

Comparison of A Novel Open Fingertip Technique for Laparoscopic Entry with the Veress Needle

Laparoskopik Girişte Veress İğne Tekniği İle Açık Fingertip Tekniğinin Karşılaştırılması

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ABSTRACT

Objective: To compare our novel abdominal entry technique (i.e., the fingertip technique) with the Veress needle technique in laparoscopic urological surgery, in terms of feasibility and complications.

Material And Methods: A total of 90 patients who underwent laparoscopic transperitoneal surgery were assigned to either the Fingertip technique group (n = 45) or the Veress needle technique group (n = 45). The duration of time for initial entry, the occurrence of gas leakage, the number of attempts for successful entry into the abdomen, and the complications were evaluated.

Results: The two groups had comparable demographic characteristics. The laparoscopic entry time was shorter in the fingertip group than it was in the Veress needle group (175.7 ± 64.9 versus 103.8 ± 26.7 s; $p < 0.001$). Pneumoperitoneum was established at the first attempt in 35 (77.7%) of the Veress needle patients and in 45 (100%) patients in the fingertip method group. The overall complication rates were 4 (8.8%) in the Veress needle group and 3 (6.6%) in the fingertip group ($p = 0.693$). In the Veress needle group, minor complications included liver injury in one patient, intestinal injury in one patient, subcutaneous emphysema in one patient and omental injury or insufflation in one patient. In contrast, in the fingertip group, subcutaneous bleeding occurred in three patients.

Conclusion: The fingertip technique may be considered as a feasible option for laparoscopic entry with its lower complications rates and shorter applying time compared to the Veress needle technique.

Keywords: complication, fingertip technique, gas leakage, laparoscopic abdominal entry, veress needle technique

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ÖZET

Amaç: Laparoskopik ürolojik cerrahide yeni abdominal giriş tekniğimizi (fingertip tekniği) Veress iğnesi tekniği ile uygulanabilirlik ve komplikasyon açısından karşılaştırmayı planladık.

Gereç ve Yöntemler: Laparoskopik transperitoneal cerrahi planlanan 90 hasta, veress iğne tekniği (n = 45) ve fingertip tekniği (n = 45) olmak üzere üzere iki gruba ayrıldı. Batına giriş süresi, gaz kaçağı oluşumu, batına başarılı giriş deneme sayısı ve komplikasyonlar değerlendirildi.

Bulgular: İki grup benzer demografik özelliklere sahipti. Laparoskopik giriş süresi fingertip grubunda Veress iğnesi grubuna göre daha kısaydı ($175,7 \pm 64,9'$ a karşılık $103,8 \pm 26,7$ sn; $p < 0,001$). Veress iğnesi grubundaki hastaların 35' inde (%77,7), fingertip yöntemi grubunda ise 45 (%100) hastada ilk denemede pnömoperiton oluştu. Genel komplikasyon oranları Veress iğnesi grubunda 4 (%8,8) ve parmak ucu grubunda 3 (%6,6) idi ($p = 0,693$). Veress iğnesi grubunda minör komplikasyonlar; bir hastada karaciğer hasarı, bir hastada bağırsak yaralanması, bir hastada cilt altı amfizemi ve bir hastada omentum yaralanması veya insuflasyonu olarak raporlandı. Fingertip grubunda ise 3 hastada cilt altı kanama meydana geldi.

Sonuç: Fingertip tekniği, Veress iğnesi tekniğine göre daha düşük komplikasyon oranları ve daha kısa uygulama süresi ile laparoskopik giriş için uygun bir seçenek olarak değerlendirilebilir.

Anahtar Kelimeler: komplikasyon, fingertip tekniği, gaz kaçağı, laparoskopik abdominal giriş, veress iğne tekniği

INTRODUCTION

Laparoscopic surgery has many advantages, such as early convalescence, less blood loss, minimal incision, and magnified endoscopic vision. It has become the gold standard in many abdominal surgeries. To obtain a safe pneumoperitoneum is the first and most crucial step of laparoscopic surgery. Ideally, the initial abdominal entry should be safe, easy, fast, cost-effective, and feasible for all abdominal procedures, including in patients with previous abdominal surgery or morbid obesity.

The closed Veress needle and open Hasson techniques are the most commonly used abdominal entry techniques in laparoscopy. Although no differences have been shown between the techniques, open entry seems to be safer than the Veress needle technique because all the structures are passed under view during entry (1).

Because incisions larger than the trocar diameter require a special Hasson cannula or purse-string suture to prevent gas leakage during surgery in open-entry techniques, it can be technically challenging and time-consuming, particularly in obese patients. In contrast, many complications have been reported in the Veress needle technique, including major and minor vascular injuries and solid organ injury. Approximately 40% of laparoscopic complications occur during primary port placement, including the insertion of the Veress needle (2); the mortality rate has been reported as 4 to 8 deaths per 100,000 surgeries due to initial abdominal entry (3). While life-threatening complications are not usual, minor complications are not rare (4).

Although more than 25 different techniques have been described to achieve safe, easy, and feasible abdominal entry, there is no consensus on the ideal approach for initial abdominal entry (1,3,5-17). We described a novel abdominal entry technique; the fingertip technique, and evaluated it in terms of feasibility, previously (18). This technique allows easy and fast entry to be made in any place on the abdomen without any solid organ and vascular injury, in all patients even if they have undergone previous surgery or have obesity (18).

In this study, we aimed to compare the fingertip technique with the Veress needle technique in terms of feasibility and complications.

MATERIAL AND METHODS

This is a retrospective, single-center study that was performed in a referral center for laparoscopic urologic surgeries between January 2019 and January 2020. Ninety patients who underwent transperitoneal laparoscopic surgery as part of their routine medical care were enrolled in this study. A retrospective review of prospectively collected data

was performed. We designed the study in a single surgeon setting in which the same surgeon (AS) performed all the operations to avoid confounding factors. This study was approved by the Ethical Committee of Kartal. Dr. Lutfi Kirdar City Hospital (Desicion Number: 2025/010.99/20/33, Date: 2025-09-29). All steps of the study were planned and applied carefully, according to the Declaration of Helsinki.

Demographic characteristics including age, gender, body mass index (BMI), initial entry site, previous abdominal surgery, and type of performed surgery were recorded. The primary outcome of the study was the duration of time required for initial abdominal entry. Secondary outcomes included successful entry at first attempt, gas leakage and entry related complications.

Surgical techniques

The initial entry place was selected based on each patient's status and planned surgery. The initial port placement was decided on in the reference to the midclavicular line in upper urinary system surgeries. We planned to place an upper working channel into the inferior of the costal margin on the midclavicular line. Initially, a 10 mm camera port was placed 4 to 5 finger-widths inferior to the medial side of the upper working channel. In pelvic surgeries, we placed initial access 2 cm superior to the umbilicus.

Fingertip technique

Briefly, in the fingertip technique, the skin is marked with a 10 mm empty disposable trocar tip to prevent excessive incision. The skin is vertically incised at the boundaries of the marked area until the subcutaneous adipose tissue can be seen. Then, blunt dissection is done with the index finger down until the upper sheet of the abdominal fascia is felt. A 15 mm scalpel is placed on the inside of the index finger and held with the proximal part of the thumb. The tip of the scalpel should not exceed the tip of the finger. After that, the finger and the scalpel are held perpendicular to the fascia while applying mild pressure on the fascia. The finger and scalpel are bent 45 degrees cranially, without moving the tip of the finger or the scalpel. Due to the softness of the fingertip, the scalpel passes the fingertip by only a few millimeters and incises the fascia. Only mild pressure on the layer during the maneuver is needed to achieve a 3 to 4 mm incision. Then, the abdominal muscle is dissected bluntly with the index finger. Finally, the peritoneal layer is incised millimetrically again using the fingertip technique and enlarged bluntly with the index finger to enter the abdomen. Then, the abdominal wall is elevated bilaterally next to the incision, and a 10 mm trocar is inserted bluntly through the incision (18-20) (Figure 1 and 2).

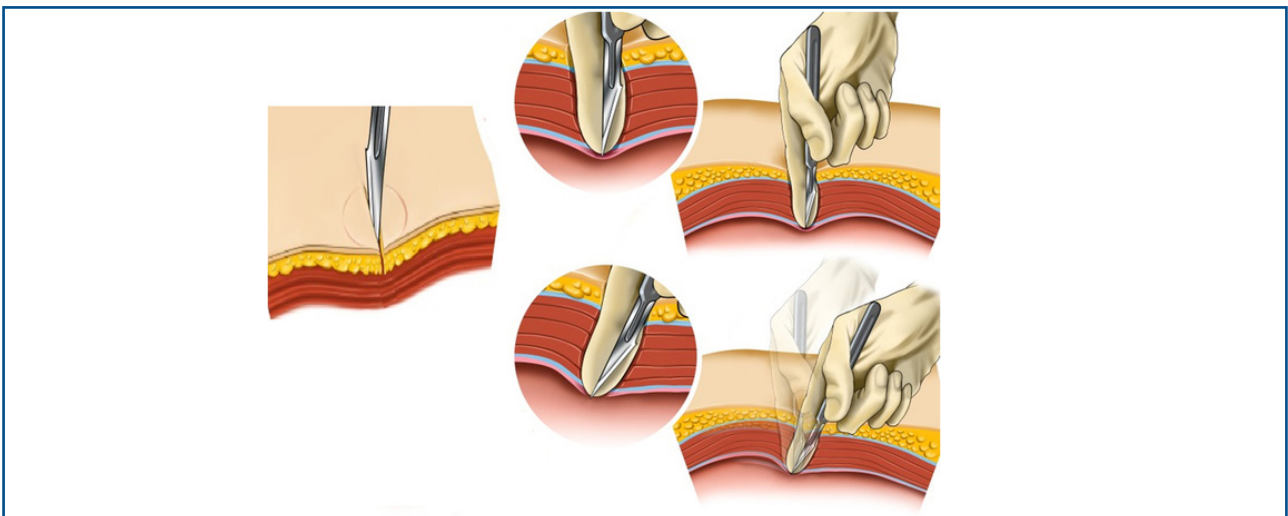


Figure 1. Illustration of the fingertip technique. The skin is marked with a 10 mm empty disposable trocar tip to prevent excessive incision. . A 15 mm scalpel is placed on the inside of the index finger and held with the proximal part of the thumb. The tip of the scalpel should not exceed the tip of the finger. The finger and the scalpel are held perpendicular to the fascia while applying mild pressure on the fascia. The finger and scalpel are bent 30 degrees medially, without moving the tip of the finger or the scalpel.

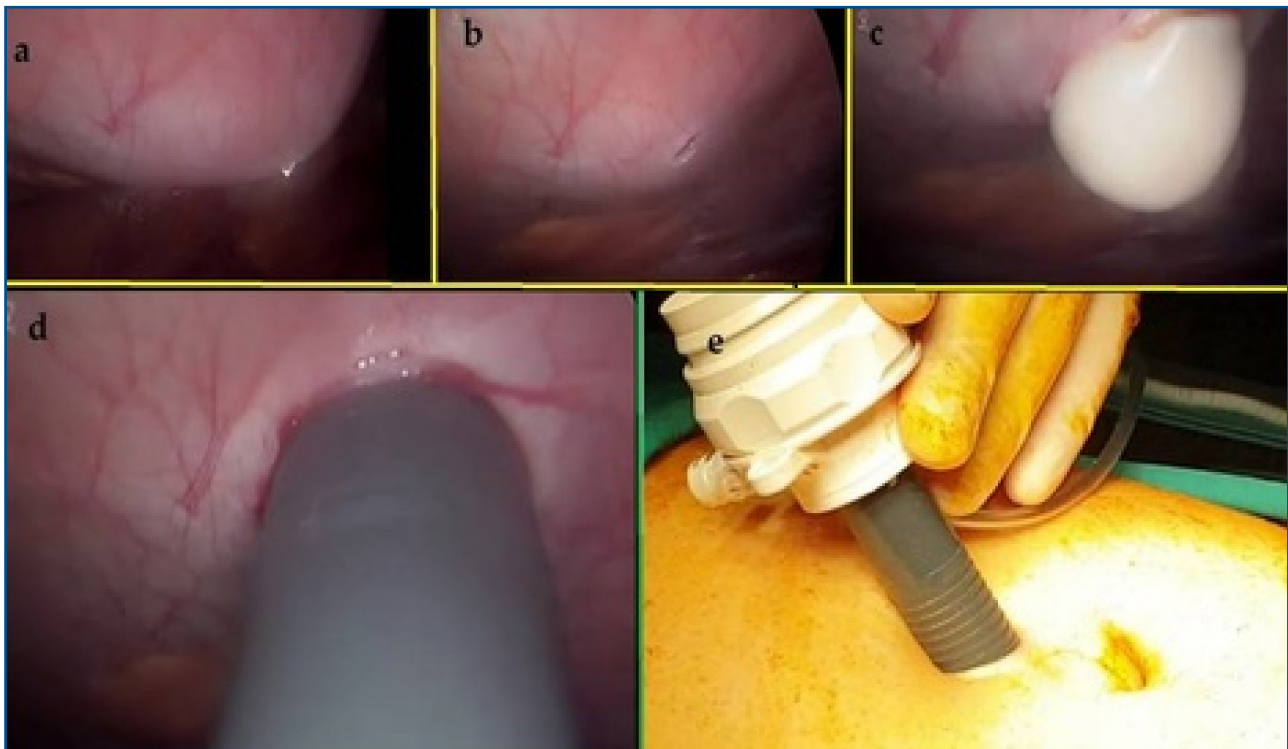


Figure 2. a) Image of the tip of the scalpel during peritoneal incision with fingertip technique b) Millimetric peritoneal incision, c) Insertion of the tip of the finger to the peritoneal cavity, d) Image of initial entry after trocar insertion intraperitoneally, e) skin is firmly cover the cannula

Veress Needle Technique

In the Veress needle technique, after deciding on the initial port placement, a 5 mm skin incision is done and the abdominal wall is elevated with towel clamps 2 cm from the incision. Then, the Veress needle is inserted through the incision with controllable pressure at 90 degrees to the abdominal wall, until it enters the peritoneal cavity. Appropriate entry is confirmed by hearing the double click sound of the Veress needle, using the saline drop test. The initial pressure is usually 4–5 mmHg; if the pressure increases slowly from this to 14 mmHg, pneumoperitoneum has been successfully established. After obtaining pneumoperitoneum, a 10 mm trocar is inserted and intra-abdominal organs are carefully inspected for possible injury.

We recorded the number of attempts to successful entry and the duration of time elapsed during initial entry (i.e., the first incision to entrance into the intra-abdomen with the camera safely). Gas leakage after entry and failed entry was also recorded. Additionally, complications, such as vascular injury (i.e., any injury to any intra-abdominal vessels), visceral injury (i.e., any serosal or deep injury to the small intestine or colon), solid organ injury (e.g., the liver or spleen), omental injury (i.e., bleeding or omental insufflation), and extraperitoneal insufflation were recorded. Failed entry was defined as the failure to obtain pneumoperitoneum after three Veress insufflation attempts. When failed entry occurred in the Veress needle group, we achieved pneumoperitoneum using the fingertip technique.

Statistical Analysis

SPSS version 20.0 (IBM Co., Armonk, NY) was used for statistical analysis. Descriptive analyses were presented using means and standard deviations. The chi-squared test or Fisher's exact test were applied to evaluate categorical data, and the two-tailed p-value was used in inference, with $p < 0.05$ accepted as significant. The variables were investigated using visual (i.e., histogram) and analytic (i.e., Kolmogorov–Smirnov) methods to determine normal distribution. The Student t test was used to compare normally distributed parameters (i.e., age, BMI, and duration of time during initial entry).

RESULTS

Overall, 90 patients were enrolled in the study; of which 45 patients undergone the Veress needle technique and 45 undergone the fingertip technique. Patients' characteristics in both groups were similar in age, gender, BMI, and presence of previous abdominal surgery ($p > 0.05$) (Table 1). The mean duration for initial abdominal entry was 175.7 ± 64.9 sec for the Veress group and 103.8 ± 26.7 sec for the fingertip group ($p = 0.001$). Successful entry at the first attempt was achieved in 35 (77.7%) patients of the Veress group and 45 (100%) of the fingertip group (Table 2). A failed entry due to subcutaneous emphysema was recorded in one patient in the Veress group, and fingertip technique was applied in this case. Gas leakage was observed in two (4.4%) patients of the Veress Group and four (8.8%) patients of the fingertip group ($p = 0.398$). This problem was resolved with switching from 10 mm to a 15mm trocar. There was no significant difference between the two groups regarding the type of operations performed ($p > 0.05$) (Table 2).

Table 1. Patient Demographics according to the groups.

	Veress needle (n:45)	Finger-tip (n:45)	p value
Age; years (mean \pm sd)	58.3 \pm 12.9	55.4 \pm 13.4	0.209
Gender (Male / Female)	16/29	13/32	0.499
Laterality; R/L/M	20/16/9	19/19/7	0.766
Body mass index; kg/m ² (mean \pm sd)	26.8 \pm 3.6	26.5 \pm 3.2	0.780
Presence of previous abdominal surgery;n	6 (13.3 %)	5 (11.1 %)	0.748

n: number; sd: standard deviation, R: Right, L: Left, M: Midline, Mann Whitney U test was used in comparing age and BMI. A Chi-square test was used to compare proportions in different groups.

Table 2. Comparison of perioperative parameters among the groups

		Veress needle (n:45)	Finger-tip (n:45)	p value
Duration of time during initial entry; seconds. (mean \pm sd)		175.7 \pm 64.9	103.8 \pm 26.7	0.001
Gas leakage		2 (4.4%)	4 (8.8%)	0.398
Number of attempt to succesful entry; n (%)	1	35 (77.7%)	45 (%100)	NA
	2	7 (13.3%)	0	
	3	2 (4.4%)	0	
	Failed	1 (2.2%)	0	
Performed Laparoscopic Surgery	Radical nephrectomy	11(24.2%)	10 (22.2%)	0.958
	Partial nephrectomy	10 (22.2%)	12 (26.7%)	
	Simple nephrectomy	10 (22.2%)	8 (16.6%)	
	Nephroureterectomy	2 (4.4%)	2 (4.4%)	
	Pyeloplasty	1 (2.2%)	2 (4.4%)	
	Uretero-Pyelolithotomy	2 (4.4%)	4 (8.8%)	
	Prostatectomy	6(13.3%)	5 (11.1%)	
	Cystoprostatectomy	3 (6.6%)	2 (4.4%)	

n: number; sd: standard deviation

Table 3. Complication of initial abdominal entry between the groups.

	Veress needle group (n:45)	Finger-tip group (n:45)
Mild liver injury; n%	1 (2.2)	0
Mild intestinal injury; n%	1 (2.2)	0
Omental injury or insufflation; n%	1 (2.2)	0
Subcutaneous emphysema; n%	1 (2.2)	0
Subcutaneous bleeding; n%	0	3 (6.6)
Total complication rate*; n%	4 (8.8)	3 (6.6)

*p value: 0.693, n: number

There were no cases of vascular injury or gas embolism in either group. In the Veress needle group, we recorded four complications that did not require any intervention. These cases included 1 (2.2%) case with liver injury, 1 (2.2%) case with intestinal injury, 1 (2.2%) case with omental insufflation, and 1 (2.2 %) case with subcutaneous emphysema. The patient who had mild liver injury did not need further intervention, whereas the intestinal injury was detected intraoperatively and only serosal tearing was observed in ascending colon. In the Fingertip group, we recorded three cases with subcutaneous bleeding that were controlled with cauterization. The overall complication rates were similar between the two groups ($p = 0.368$) (Table 3). All complications that occurred in both groups were classified as Grade 1 according to the Clavien-Dindo classification system.

DISCUSSION

Although laparoscopic surgery has become a well-established procedure in recent years, there is still controversy about the optimal method for entering the abdomen and creating the pneumoperitoneum. Complications are the most important concern related to initial entry. Mortality rates after closed and open laparoscopy entry methods are relatively low and have been reported as 0.003% and 0%, respectively (21). Open entry seems to be safer than closed entry, although no differences in the complications of the techniques have been shown (3). Because complications are seen rarely, statistically significant differences in complication rates have not been shown in previous studies using small sample size (3).

Although the Veress needle technique is one of the most commonly closed entry techniques, there is no reliable test to check the accurate placement of the Veress needle. Teoh et al. reported that the double click, aspiration, and hanging drop tests provide very little useful information about the placement of the Veress needle at initial entry; in their study, the initial gas pressure was the only valuable measure reflecting correct intraperitoneal Veress needle placement (22). The ultrasound-guided visual insertion of the Veress needle has been described in order to minimize entry-related complications (23). In the present study we have observed one case with mild liver injury, one case with intestinal injury, and one case with omental injury which did not require any surgical intervention in the Veress needle technique. Using the fingertip technique, we have not observed any complications during the initial entry. This can be explained by the method that the surgeon enters the peritoneal cavity with the tip of the finger bluntly after millimetrically incised peritoneal layer with fingertip technique. Also, the surgeon can check the peritoneal cavity with the finger to ensure that entering process is performed correctly. In addition, in patients with history of previous surgery the (fingertip technique can be applied in any localization) initial trocar can be inserted in any localization of the abdomen easily.

In a study published by Nasab et al, gas leakage was reported with the rate of 15% and 9.5% for open-entry and the Veress technique respectively (19). For open entry technique and direct trocar insertion technique the leakage rates were reported as 8.8% and 1% respectively by Kaistha et al. Although we haven't used additional suturing, our results are still comparable with previous studies which utilized suturing after trocar insertion (6,19,24). In our study, leakage that needs suturing around the standard 10 mm trocar was observed in only 4 (8.8%) patients in the fingertip

technique group and 2 (4.4%) patients in the Veress needle group. In these patients, we switched the 10 mm trocar with a 15 mm trocar instead of reducing the incision line with sutures. Gas leakage was observed in two patients with subcutaneous bleeding (two of four patients) in the fingertip group due to skin retraction during cauterization of the bleeding area. The other two patients with leakage were obese. Gas leakage was controlled either by changing the trocar with 15 mm size or suturing around the cannula. In these patients, the whole finger had to be inserted into the abdominal layer to reach the peritoneal cavity; however, the diameter of the proximal part of the finger is larger, and this causes the enlargement of the incision. It is notable that there is no need for extractors or assistance during entry when using the fingertip technique, in comparison to open entry techniques, which do require such measures. In our experience, the most important point to prevent gas leakage is to make the skin incision slightly smaller than the diameter of the trocar. Also, another tip to prevent gas leakage is to insert the only tip of the finger during the peritoneal layer blunt dissection. With these maneuvers, peritoneal layer was not open too large. Furthermore, using a cannula with a helical structure shaft can also decrease the gas leakage than straight shaft cannula.

The duration of the initial entry into the abdomen is another important issue. In a prospective study, the time required for entry was 375 s for open entry technique and 331 s for the Veress technique (19). In another study, the mean access time was reported as 180 s for the open-entry technique and 80 s for the direct trocar insertion technique (24).

In the current study, the duration of entry was shorter in the fingertip technique than the Veress needle technique. Also, for this matter, the results of the fingertip technique were better than open entry technique and direct trocar insertion technique (7,11,12,24-28). Our better results can be explained by some technical advantages that the fingertip technique has over the other methods. Open entry techniques require maneuvers such as traction of skin, suturing around the trocar which are time-consuming (7,11,12,24-27). Also, high flow modification Veress technique requires a longer time to fill the peritoneal cavity with CO₂ in order to achieve proper pressure compared to the fingertip technique. Unsuccessful attempts while performing the Veress needle technique also increase the duration of entry.

Moreover, failed attempts can also increase the procedure time. In the literature, successful entry was achieved in second or more than two attempts in 12% to 33% of cases when using various modified Veress needle techniques (9,29,30), and in 7.8% of cases when using the indirect trocar entry technique (30). It is well known that the complication rate increases with the number of entry attempts. Two or more attempts during Veress needle technique was associated with a significantly higher risk of preperitoneal insufflation (22). In our study, we achieved pneumoperitoneum in 77.7% of patients in the Veress needle group and in 100% of patients in the fingertip group by a single attempt; this ratio obtained in our Veress needle group is similar to ratios in previous studies. Concerning the fingertip technique, we safely achieved pneumoperitoneum in a short time in all patients, without the need for second attempts or different entry techniques. Furthermore, we were able to achieve pneumoperitoneum using the fingertip technique safely and easily in a patient for whom entry with the Veress needle technique had failed.

Habibi et al stated that obesity is the most challenging factor for a successful abdominal entry during laparoscopic surgery and it is irrespective of the used technique (14). Fingertip technique enables easily reach into the peritoneum to finger length, and the abdominal wall layers were passed with the fingertip bluntly. Unfortunately, in our experience, gas leakage is observed more frequently in obese patients because the diameter of the proximal of the finger is larger than that of the fingertip. In these cases, the problem may be resolved by initial entry being done in the lateral position (i.e., the working channel position) and by then inserting the camera port.

The Fingertip technique and Veress needle technique are different regarding several features. In addition to being a safe, easy, fast, and feasible method for any kind of laparoscopic surgery, it minimizes the possible complications, which also prevents time loss. Especially for surgeons just starting to learn, laparoscopic entry is challenging most of the time; as such, surgeons are always seeking a safe entry method.

There are, however, some flaws in this technique. First, if the surgeon has a large index finger, the initial incision will also be enlarged. In this situation, the little finger may be used as a guide. Second, although this technique helps

avoid major intra-abdominal vascular injury and solid organ injury, in cases of adhesion due to previous surgery, the technique does not allow for the accurate assessment of intra-abdominal adhesion, as in other techniques. This problem can be solved by entering the abdominal cavity using the fingertip technique in a location away from the previous incision line.

Limitations

This study has several limitations. First of all, our study was designed with a retrospective nature while the data were collected prospectively. Secondly, the study is based on data from a single tertiary center. This study uses a small sample size to show differences between the two groups according to major complications; A larger sample size would provide more reliable results. The fact that all procedures were performed by the same surgeon should be stated as another weakness. Furthermore, our results should be confirmed by a prospective, multi-institutional study. In addition, we could not assess long-term complications, such as port-site hernia and port-site infection.

CONCLUSION

The fingertip technique may be considered as an option for initial laparoscopic entry during any kind of laparoscopic abdominal surgery with its lower major and minor complications rates and shorter applying time compared to the Veress needle technique.

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Author contributions: Conceptualization and Methodology: AS, OO, ED ; Investigation; ED, UC, CC, ; Resources: AC ; Writing - Original Draft; AC,OO,CC,ED; Writing - Review & Editing; ED,UC,CC; Supervision: AS, OO.

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