

ORIGINAL ARTICLE

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Feasible first trocar insertion technique in bariatric surgery: A novel technique**Emin Daldal¹, Hasan Dagmura², Ahmet Akbas³, Fatih Dasiran¹, Ertan Bulbuloglu⁴**¹Gazi Osman Pasa University, Faculty of Medicine, Department of General Surgery, Tokat, Turkey²Kutahya Health Science University, Evliya Celebi Training and Research Hospital, Department of Surgical Oncology, Kutahya, Turkey³Bagcilar Training and Research Hospital, Department of Surgical Oncology, Istanbul, Turkey⁴Kahramanmaraş Sutcu Imam University Faculty of Medicine, Department of General Surgery, Kahramanmaraş, Turkey

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Abstract

Although tremendous advancements in bariatric surgery have been made, there is still no universal approach to initial abdominal access. Herein, we describe a novel technique for first trocar entry that is feasible, safe and fast to perform in morbidly obese patients undergoing laparoscopic bariatric surgery. Our aim is to describe a trocar insertion technique in bariatric surgery used as a routine in our obesity clinics and to present its results. The registries from the Tokat Gaziosmanpasa University Hospital recorded between January 2017 and January 2019 were reviewed to retrieve data on morbidly obese patients operated on by a single surgical team using the novel trocar insertion technique. A total of 244 consecutive morbidly obese patients who underwent sleeve gastrectomy and gastric bypass performed by the same surgical team with the same technique were included in this study. Among 244 patients, 224 (91.8%) underwent sleeve gastrectomy, and 20 (8.2%) underwent gastric bypass. The mean body mass index was 46.23 kg/m² (range 31 – 80 kg/m²). All interventions were performed laparoscopically with no cases of conversion to open surgery. During this study, eight cases of omental (3.27%) and three cases of small bowel mesentery (1.22%) injuries were encountered in 11 different patients (4.5%) and were self-limited; no major bleeding, bowel injuries, gas emboli or deaths occurred. As a conclusion this technique for direct trocar entry in morbidly obese patients is considered to be safe since no major complications occurred, fast because no dissection or time-consuming steps were required and finally, feasible because the trocar insertion procedure is straightforward.

Keywords: Laparoscopy; obesity; body mass index (BMI); trocar insertion**Introduction**

Laparoscopic surgery has become the standard type of surgery worldwide and is used for most surgical specialty cases, including oncology, elective and even emergency cases. Of course, the tremendous amount of progress made in this field has revealed associated complications that are not encountered in open surgery. The rate of obesity is alarmingly high in the USA and Western countries [1] with this increase in incidence, there have been rapid developments in the field of bariatric surgery, including an increase in the number of surgical procedures and techniques performed over the last few decades. The first step in any laparoscopic intervention is to obtain abdominal cavity access and insert the

optic trocar, which is rendered more laborious and challenging in obese patients with a thickened subcutaneous fat tissue layer.

Regardless of which technique is used, numerous complications, including mesenteric vessel laceration, visceral injury, solid organ injury, and major vessel injury, have been reported during the insertion of the first trocar [2,3]. The aim of this study is to describe a first trocar insertion technique in bariatric surgery used as a routine in our obesity clinics and to present its results.

Material and Methods

Data were retrieved from the electronic database of patient files recorded between January 2017 and January 2019 at Tokat Gaziosmanpasa University Hospital using the keywords “sleeve gastrectomy” and “gastric bypass”. We collected all the data needed for this single-center study during this time period. The procedures were performed by a single surgical team who used the same techniques and standard protocol for all cases of sleeve gastrectomy and gastric bypass.

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Ethics committee approval for this study was obtained from the Local Research Ethics Committee, and the study was registered under the number 18-KAEK-21. The study was reviewed and approved by the University of Tokat Gaziosmanpasa Institutional Review Board.

All methods were performed in accordance with the relevant guidelines and regulations of the institution. All patients and/or their legal guardians provided written informed consent, and basic demographic information was collected.

Statistical Analysis

Descriptive analyses were performed to obtain information on the general characteristics of the study population. Quantitative data are expressed as the arithmetic mean and standard deviation. Qualitative data are expressed as the count and percentage. Analyses were performed using SPSS 20 (IBM SPSS Statistics 20, SPSS Inc., IBM Co., Somers, NY),.

The p values <0.05 is accepted as statistically significant.

Surgical Technique

Under general anesthesia and complete muscle relaxation with the patient lying in supine position, a vertical incision of 1-1.2 cm in length is made starting from the point of intersection of a horizontal line drawn at a distance of one hand span from the xiphoid process and a vertical line on the left side of the patient parallel and 1.5 cm from the midline.

The trocar used is an Endopath Xcel trocar measuring 11 mm, which is a bladeless, blunt trocar.

Once the skin incision is made (figure 1), the surgeon does not need to search for fascia or perform a dissection of the thick fatty subcutaneous tissue; the trocar is directed at a right angle to the abdominal surface, and a steady force is applied in the form of a semi-screw-like movement until the trocar is fully inserted into the abdomen (figure 2).

When the layers of the anterior abdominal wall are passed, the intersection of the anterior and posterior rectus sheath is felt. As soon as there is no resistance and once the feeling of emptiness is sensed, no more force is applied. Then, without gas insufflation and without changing the trocar position, an optic device is inserted to inspect site of entry for any injuries. After CO₂ insufflation is started, the exploration for undetected entry site damage is continued.

Results

The data on 244 consecutive patients who underwent sleeve gastrectomy and gastric bypass performed by the same surgical team with the same technique were available in our university hospital registry and included in this study. Among the 244 patients, 224 (91.8%) underwent sleeve gastrectomy, and 20 (8.2%) underwent gastric bypass. The mean body mass index was 46.23 kg/m² (range 31 – 80 kg/m²). The mean age was 38.05

years (range 16-70 years). There were 152 (62.29%) female and 92 (37.71%) male patients (Table 1). All interventions were performed laparoscopically with no cases of conversion to open surgery. During this study, eight cases of omental (3.27%) and three cases of small bowel mesentery (1.22%) injuries occurred in 11 different patients (4.5%) and were self-limited (Table 2). No major bleeding, bowel injuries, gas emboli or death occurred. During hospitalization no surgical site infections were encountered.

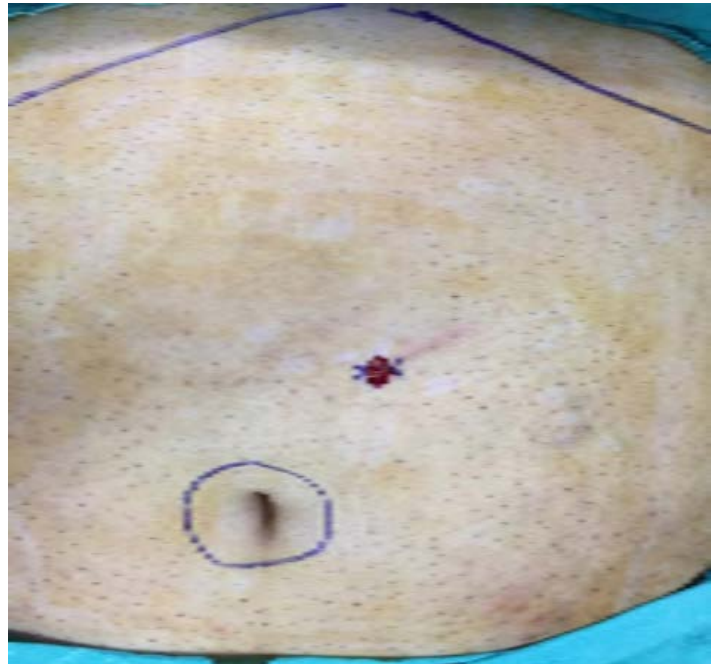


Figure 1. Incision made at the intersection point for first trocar entry

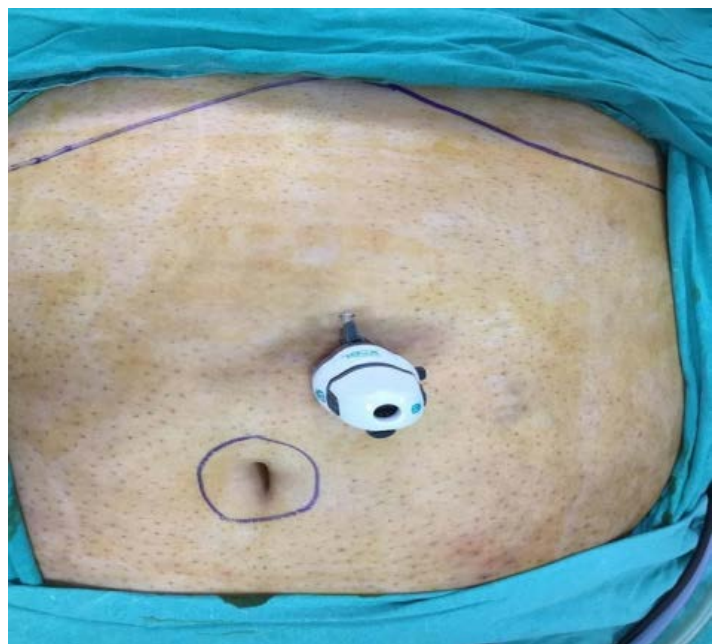


Figure 2. Trocar inserted in place.

Table 1. Gender, age and BMI distributions according to the type of operation

Type of operation	Sex		Age		BMI	
	Female n (%)	Male n (%)	Male	Female	Male	Female
Sleeve gastrectomy	140 (57.4%)	84(34.4%)	37.93	37.98	46.56	46.52
Gastric by-pass	12(4.9%)	(3.3%)	48.25	48.77	36.37	43.92

Table 2. Complications encountered during surgery.

Complications Operations type	Omental Injury n (%)	Bowel mesentery injury n(%)
Sleeve	7 (2.9%)	2 (0.8%)
Gastric by-pass	1(5%)	1 (5%)
Total	8 (3.3 %)	3 (1.2%)

Discussion

The rate of obesity is increasing at an alarmingly high rate in the USA and Western countries [4-6]. Surgery plays a major role here in treating and decreasing the complications of obesity. Many advancements in bariatric surgery have been made over the last decade; however, many aspects still need to be improved.

The development of pneumoperitoneum with optical trocar insertion is considered to be the first step in laparoscopic surgery, and it is a crucial step since as many as 50% of life-threatening complications occur during this step [7-9]. A few techniques (Table 3) have been developed to facilitate peritonization; however, none of these techniques have shown superiority over the other since even with optical trocars, minor complications have been reported [10-13]. Peritoneal access can be performed as a closed entry technique via the use of a Veress needle, open techniques such as the Hasson technique, the direct trocar entry technique, the Radially Expanding Access System, or the Visual Entry System; hence, many types of trocars have been created and adapted for easy abdomen entry; there are bladed, bladeless, blunt or sharp, disposable or reusable and uncategorized types of trocars.

First trocar entry is a step of critical importance since major complications can take place while accessing the abdomen and creating pneumoperitoneum. The two major types of complications encountered during the first trocar entry are major bleeding due to great vessel injury and intestinal injury [14-21]. In this study, we did not observe any of these major complications; however, 11 patients (4.5%) had minor complications, such as omental laceration (figure 3) and injury to the root of the small bowel mesentery (figure 4).

Direct trocar entry (DTE) was first described by Dingfelder, where access to the gasless abdomen was performed by blind, straight, and forward insertion of the trocar [22]. Several studies have pointed out that direct trocar entry without pneumoperitoneum is a safe alternative to Veress needle entry [23]; in addition, DTE with or without gas insufflation is a safe technique, with low access rate failure and low gas leakage [10,12,24]. These results are consistent with those in our study since we encountered self-limited injuries in only 11 patients (4.5%) with no major damage or any cases of gas leakage or access failure.

Table 3. Published techniques describing first trocar entry in obese patients without prior creation of pneumoperitoneum and with the use of variant types of bladeless trocars.

Authors	Trocar entry method	Type of trocar used	Patients number	Minor complications	Abdominal Wall lifting	Site of entry
Rabl et al ⁽¹²⁾	Direct with optical view	Endopath 12mm endopath xcel 11mm	196	3 (1.5%)	No	Left side of the umbilicus
Madan and Menachery ⁽¹⁰⁾	Direct with optical view	Endopath 12mm	48.25	0(0%)	No	Subcostal area left upper quadrant.
Rosenthal et al ⁽¹¹⁾	Direct with optical view	Endopath 12mm	228	0(0%)	No	Supraumbilical incision
Berch et al ⁽¹³⁾	Direct with optical view	Optiview 12mm	849	0(0%)	No	mid-left upper quadrant
Habibi et al ⁽²⁹⁾	Direct	12 mm shielded	327	11 (2.9%)	Yes	Transverse skin incision below the xyphoid process and left to the midline
Altun et al ⁽³⁰⁾	Direct	Versaport plus 12 mm	376	7 (4.4%)	Yes	Supraumbilical incision



Figure 3. Omental laceration during trocar insertion.



Figure 4. Small bowel mesentery root laceration during trocar insertion.

Considering that the distance between the inner side of the anterior abdominal wall and the anterior surface of the lumbar spine is longer in obese people and that at the level at which the incision is made for the initial trocar entry, there is no major vascular structure, we assume that these two important factors contribute to the low incidence of major complications in our study.

Several authors consider countertraction to be a crucial step for trocar insertion into the abdominal cavity [25]; however, this is not the case in this study, as we did not consider the elevation of the abdominal wall since in obese patients, the distance between the anterior abdomen and the posterior spine (13.5 cm) is sufficiently long (Table 4) [26] to cause major damage to the great vessels of the abdomen, so there is no evidence that DTE with abdominal wall lifting is superior to that without lifting, as shown in previous papers [27].

Table 4. The distance of important abdominal structures to the umbilicus.

	Distance from umbilicus (cm)			Recommended angle of entry
	To bifurcation	to peritoneum	to great vessels	
Obese	2.9 ± 2.5	12 (median)	13 ± 4	Near 90°

(Hurd WW. et al. (1992)

DTE has been described differently in many articles; for example, it has been described with distinct sites of trocar insertion (umbilicus, midline supraumbilical region, Palmer's point), with or without the creation of pneumoperitoneum, with or without abdominal wall elevation (rectus sheath, skin elevation with towel clips), with or without subcutaneous tissue dissection to reach the anterior fascia, and different patient positions during trocar entry, so the complexity of these previously mentioned techniques and the time required for peritoneal access make these approaches impractical.

In this report, we aimed to describe this technique that we routinely use in our clinics mainly in laparoscopic bariatric surgery. We did not observe any cases of initial entry failure, and we did not have any major CO₂ gas leakage from the trocar entry site. The position of the patient was supine with complete muscle relaxation, so there was no need for special positioning of the patient, such as the reverse Trendelenburg positioning with right lateral tilt [28].

Factors that may influence DTE include the site of entry, type of trocar used and surgeon's experience.

There is always a risk of injury, regardless of the kind of access used since this step involves the introduction of a rigid instrument, regardless of whether it is blunt or sharp, bladed or bladeless, and inserted under direct vision or blindly.

Our results are consistent with those in several studies that showed no major complications and a relatively reasonably low rate of minor self-limited complications. At the end of the procedure, we did not close the trocar entry site.

Although we did not take into consideration the trocar insertion time in this study, one can easily conclude that this technique is relatively shorter than other previously described techniques, which necessitate the prior insufflation of the abdomen, subcutaneous tissue dissection in the search of the fascia, anterior abdominal wall elevation or special patient positioning. We assume that this technique has the shortest insertion time by far since there is straight and forward access to the abdomen with direct trocar insertion and that it is safe since no major complications were observed.

Factors that may influence DTE include the site of entry, type of trocar used and surgeon's experience, so the limitations of this study may include the fact that we only included morbidly obese patients with a BMI greater than 35 and without a history of abdominal surgery. Another limitation is that this procedure is operator dependent, so minimal skills and experience are required. However, this study may be considered the foundation

for relatively larger prospective studies that should be conducted to determine whether this approach can be used universally. The possible contraindications to this technique may be the absence of obesity and a history of abdominal surgery.

Conclusion

In laparoscopic surgery, there is no gold standard technique for the first trocar entry. In obese patients, the first trocar entry is more difficult. Our first trocar insertion technique is easy, feasible, easy to learn and acceptable compared to the morbidity with other first trocar entry methods. For this reason, we think that the method we have described will attract the attention and ease of surgeons who are interested in obesity surgery.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

All authors declare no financial support.

Data availability statement

The data sets generated during the current study are available from the corresponding author upon request.

Ethical approval

Local Research Ethics Committee, and the study was registered under the number 18-KAEK-21. The study was reviewed and approved by the University of Gaziosmanpaşa Institutional Review Board.

References

1. Agha MA, Agha RI. The rising prevalence of obesity: part A: impact on public health. *Int J Surg Oncol*. 2017;2:17.
2. Pryor AU, Gracia GO. Abdominal access techniques used in laparoscopic surgery. Up To Date version. 2015;22.
3. Ahmad GA, Duffy JM, Watson AJ. Laparoscopic entry techniques and complications. *Int J Gynaecol Obstet*. 2007;99:52-5.
4. Eisenberg DA, Duffy AJ, Bell RL. Update on obesity surgery. *World J Gastroenterol*. 2006;12:3196.
5. Buchwald HE, Oien DM. Metabolic/bariatric surgery worldwide 2008. *Obes Surg*. 2009;19:1605-11.
6. Fried MA, Hainer VO, Basdevant AR, et al. Interdisciplinary European guidelines for surgery for severe morbid obesity. *Obes Surg*. 2007;17:260-70.
7. Jansen FW, Kapiteyn KI, Trimbos-Kemper TR, et al. Complications of laparoscopy: a prospective multicentre observational study. *BJOG*. 1997;104:595-600.
8. Carlson WH, Tully GR, Rajguru AM, et al. Cameraless peritoneal entry in abdominal laparoscopy. *JSLs*. 2012;16:559.
9. Angioli RO, Terranova CO, Nardone CD, et al. A comparison of three different entry techniques in gynecological laparoscopic surgery: a randomized prospective trial. *Eur J Obstet Gynecol Reprod Biol*. 2013;171:339-42.
10. Madan AK, Menachery SU. Safety and efficacy of initial trocar placement in morbidly obese patients. *Arch Surg*. 2006;141:300-3.
11. Rosenthal RJ, Szomstein SA, Kennedy CI, et al. Direct visual insertion of primary trocar and avoidance of fascial closure with laparoscopic Roux-en-Y gastric bypass. *Surg Endosc*. 2007;21:124-8.
12. Rabl CH, Palazzo FR, Aoki HI, et al. Initial laparoscopic access using an optical trocar without pneumoperitoneum is safe and effective in the morbidly obese. *Surg Innov*. 2008;15:126-31.
13. Berch BR, Torquati AL, Lutfi RE, et al. Experience with the optical access trocar for safe and rapid entry in the performance of laparoscopic gastric bypass. *Surg Endosc*. 2006;20:1238-41.
14. Nezhat CA. Operative endoscopy will replace almost all open procedures. *JSLs*. 2004;8:101.
15. Philips PA, Amaral JF. Abdominal access complications in laparoscopic surgery. *J Am Coll Surg*. 2001;192:525-36.
16. Champault GG, Cazacu F, Taffinder NJ. Serious trocar accidents in laparoscopic surgery: a French survey of 103,852 operations. *Surg Laparosc Endosc*. 1996;6:367-70.
17. Dunne N, Booth MI, Dehn TC. Establishing pneumoperitoneum: Verres or Hasson? The debate continues. *Ann R Coll Surg Engl*. 2010;93:22-4.
18. Merlin T, Hiller JE, Maddern GJ, et al. Systematic review of the safety and effectiveness of methods used to establish pneumoperitoneum in laparoscopic surgery. *Br J Surg*. 2003;90:668-79.
19. Catarci M, Carlini M, Gentileschi P. Major and minor injuries during the creation of pneumoperitoneum. *Surg Endosc*. 2001;15:566-9.
20. Bonjer H, Hazebroek E, Kazemier G, et al. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. *Br J Surg*. 1997;84:599-602.
21. Azevedo JL, Azevedo OC, Miyahira SA, et al. Injuries caused by Veress needle insertion for creation of pneumoperitoneum: a systematic literature review. *Surg Endosc*. 2009;23:1428-32.
22. Dingfelder J. Direct laparoscope trocar insertion without prior pneumoperitoneum. *J Reprod Med*. 1978;21:45-7.
23. Agresta F, De Simone P, Ciardo L, et al. Direct trocar insertion vs Veress needle in nonobese patients undergoing laparoscopic procedures: a randomized prospective single-center study. *Surg Endosc*. 2004;18:1778-81.
24. Bernante P, Foletto M, Toniato A. Creation of pneumoperitoneum using a bladed optical trocar in morbidly obese patients: technique and results. *Obes Surg*. 2008;18:1043-6.
25. Byron JW, Markenson G, Miyazawa K. A randomized comparison of Verres needle and direct trocar insertion for laparoscopy. *Surg Gynecol Obstet*. 1993;177:259-62.
26. Hurd WW, Bude RO, DeLancey J, et al. The relationship of the umbilicus to the aortic bifurcation: implications for laparoscopic technique. *Obstet Gynecol*. 1992;80:48-51.
27. Tonouchi H, Ohmori Y, Kobayashi M, et al. Trocar site hernia. *Arch Surg*. 2004;139:1248-56.
28. Koç O, Şahiner İT, Ekiz F. A new method in laparoscopic sleeve gastrectomy: Reverse trendelenburg with right lateral tilt position prior to trocar entry. *Med Sci Monit*. 2017;23:4513.
29. Habibi M, Seyit H, Kones O, et al. Direct Trocar Insertion with Elevation of the Rectus Sheath in Bariatric Surgery: A Novel Technique. *Pol Przegl Chir*. 2017;89:23-5.
30. Altun H, Banli O, Karakoyun R, et al. Direct trocar insertion technique for initial access in morbid obesity surgery: technique and results. *Surg Laparosc Endosc Percutan Tech*. 2010;20:228-30.