the sleeve is short, averaging 35 minutes, which attests to the method's technical refinement. In contrast, removal after completion of the study took an average of only 43 minutes.

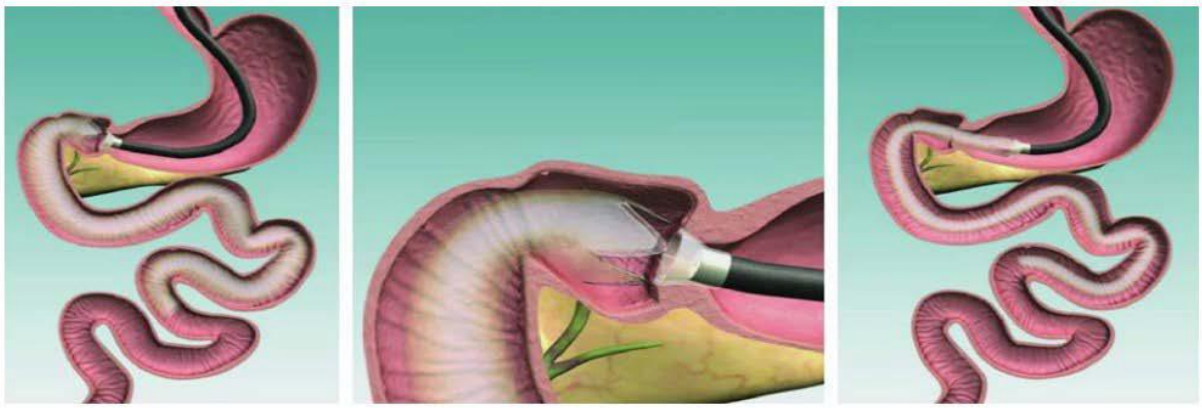

Figure 3. The implantation of the EndoBarrier device is depicted in the figure. [49]

4.4.2. ValenTx

The ValenTx gastric–duodenal bypass sleeve is a technology similar to EndoBarrier, but it is significantly longer (120 cm). Under laparoscopic guidance, the sleeve is sutured endoscopically to the upper margin of the gastric inlet. The endoluminal bypass sleeve ValenTx mimics the permanent anatomical changes achieved by the RYGB procedure, but does so using an adjustable, removable, and exchangeable device. This technology is still in the early stages of clinical trials. Results from one prospective study evaluating the efficacy of this method, conducted without a control group, have been published. Among 22 patients, within 8 weeks, the reduction in excess weight reached as high as 40% and was maintained at 12 weeks of follow-up. Additionally, in 7 patients with diabetes, normalization of glycemia and a reduction in glycated hemoglobin levels were observed with complete discontinuation of previously used medications. Five patients required early removal of the sleeve due to complications [9].

4.4.3. Other Endoscopic Bariatric Methods Performed on the Small Intestine

Another procedure that has been developed is resurfacing, or the “renewal” of the duodenal mucosa. In this procedure, a special catheter is used to deliver thermal energy, providing thermal ablation of the superficial duodenal mucosa. This causes remodeling of the mucosa and subsequently resets the signaling pathway of the duodenal neuroendocrine cells, resulting in improved control of hyperglycemia and diabetes. The SAMSEN method involves the use of biodegradable magnets that are placed in the patient’s stomach via endoscopy. These special magnets allow the creation of a connection between the proximal jejunum and the ileum. This method enables nutrients to bypass a larger absorptive surface of the small intestine, leading to impaired nutrient absorption and, consequently, weight loss [9].

Summary and Conclusions

Research has shown that lifestyle modifications and pharmacotherapy are only capable of achieving moderate weight loss. However, most obese individuals aim for a weight loss of 15% or more, which is usually attainable only through bariatric surgery. Although bariatric surgery is the most effective, it is associated with the highest rate of serious short- and long-term complications. Therefore, there remains a need to develop less invasive treatment methods with similar clinical efficacy to classical bariatric surgery procedures. Endoscopic bariatric treatments, although relatively new, have proven effective in treating obesity. It is highly likely that in the near future they will become more popular and widely used, including in Poland. This probability stems from the fact that these methods are relatively minimally invasive, with a limited risk of complications, yet they demonstrate high efficacy in obesity treatment. The long-term effectiveness of these methods is not yet well known, but should become available in the near future. Classical bariatric surgery remains among the most effective and cost-efficient treatment methods. Further studies must also address the impact of endoscopic obesity treatment methods on the course of obesity-related comorbidities (cardiovascular diseases, diabetes, hyperlipidemia). The future of this developing field will largely depend on the training of future gastroenterologists in both the technical and medical aspects of this discipline. In gastroenterology training programs, a formal training pathway for bariatric endoscopy does not yet exist. Primary care physicians, bariatric medicine specialists, and bariatric surgeons should consider the possibility of incorporating bariatric endoscopy in the evaluation of patients. Given the promising results of the methods described, the authors of this paper believe that the future of bariatric medicine will include endoscopic interventions as a fundamental tool in its arsenal.

Disclosure

Authors do not report any disclosures.

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