LAPAROSCOPIC SINGLE-PORT SLEEVE GASTRECTOMY FOR MORBID OBESITY: PRELIMINARY SERIES

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Abstract: Background: Laparoscopic sleeve gastrectomy (LSG) has been recently proposed as a sole bariatric procedure because of its considerable weight loss in morbidly obese patients. Traditionally, LSG requires five to six skin incisions to allow for placement of multiple trocars. With the introduction of single-incision laparoscopic surgery (SILS), multiple abdominal procedures have been performed with a sole umbilical incision with good cosmetic outcomes. The purpose of our study is to evaluate the feasibility and safety of laparoscopic single incision sleeve gastrectomy for morbid obesity.

Methods: Eight consecutive patients underwent laparoscopic single-incision sleeve gastrectomy at the Operative Unit of Bariatric Surgery of the University of Rome Tor Vergata between March 2009 and June 2009.

Results: There were five women and three men, with a mean age of 44.4 years. Mean pre-operative BMI (body mass index) was 56.2 Kg/m². Mean operative time was 128 min. Mean post-operative stay was 2.4 days. Mean post-operative BMI was 49.3 Kg/m² with a mean follow-up period of 3.6 months.

Conclusion: Laparoscopic single incision sleeve gastrectomy seems to be safe, technically feasible and reproducible. Anyway we need further prospective randomized studies between single incision approach and conventional laparoscopy, with larger numbers of patients and longer follow-up, to confirm our preliminary experience.
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ABSTRACT

Background: Laparoscopic sleeve gastrectomy (LSG) has been recently proposed as a sole bariatric procedure because of its considerable weight loss in morbidly obese patients. Traditionally, LSG requires five to six skin incisions to allow for placement of multiple trocars. With the introduction of single-incision laparoscopic surgery (SILS), multiple abdominal procedures have been performed with a sole umbilical incision with good cosmetic outcomes. The purpose of our study is to evaluate the feasibility and safety of laparoscopic single incision sleeve gastrectomy for morbid obesity.

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INTRODUCTION

The prevalence of obesity is dramatically increasing world-wide at an alarming rate, reaching the proportion of a global epidemic in both developed and developing countries [1]. Bariatric surgery has proved to be the most effective treatment for morbidly obese patients, providing excellent weight loss and correcting the associated co-morbidities, with a marked survival advantage.

Laparoscopic sleeve gastrectomy (LSG) is a relatively new bariatric procedure and is very popular among bariatric surgeons nowadays. This is due to its technical simplicity compared to Roux-en-Y gastric bypass and other malabsorptive procedures, the lack of a foreign body and the maintenance of gastrointestinal continuity. LSG is not a new operation, being introduced as the first-step restrictive part of a more complex malabsorptive bariatric procedure, the duodenal switch [2]. Because of its considerable weight loss, it has been proposed as a sole bariatric procedure. The recent ASMBS position statement on the Sleeve Gastrectomy also confirms its use as a final bariatric operation [3].

Traditionally, LSG requires five to six skin incisions to allow for placement of multiple trocars. To reach the objective of no-scar surgery, natural orifice
transluminal endoscopic surgery (NOTES) has been introduced in 2004, and it represents a great attraction for most surgeons. Recently, an emerging approach, single incision laparoscopic surgery (SILS), has been applied to cholecystectomy, appendectomy, splenectomy, and adjustable gastric banding \[4-8\]. It consists of a single umbilical incision as the sole entry of all trocars in order to obtain an excellent cosmetic outcome, with the wound completely hidden in the umbilicus without visible abdominal scars. The purpose of our study is to evaluate the feasibility and safety of laparoscopic single incision sleeve gastrectomy for morbid obesity.

MATERIALS AND METHODS

Eight consecutive patients underwent laparoscopic single-incision sleeve gastrectomy at the Operative Unit of Bariatric Surgery of the University of Rome Tor Vergata between March 2009 and June 2009. We used the same operative technique and peri-operative protocols for all patients. All patients were extensively informed and gave consent to the procedure. Exclusion criteria were previous open upper GI surgical procedures and the general contra-indications to bariatric surgery. Operative results were prospectively collected and analyzed.

OPERATIVE TECHNIQUE

The patient lays in the supine position on the operating table with his arms extended laterally and legs opened. The surgeon stands between the legs with the assistant on the right side of the patient. The first step of the procedure is the introduction of the single-port device (SILS trocar, Covidien, USA) through a little (2 cm in diameter)
umbilical incision. The SILS port allows for the introduction of two 5-mm instruments and 1 10 mm instrument through its small three trocars. In other words, it provides visualization as well as two working channels with a single skin incision (Fig. 1,2).

An open technique is used to introduce the SILS port, with the incision at the upper half of the umbilicus and deepened up to the linea alba, where a 2-cm fascial opening is made. After the incision of the peritoneum, the SILS port is inserted. It is important to make a small fascial incision to create an effective seal and prevent gas leakage. Carbon dioxide insufflation with a pneumoperitoneum pressure of 15 mm/Hg is achieved. A long, 5-mm, rigid, 30° video laparoscope is inserted. Under direct visualization, one 5 mm coagulating dissector (Ligasure, Covidien, USA) and one 5 mm roticulating grasper (Covidien, USA) are placed through the same SILS port device.

The technical operative steps are similar to standard laparoscopic sleeve gastrectomy. The main difference is in the liver retraction which is difficult to achieve with a true single-incision approach. In another report [9], liver retraction was performed with an additional port for the introduction of a standard liver suspender. We do not use additional ports and liver retraction is obtained with the scope. Using a 5-mm dissecting coagulator (LigaSure, Covidien), the greater curvature of the stomach is mobilized at a point 3 cm proximal to the pylorus (Fig. 3).

The lesser sac is entered (Fig.4), and staying close to the wall of the stomach, the greater curvature ligaments (gastrosplenic and gastrocolic) are divided all the way up to the angle of His.
It is important to identify and mobilize the angle of His with exposure of the left crus of the diaphragm to delineate the gastroesophageal junction and to facilitate complete resection of the gastric fundus. Retrogastric adhesions are taken down with the LigaSure device to allow for complete mobilization of the stomach, to eliminate any redundant posterior wall of the sleeve, and to exclude the fundus from the gastric sleeve.

After a complete mobilization of the stomach has been reached, a 42-Fr orogastric tube is inserted transorally into the pylorus and placed against the lesser curvature. This will help to calibrate the size of the gastric sleeve, prevent any constriction at the gastroesophageal junction, and provide a uniform shape to the entire stomach.

Gastric transection begins at a point 3 cm proximal to the pylorus, leaving the antrum and preserving gastric emptying. A long laparoscopic roticulating 60-mm XL endo GIA stapler with blue cartridge (Covidien, USA) and bioabsorbable glycolide copolymer buttressing material reinforcements (Seamguard; W.L. Gore & Associates, Flagstaff, AZ, USA) is inserted through the SILS port in a cephalad direction and used for gastric transection (Fig. 5,6).

The stapler is fired consecutively along the length of the orogastric tube until the angle of His is reached. Care must be taken not to narrow the stomach at the angularis. It is important to inspect the stomach anteriorly and posteriorly to ensure no redundant posterior stomach.

The entire staple line is inspected for bleeding and tested for leak. The patient is placed flat, and an atraumatic clamp is placed near the pylorus. The integrity of the
staple line is tested by insufflating air under saline and infusing 30-60 cm³ of methylene blue into the remaining stomach.

The resected stomach is extracted through the umbilical incision at the end of the procedure (Fig. 7).

No drains and naso-gastric tube are left in place. The fascial defect is closed with a figure of eight 2/0 nonabsorbable suture to prevent port site hernia.

Laparoscopic single incision surgery needs some obvious modifications compared to traditional laparoscopic surgery. In morbidly obese patients, the umbilicus is usually far from the gastroesophageal junction, so longer instruments (dissectors, staplers, scope, clip appliers) may be necessary. Laparoscopic single incision procedures can often represent a challenge because the triangulation of the instruments can be difficult. Frequent realignment of the instruments and scope relative to each other is crucial to have an adequate visualization and minimize clinching of the instruments and the laparoscope.

A routine gastrographin swallow study is performed on postoperative day 1 and patients can have an oral liquid food intake. Patients are encouraged to go home on postoperative day 2.

RESULTS

A total of eight patients underwent laparoscopic single-incision sleeve gastrectomy at the Operative Unit of Bariatric Surgery of the University of Rome Tor Vergata
between March 2009 and June 2009. There were five women and three men, with a mean age of 44.4 years (range, 39 to 52 years). Mean pre-operative BMI (body mass index) was 56.2 Kg/m² (range, 44.2 to 62.6 Kg/m²). Mean operative time was 128 min (range, 84 to 140 min). No conversion to standard laparoscopic surgery was needed. We observed only one post-operative complication (1 wound infection, treated with drainage and antibiotic therapy). Mean post-operative stay was 2.4 days (range, 1 to 3 days). Mean post-operative BMI was 49.3 Kg/m² with a mean follow-up period of 3.6 months (range, 3 to 6 months).

**DISCUSSION**

Laparoscopy has great advantages compared to open surgery, and nowadays the interest of most surgeons is moving to even less invasive surgical techniques, such as natural orifice transluminal endoscopic surgery and single-access laparoscopy (SILS). Up to date, SILS has been applied to several abdominal procedures such as appendectomy, cholecystectomy, splenectomy and colectomy \cite{4-8, 10, 11}. The first description of single-incision laparoscopic cholecystectomy was reported in 1999 \cite{12}, with an initial criticism among surgeons world-wide. After the introduction of NOTES the interest for minimally invasive procedures has consistently increased.

SILS represents an interesting innovation because it allows to perform complex surgical procedures using only one skin incision for the introduction of special multichannel access devices. According to several studies, the access through the umbilicus takes some advantages, such as better cosmesis and less incision pain, avoiding muscle penetration. Moreover, it eliminates the risk of bleeding from the
epigastric vessels. However, SILS needs a critical learning curve, because the limited range of motion and the loss of the triangulation between the instruments and laparoscope make surgical dissection a real challenge compared to conventional multi-port laparoscopy.

The application of SILS to bariatric surgery has been rarely reported \[^9,13-16\]. The first procedure to be reported using a single-incision approach was adjustable gastric banding \[^{14}\]. Teixeira et al. described 22 patients who underwent laparoendoscopic single-site (LESS) surgery for placement of an adjustable gastric band between December 2007 and December 2008. They report no intraoperative or postoperative complications and only one conversion to conventional laparoscopy. Since then others described case reports of transumbilical single-port laparoscopic adjustable gastric band placement, with good results and no complications \[^{13,15}\]. In 2009, Huang et al. described the first case report of single incision transumbilical laparoscopic Roux-en-Y gastric bypass, with an operative time of 170 min and no intraoperative complications \[^{16}\]. To our knowledge, this is the only report about Roux-en-Y gastric bypass through a SILS approach.

Concerning to sleeve gastrectomy, Saber et al. described 7 patients who underwent single access transumbilical laparoscopic sleeve gastrectomy between March 2008 and July 2008 \[^9\]. Mean operating time was 125 min. None of the patients required conversion to an open procedure and there were no mortalities or postoperative complications during the mean follow-up period of 3.4 months. The real limitation of this report is the use of an additional subxiphoid skin incision for the entry of a liver retractor. Another report on sleeve gastrectomy using a single-port approach
describes a case using a 4-cm transverse skin incision performed in the epigastric region just to the left of patient’s midline \[^{17}\]. Through this single incision, three trocars were placed through separate fascial entries. They describe a good outcome, but in our opinion this approach is associated with a poor cosmetic result compared to trans-umbilical SILS.

In this report, we describe our preliminary experience with SILS applied to sleeve gastrectomy for morbid obesity. To our knowledge, this is the first report describing laparoscopic single-incision sleeve gastrectomy for morbid obesity, using only the umbilical access for the introduction of both laparoscope and surgical instruments, without any other abdominal incision for liver retraction.

At our institution, sleeve gastrectomy is offered either to morbidly obese patients with a BMI>40 Kg/m² as a sole bariatric operation, or to morbidly obese patients with a BMI>60 Kg/m² as a first-stage operation.

The conventional laparoscopic sleeve gastrectomy usually needs five to six small skin incisions. The main potential advantages of SILS are the presence of only one umbilical incision, with better aesthetic and psychological outcomes, and the lack of bleeding and hernia from trocar insertion. On the other hand, it represents a great technical challenge because of the “crowding” of the laparoscope and instruments, the lack of a liver retraction that decreases visibility. Moreover, the stapling is more difficult than conventional laparoscopy and there is no staple line suture reinforcement which is achieved with the use of a bioabsorbable glycolide copolymer buttressing material. Even if there is only one umbilical skin incision, it is larger than conventional laparoscopy and therefore may result to be more painful.
CONCLUSION

In conclusion, according to our experience laparoscopic single incision sleeve gastrectomy seems to be safe, technically feasible and reproducible. Anyway we need further prospective randomized studies between single incision approach and conventional laparoscopy, with larger numbers of patients and longer follow-up, to confirm our preliminary experience.
REFERENCES


Fig.1,2 - The SILS port allows for the introduction of two 5-mm instruments and 1 10 mm instrument through its small three trocars.

Fig.3 – Mobilization of the greater curvature of the stomach by a 5-mm dissecting coagulator (LigaSure, Covidien).

Fig.4 – The lesser sac is entered and the dissection is continued to a point 3 cm from the pylorus.

Figg. 5,6 – Gastric transection by endo GIA stapler with blue cartridge (Covidien, USA).

Fig.7 – Extraction of the resected stomach through the umbilical incision.