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Magnetic-assisted Single-port Sleeve Gastrectomy

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Key words: Laparoscopy, bariatric surgery, morbid obesity, sleeve, single-port, single-access, magnetic, magnetics. Neodymium, equipment designs, surgical instruments

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ABSTRACT

Background. Tubular gastrectomy is a recently, purely restrictive procedure in bariatric surgery which has shown similar results to the gastric bypass in the short and medium term. At the same time single port access surgery has fostered the development of new techniques and methods in search for better cosmetic results, less postoperative pain and at the same time preserving the satisfactory results obtained through this approach. One of the problems associated to this approach is the lack of traction and the difficulties to retract the liver Our goal is to try to avoid additional trocars or sutures to perform a pure single access surgery, by using two magnetic forceps

Methods. We present a 51-years-old morbidly obese female patient (BMI: 44.82) who underwent a pure single access laparoscopic sleeve gastrectomy with no additional trocars or sutures, being assisted by two Neodymium magnetic forceps, one to retract the liver and one to allow enough controlled strength for retraction of the stomach to provide sufficient triangulation for adequate exposure of the surgical field during the dissection.

Results. The procedure was completed in 120 minutes. No preoperative or postoperative complications were reported, being discharged two days after the surgery.

Conclusion. Single port access sleeve gastrectomy operation using a single-port approach assisted by magnetic forceps is feasible and safe in the hands of experienced laparoscopic surgeons, solving one of the problems associated to this surgery, such us the need of an additional trocar, a needle or sutures to retract the liver and to pull from the stomach to perform the surgery.

Introduction

Tubular gastrectomy is a recently, purely restrictive procedure in bariatric surgery which has shown similar results to the gastric bypass in the short and medium term.(1-4) The conventional laparoscopic technique involves placing four to five trocars, and occasionally requires enlarge one of the incisions to extract the surgical specimen. Continuous development of the concept of minimally invasive surgery has produced new work systems striving for better aesthetic results, less post-operative pain and a decrease in the potential complications associated with the laparoscopic approach. In fact, single-port surgery(5) is beginning to establish in certain procedures such as cholecystectomy,(6) nephrectomy(7) or colon surgery.(8, 9) One of the problems related to this approach is the lack of triangulation and traction to retract the liver and to pull from the stomach during the dissection, being described the need of adding and additional 3 or 5 mm trocar to perform this procedure. Our goal is to try to avoid this additional trocar to perform a pure single access surgery, by using two magnetic forceps.

Case Report

We present a 51-years-old morbidly obese female patient (BMI: 44.82) with clinical past history of hypertension. The proposed surgical procedure was a sleeve gastrectomy; the patient was offered the single-port access.

The single-port procedure (Figure 1) was carried out exclusively through the 2.5cm transverse incision at the midway point between the umbilicus and the xiphoid without any additional trocar. Exposure of the surgical field was achieved by retracting the left hepatic lobe aside and maintaining traction on the greater curvature of the stomach with the aid of two magnetic forceps. We used a single port with two orifices of 5mm and one of 12mm (SILS port, Covidien Ltd., Norwalk, Connecticut, USA). The surgery was carried out using a 5mm 30° optic (Olympus Ltd. Hamburg, Germany) and a laparoscopic roticulator grasper (Roticulator Endo grasp, Covidien Ltd., Norwalk, Connecticut, USA) in the left hand. The 12mm orifice was used to insert the different energy sources, such as the flexible endoscopic scissors with electrocautery (Roticulator Endo mini-shears, Covidien Ltd., Norwalk, Connecticut, USA), the Ligasure atlas (Covidien Ltd., Norwalk, Connecticut, USA) and the 60mm articulating endocutter, EndoGIA Roticulator, Covidien Ltd., Norwalk, Connecticut, USA), with 4.8mm green load or a 3,8 mm blue load and reinforcement (Bioabsorbable Seamguard, WL Gore & associates, AZ, USA).

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3 The procedure was completed in 120 minutes. Surgery starts by placing two
4 stitches with the needle holder, one in the hiatus and another one to the stomach.
5 These stitches are attached to two tapes to be grasped by the magnetic forceps in
6 order to reduce the distances of them to the external retracting system, since the
7 large subcutaneous tissue of the obese patients would not allow to grasp directly
8 both areas. The magnets are introduced to the 12 mm trocar of the single port
9 device and set in place to expose the surgical field. Each TD-magnet device (10–
10 11 mm in diameter) is made by a surgical steel tube with neodymium magnets
11 inside of it, attached with a flexible band to an alligator-type grasper. These TD-
12 magnet instruments are handled by specially designed forceps made by austenitic
13 surgical steel that is not affected by the magnet field. The Thomas-forceps allows
14 the positioning of the alligators of each magnet in both tapes, allowing to be
15 changed in position when necessary. These magnet-retracting systems (TD-
16 magnets and external magnets) exert dynamic force on the stomach, beyond the
17 abdominal wall under a remote-controlled system (external magnets). This external
18 system allows controlled movements of the TD-magnet forceps inside the
19 peritoneal cavity for retraction and triangulation.
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25 Once the magnets are placed, we used the same steps that in the conventional
26 laparoscopic surgery, with the resection of the gastrocolic and gastrosplenic
27 ligaments up to the angle of His. Next, a 58 French oesophageal probe was
28 inserted in order to perform the gastric section. This was started at 6cm proximal to
29 the pylorus and continued to the angle of His, while verifying suture line continuity
30 and haemostasis. Blood loss during the intervention amounted to 50cc. The
31 surgical specimen was removed in a 15mm bag through that incision. The 2.5cm
32 incision was closed by a running absorbable sutures.
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35 No perioperative or postoperative complications were reported. Liquid diet was
36 started on the following day and discharged on the third day after surgery.
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39 **Discussion**

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41 We report the first magnetic-assisted tubular gastrectomy through a single port.
42 This novel approach is the result of constant evolution of the concept of minimally
43 invasive surgery, and we were able to perform it thanks to the creation of trocars
44 with access for multiple instruments and the manufacture of flexible material. In this
45 case, we were also aided by magnetic forceps which made it unnecessary to place
46 additional trocars or external sutures for traction or for exposing the surgical field.
47 The magnetic forceps were recently developed, and have demonstrated their
48 usefulness in both experimental models(10) and regulated surgical procedures.
49 Domínguez et al.(11) presented 40 single-port laparoscopic cholecystectomies
50 assisted by magnetic forceps and the first single-incision laparoscopic Nissen
51 Fundoplication with adjunctive magnetic guidance(12). The purpose of these
52 instruments is to provide proper exposure of the structures and solve the main
53 problems of the single-port approach: the difficulty of achieving adequate
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3 triangulation, as well as to solve the limit number of instruments that could be
4 introduced through the single port device, which only have three work ports.
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7 The main objective was to reproduce the same steps and principles observed in
8 the conventional laparoscopic gastric sleeve procedure. By means of exclusive
9 single-port access, we attempt to gain a set of advantages in addition to those
10 provided by the laparoscopic approach. These include better aesthetic results, a
11 potential decrease in post-operative pain, a decrease in bleeding caused by
12 additional trocars and better closure of the abdominal cavity, thus avoiding the
13 appearance of post-trocar hernias.
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16 Similar existing studies show the use of single port surgery to perform a sleeve
17 gastrectomy either by inserting various trocars through the same cutaneous
18 incision,(13) or by using different single port devices. In these cases, in order to
19 retract the left hepatic lobe, a sub-xiphoid trocar has been added through which a
20 hepatic retractor is introduced.(14) In our case, we solve the problem of retracting
21 the liver by using a magnetic forcep.
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24 Lastly, we can state that the gastric sleeve operation using a single-port approach
25 with the aid of magnetic forceps is feasible and safe in the hands of experienced
26 laparoscopic surgeons with single-port training, and any patient referred for this
27 procedure may be a candidate for the single-port approach.
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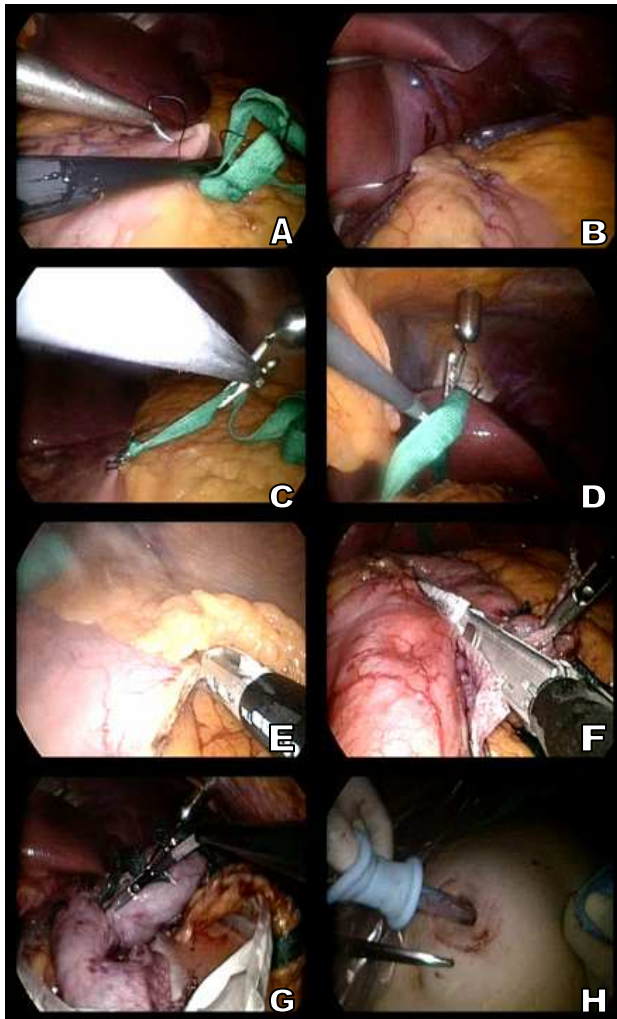
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FIGURE 1

A-B. Anchorage gastric fundus and gastrohepatic ligament for further traction with metal clips pulled by magnets (**C-D**).

E. Section shorter vessels for liberation greater curvature. **F.** Gastric section with Endogia Universal.

G. Extraction of the surgical specimen with Endocatch.

H. Removing by the same single umbilical trocar incision.