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Bladeless optical trocar insertion technique for initial access in morbidly obese patients: Technique and results

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ABSTRACT

Introduction: The initial access into the abdomen during laparoscopic surgery can become difficult and complex, especially in morbidly obese patients. No ideal technique to solve this issue has been elucidated. In this study, we aimed to evaluate the safety and feasibility of using a bladeless optical trocar for abdominal entry without producing pneumoperitoneum in morbidly obese patients.

Materials and Methods: The study included 170 patients who underwent surgery to treat morbid obesity from January 2015 to December 2017. Demographic data, data about the initial access to the abdomen, and the complications were recorded.

Results: All surgical procedures were performed by the same team of two surgeons. The mean body mass index (BMI) of the patients was 45.8±6.0 kg/m². The Veress needle access failed in the first five patients. The initial access was successfully achieved in all patients, including the first five patients, by using a bladeless optical trocar without producing pneumoperitoneum. After the skin incision, insufflation and trocar insertion were completed in a mean period of 58±35.3 (range; 23–272) seconds. Omental injury due to trocar insertion occurred in two patients. No other complications developed. Fascial defect closures were not performed for any patient. The mean operating times for sleeve gastrectomy and the Roux-en-Y gastric bypass were 76±19 (range: 45–135) and 203±61.4 (range: 100–345) minutes, respectively. During the follow-up period of 24 months, no patient developed trocar site hernia.

Conclusion: Initial access to the abdomen by a bladeless optical trocar without producing pneumoperitoneum is a practical, fast, safe, and effective method in morbidly obese patients.

Keywords: Complications; laparoscopic entry; morbid obesity; optical trocars; pneumoperitoneum.

Introduction

Today, laparoscopic surgery is widely used in the surgical treatment of many intraabdominal pathologies. The first step of laparoscopy is the abdominal entry and the installation of pneumoperitoneum regardless of the surgical procedure. This step can become difficult and complex at times. Thus, one-third of injuries to major vessels and visceral organs encountered in laparoscopic surgery

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occur at this stage.[1] Moreover, unsuccessful attempts for abdominal entry can extend operating times and compromise safety.

This stage may become even more complex in morbidly obese patients, whose subcutaneous tissues are thick and the landmarks of the abdominal wall are variable from the traditional ones.[2] Many different techniques have been described including the closed (Veress needle or direct trocar entry) and open (Hasson technique) methods. However, there is no consensus yet on an ideal technique that reduces the risk of failed interventions and potential complications.[3]

An optical trocar is a type of trocar, which allows for the visualization of the abdominal layers. The use of optical trocars may offer a safer method for abdominal entry compared to conventional methods. The recommendations for the use of optical trocars include the previous installation of pneumoperitoneum. However, the production of pneumoperitoneum is the challenging stage with potential effects on safety during the initial access into the abdominal cavity. This study aimed to evaluate the technique of using a bladeless optical trocar for abdominal entry to perform laparoscopy without pneumoperitoneum in morbidly obese patients and to evaluate the safety and feasibility of this technique.

Materials and Methods

This study was approved by the Clinical Research Ethics Committee of Health Sciences University Kocaeli Derince Training and Research Hospital. Informed consent was obtained from all patients included in the study. The study included 170 patients; who were operated consecutively for morbid obesity in the period from January 2015 to December 2017. The indications for surgery were determined based on the NIH consensus criteria.[4] All surgical procedures were performed by the same team of two surgeons (A.Y, M.C). The bariatric surgery technique (sleeve gastrectomy or Roux-en-y gastric bypass) was selected based on patients' preferences. The trocar insertion sites were the same in both procedures. The Veress needle insertion through the Palmer point was attempted in the first five patients. Abdominal access without producing pneumoperitoneum was achieved directly by using a bladeless 12-mm optical trocar (Kii; Applied Medical, North America) in all study patients, including the first five patients.

Demographic and clinical characteristics of the patients were retrieved by reviewing the electronic data archive retrospectively. The time from skin incision to insufflation and trocar insertion into the abdomen was calculated either prospectively or by using the previous recordings retrospectively.

Surgical Technique

The surgical procedures were performed when the patient was in the supine position under general anesthesia. A minimum of three Veress needle access attempts through the Palmer point was performed in the first five patients. However, these attempts were not successful in any of these patients. Regardless of the selected surgical procedure, a 1.5-cm skin incision 19 cm below the xiphoid process and 4 cm to the left from the midline was performed in all patients, including these first five patients (Fig. 1). A zero-degree optical camera and a 12-mm bladeless optical trocar (Fig. 2) were advanced subcutaneously. The anteri-

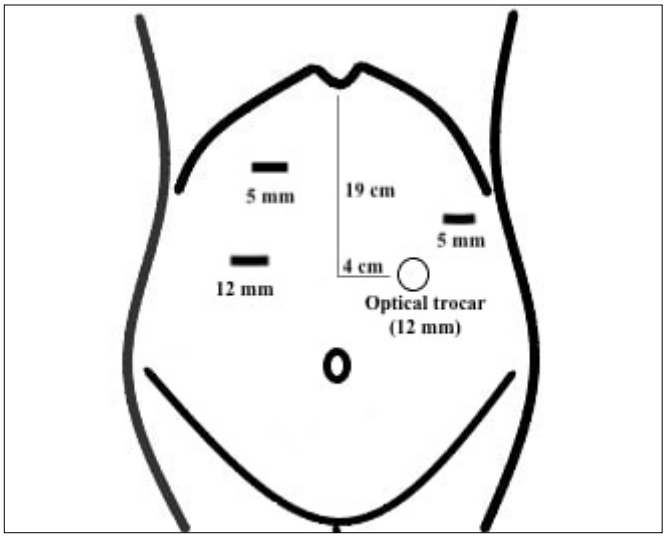

Figure 1. Placement of trocars.

Figure 2. Bladeless optical trocar.

or fascia of the rectus muscle, the rectus muscle, and the posterior fascia were passed through under direct vision by advancing the trocar with rotation motion (Figs. 3, 4). A minimal defect was created in the peritoneum (Fig. 5). The internal component of the optical trocar was removed. CO^2 was insufflated to produce pneumoperitoneum. Then, the inner part of the trocar was placed again, and the trocar was introduced into the abdomen under vision with a zero-degree camera. The time from skin incision to insufflation and the trocar insertion inside the abdomen was recorded. The angle of view was changed, and the intraabdominal exploration was performed by using a 30-degree optical camera. Any potential complications were noted. Under direct vision, other trocars were placed inside the abdomen based on their configurations. After completing the procedure, all inserted trocars were withdrawn under direct vision. Fascial defects at the trocar insertion sites were not closed in any of the patients. The operating time was recorded.

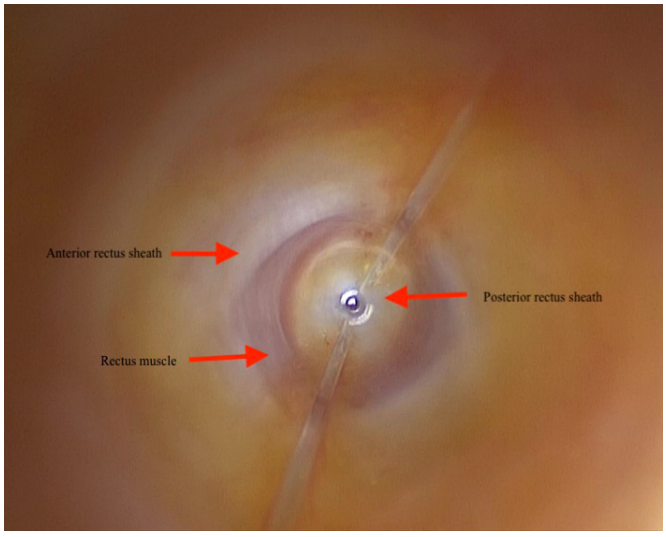

Figure 3. The view of rectus anterior sheath being crossed.

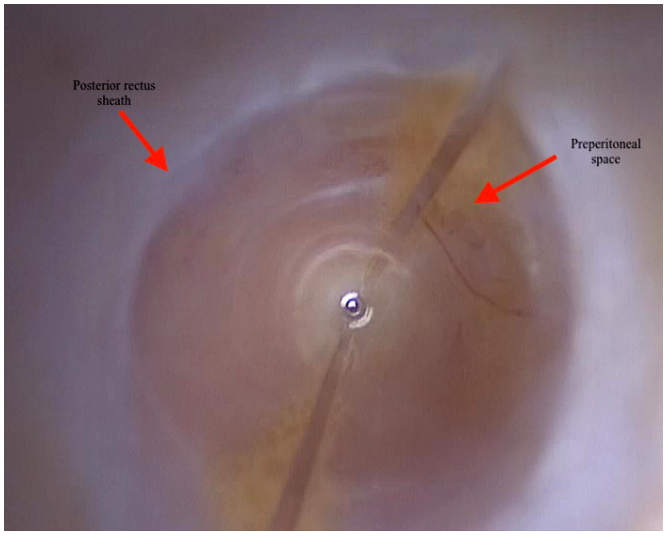

Figure 4. The view of passing the posterior rectus sheath and entering preperitoneal space.

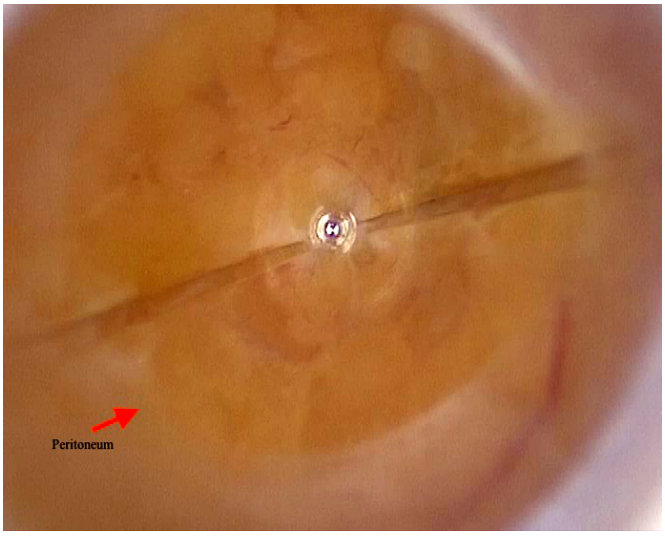

Figure 5. The view of creating a minimal defect in the peritoneum.

The patients were examined at follow-up visits in the outpatient clinic on day 15 and in the first, sixth, and the 12th months after the intervention. Then, the patients were followed up yearly.

Results

The mean age of the patients was 38.8±8.8 years. The mean BMI was 45.8±6.0 (range: 36.1- 61.9 kg/m^2). Of the study patients, 55.9% (95/170) had previous abdominal or gynecological surgery history. A Pfannenstiel incision scar was present in 68 patients, a McBurney's incision scar was present in 14 patients, a midline incision scar was present in 7 patients, and a right subcostal incision scar was present in 3 patients. The demographic and clinical characteristics of the patients are listed in Table 1. The Veress needle access failed in the first five patients. No complications were observed due to failed Veress needle access attempts. The abdominal entry was achieved by using an optical trocar in these patients, too. In all patients, abdominal access was accomplished at the first attempt. No major complications occurred in association with the use of the optical trocar. Only two (1.2%) patients developed omental laceration that was self-limiting and did not require additional procedures. After the skin incision, insufflation and trocar insertion were completed in a mean period of 58±35.3 (range; 23–272) seconds. The mean follow-up time was 24 months. Trocar-site hernias did not occur in any patients during the follow-up period (Table 2).

Table 1. Overview of Patient Characteristics

Patient Characteristics	Value
No. patient (n)	170
Mean age (years)	38.8±8.8
Sex (female/male)	142/28
Mean BMI (kg/m^2)	45.8±6.0
Previous abdominal and gynecological surgery (%)	95 (55.9)
Pfannenstiel incision	68
Mc Burney incision	14
Midline incision	7
Right subcostal incision	3
Laparoscopic bariatric procedure	3

BMI: Body mass index.

Table 2. Operative variables and trocar related complications

Operative variables and trocar related complications	Value
Procedure Type	
LSG	141
LRYGB	29
Mean trocar insertion time (second)	58±35.3 (range 23–272)
Mean operation time (minute)	76±19 (range 45-135)
LSG	
LRYGB	203±61.4 (range 100-345)
Complications	
Omental injury (%)	2 (1.2)

LSG: Laparoscopic sleeve gastrectomy; LRYGB: Laparoscopic roux-en y gastric bypass.

Discussion

The initial access to the peritoneal cavity during laparoscopic surgery is a critical stage, which acts on the success of the procedure. Some medical conditions like previous abdominal surgery or morbid obesity can make this stage more difficult and complicated.[4] In our study, in which the bladeless optical trocar was used by the surgical team for the first time in morbidly obese patients; access into the peritoneal cavity was achieved without any major complications and within an acceptable time frame.

Many different techniques have been described for performing the initial access. One of the most commonly used methods is the Veress needle technique.[5] The thick abdominal wall and the preperitoneal area may impair the success of the procedure when the Veress needle technique is used for the initial access.[4] Thus, some studies have reported that failed interventions can occur at rates of 14.5-25%.[6,7] The shortest distance from the skin to the peritoneal space is the periumbilical area. It has been reported that the insertion of the Veress needle at a 90-degree angle through the periumbilical area in obese patients can increase the success rate of the procedure.[8,9] However, this approach can increase the risk of injury. The reported rates of complications associated with the Veress needle range from 1-8.4%.[10,11] Regardless of the patient's BMI, the general approach in our clinic to produce pneumoperitoneum is to perform abdominal entry through the periumbilical region by using a Veress needle. However, we ended in preferring the use of other entry methods in morbidly obese patients because of several reasons including the caudal shift of the umbilicus in morbid obesity,[2] the inadequacy of the periumbilical area as a trocar insertion site for bariatric surgery, and the unsuccessful entry attempts through the alternative sites (Palmer point).

The open access technique (Hasson) and the direct trocar entry are the other most commonly performed methods for access to the abdominal cavity. A metaanalysis that compared the open technique with the closed techniques (Veress needle, direct trocar insertion) have reported lower rates of vascular injury with the open method.[12] However, some concerns have been raised in association with the use of the open technique in morbidly obese patients. It has been reported that the open technique requires a wide skin incision that may result in an intraoperative CO^2 leak and an increased risk of operation site injury, as well as requiring a longer time for abdominal entry.[4,13] The study by Altun et al.[14] has reported that the direct trocar insertion technique is a safe, fast, and effective method. However, the authors have added that they were experienced in using the direct trocar insertion technique. Contrary to the findings reported by that study; a randomized controlled study comparing the Veress needle technique with the direct trocar insertion by Ertugrul et al.[15] have reported that mesenteric vascular injury occurred in two patients with the direct trocar insertion and that the intervention was switched to open surgery in one of those pa-

tients. As a conclusion of that study, the authors reported that abdominal access by using the Veress needle can be a safer method.

Another randomized controlled study; which compared the use of Veress needle with the use of an optical trocar and which excluded obese patients, reported that no major injuries occurred with those techniques, but minor injuries occurred at higher rates in the Veress group (5.9% vs 2.1%).[6] There are no studies on morbidly obese patients available in the literature comparing the other techniques to the abdominal access by using an optical trocar. Studies on patients with morbid obesity are conducted as large-scale case series.[16–18] In two of those studies, no intestinal or vascular injuries were reported and the technique was considered a safe and effective method.[16,17] In another study, vascular injuries occurred in four (0.18%) patients and the intervention was switched to open surgery in three of those patients. The authors reported that all injuries were associated with insertions performed laterally to the midline and that the insertions performed on the midline were safer.[18] In our study, all entries were performed left laterally to the midline. Unlike that study, no vascular injuries occurred in the study patients. Insufflating the abdominal cavity with gas after creating a small defect in the peritoneum by using an optical trocar and inserting the trocar inside the abdomen later can reduce the risk of vascular injury.

After the skin incision, the gas insufflation into the abdomen and the trocar insertion were completed in a mean period of 58 seconds in our study. The respective time frame required for a direct trocar insertion was reported in the mean range from 33 to 79.6 seconds.[14,15] However, it has been reported that the respective procedure by using a Veress needle was completed in a mean of 217.6 seconds.[15] A review of those studies reveals that the use of an optic trocar offers a shorter time frame to achieve abdominal entry.

A bladeless optical trocar allows advancing by separating the muscle and tissue layers. Also, injuries and ruptures that may occur with the use of bladed trocars are avoided. This feature of bladeless trocars may eliminate the need for facial defect repair. This can be an important advantage, especially in morbidly obese patients with thick subcutaneous tissue. Rosenthal et al.[19] reported that the fascia was not closed, and trocar site hernia occurred in only 2 patients during the follow-up period out of 859 patients with morbid obesity, who underwent laparoscopy with the use of bladeless optical trocars. The authors emphasized that this approach might be more suitable for the use of trocar sites lateral to the midline. In our study, too, no hernias occurred at the bladeless optical trocar entry sites lateral to the midline in any patient; in whom facial defect repair was not performed.

The limitations of our study include the single-arm and retrospective design and the small sample size for the evaluation of trocar-associated complications.

In conclusion; laparoscopic abdominal entry by using bladeless optical trocars without producing pneumoperitoneum in patients with morbid obesity is a fast and safe method with high success rates.

Disclosures

Ethichs Committee Approval: The approval for this study was obtained by the Ethics Committee of Health Sciences University Kocaeli Derince Training and Research Hospital with the registration number 2020-22, 13/02/2020.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – M.C.; Design – M.C; Supervision – M.C.; Materials – M.C., A.Y.; Data collection and/or processing – M.C., A.Y.; Analysis and/ or interpretation – M.C.; Literature search – M.C.; Writing – M.C.; Critical review – A.Y.

References

1. Chapron CM, Pierre F, Lacroix S, Querleu D, Lansac J, Dubuisson JB. Major vascular injuries during gynecologic laparoscopy. J Am Coll Surg 1997;185:461–5. [CrossRef]
2. Ambardar S, Cabot J, Cekic V, Baxter K, Arnell TD, Forde KA, et al. Abdominal wall dimensions and umbilical position vary widely with BMI and should be taken into account when choosing port locations. Surg Endosc 2009;23:1995–2000.
3. Ahmad G, Baker J, Finnerty J, Phillips K, Watson A. Laparoscopic entry techniques. Cochrane Database Syst Rev 2019;18;1:CD006583. [CrossRef]
4. Curet MJ. Special problems in laparoscopic surgery. Previous abdominal surgery, obesity, and pregnancy. Surg Clin North Am 2000;80:1093–110. [CrossRef]
5. Ahmad G, O'Flynn H, Duffy JM, Phillips K, Watson A. Laparoscopic entry techniques. Cochrane Database Syst Rev 2012 15;CD006583. [CrossRef]
6. Marcovich R, Del Terzo MA, Wolf JS Jr. Comparison of transperitoneal laparoscopic access techniques: Optiview visualizing trocar and Veress needle. J Endourol 2000;14:175–9. [CrossRef]

7. Teoh B, Sen R, Abbott J. An evaluation of four tests used to ascertain Veres needle placement at closed laparoscopy. J Minim Invasive Gynecol 2005;12:153–8. [CrossRef]
8. Poindexter AN, Ritter M, Fahim A, Humphrey H. Trocar introduction performed during laparoscopy of the obese patient. Surg Gynecol Obstet 1987;165:57–9.
9. Vakili C, Knight R. A technique for needle insufflation in obese patients. Surg Laparosc Endosc 1993;3:489–91.
10. Hashizume M, Sugimachi K. Needle and trocar injury during laparoscopic surgery in Japan. Surg Endosc 1997;11:1198–201. [CrossRef]
11. Mayol J, Garcia-Aguilar J, Ortiz-Oshiro E, De-Diego Carmona JA, Fernandez-Represa JA. Risks of the minimal access approach for laparoscopic surgery: multivariate analysis of morbidity related to umbilical trocar insertion. World J Surg 1997;21:529–33. [CrossRef]
12. Larobina M, Nottle P. Complete evidence regarding major vascular injuries during laparoscopic access. Surg Laparosc Endosc Percutan Tech 2005;15:119–23. [CrossRef]
13. Hasson HM. Open laparoscopy as a method of access in laparoscopic surgery. Gynaecological Endoscopy 1999;8:353–62. [CrossRef]
14. Altun H, Banli O, Karakoyun R, Boyuk A, Okuducu M, Onur E, 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. [CrossRef]
15. Ertugrul I, Kayaalp C, Yagci MA, Sumer F, Karagul S, Tolan K. Comparison of Direct Trocar Entry and Veress Needle Entry in Laparoscopic Bariatric Surgery: Randomized Controlled Trial. J Laparoendosc Adv Surg Tech A 2015;25:875–9. [CrossRef]
16. Rabl C, Palazzo F, Aoki H, Campos GM. Initial laparoscopic access using an optical trocar without pneumoperitoneum is safe and effective in the morbidly obese. Surg Innov 2008;15:126–31. [CrossRef]
17. Madan AK, Taddeucci RJ, Harper JL, Tichansky DS. Initial trocar placement and abdominal insufflation in laparoscopic bariatric surgery. J Surg Res 2008;148:210–3. [CrossRef]
18. Sabeti N, Tarnoff M, Kim J, Shikora S. Primary midline peritoneal access with optical trocar is safe and effective in morbidly obese patients. Surg Obes Relat Dis 2009;5:610–4. [CrossRef]
19. Rosenthal RJ, Szomstein S, Kennedy CI, Zundel N. Direct visual insertion of primary trocar and avoidance of fascial closure with laparoscopic Roux-en-Y gastric bypass. Surg Endosc 2007;21:124–8. [CrossRef]