



Scienxt Journal of Pharmacology & Toxicology
 Volume-1 || Issue-2 || May-Aug || Year-2023 || pp. 1-23

An overview and introduction to intragastric balloon therapy for treatment of obesity

***¹Ankush Sabale, ²Isak Sayyad, ³Tushar Rode, ⁴Ravindra Rohokale**

Student, Final Year B. Pharmacy,
 Shri Swami Samarth institute of Pharmacy, Malwadi (Bota), 422602, (MH), India.

⁵Akash Shelke (M. Pharm)

Review Guide, Department of Pharmaceutical Quality Assurance, Shri Swami Samarth Institute of Pharmacy,
 Malwadi (Bota), 422602, (MH), India.

**Corresponding Author: Mr. Sabale Ankush Vasant
 E-mail: ankushvs198@gmail.com*

Abstract:

There are currently one billion obese and overweight people in the world. Just a small portion of the patients indicate a desire or have the ability to have surgery. At present there is no medical cure for obesity. Over the past 30 years, endoscopically placed intragastric balloons (IGBs) have been an important part of the treatment of obesity, effectively bridging the gap between bariatric surgery and lifestyle modification/pharmacotherapy. They have typically been considered an efficient and reversible, less invasive, non-surgical method for weight loss because they offer a constant feeling of satiety that encourages the consumption of smaller portions of food, easing maintenance of a low-calorie diet. It is possible to reduce the surgical and anesthetic problems associated with bariatric surgery by achieving the weight loss done with the balloon. The goal of this review is to give a current summary of the insertion, removal, types, history, side effects, and mechanism of intragastric balloon treatment for obesity.

Keywords:

Obesity, BMI, Intragastric balloons (IGB), Fluid-filled balloons, Gas-filled balloons, Swallowable balloons, Endoscopy.

1. Introduction:

Obesity is a health condition in which excess body fat has accumulated to an extent that it could negatively impact on health^[1] When person’s body mass index (BMI) is greater than 30 they are generally considered as obese.

1.1. Formula for calculate body mass index is:

$$\frac{\text{weight (in kilogram)}}{\text{height}^2(\text{in meter})}$$

Table. 1: World health organization classified weight status

	Weight status	BMI kg/m ²
1	Under weight	<18.5
2	Normal range	18.5 – 24.9
3	Over weight	25.0 – 29.9
4	Obese	≥30
	• obese class I	30.0 – 34.9
	• obese class II	35.0 – 39.9
	• obese class III	≥40

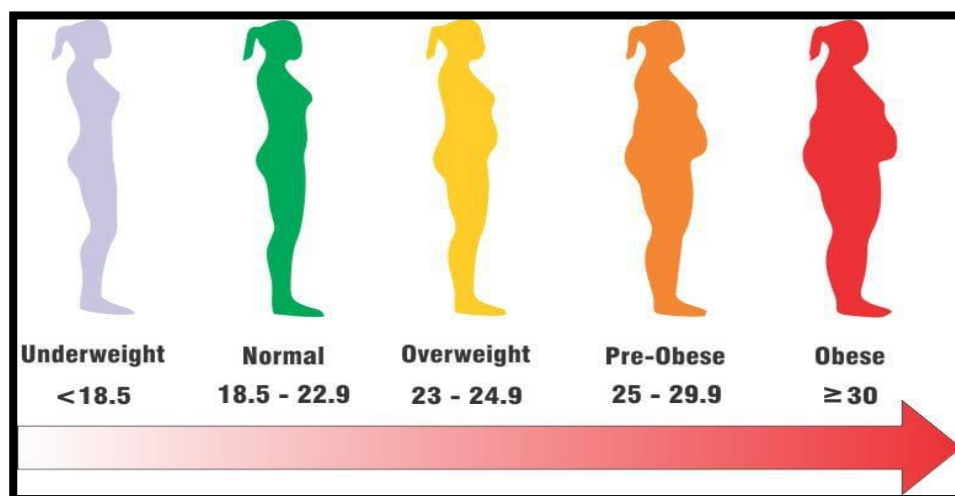


Figure. 1: Representation of scale of body Mass Index

Obesity symptoms include an excess fat deposition in abdomen and waist, excessive sweating, breathlessness, feeling tired after any physical activity.^[1] obesity-related complications include cardiovascular conditions, type 2 diabetes, obstructive sleep apnea, and some cancers, hypertension, osteoarthritis, depression. Obesity causes include excessive calorie intake, sedentary lifestyles, a lack of physical activity, changes in transportation, urbanization, a lack of supportive policies, access to a nutritious diet that is out of reach, and heredity are all contributing factors. Some individuals have obesity that is caused by additional factors like as genes, endocrine diseases, drugs, or mental illnesses. BMI greater than 30 kg/m² is a diagnostic indicator of obesity. Diet, exercise, medication, surgery, and intragastric balloon therapy are all methods of treating obesity. Diet and exercise are main treatment for obesity. Diet quality of obese people can be improved by consuming less food that is heavy in fat or sugar and consumption of more dietary fiber. To suppress the appetite or lower fat absorption, medications can be used, along with a healthy diet. If diet, exercise and medicine are not effective in certain people a gastric balloon or surgery may be used to reduce stomach volume or length of the intestine. Resulting an earlier feeling of fullness or a decreased capacity for nutrient absorption from food. As a result, effective and minimally invasive techniques are required for the treatment of obesity. Endoscopic bariatric therapy was so recently developed. It includes gastrointestinal bypass sleeves, aspiration therapy, gastroplasty methods, and intragastric balloons. The intragastric balloon has been the most extensively researched and used in clinical practice among them all for treating obesity.

2. Intragastric Balloon:

An innovative method of losing weight is using an intragastric balloon. The patient has a saline-filled silicone balloon implanted in their stomach, which reduces the amount of food they can consume and aids in weight loss. Additionally, it causes patients to feel fuller more quickly than usual. If exercise and diet have failed for the patients and they are either overweight or obese, they have the option to undergo this process. The intragastric balloon treatment is completed as an outpatient procedure in the endoscopy unit. Intragastric balloon also called endoscopic intragastric balloon. For the process, you will be sedated. During the procedure, the doctor inserts a tiny tube (catheter) into your stomach that is loaded with an intragastric balloon. A light sedative will be given before the gastric balloon is removed, and then the gastroenterologist will deflate the balloon and remove it using an endoscope through the mouth. The procedure to remove the intragastric balloon is under 30 minutes. For intragastric balloon

treatment consenting adult must be between the ages of 18 to 65, with a BMI of at least 27 but typically between 30 to 40. The gastric balloon can be inserted for a duration 6 or 12 months. Due to the risk of balloon deterioration and tissue wall injury, longer placement is not suggested. Non-endoscopic balloons are another minimally invasive alternative to weight loss surgery. When Allurion's Elipse gastric balloon received approval in Europe in 2015, it became the first non-endoscopic swallowable gastric balloon.

The "intra-gastric balloon," it is a medical device that is used as a temporary, nonsurgical weight loss treatment. The intra-gastric balloon is placed inside the stomach to create a feeling of fullness, which can help people eat smaller portions and lose weight.

Here's a brief overview of how the procedure typically works:

2.1.1. Placement:

The intra-gastric balloon is inserted into the stomach through the mouth without the need for surgery. It is usually done as an outpatient procedure, and the patient is typically sedated.

2.1.2 Inflation:

Once in the stomach, the balloon is filled with a sterile saline solution or gas, such as nitrogen. This inflation helps the balloon occupy space in the stomach, leading to a feeling of fullness and reduced hunger.

2.1.3. Duration:

The balloon is typically left in place for a few months, often around six months. The exact duration may vary depending on the specific type of balloon used and the patient's needs.

2.1.4. Diet and Lifestyle Changes:

While the balloon is in place, patients are usually advised to make significant changes to their diet and lifestyle. This includes adopting a healthy eating plan and increasing physical activity to maximize weight loss.

2.1.5. Removal:

After the recommended period, the intra-gastric balloon is removed. This is typically done through a similar procedure to the insertion, using an endoscope.

It's important to note that the intra-gastric balloon is not a permanent solution for weight loss. It is meant to kick start weight loss and should be used in conjunction with a comprehensive weight loss program that includes dietary and lifestyle changes.

3. History:

In the year 1979, A. Henning became the first person to treat obesity with a gastric balloon (Inn. Med.6 (1979), 149) for a self-experiment, he and his wife used it. According to DeBakey's review from 1938, bezoars cause weight loss. Nieben and Harboe utilized free-floating intragastric balloons in 1982. In 1984, Percival introduced a "balloon diet" by using inflated mammary implants as gastrointestinal balloons. The first intra-gastric balloon (IGB) to be approved by the US Food and Drug Administration (FDA) was the Garren-Edwards gastric bubble in 1985. This balloon was made by American Edwards Laboratories in Santa Ana, California, and was created by two gastroenterologists, Lloyd R. Garren and his wife Mary L. The balloon was made to be placed and removed endoscopically. It had a cylindrical shape with a hollow central channel. The balloon is inserted, filled with 200 cc of room air, and kept in the stomach for four months.

3.1.1. Indication:

Intragastric balloon therapy is a non-surgical, temporary intervention used for weight loss in individuals with obesity who have not responded to diet and exercise alone. The procedure involves placing a deflated balloon in the stomach, which is then inflated with saline or another liquid to create a feeling of fullness. The balloon is usually left in place for a few months and then removed.

Indications for intragastric balloon therapy typically include:

3.1.2. BMI Criteria:

Intragastric balloon therapy is generally considered for individuals with a body mass index (BMI) between 30 and 40 kg/m² who have not achieved weight loss through diet and exercise alone. In some cases, it may be considered for individuals with a BMI as low as 27 kg/m² if they have obesity-related comorbidities.

3.1.3. Health Conditions:

The presence of obesity-related health conditions, such as type 2 diabetes, hypertension, sleep apnea, or other obesity-related comorbidities, may be a factor in determining whether intragastric balloon therapy is appropriate.

3.1.4. Unsuccessful Previous Weight Loss Attempts:

Intragastric balloon therapy is often considered for individuals who have not been successful in losing weight through conventional methods like diet and exercise.

3.1.5. Preoperative Weight Loss:

In some cases, intragastric balloon therapy may be used as a preoperative measure for individuals who are scheduled to undergo weight loss surgery. This can help reduce liver size and improve the feasibility of surgery.

3.1.6. Patient Preference:

Some individuals may prefer non-surgical weight loss interventions, and intragastric balloon therapy can be an option for those who are not interested in or eligible for weight loss surgery.

3.1.7. Bridge to Other Interventions:

Intragastric balloon therapy may serve as a temporary measure, providing a "bridge" to other weight loss interventions. For example, it may be used to jumpstart weight loss before transitioning to a long-term diet and exercise program.^[15]

3.1.8. Contraindication:

Intragastric balloon therapy for obesity is generally considered a safe and effective option for weight loss in certain individuals. However, there are contraindications, or situations where the use of intragastric balloons may not be recommended due to potential risks or complications. Contraindications may vary depending on the specific type of intragastric balloon device and individual patient characteristics, but common contraindications may include:

3.1.9. Gastrointestinal Issues:

Individuals with certain gastrointestinal conditions, such as active inflammatory diseases or conditions that may predispose them to bleeding, may be advised against intragastric balloon therapy.

3.1.10. Previous Gastrointestinal Surgery:

Patients who have undergone certain types of gastrointestinal surgery may be at an increased risk of complications with intragastric balloons.

3.1.11. Pregnancy or Planning for Pregnancy:

Intragastric balloon therapy is generally not recommended for pregnant women or those planning to become pregnant during the treatment period.

3.1.12. Severe Heart or Lung Conditions:

Individuals with severe heart or lung conditions may not be suitable candidates for intragastric balloon therapy, as the procedure may pose additional risks in these cases.

3.1.13. Previous Allergic Reactions:

If a patient has a known allergy to materials used in the intragastric balloon, the procedure may not be suitable.

3.1.14. Unwillingness or Inability to Comply with Post-Procedure Recommendations:

Successful use of intragastric balloons often requires adherence to a specific diet and lifestyle modifications. Individuals who are unwilling or unable to comply with these recommendations may not be suitable candidates.

3.1.15. Psychological or Psychiatric Issues:

Patients with certain psychological or psychiatric conditions may require careful evaluation before undergoing intragastric balloon therapy. It's important to address any potential eating disorders or mental health concerns.

3.1.16. Uncontrolled Diabetes:

Poorly controlled diabetes may increase the risk of complications with intragastric balloon therapy.

3.2. Types of Intragastric balloons Approved for use:

3.2.1. FDA approved:

1. Orbera
2. Reshape Duo
3. Obalon

3.2.2. European Community (CE) approved:

1. Heliosphere
2. Spatz

3. Elipse

Table. 2: Types of FDA approved intragastric balloons with specifications

	IGBs Devices	Orbera	ReShape Duo	Obalon
1.	Manufacturer	Apollo Endosurgery	ReShape Medical	Obalon Therapeutics
2.	FDA Approval	Approved in 2015: BMI 30–40 kg/m ²	Approved in 2015: BMI 30–40 kg/m ²	Approved in 2016: BMI 30–40 kg/m ²
3.	Volume (mL)	400–700 MI	900 mL (450 mL×2)	250 mL (250 mL×3)
4.	Filled with	Liquid (Saline)	Liquid (Saline)	Nitrogen gas
5.	Insertion	Endoscopy	Endoscopy	Swallowed
6.	Removal	Endoscopy	Endoscopy	Endoscopy
7.	Duration	6 months	6 months	6 months
8.	Number of balloons	1	2	Up to 3
9.	Adjustable	No	No	No

Table. 3: Types of CE approved intragastric balloons with specifications

	IGBs Devices	Heliosphere	Spatz	Elipse
1.	Manufacturer	Helioscopie Medical Implants	Spatz FGIA	Allurion Technologies
2.	Capacity (mL)	900-1000	300-900	550
3.	Filled with	Air	Saline	Liquid
4.	Insertion	Endoscopy	Endoscopy	Swallowed
5.	Removal	Endoscopy	Endoscopy	Natural pass
6.	Duration	6	12	4
7.	Number of balloons	1	1	1

8.	Adjustable	No	Yes	No
----	------------	----	-----	----

3.3. FDA approved:

3.3.1. Orbera:

The first balloon of the new generation, Orbera IGB (Apollo Endosurgery, Austin, TX, United States), formerly BioEnterics IGB (BIB, Inamed Corporation, Santa Barbara, CA, United States), appeared in 1991, following the Tarpon Springs Consensus meeting. It is currently the most frequently used and popular endoscopic device for weight loss. [17] Primarily a single balloon system filled with saline with a fill volume of 500–750 mL that is usually inserted endoscopic ally and Placed for a maximum of six months. Deflation and removal require endoscopy and sedation; two long-jaw rat-tooth forceps and a double-channel endoscope may make the process easier.

3.3.2. Key points about the Orbera intragastric balloon:

Duration: The balloon remains in the stomach for around six months. During this time, patients typically work with healthcare professionals to adopt healthier eating habits and lifestyle changes.

Support Program: Orbera treatment involves a comprehensive program that includes dietary counseling, exercise routines, and support from a multidisciplinary team to maximize weight loss and maintain healthy habits.

Removal: After about six months, the balloon is removed via another endoscopic procedure. The removal process is relatively straightforward and doesn't involve surgery.

Effectiveness: Clinical studies have shown that Orbera, in conjunction with lifestyle changes, can result in significant weight loss in individuals with obesity.

Safety Considerations: As with any medical procedure, there are potential risks and side effects associated with the Orbera intragastric balloon, such as nausea, vomiting, abdominal discomfort, and in rare cases, balloon deflation or migration. Close monitoring by healthcare providers is essential during the treatment period.

Orbera and similar intragastric balloons are typically recommended for individuals with a BMI between 30 and 40 who haven't achieved weight loss through diet and exercise alone and are seeking a non-surgical intervention. [18]



Figure. 2: Orbera balloon

3.4. Reshape Duo:

It's the double balloon system filled with saline. Each balloon has a fill volume of 450 mL, making a total capacity of 900 ml. Most frequently used endoscopically Implanted for a maximum of six months, endoscopy is necessary for deflation and removal. The two independently filled silicone spheres of the ReShape Duo integrated dual balloon system (ReShape Medical, Inc., San Clemente, CA, United States) are connected by a central, short, flexible silicone shaft that prevents communication. In the unlikely event that one of the balloons unintentionally deflates, the primary goal of this system design is to reduce the chances of intestinal migration. Also, the manufacturers claim that this flexible structure enables the balloons to follow the natural contours of the stomach.

Key features of the ReShape Duo intragastric balloon:

Dual Balloon Design: ReShape Duo consists of two connected silicone balloons filled with saline solution. This design aims to enhance the effectiveness of the treatment by occupying more space in the stomach and potentially increasing feelings of fullness.

Insertion Procedure: The balloons are inserted into the stomach endoscopically while deflated and then filled with saline solution to expand and occupy space within the stomach.

Duration of Placement: Similar to other intragastric balloons, ReShape Duo is intended to remain in the stomach for approximately six months.

Comprehensive Program: Treatment with ReShape Duo involves a comprehensive program that includes lifestyle coaching, dietary counseling, and support from healthcare professionals to help patients adopt healthier eating habits and lifestyle changes.

Removal: After about six months, the balloons are removed through an endoscopic procedure, which is typically non-surgical.

Effectiveness: Clinical studies have demonstrated that the ReShape Duo, combined with lifestyle modifications, can lead to significant weight loss in individuals with obesity.

Safety Considerations: As with other intragastric balloons, potential side effects of the ReShape Duo may include nausea, vomiting, abdominal discomfort, and rare instances of balloon deflation or migration. Patients are closely monitored by healthcare providers during the treatment period.

The ReShape Duo intragastric balloon is generally recommended for individuals with a BMI between 30 and 40 who haven't achieved weight loss through conventional methods like diet and exercise alone.^[19]

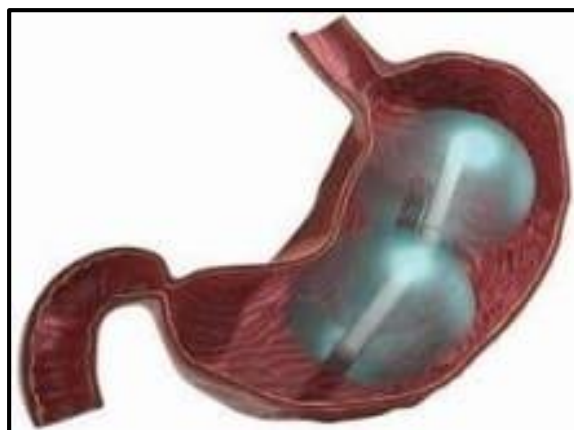


Figure. 3: Reshape Duo balloon

3.5. Obalon:

This is the gas-filled multiballoon system; it has a 250 mL fill volume and can hold up to three balloons. It is a swallowed capsule delivery device. does not require sedation or endoscopy for implantation; fluoroscopy is used to check the device's location in the stomach before inflating. Implanted for a maximum of six months, endoscopy is necessary for deflation and removal. The 250 mL gas-filled, swallowable, thin-walled Obalon (Obalon Therapeutics Inc., Carlsbad, CA, USA) is a novel IGB that makes gastric volume titration simple with the use of extra balloons. The gadget is FDA-approved and consists of three separate balloons with a combined volume of 750 ml. These balloons can be swallowed one month apart and most patients tolerate it rather well. To ensure that the full capsule has reached the stomach, each balloon is compressed, folded, and put into a 6 g dissolvable gelatin capsule. The capsule is then consumed under fluoroscopic vision. The balloon is fitted with a thin, 2 Fr catheter, the other

end of which extends outside the mouth and is used for remote, automated balloon inflation to a maximum capacity of 250 ml. The balloon is inflated using a canister that is filled with a special air mixture, primarily nitrogen-based, once the capsule reaches the stomach. One operator can complete the very simple procedure. The balloon valve can securely self-seal once the balloon is inflated and the catheter is removed.

Key features of the Obalon intragastric balloon system:

Swallowable Balloons: Obalon differs from other intragastric balloons in that it is a swallowable capsule containing a deflated balloon. Patients ingest the capsule, and once it reaches the stomach, it is remotely inflated with gas via a small tube connected to the balloon.

Multiple Balloons: Typically, a series of three balloons are swallowed over several weeks, gradually increasing the volume occupied in the stomach to help reduce hunger and promote earlier feelings of fullness.

Duration of Placement: The balloons are left in the stomach for about six months, in line with other intragastric balloon therapies.

Comprehensive Program: The Obalon treatment is combined with a comprehensive weight loss program that includes dietary counseling, lifestyle modifications, and support from healthcare professionals to optimize weight loss results.

Non-surgical: The placement of the Obalon balloons does not require an endoscopic procedure. It is a non-invasive and outpatient process.

Removal: After approximately six months, the balloons are removed through an endoscopic procedure, typically performed under conscious sedation.

Effectiveness: Clinical studies have shown that the Obalon intragastric balloon system, when combined with a comprehensive weight loss program, can lead to significant weight loss in eligible individuals.

Safety Considerations: Common side effects may include mild abdominal discomfort, nausea, and bloating. Serious adverse events are rare but could include balloon deflation or migration, ulceration, or bowel obstruction.

The Obalon system is generally recommended for individuals with a BMI between 30 and 40 who have struggled with weight loss through conventional methods like diet and exercise alone.



Figure. 4: Obalon balloon

3.6. European Community (CE) approved:

3.6.1. Heliosphere:

The only air-filled balloon available on the market for six months of bodily implantation is the Heliosphere Newtech. The primary benefit of air filling is its ability to reduce weight and assist patients control their level of satiety. The volume of the Heliosphere Newtech 600 is 600cc. Because the balloon weighs no more than 15 g, the air-filled Heliosphere minimizes common post-implantation nausea and pain and keeps patients from taking excessive amounts of medicine, such as proton pump inhibitors. Heliosphere comes with a special extraction kit that includes an endoscopic needle and forceps (double hook) for deflating the balloon first and extracting it from the stomach naturally.

Key features of the Heliosphere intragastric balloon:

Design: The Heliosphere balloon is designed to be placed in the stomach endoscopically, like other intragastric balloons, to occupy space and create a feeling of fullness, thereby aiding in weight loss.

Material: It is typically made of silicone and filled with saline solution after placement in the stomach.

Duration of Placement: The balloon is intended to stay in the stomach for a specified period, often around six months, to assist in weight loss efforts.

Support Program: Patients using the Heliosphere balloon are usually enrolled in a comprehensive weight loss program involving dietary guidance, lifestyle changes, and regular monitoring by healthcare professionals.

Removal: After the recommended duration, the Heliosphere balloon is removed via an endoscopic procedure, which is usually performed on an outpatient basis.

Effectiveness and Safety: Information regarding the specific effectiveness and safety profile of the Heliosphere intragastric balloon might vary and may be limited compared to more widely known intragastric balloon systems. As with any medical intervention, there may be potential risks and side effects associated with the procedure, including but not limited to nausea, vomiting, abdominal discomfort, and, rarely, balloon-related complications.

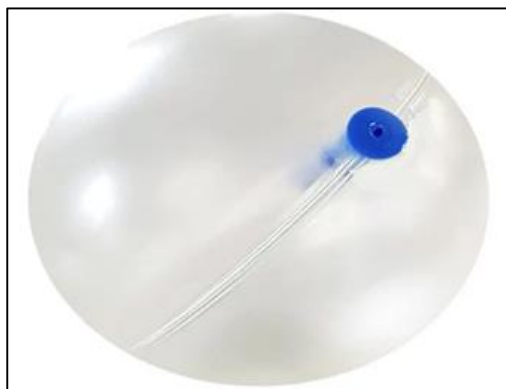


Figure. 5: Heliosphere

3.7. Spatz3:

The Spatz3 is a type of gastric balloon used in the treatment of obesity. A gastric balloon is a non-surgical, temporary weight loss device that is placed in the stomach to reduce its capacity, leading to a feeling of fullness and helping people eat smaller portions.

Here's some information about the Spatz3 Intragastric Balloon:

Adjustability: One notable feature of the Spatz3 balloon is its adjustability. Unlike some other gastric balloons that are a fixed size, the Spatz3 balloon can be adjusted after placement. This is done by adding or removing saline through a catheter connected to the balloon.

Placement: The Spatz3 balloon is typically placed in the stomach through a minimally invasive endoscopic procedure. Once in place, it is filled with saline to the desired volume.

Duration: The Spatz3 balloon is meant to be a temporary measure. The recommended duration for leaving the balloon in the stomach is around 12 months, but this can vary based on individual circumstances.

Weight Loss: The primary goal of using the Spatz3 balloon, like other gastric balloons, is to aid in weight loss. By reducing the stomach's capacity, individuals may feel full with smaller amounts of food, leading to reduced calorie intake and weight loss.

Multidisciplinary Approach: The use of intragastric balloons is often part of a comprehensive weight management program that includes dietary and lifestyle changes, as well as medical supervision.



Figure. 6: Spatz

3.8. Elipse:

The Elipse intragastric balloon is a novel endoscopic option for weight loss. It is swallowed and filled with fluid. A non-FDA-approved IGB, the Elipse balloon (Elipse; Allurion Technologies, Wellesley, MA, USA) is comparable in size, form, and functionality to the most popular and endoscopically positioned Orbera balloon. But this is the first intragastric device that may be placed or removed without an invasive endoscopic procedure or anesthesia. The balloon, which is composed of a thin polymer film with no rigid elements, is tightly packed inside a tiny, ingestible vegetarian capsule that is attached to a thin catheter that is 75 cm long and 1.3 mm in diameter. The capsule is as easily swollen with water as a pill. After swallowing, the balloon's correct placement in the stomach is verified by an X-ray showing the radiopaque ring-shaped marker. The balloon is then filled with 550 mL of fluid distilled water with potassium sorbate preservative through the catheter, which can be easily removed by pulling it back. This intragastric balloon Placement is performed in a 20 min outpatient visit. The balloon naturally removes after 4 months when it self-empties.

Key features of the Elipse Intragastric Balloon:

Swallowable Capsule: The Elipse balloon is enclosed within a swallowable capsule. Once swallowed by the patient, the capsule reaches the stomach and then the balloon is filled with a specified amount of fluid (usually water) via a thin catheter attached to the balloon.

No Endoscopy or Anesthesia: As the balloon is ingested orally, there's no need for an invasive endoscopic procedure or anesthesia for placement.

Duration of Placement: The Elipse balloon remains in the stomach for about four months, after which it self-deflates and passes naturally through the digestive system.

Support Program: Patients undergoing treatment with the Elipse Intra gastric Balloon are usually enrolled in a comprehensive weight loss program involving dietary guidance and lifestyle changes.

Non-surgical and Non-invasive: Since the Elipse balloon is swallowed as a capsule, the insertion process is non-surgical and minimally invasive.

Self-Emptying Mechanism: After the designated period, the balloon automatically deflates, allowing it to pass through the digestive system and be excreted naturally.

Effectiveness and Safety: Clinical studies have shown that the Elipse Intra gastric Balloon System, combined with a comprehensive weight loss program, can lead to significant weight loss in eligible individuals. As with any medical intervention, there may be potential risks and side effects associated with the Elipse balloon, such as nausea, discomfort, or balloon-related complications.

The Elipse Intra gastric Balloon offers a non-invasive alternative to traditional intra gastric balloons, making it more appealing to individuals who might prefer a procedure without endoscopy or anesthesia.



Figure. 7: Elipse

3.9. Mechanism of action:

The mechanism of action of intragastric balloon therapy is thought to achieve weight loss through several ways:

Reduced Gastric Capacity: The balloon takes up space in the stomach, reducing its capacity for food intake. This creates a sensation of fullness even with smaller meals, leading to reduced calorie intake.

Early Satiety: By occupying space in the stomach, the balloon can trigger feelings of fullness or satiety sooner during a meal, leading to decreased food consumption.

Delayed Gastric Emptying: The presence of the balloon in the stomach can slow down the rate at which food moves from the stomach to the intestines. This delay can prolong the feeling of fullness and reduce the urge to eat.

Hormonal Changes: The presence of the balloon might influence the release of hormones involved in appetite regulation, such as ghrelin (the hunger hormone), leading to reduced hunger and increased feelings of fullness.

Behavioral Changes: Patients often undergo counseling or dietary advice in conjunction with balloon placement. This can encourage changes in eating behaviors, such as adopting healthier diets and portion control, which contribute to weight loss.

It's important to note that while the intragastric balloon can assist with weight loss, its effectiveness might vary among individuals. Also, it's typically used as a temporary aid, usually for a period of six months, and is often combined with lifestyle changes to achieve sustained weight loss.

Balloon insertion and removal:

Preparation: Before the procedure, the patient typically undergoes a thorough medical evaluation, including blood tests and imaging studies, to ensure they are a suitable candidate for the intragastric balloon.

Insertion: The procedure is usually performed endoscopically, meaning a flexible tube with a camera and a light source (endoscope) is passed through the mouth and into the stomach. The deflated balloon is attached to the endoscope and guided into the stomach.

Inflation: Once the balloon is properly positioned in the stomach, it is inflated with a sterile saline solution. The inflated balloon takes up space in the stomach, reducing its capacity and creating a sensation of fullness.

Monitoring: The patient is typically monitored for a short period after the procedure to ensure there are no immediate complications.

Follow-up: After the balloon is inserted, patients usually receive guidance on diet and lifestyle changes to maximize the benefits of the procedure. The balloon is left in place for a specific period, often around six months.

Removal: At the end of the predetermined period, the balloon is deflated and removed. This is also done endoscopically.

It's important to note that while intragastric balloons can be effective in promoting weight loss, they are not a long-term solution on their own. Lifestyle changes, including diet and exercise, are crucial for maintaining weight loss after the balloon is removed.

Adverse effect:

Some of the possible adverse effects associated with intragastric balloon therapy:

1. **Nausea and Vomiting:** Patients may experience nausea and vomiting, especially in the initial days after the balloon placement. This can be a result of the stomach adjusting to the presence of the balloon.
2. **Abdominal Pain and Discomfort:** Some individuals may experience abdominal pain and discomfort due to the presence of the balloon in the stomach. This can range from mild discomfort to more severe pain.
3. **Gastrointestinal Issues:** The balloon may cause other gastrointestinal issues such as bloating, indigestion, and acid reflux. These symptoms can affect the patient's quality of life during the treatment period.

4. **Migration or Deflation of the Balloon:** In rare cases, the balloon may migrate within the stomach or deflate prematurely. This could require removal or repositioning of the balloon.
5. **Ulcers or Erosions:** The presence of the balloon may lead to irritation of the stomach lining, potentially causing ulcers or erosions.
6. **Infection:** Although rare, there is a risk of infection associated with the insertion of the balloon. This can lead to more serious complications if not addressed promptly.
7. **Obstruction:** There is a small risk of the balloon causing obstruction in the gastrointestinal tract, which may require surgical intervention.
8. **Intolerance or Psychological Effects:** Some individuals may find the intragastric balloon uncomfortable or psychologically challenging to adapt to, impacting their ability to adhere to the recommended lifestyle changes for weight loss.

4. Conclusion:

The long-term remedy for obesity is essentially to continue eating a healthy diet and exercising on a regular basis, but this takes time and is not possible in the modern world. The medications that are now available to treat obesity are not very healthy options, and their effects wear off quickly. Thus, intragastric balloons have been a major advancement in the treatment of obesity. Due to its reversibility, ease of use, and favorable short-term outcomes, numerous balloon varieties have been developed. Obalon It provides a moderately intrusive, low-side-effect approach to controlling obesity and related problems. The way that obesity is treated will change as more IGBs become available and as interdisciplinary programs are created to provide long-term follow-up. It exhibits promise in terms of safety, efficacy, and cost-effectiveness in enhancing the health and quality of life of obese people.

5. References:

- (1) "Obesity and overweight Fact sheet N°311" (<https://www.who.int/mediacentre/factsheets/fs311/en/>). WHO. January 2015. Retrieved 2 February 2016.
- (2) Haslam DW, James WP (October 2005). "Obesity". *Lancet (Review)*. 366 (9492): 1197–1209.

- (3) Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, Zitman FG (March 2010). "Overweight, obesity, and depression: a systematic review and metaanalysis of longitudinal studies". *Archives of General Psychiatry*. 67 (3): 2209.
- (4) Haslam DW, James WP (October 2005). "Obesity". *Lancet (Review)*. 366 (9492): 1197–1209.
- (5) Yazdi FT, Clee SM, Meyre D (2015). "Obesity genetics in mouse and human: back and forth, and back again". *Peer J*. 3: 856.
- (6) Yanovski SZ, Yanovski JA (January 2014). "Long-term drug treatment for obesity: a systematic and clinical review". *JAMA (Review)*. 311 (1): 74–86.
- (7) Colquitt JL, Pickett K, Loveman E, Frampton GK (August 2014). "Surgery for weight loss in adults". *The Cochrane Database of Systematic Reviews (Metaanalysis, Review)*. 8(8): CD003641
- (8) Kanazawa M, Yoshiike N, Osaka T, Numba Y, Zimmet P, Inoue S (2005). "Criteria and Classification of Obesity in Japan and AsiaOceania". *Nutrition and Fitness: Obesity, the Metabolic Syndrome, Cardiovascular Disease, and Cancer. World Review of Nutrition and Dietetics*. 94. pp. 1–12.
- (9) Ienca R, Al Jarallah M, Caballero A, Giardiello C, Rosa M, Kolmer S, Sebbag H, Hansoulle J, Quartararo G, Zouaghi SAS, Juneja G, Murcia S, Turro R, Pagan A, Badiuddin F, Dargent J, Urbain P, Paveliu S, di Cola RS, Selvaggio C, Al Kuwari M. The Procedureless Elipse Gastric Balloon Program: Multicenter Experience in 1770 Consecutive Patients. *Obes Surg*. 2020; 30:3354–3362.
- (10) Dhanashree Kavhale, Darshana.Lahoti, Jaya Ambhore, Shital Gandhi *International Journal of Advances in Engineering and Management (IJAEM) Volume 2, Issue 5, pp: 721-727*
- (11) DeBakey M, Ochsner A (1939). "Bezoars and concretions. A comprehensive review of the literature with an analysis of 303 collected cases and a presentation of 8 additional cases". *Surgery*. 5: 132–160.
- (12) Nieben OG, Harboe H (1982). "Intragastric balloon as an artificial bezoar for treatment of obesity" *Lancet*. 319 (8265): 198–199.

- (13) Percival WL (1984). "The balloon diet: non-invasive treatment invasive treatment for morbid obesity: preliminary report on 108 patients". *Canadian Journal of Surgery*. 27 (2): 135–136.
- (14) J. Gleysteen, A history of intragastric balloons, *Surg. Obes. Relat. Dis.* 12 (2) (2016) 430–435
- (15) Abu Dayyeh BK, Maselli DB, Rapaka B, Lavin T, Noar M, Hussan H, Chapman CG, Popov V, Jirapinyo P, Acosta A, Vargas EJ, Storm AC, Bazerbach F, Ryou M, French M, Noria S, Molina D, Thompson CC. Adjustable intragastric balloon for treatment of obesity: a multicentre, open-label, randomised clinical trial. *Lancet*. 2021 Nov 27; 398(10315):1965-1973.
- (16) Dumonceau JM. Evidence-based review of the Bioenterics intragastric balloon for weight loss. *Obes Surg*. 2008 Dec; 18(12):1611-7.
- (17) Schapiro M, Benjamin S, Blackburn G, Frank B, Heber D, Kozarek R, Randall S, Stern W. Obesity and the gastric balloon: a comprehensive workshop. Tarpon Springs, Florida, March 19-21, 1987. *Gastrointest Endosc*. 1987; 33:323–327.
- (18) Apollo Endosurgery. Obara managed weight loss system. 2016. [Online]. Available at: www.obera.com. Accessed September 17, 2016.
- (19) Reshaper on-surgical weight loss procedure. Reshape Medical; 2016 [Online]. Available at: <http://pro.reshapeready.com/aboutreshape/>. Accessed September 17, 2016.
- (20) Ulicny K, Goldberg SJ, Harper WJ, et al. Surgical complications of the GarrenEdwards Gastric Bubble. *SurgGynecolObstet*1988; 166(6):535–40.
- (21) Espinet-Coll E, Nebreda-Durán J, Gómez-Valero JA, Muñoz-Navas M, Pujol-Gebelli J, Vila-Lolo C, Martínez-Gómez A, Juan-Creix-Comamala A. Current endoscopic techniques in the treatment of obesity. *Rev Esp Enferm Dig*. 2012; 104:72–87.
- (22) Choi SJ, Choi HS. Various Intragastric Balloons under Clinical Investigation. *Clin Endosc*. 2018; 51:407–415.
- (23) Russo T, Aprea G, Formisano C, Ruggiero S, Quarto G, Serra R, Massa G, Sivero L. BioEnterics Intragastric Balloon (BIB) versus Spatz Adjustable Balloon System (ABS): Our experience in the elderly. *Int J Surg*. 2017; 38:138–140.

- (24) Gomez V. Baseline gastric emptying and its change in response to diverse endo-scopic bariatric therapies predict weight change after intervention. *Obesity* 2016; 24(9):1849–53.
- (25) Mion F, Napoléon B, Roman S, et al. Effects of intragastric balloon on gastric emptying and plasma ghrelin levels in non-morbid obese patients. *Obes Surg.* 2005; 15(4):510-516.
- (26) Ulicnyksjr, goldbergsj, harper wj, korelitzjl, podore pc, fegelmanrh. Surgical complications of the garren-edwards gastric bubble. *Surggyne colobstet* 1988; 166: 535-540.
- (27) Mion, F., Ibrahim, M., Marjoux, S., Ponchon, T., Dugardeyn, S., Roman, S., & Deviere, J. (2013). Swallowable Obalon® Gastric Balloons as an Aid for Weight Loss: A Pilot Feasibility Study. *Obesity Surgery*, 23(5), 730–733.
- (28) Vyas d, deshpande k, pandya y. Advances in endoscopic balloon therapy for weight loss and its limitations. *World j gastroenterol* 2017; 23(44): 7813-7817.