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CLINICAL STUDY

Laparoscopic sleeve gastrectomy for morbid obesity with natural orifice specimen extraction (NOSE)

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ABSTRACT

OBJECTIVE: An experience with laparoscopic sleeve gastrectomy using the natural orifice specimen extraction (NOSE) technique.

BACKGROUND: Bariatric surgery is nowadays the only long term effective obesity treatment method.

METHODS: Twenty one consecutive patients underwent laparoscopic sleeve gastrectomy with the use of natural orifice specimen extraction (NOSE) in the Surgical Clinic of Faculty Hospital Ostrava between May 2012 and August 2012. Inclusion criteria were the body mass index (BMI) higher than 35 kg/m^2 or higher than 32 kg/m^2 accompanied with relevant comorbidities.

RESULTS: Among 21 patients in this series, there were three men (14.3 %) and 18 women (85.7 %). Their mean age was 40.9 ± 10.2 years. Their mean preoperative BMI was 40.4 ± 4.6 kg/m^2. No patient had previous bariatric surgery, one patient had laparoscopic fundoplication. All operations were completed laparoscopically with no conversions to an open procedure. In two cases, laparoscopic cholecystectomy was performed and the gallbladder was extracted along with the gastric specimen by transgastric approach.

CONCLUSION: Laparoscopic sleeve gastrectomy is a safe and effective bariatric procedure with low morbidity and mortality. Based on our initial experiences it could be an indication for NOSE with transgastric approach. Obese patients would benefit from this approach due to the elimination of wound complications *(Tab. 2, Fig. 3, Ref. 22)*. Text in PDF *www.elis.sk.*

KEY WORDS: laparoscopic sleeve gastrectomy- morbid obesity- bariatric surgery- natural orifice specimen extraction

Introduction

Obesity is a worldwide epidemic. There are more than 1 billion overweight adults, and at least 300 million of them are obese (1). Morbid obesity and obesity related comorbidities dramatically decrease life expectation in obese population. Bariatric surgery is nowadays the only long term effective obesity treatment method. The ideal bariatric operation means safe surgery with acceptable outcomes in terms of weight loss and comorbidity resolution.

Laparoscopic sleeve gastrectomy is a rather young technique but it became a standard bariatric procedure for the surgical management of morbid obesity. The results obtained by this technique are weight loss as well as solution of comorbidities. Weight loss is achieved by restricting the stomach´s size and by endocrine mechanism related to decreasing serum levels of ghrelin. In comparison with laparoscopic adjustable gastric band and laparoscopic gastrin bypass, the advantages of laparoscopic sleeve gastrectomy include: technical efficiency, lack of a digestive anastomosis, normal intestinal absorption, no risk of internal hernia, no implantation of a foreign body and pylorus preservation. The major advantages of this procedure appear to be a lower postoperative morbidity than in laparoscopic gastric bypass and biliopancreatic diversion with a superior weight loss compared to laparoscopic adjustable gastric banding (2). Laparoscopic sleeve gastrectomy does not alter bowel continuity, and there are no mineral and vitamin deficiencies, except potential vitamin B_{12} deficiency.

Standard laparoscopic sleeve gastrectomy requires an enlargement of a trocar incision (20 to 30 mm) in the left mesogastrium for removal of the resected specimen. This incision can present the risk of infection, wound dehiscence, pain and hernia formation, with consequent morbidity, prolonged length of hospital stay and cost increases. In order to reduce trauma to the abdominal wall, incision-related complications and to make operation more safe and efficient, new approaches such as transumbilical sleeve gastrectomy completed laparoscopically (3) or the Da Vinci robotic surgical system (4) were introduced. The other new technique, which can reduce invasivity of the procedure, is the use of natural orifices for specimen removal. We report our first experience with laparoscopic sleeve gastrectomy being performed with the use of NOSE (natural orifice specimen extraction).

Materials and methods

Twenty one consecutive patients underwent laparoscopic sleeve gastrectomy with the use natural orifice specimen extraction (NOSE) in the Surgical Clinic of Faculty Hospital Ostrava

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between May 2012 and August 2012. Inclusion criteria were the body mass index (BMI) higher than 35 kg/m^2 or higher than 32 kg/m^2 accompanied with relevant comorbidities. Age was not an exclusion criterion. No patients were excluded based on any sociodemographic or clinical factor.

Preoperative work-up included blood tests, abdominal ultrasound, chest X-ray, ECG, pulmonary functional tests, esophagogastroscopy, endocrinological and psychological evaluation. All patients signed the informed consent document. All patients received low molecular weight heparin subcutaneously two hours before surgery and then postoperatively until a complete mobilization.

The oral intake was initiated usually on the first postoperative day or after the nausea and vomiting have subsided. Patients were discharged from the hospital when tolerating full liquid diet.

Statistical analysis was performed according to the characteristics of the data. All quantitative data were expressed as the mean with the standard deviation and median with range.

Operative technique

The operation was performed under a general anaesthesia. The patient was placed in the reverse Trendelenburg position, his/her legs were placed in the abducted position. The operating surgeon stood between legs and the surgical assistants stood one on each side of the patient (the first assistant on the patient´s left side and the second assistant-camera operator on the patient´s right side). Intraabdominal CO_2 pressure was maintained between 14 to 16 mm Hg. A four or five trocar technique was used and the distribution was as follows: 10 mm camera port for 5 cm above umbilicus, 12 mm port both in the right and left mesogastrium and 5 mm port in the midaxillary line in the left hypochondrium. The fifth trocar was no obligatory. It was 10 mm trocar located in the midline under xiphoid and was used for retraction of the enlarged left lateral liver lobe. The operation started with a survey of the intraabdominal cavity. In some cases, it was necessary to retract the left lateral segments of the liver with a 10 mm liver retractor or suture anchored left crus of diaphragm and peritoneum to exposure of the mostly enlarged stomach. The distance from the pylorus at which gastric division begins was 4 cm. The division of the vascular supply of the great curvature of the stomach was performed with a harmonic scalpel. It was necessary to cut off the gastrocolic, gastrosplenic and gastrophrenic ligaments to the angle of His to make totally free gastric fundus in order to excise it. A 36 French calibration bougie was placed transorally along the lesser curvature of the stomach. The procedure continued with a longitudinal gastrectomy of the great curvature of the stomach with stapling device producing a narrow, tubular stomach. We used 60 mm endostaplers (ENDO GIA universal 60 3,5 Covidien, Norwalk, CT, USA). The staple line in the distal part of the stomach was excised and the specimen was subsequently extracted (Figs 1 and 2) through the esophagus and mouth (Fig. 3) with the use of gastroscope and polypectomy snare . The extraction site was closed again using linear endostaplers. The staple line was oversewn with a running seroserous invaginating suture. We don´t use routinely any seal test to de-

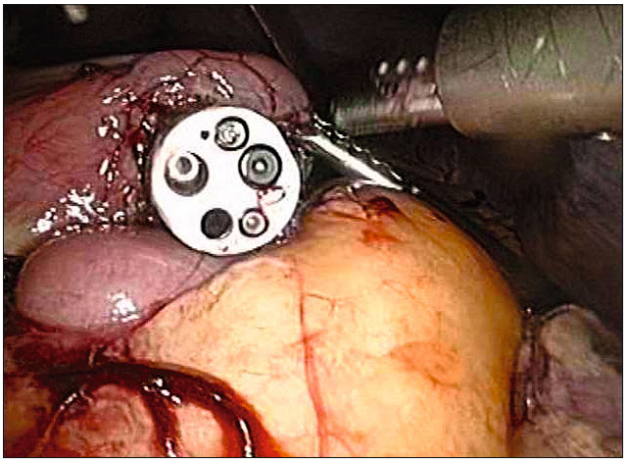

Fig. 1. Distal tip of endoscope.

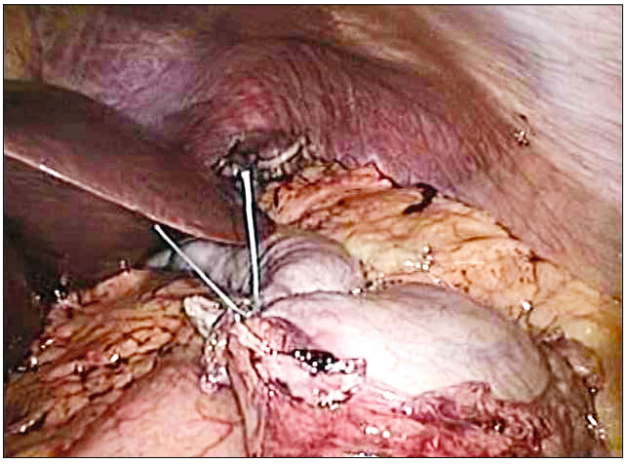

Fig. 2. Gallblader sutured to gastric specimen.

Fig. 3. Transoral specimen removal.

tect intraoperative leak. The abdominal cavity was flushed with antiseptic solution (Povidonum iodinatum 1 %). A drain was left along the stapling line.

Results

Table 1 presents the baseline characteristics of the patients. Details on patients´ comorbidities are presented in Table 2. No patient had previous bariatric surgery, one patient had laparoscopic fundoplication. All operations were completed laparoscopically with no conversions to an open procedure. The median operating time was 125 min (range 80–210). In two cases, laparoscopic cholecystectomy was performed and the gallbladder was extracted along with the gastric specimen by transgastric approach. The histology confirmed chronic gallstone cholecystitis. There were no peroperative complications. Blood loss was minimal in all operations. There was no mortality.

Three patients (14.3 %) had postoperative complications. One patient (4.8 %) had a wound abscess in 12 mm trocar site, treated with an antiseptic solution. One patient (4.8 %) had a staple line leak in our series. A 43-year old woman with BMI 41 who was hypertensive, with noninsulin-dependent diabetes had in the 4th postoperative day septic signs and CT scans showed subphrenic collection with a leak of contrast material. Leak was also proved by the presence of orally ingested blue demethylene in the abdominal drain. The patient received conservative therapy with antibiotics, total parenteral nutrition to maintain the patient´s nutritional status and drainage under a CT guidance. Maximal nutritional support with a positive nitrogen balance was confirmed by a pre-albumin level 0.25 g/l and albumin level 35 g/l. The drain was slowly backed out. Control CT scans confirmed that the leak had been completely eliminated. The patient remained medically stable and afebrile. The fistula healed in 16 days without any consequences.

Tab. 1. Baseline characteristics of patients.

		n = 21
Sex	males	3 (14.3 %)
	females	18 (85.7 %)
Age	mean ± SD	40.9 ± 10.2
	median (range)	42 (24–58)
ASA	II	16 (76.2 %)
	III	5 (23.8 %)
BMI	mean ± SD	40.4 ± 4.6
	median (range)	40.6 (32–48.5)

Tab. 2. Comorbidities.

	n = 21
hypertension	11 (52.4 %)
diabetes	4 (19.0 %)
gallstones	2 (9.5 %)
polycystic ovaries	1 (4.8 %)
polyartrosis	2 (9.5 %)
vertebrogenetic pain syndrome	4 (19.0 %)
hypothyreosis	2 (9.5 %)
chronic venous insufficiency	5 (23.8 %)
bronchial asthma	2 (9.5 %)

An endoscopy examination at 3 months revealed the absence of a leak or fistula. One patient (4.8 %) with a previous laparoscopic fundoplication had asevere esophagitis and the reintervention was done. Laparoscopic gastric bypass was performed 35 days after the primary operation with favourable outcome. Patients started with the liquid diet usually from the first postoperative day. The full oral intake was on day 3 (range 2–5). The postoperative pain was minimal and easily responsive to paracetamol at usual doses. Protein pump inhibitors were given during the hospitalization and liquid diet was advised for three weeks. The median hospital stay was five days (range 3–14).

Discussion

Open sleeve gastrectomy was first applied to the treatment of patient with BMI > 55 by Almogy (5) in 1993. In 1999, Gagner performed the first laparoscopic sleeve gastrectomy as a part of biliopancreatic diversion (6). It was first used as a two- step procedure for the superobese but showed good weight loss and resolution of comorbidities with low complication rate. Therefore, laparoscopic sleeve gastrectomy became more popular as a stand- alone procedure.

According to a systematic review published by Shi in 2010 (1), preoperative BMI range from 37.2 to 69 and the most of patients are female (71.2 %). Operative time ranged from 49 to 143 minutes with the mean time of 100.4 min. Hospital stay was from 1.9 to 8 days, on mean 4.4 days.

Postoperative complications of laparoscopic sleeve gastrectomy are relatively rare and vary from 0 % to 29 % (mean 11 %) with 0.3 % mortality (1, 7, 8, 9). Perioperative minor complications have an overall incidence of 11 % and major surgical complications 5% in large series (10). Bleeding, abscess formation and staple line leak are the most common major complications of laparoscopic sleeve gastrectomy.

Gastric leaks represent serious complications of bariatric surgery with possibility of development of peritonitis. The incidence of leak after laparoscopic sleeve gastrectomy has been reported to be 0 to 8% for primary surgery (8, 11, 12, 13) and 16–24 % in reintervention procedures (12). Most of these leaks are located near the gastroesophageal junction, in the proximal third of the stomach (14). The main cause is considered a high intraluminal pressure combined with a low gastric tube compliance (12). Moreover, the proximal gastric fundus is the critical area of dissection during sleeve gastrectomy. Our patient had leak in this localization, too. Possible cause of leak at NOSE technique is the combination of passage of bulky specimen and above described risk parameters of proximal stomach.

The incidence of staple line haemorrhage has been reported to be 0 to 8.7 % (1, 13). We protect the staple line with a running seroserous invaginating suture. We think that it can control bleeding and reduce the number of leaks without increasing the cost of the operation. Reflux occurs in up to 24.9 % (15).

Nowadays, it is a tendency to use in the laparoscopic surgery intraoperative endoscopy for the extraction of the specimen which means the possibility to perform a totally laparoscopic surgery.

Developing NOSE techniques may be considered as a bridge to Natural Orifice Translumenal Endoscopic Surgery (NOTES). Several studies confirmed the technical feasibility of NOSE with transgastric route (liver biopsy, gastrojejunostomy (16), tubal ligation (17), cholecystectomy (18) and splenectomy (19)). Some of these studies were performed on porcine models. There have been no reports in the international literature of laparoscopic sleeve gastrectomy for morbid obesity using natural orifice specimen extraction.

In addition to better cosmetics, the advantages of NOSE over laparoscopic operations may be decreased incision-related complications such as wound infection, incisional hernia, and postoperative pain (20). Incisional hernia is one of the most common late complications, which require a surgical repair. The incidence of incisional hernias after laparotomy reaches 10 % to 19 % (21, 22). One of the major risk factor for the development of incisional hernia is just obesity. The incidence of this complication can be as high as 24 % for obese patients and 51 % for the superobese (BMI > 50) (22). Currently, the laparoscopic approach in bariatric surgery significantly reduces the incidence to 0.23 % to 6 % (20), depending on trocar size. For obese patients, 12 mm trocars lead to hernias in 6 % (20).

Laparoscopic sleeve gastrectomy is a safe and effective bariatric procedure with a low morbidity and mortality. Based on our initial experiences, it could be an indication for NOSE with transgastric approach. Morbidly obese patients would benefit from this approach due to the elimination of wound complications. Other potential advantages from the NOSE approach can be reduced adhesion formation, lower stress response and faster recovery.

The main disadvantage of this innovative procedure is an increase in the costs because of additional stapler cartridges used for repeated gastric closure, potential damage to the esophageal wall during extraction and potential intraabdominal infection. NOSE procedures in bariatric/metabolic surgery are still in development and it is difficult to compare safety and efficacy of using trangastric approach with standard laparoscopic sleeve gastrectomy.

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