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Case report

9-step magnetic assisted conversion from sleeve gastrectomy to roux-en-Y gastric bypass and hiatoplasty by single-port: Case report

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ABSTRACT

RYGB represents one of the best alternatives for weight loss in obese patients achieving a weight loss of up to 60% and a resolution of comorbidities of 70%. Revision surgery contemplates multiple techniques including the conversion from one surgical technique to another, structural changes to the primary technique, among others. GERD is now a long-term problem for patients who have undergone LGS. With this case report, we show the feasibility and viability of making this revisional procedure with magnetic assistance and single-port device. (ClinicalTrials.govNCT04945304). A 32-year-old female patient underwent a SG in September 2018 with a BMI of 30 Kg/m^2 and no medical history of comorbidities. One year after the surgery the patient reached a BMI of 23,9 Kg/m^2. In 2020 the multidisciplinary team made a diagnosis of intractable GERD and for that reason, it was decided to perform a conversion surgery to RYGB by single port technique and magnetic assistance. The purpose of this case report is to expose the viability to perform a revisional bariatric surgery with magnetic assistance acting like a second surgical assistant in the steps of the procedure and utilizing a single port device to make fewer before incisions, reduce postoperative pain, length of hospital stay and better cosmesis with a safety approach. We can demonstrate the technical feasibility and safety of performing a conversion surgery of LGS to RYGB and hiatoplasty with magnetic assistance by single port and also demonstrate that the magnetic system serves beyond the liver retraction.

1. Introduction

1.6 billion people worldwide suffer from obesity, a number that has been increasing since 1973 [1]. Roux En-Y Gastric Bypass (RYGB) represents one of the best alternatives for weight loss in obese patients achieving a weight loss of up to 60% and a resolution of comorbidities of 70% [2,3]. Annually, 229,455 RYGB are performed worldwide, 40% of all bariatric surgeries [4].

On the other hand, revision surgery has been a developing field during the last years. According to the latest data published during the period 2015 to 2017, there were 57,683 revisions/conversions of 528,081 patients [5]. Revision surgery contemplates multiple techniques including the conversion from one surgical technique to another, structural changes to the primary technique, among others.

Gastroesophageal reflux disease (GERD) is now a long-term problem for patients who have undergone Laparoscopic Sleeve Gastrectomy (LSG). 32% of patients who have gastric sleeve surgery suffer from gastroesophageal reflux. A viable option for the treatment of reflux in bariatric patients is RYGB which has reported remission of about 60%. It is important, besides the surgical treatment, to elucidate the causality of its symptomatology.

Peterli, R. et al. demonstrate in their study that gastric reflux or gastroesophageal reflux disease remission was observed more frequently after RYGB (60,4%) than after sleeve gastrectomy (25%). The symptoms worsened more often after sleeve gastrectomy (31,8%) over RYGB (6,3%) [6]. On patients with GERD after sleeve gastrectomy one of the options is to perform a conversion surgery to RYGB.

Since the first RYGB performed by laparoscopy by Wittgrove and Clark in 1994 [7], the surgical technique has gone through numerous changes. In the last decades, magnets in bariatric surgery were introduced in 2007 for many uses; they are frequently used for liver retraction, a vital step for optimal visualization of the surgical field [8]. Many of the uses we make of the magnet system in this surgery are similar to the third arm in robotic surgery.

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With this case-report, we expose the technical feasibility on one side of using the magnet system as a second assistant and on the other hand that the magnets allow us to make a less invasive approach such as single-port surgery. This case has been reported in line with the SCARE criteria [9].

The ethical committee approval was obtained and informed consent was obtained from the participant included in the study. The protocol was registered in ClinicalTrials.gov (NCT04945304) before enrollment.

2. Presentation of case

A 32-year-old female patient underwent a sleeve gastrectomy in September 2018 with a Body Mass Index (BMI) of 29.2 kg/m^2 medical history of comorbidities.

In November 2020 the patient consulted with heartburn and abdominal pain after eating. Medical therapy with IBP and prokinetics was indicated also with nutritional control. After two months the medical treatment did not solve the symptoms and it was decided that the patient should undergo a series of evaluations.

In the multidisciplinary evaluation, the gastroduodenoscopy reported severe GERD. The barium swallow is referred to as a normal esophagus with no evidence of hiatal hernia and any abnormal dilation. Also, a high-resolution manometry was performed in her preoperative evaluation with normal pressurization of EEI and a hypotensive EES. All laboratory and other studies were within normal limits.

Due to the presence of an intractable GERD, it was decided to perform a magnetic assisted conversion from sleeve gastrectomy to Roux-en-Y gastric bypass by single port.

2.1. Magnetic surgical system

The magnetic surgical system used was the IMANLAP® Project introduced by Dr. Dominguez in 2007 [8]. The system comprises an external neodymium magnet, grasper coupled with a magnet, grasper with a magnet plus a silastic tube, and a magnetic enhancer (Fig. 1).

2.2. Operative technique

Roux-en-Y gastric bypass was performed with the patient in the French position by a bariatric surgeon with 8 years of experience. A single port was placed in the umbilicus, an additional trocar (5 mm) was placed on the right side of the abdomen. The surgery started by performing the liver retraction (Fig. 2) with the grasper plus magnet attached to the border for the correct visualization of the surgical field. Later, the division of the major curvature of the omentum was started, and as it is performed in a superior direction, the magnet was positioned to retract the fundus (Fig. 3) and finishing exposing the esophageal hiatus where a hiatal hernia was visualized, which is decided to be repaired transoperatively. For the hiatoplasty, after placing a reference around the stomach, the magnet was positioned in that reference (Fig. 4) to retract the stomach and esophagus and to be able to suture the hernia defect. Then we proceed to perform the RYGB with the simplified technique, starting with the reference attached to the magnet (Fig. 5) but this time at the opposite end to start the resection of the lesser omentum, a minor step before the confection of the pouch. The pouch confection was done with 3 blue cartridges. Continuing with the procedure, the retraction of the transverse colon was performed with the use of the magnet (Fig. 6) to visualize the Treitz angle and start the 60 cm measurement of the biliopancreatic limb. Later, gastrojejunal anastomosis was performed traditionally. Once this step was finished, the 100 cm alimentary limb was measured and then, the magnet-assisted jejunal anastomosis is performed (Fig. 7). The Petersen defect and the intermesenteric defect were closed with the assistance of magnets (Figs. 8, 9). A methylene blue leak test was performed, with negative results, this time testing both anastomoses. Finally, the magnet-assisted omega section was made with the retraction of the limb (Fig. 10) to finish the Roux-en-Y Gastric Bypass.

Fig. 1. IMANLAP® - Magnetic Surgical System. External neodymium magnet, grasper coupled with magnet, grasper with magnet plus silastic tube, and magnetic enhancer.

2.3. Postoperative course

The patient ambulates 6 h after the surgery, initiating oral tolerance after 48 h during the postoperative period, with a satisfactory recovery being discharged under medical and nutritional indications. No intraoperative or postoperative complications were reported, the duration of the surgery was 148 min. The patient is satisfied with the surgical and aesthetics results without any complaint. Discharged on the second postoperative day without complications.

3. Discussion

Magnetic assisted surgery was born nearly a decade ago with the publication of the first case report of a laparoscopic cholecystectomy by Dominguez, et al. [8]. Two years later the same author published a cohort of 40 single-port cholecystectomies assisted with magnetic forceps. There were no intraoperative complications, no need for conversion to open surgery, and no need for an additional port reported. They conclude that this innovative procedure is safe and feasible [10].

In 2011, magnetic-assisted single-port sleeve gastrectomy was published by Morales-Conde, S. et al. [11]. One of the first studies in bariatric surgery demonstrated the use of the magnetic system in liver retraction without complications in a patient with a BMI of 44,82 Kg/m^2. They used two magnetic graspers to maintain the left liver lobe retraction and greater curvature of the stomach.

In summary, in this case, the magnetic system was used in 9 key steps of the surgery:

1. Liver retraction.
2. Fundus retraction for dissection of the GE junction.
3. Gastroesophageal retraction by reference strip for hiatoplasty.
4. Gastric body retraction by reference strip.
5. Transverse colon retraction.
6. Jejunojejunal anastomosis retraction assistance.
7. Intermesenteric closure.
8. Petersen's closure.
9. Limb retraction for the omega loop section.

Although the use of magnets has been reported in different areas and different surgeries, the majority of reported works only make use of the magnet for liver retraction mainly. This case report demonstrates the

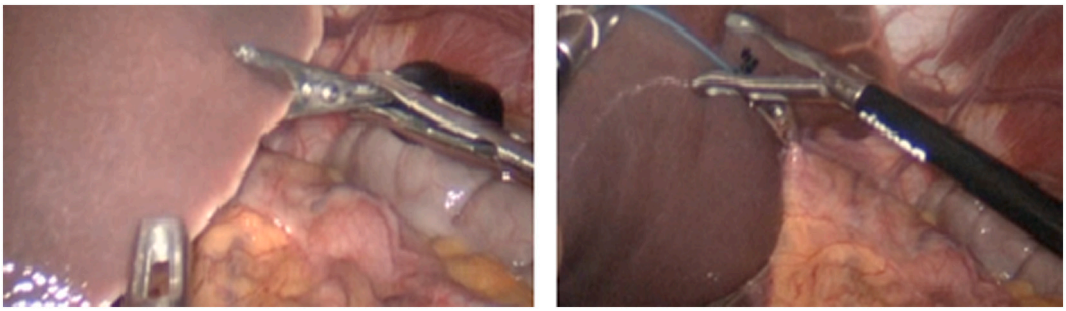

Fig. 2. (A) Liver retraction with magnetic grasper attached; (B) Liver retraction with magnetic grasper attached to silastic tube.

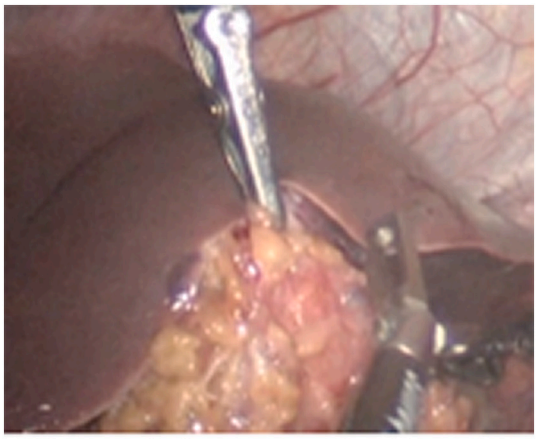

Fig. 3. Fundus retraction for dissection of the GE junction.

potential use that magnets can have in highly-complex areas within bariatric surgery as revisional surgery.

By using the magnetic system nearly as a second assistance it was feasible to perform this procedure through a single-port. This is a benefit because it improves the esthetic results even in high complexity surgeries. Narvaez, A et al. made a study of the importance of incision decisions in bariatric patients and they demonstrate that cosmesis was found to be an important factor in 77% of the patients [12]. Selecting this surgical approach, we reduce from six trocars used in the standard manner to only one single-port, without increasing complications and surgical time.

Another of the benefits of surgery with magnets is that provide the use of fewer trocars. By reducing the number of trocars, we reduce complications related to it, such as infections that are one of the major causes of morbidity and costs for both the patient and the hospital [13].

Among the limitations of this surgical technique is the learning curve of the technique, which is why these procedures must be performed by experienced surgeons in the area who are familiar with the use of magnets. There is also a need for descriptive and comparative studies of large numbers of patients, to give statistical validation of the importance of the technique.

4. Conclusion

With this case report, we can demonstrate the technical feasibility and safety of performing a conversion surgery of LGS to RYGB and hiatoplasty with magnetic assistance by single port. We also demonstrated that the magnetic system serves beyond the liver retraction, almost as a second surgical assistant. Because of the results obtained, we believe that it is a device in which the patients themselves will demand its use by the surgeons because of its esthetic and medical benefits.

Funding information

This study was self-funded.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this

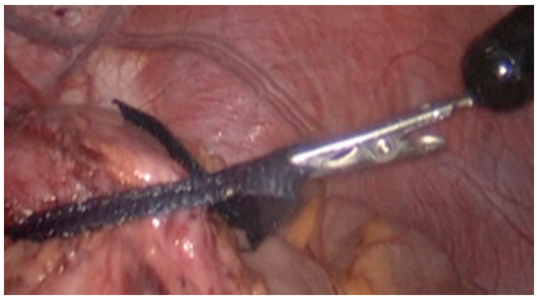

Fig. 5. Gastric body retraction by reference strip.

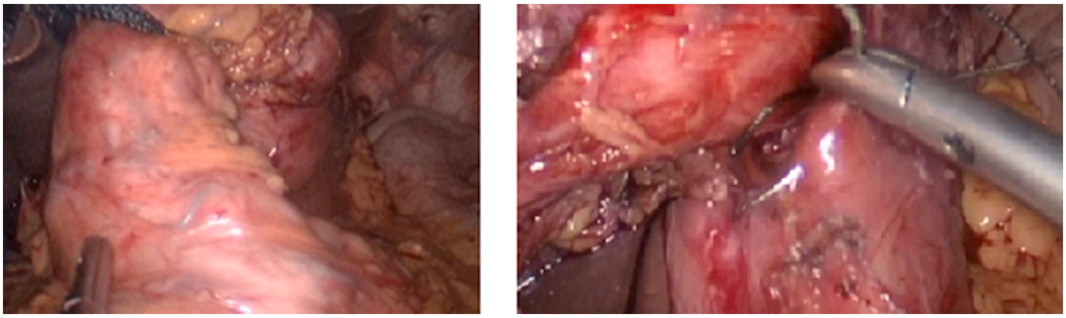

Fig. 4. Gastroesophageal retraction by reference strip for hernioplasty.

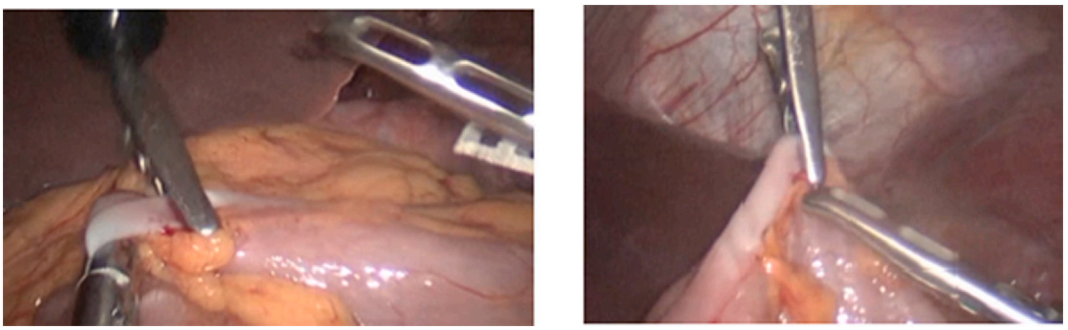

Fig. 6. Transverse colon retraction.

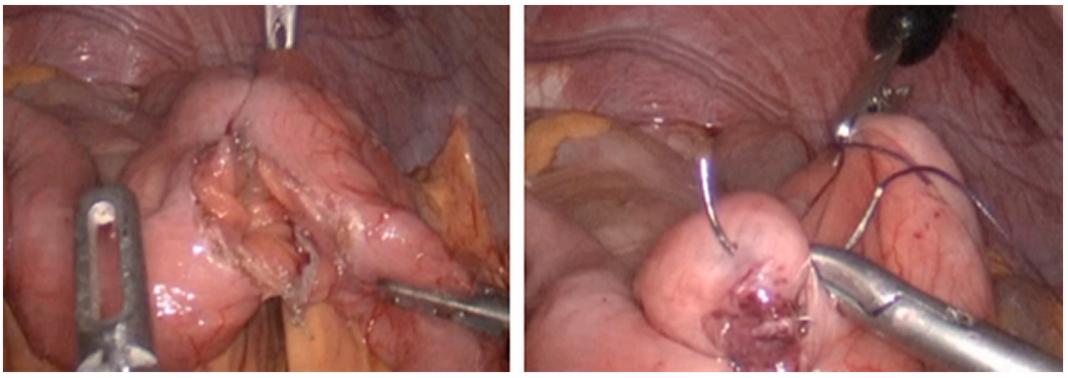

Fig. 7. Jejunojejunal anastomosis retraction assistance.

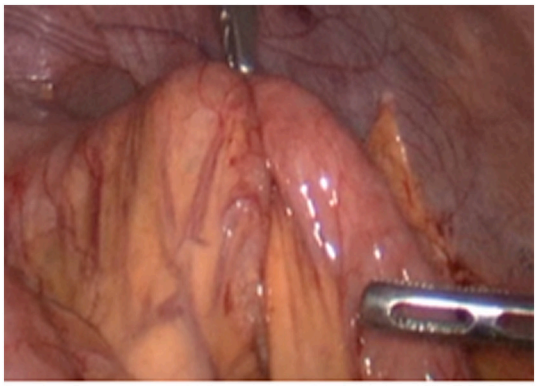

Fig. 8. Intermesenteric closure.

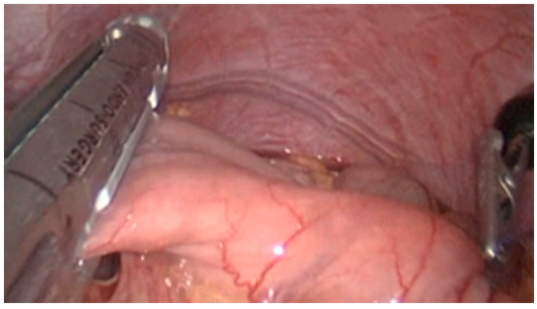

Fig. 10. Limb retraction for the omega loop section.

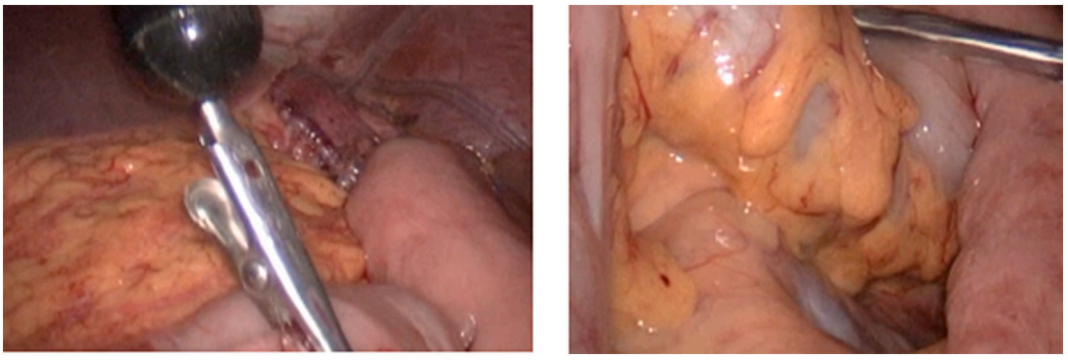

Fig. 9. Petersen's closure.

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the participant included in the study.

Declaration of competing interest

The authors declare they have no conflict of interest.

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