



Original research

Trocar site hernia after bariatric surgery: Our experience without fascial closure



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ABSTRACT

Introduction: The spreading of laparoscopic surgery has increased the occurrence of trocar site hernias, along with their related complications. Bariatric surgery combines two important risk factors in hernia formation: obesity and complexity of port-site closure. Several techniques and devices have been proposed to close the trocar wounds to minimize the risk of hernia occurrence.

Materials and methods: The records of 624 obese patients who underwent laparoscopic bariatric procedures between January 2006 and December 2012 were retrospectively reviewed. In no patient was performed the closure of the fascial layers of trocar incisions. Weight, BMI, E%WL and onset of complications were monthly collected for the first year after the procedure, then every six month.

Results: 10 patients showed trocar site hernia, for an overall prevalence of 1.6%. The mean time of occurrence was 15 months. None developed intestinal obstruction or other complications as a consequence of the hernia. The mean time of follow-up was 54 months. The mean weight and BMI before interventions were 136.3 ± 17.7 kg and 46.0 ± 4.6 kg/m² respectively. The mean percentage of excess weight loss (E%WL) at one year was 45.9%.

Conclusion: We avoided complicating the wound closure with fascia closure, accepting the risks related to the BMI. So far our procedure for port-site closure is relatively simple, safe, less invasive, less time-consuming and costless. These advantages could arise from the fact that our patients benefit from a remarkable weight loss after the intervention thus reducing one of the most important risk factors in the onset of trocar site hernia.

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1. Introduction

Trocar or port site hernia is defined as an incisional hernia which occurs after minimally invasive surgery on the trocar incision site [1]. The spreading of laparoscopic surgery for many abdominal procedures has increased the occurrence of trocar site hernias (1–6%), along with their related complications (bowel or omentum incarceration, intestinal occlusion or perforation, Richter's hernia) [2,3]. Bariatric surgery combines two important risk factors in hernia formation: obesity and difficulty in port-site closure because of sub-optimal visualization of fascia through small and deep wounds. The standard closure technique of all layers, from fascia to cutis, at the port site, can be very hard. Several techniques have been proposed to close the trocar wounds minimizing the risk of hernia formation

such as use of special devices, endoscopic suture or different ways to introduce trocars, but all solutions imply a cost in terms of time or money. We present our experience concerning closure technique for trocar incisions. Leaving fascia unclosed has given good results, being understood that a particular care in respecting the fascia in all manipulations and retractions is required.

2. Materials and methods

This retrospective study was carried out in the Department of Clinical Medicine and Surgery of the University of Naples Federico II, from January 2006 to December 2012. During that time, all data about patients, operations and postoperative complications were recorded in a computer database, which was retrospectively reviewed to query the incidence of trocar site hernias. We enrolled all patients undergoing the following bariatric procedures: gastric bandings (GB), sleeve gastrectomies (SG), bilio-pancreatic

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diversions (BPD). All procedures were completely performed laparoscopically, using 4 trocars in GB, 5 in SG, 5 in BPD. In all the procedures, pneumoperitoneum was established via a Veress needle insufflation with an intra-abdominal pressure up to 15 mmHg. The first trocar was positioned according to the transperitoneal technique. Disposable trocars of different brands, both non-bladed and cutting, were employed. We preferred blunt conical trocars (after the Veress needle insufflation) and flat-blade trocars. For the GB we inserted two 5-mm trocars, one 10–12 mm trocar and one 15-mm trocar; for SG two 5-mm trocars and three 10–12 mm trocars; two 5-mm trocars and three 10–12 mm trocars for BPD (Table 1). The 15-mm trocar positioned in left hypochondrium was always a non-bladed one, the 10/12-mm trocar in mesogastrium always a cutting one, and for 5-mm trocars we used randomly non-bladed and bladed ones. At the end of each intervention, we removed the trocars under visualization and closed the trocar site in correspondence of cutis by non-absorbable No. 2-0 suture, leaving fascia unclosed. The stitches were removed after 14 days. Standard postoperative follow-up included clinical visits at 3 week, 3 months, 6 months and 12 months, and every six months thereafter. Weight, BMI, E%WL, onset of complications were collected each time. Data about the onset of trocar site hernias were analysed: incidence, site, trocar diameter, time of hernia onset, patients' clinical features, eventual surgical repair.

3. Results

624 obese patients were candidate to bariatric surgery over a seven year period. The mean age was 37.8 years, the mean weight and BMI were respectively 136.3 ± 17.7 Kg (range 67–207) and 46.0 ± 4.6 kg/m² (range 27.7–67.6) (Table 2). We totally performed 624 procedures, in particular 542 GB, 65 SG, 17 BPD (Table 3). Data from all 624 patients were available for review. At a mean follow-up of 54 months (ranged from 12 to 84 months), 10 hernias were detected in 10 patients (Table 4). The incidence of trocar site hernia was 1.6% (10/624), with a mean time of trocar site hernia onset of 15 months. Our data report 3 hernias in left hypochondrium (15-mm wound, with non-bladed trocar), 5 in mesogastrium (10-mm wound, bladed trocars) and 2 in the umbilical site (10-mm trocar). No herniation was detected at the 5-mm wounds. No patient was lost at follow-up. Seven of these hernias have subsequently been repaired. No patient developed symptoms of bowel obstruction as a consequence of hernia. No wound infections were reported in these patients. In medical records of patients who presented a trocar wound hernia, we found that 3 patients were smokers; one suffered from diabetes; 2 patients had an history of hypertension and thyroiditis; one patient suffered from hypertension, GERD and COPD; and 6 patients had no comorbidities at the time of the surgery. The mean postoperative weight and BMI were 105.9 ± 19.3 Kg (range 53.3–151) and 34.8 ± 6.2 kg/m² (range 21.3–51.4) respectively. The mean percentage of excess weight loss (E%WL) was 45.9% (range 20.5–85.1).

4. Discussion

Herniation through trocar site was born with laparoscopic surgery, it is less frequent than incisional hernia after open surgery, but

Table 2
Baseline characteristics of the 624 patients.

	Mean (\pm SD)	Range
Age (years)	37.8 (\pm 3.37)	13–65
Gender (men/women)	222/402	–
Height (cm)	169.5 (\pm 4.2)	150–191
Weight (kg)	136.3 (\pm 17.7)	67–207
BMI (kg/m ²)	46.0 (\pm 4.6)	27.7–67.6

it still represents an unsafe complication. Tonouchi et al. first classified three types of trocar site hernias according to the cause and the onset time. The early onset type of hernia occurs by the dehiscence of anterior and posterior fascial plane and peritoneum several days after surgery. The late onset type of hernia occurs by the dehiscence of anterior and posterior fascial plane, while peritoneum provides the hernia sac; they appear several months after surgery as a swelling by the wound side. The special type of hernia is due to the dehiscence of the whole abdominal wall immediately after surgery, with intestine and/or omentum protruding without a sac [4]. The clinical onset of a trocar site hernia is usually early as it often occurs within the 30th postoperative day, and it is due to the omentum or small bowel entrapment into the trocar wound. Its prognosis improves if it is rapidly diagnosed, but its clinical presentation is often insidious with progression to an acute abdomen, requiring an emergency surgical approach [5,6]. Several risk factors associated to trocar site hernia have been described related both to patient's characteristics and surgical technique. An important predisposing factor is obesity, because of the higher intra-abdominal pressure, the thicker peritoneum, the larger preperitoneal space, and because of the difficulty of achieving a full-thickness closure [7]. Other authors report that obesity represents a risk factor for incisional hernia because of the increased risk of wound infections determined by obesity itself [8].

In addition, advanced age, gender (male > female), nutritional status, diabetes, anemia, steroid therapy, renal insufficiency, cancer and wound infections also contribute to the occurrence of trocar site hernia. Surgical factors increasing the risk of herniation are widening fascial defects, larger procedures and manipulation of port sites, large ports, cutting trocars, undetected omentum or bowel entrapment into the intraperitoneal defect after the trocar removal, not sutured larger fascial defects. Perpendicular insertion of trocars rather than tangential or oblique [9]. Most complications occur with 10-mm trocars, but some have occurred at 5-mm and 3-mm trocar sites [10]. Interestingly, many authors suggest that most hernias occur at the site of midline trocars, especially at the umbilical site, probably due to the weakness of the paraumbilical region or because the small intestine is more often in contact with this region than with the lateral part of the abdominal wall. Some authors proposed that the location of the trocar is more important than the risk factors or the trocar size [11–14]. In our data, hernias occurred at the 15-mm (left hypochondrium) and 10-mm trocar (mesogastrium) wounds. Considering obesity as a risk factor for every single patient (624 bariatric patients), we observed that the trocar size was relevant in hernia formation. The occurrence of these complications has been attributed to the difficulty in applying standard suturing techniques for wound closure. The closure of all layers in smalls and deep wounds is sometimes difficult, and never quick and easy, in particular in obese patients. These reasons led to several proposal of new techniques for suturing port-site wounds: Lasheen needle [15], Deschamps needle [16], VersaStep™ trocar system [17], use of two S-retractors [18], use of a skin hook and a Langenbach retractor [19], non-bladed, radially dilating and conical blunt devices [20], Carter-Thomason device [21,22], tangential insertion of trocars [23,24], endoscopic placement of fascial sutures

Table 1
Procedures and number of trocars used.

Type of bariatric surgery	N° Procedures	Trocars		
		5 mm	10–12 mm	15 mm
Adjustable gastric banding	542	2	1	1
Sleeve gastrectomy	65	2	3	–
Bilio-pancreatic diversion	17	2	3	–

Table 3
Procedures and patients characteristics.

Type of bariatric surgery	N° procedures	Male/Female	Age (years)	Weight (Kg)	BMI (Kg/m ²)
Adjustable gastric banding	542	186/356	35.6 (13–70)	118.4 (67–181)	41.3 (28.7–67)
Sleeve gastrectomy	65	33/32	38.8 (20–60)	153.8 (100–207)	50.5 (33–67.6)
Bilio-pancreatic diversion	17	3/14	39 (25–57)	136.6 (80–180)	46.4 (27.7–61.9)

under direct vision [25], insertion of a Surgicel plug into the muscular layer [26]. Sánchez-Pernaute and Moreno-Sanz have proposed the prophylactic closure of large trocar incisions with mesh in bariatric patients [27,28]. According to us, this is an unsafe procedure considering the risk of wound infections. The port-closure techniques were classified by Shaher into three groups: techniques that use extracorporeal assistance, techniques that use assistance from inside the abdomen and techniques that can be performed with or without visualization [29]. All these solutions require special devices; some are time-consuming or require assistance from inside abdomen and so an additional surgical experience, along with their related complications (hemorrhage, intestinal perforation, infection, seroma, hematoma).

In our experience, we have chosen the simplest solution for the most difficult patients. We know that obese patients make difficult even the standard closure technique for fascia, often requiring blind suturing of the fascial defect with the risk of incomplete suture and injury to the intraperitoneal organs. Thus we avoided to complicate the wound closure with fascia closure and to look for special devices, accepting the risks related to patient's BMI. So far our procedure for port-site closure is relatively simple, safe, less invasive, less time-consuming and costless. These advantages could arise from the fact that our patients benefit from a remarkable weight loss after the intervention thus reducing one of the most important risk factors in the onset of trocar site hernia. Indeed, by the first three postoperative months, when the risk of hernia onset is the highest, bariatric patients experience an outstanding weight loss as a consequence of a liquid, semiliquid, semisolid and then solid diet. Postoperative follow-up showed a significant reduction in the average weight (105.9 vs 136.3 kg) and BMI (34.8 vs 46.0 kg/m²). The mean E%WL of 45.9% (range 20.5–85.1) also confirmed the good result in weight loss after bariatric procedures. Interestingly our experience gives a slight suggestion to investigate the association between the rate of trocars site hernia and weight loss after bariatric surgery, but further studies are required.

5. Conclusions

Leaving fascia unclosed after laparoscopic bariatric surgery has given good results. Our procedure for port-site closure is simple, safe, easy to perform, less invasive, less time-consuming, costless, and efficacious at about a 5 years mean follow-up. According to this experience we seem to have followed the most manageable solution in the most difficult cases, combining an outstanding weight loss with low incidence of trocars site hernia.

Table 4
Characteristics of the 10 patients.

	Mean (±SD)	Range
Age (years)	36.1 (±6.77)	25–48
Gender (men/women)	6/4	–
Height (cm)	169.8 (±12.35)	150–188
Weight (kg)	139.9 (±28.23)	90–180
BMI (kg/m ²)	49.1 (±10.77)	36.1–63.6
Time of hernia onset (months)	15 (±21.93)	1–72

Ethical approval

None.

Conflict of interest statement

The authors have no conflict of interest or any financial support.

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Author contribution

Vincenzo Pilone: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Rosa Di Micco: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Ariola Hasani: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Giuseppe Celentano: Participated substantially in data collections, execution of the study and in the analysis and interpretation of data.

Angela Monda: Participated in execution of the study and in the analysis and interpretation of data.

Antonio Vitiello: Participated in conception, design, and execution of the study.

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Leucio Iacobelli: Participated in execution of the study and in the analysis and interpretation of data.

Pietro Forestieri: Participated in the drafting and editing of the manuscript.

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