Material: What Is the Minimum, the Desirable, and the Optimal

15

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Introduction

The use of intragastric balloons (IGB) is becoming more common each day as obesity and overweight increases worldwide. In a recent survey done in Brazil with expert endoscopists, it was estimated that there are over 40,000 balloons placed among these professionals [1].

As the IGB is supposed to be a minimally invasive procedure, the risk for the patient must remain low, thus, some minimum material is necessary to perform insertion and removal of IGBs with safety.

One must assume that the patient is already well selected and prepared, with an upper endoscopy (EGD) showing no contraindications for the device placement [2]. The procedure must be performed by a registered/specialized physician, in a prepared room/suite, with adequate patient ventilation support and cardiac monitoring, under conscious sedation or general anesthesia [1, 3, 4].

Intragastric Balloon Insertion

The insertion of most fluid-filled IGBs is done under endoscopic direct visualization, and a standard gastroscope is always needed for the procedure [5]. Exception has to be made for the Spatz3® balloon (Spatz Medical, Great Neck, NY, USA), that is inserted attached to the scope, and the Ellipse® (Allurion Technologies Inc.,

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Table 15.1 Material needed for balloon implant

Minimum material	Desirable material	Optimum material
Intragastric balloon	Methylene blue	Removal accessories
60 cc syringe luer-lock tip	Additional balloon	
Saline solution (1000 cc)		
Lubricant gel		

Natick, MA, USA) and Obalon® (Obalon Therapeutics Inc., Carlsbad, CA, USA), which are both swallowable, and need no gastroscope – but X-ray visualization – to be inserted [6, 7].

For the Orbera® (Apollo Endosurgery, Inc., Austin, TX, USA), Spatz3, Medicone, Bioflex, ReShape (ReShape Medical Inc., San Clemente, CA, USA) and Heliosphere® BAG (Helioscopie Medical Implants, Vienne, France) [8–13] balloons, a 60 cc syringe is recommended for insufflation. Orbera, Spatz3, Medicone, ReShape, and GFE balloons are filled with saline and a methylene blue solution, according to the manufacturer.

Note: In the USA, FDA did not approve methylene blue for Orbera. Heliosphere BAG is an air-filled balloon.

Besides the gastroscope, the physician must have enough lubricant gel and all the recommended material for an unexpected balloon removal. An additional balloon is also recommended, for any uneventful happening (Table 15.1).

Intragastric Balloon Removal

Upon balloon removal, one must read the balloon manufacturer's instructions and be specifically trained for this procedure. The removal of an intragastric balloon has to be done under optimal circumstances always, as we must assume the stomach is full and there is risk of bronchial aspiration.

The removal of intragastric balloons can be performed under conscious sedation or general anesthesia [1, 4, 6]. After performing the esophagogastroduodenoscopy (EGD), the intragastric balloon is generally punctured with a needle, has its contents aspired to a vacuum system through a catheter, and then it is grasped and removed, under direct visualization [6] (Table 15.2).

There are specific catheters with needles for balloon puncture and aspiration, sold by many manufacturers such as G-Flex® and Albyn Medical®.

After puncturing the balloon with the needle, the needle is removed from the catheter, and the catheter is connected to a vacuum system to aspire the balloon contents. Under direct visualization, the physician must be sure the balloon is completely deflated before its removal. Note: For the Heliosphere® BAG, more than one puncture is recommended, as there's no risk of fluid leaks from the balloon to the stomach. This step can be done under frontal view or in retroflex view [6].

After complete suction of all the balloon contents, grasping and removal takes place. The optimal situation occurs when the combined rat tooth alligator grasping forceps apprehends a three-fold angle of the empty balloon. With a constant

Table 15.2 Material needed for balloon removal

Minimum material	Desirable material	Optimum material
Suction catheter with puncture needle	Foreign body combined rat tooth and alligator jaw forceps	Double Channel gastroscope
Balloon grasping forceps	Large diameter symmetrical or asymmetrical polypectomy snare	Gastric overtube
Lubricant gel	Cooking vegetable oil	McGill forceps
Vacuum system		Endoscopic scissors

traction, the balloon is brought to the gastroesophageal junction and pulled through the esophagus.

When the balloon reaches the upper esophageal sphincter, constant traction is maintained, and small deflation of the endotracheal tube might help balloon removal through the upper esophageal sphincter (UES) if the patient is under general anesthesia. In some cases, the grasping forceps tears the balloon or loses it, specifically when going through the lower esophageal sphincter (LES). For those situations, a large polypectomy snare may be useful, as it captures more of the balloon silicone.

For easier removals, hyoscine is used when the balloon reaches the lower esophageal sphincter, to avoid or diminish esophageal spasms [6]. Another very useful tool is canola oil. After balloon emptying, using the drainage catheter, 10–15 cc of vegetable cooking oil are sprayed over the distal esophagus, from the LES toward the mouth [14]. The balloon is then apprehended with the forceps or the snare and brought, with constant traction, to the mouth. The oil smooths the passage of the balloon through the esophagus.

A gastric overtube might be used if the LES is under constant spasm. After grasping the balloon in the stomach, the balloon is brought to the distal part of the overtube and then removed along with it. In some more difficult cases, the balloon valve offers a resistance during balloon removal. The use of endoscopic scissors is useful to cut the valve of the balloon, and the two parts are then removed separately.

Also, another useful method to remove the intragastric balloon is to use a double-channel therapeutic gastroscope. In one channel a grasping forceps is inserted, and at the other a polypectomy snare. Once inside the stomach, open the snare completely and advance the forceps through it, closing the snare around the forceps. Grasp the balloon with the forceps, bring balloon toward the scope and open the snare, closing it around the balloon, thus apprehending the balloon with two instruments. This method gives a secure way to retrieve the balloon [15, 16].

Conclusions

Insertion and removal of intragastric balloons is a safe, feasible, and reproducible procedure, as the minimum material is present in many endoscopy suites and adequate training for the physician is easily available.

Ideally, the performing physician must have all the optimum material available, if any complication occurs, decreasing the risks for the patient.

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