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Assessment of direct trocar insertion in patients undergoing laparoscopic procedures

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Abstract

Background: The Veress needle technique is widely used for establishing pneumoperitoneum in laparoscopic surgery but is associated with complications. Direct trocar insertion is an alternative method, potentially avoiding these complications.

Aim of the study: This study evaluates the safety and feasibility of direct trocar insertion without prior pneumoperitoneum in laparoscopic procedures.

Methods: An observational study involving 103 patients was conducted from February 2020 to May 2021 at Al-Yarmouk Teaching Hospital and private hospitals in Baghdad, Iraq. The study included patients undergoing elective and emergency laparoscopic procedures for gallstones, acute appendicitis, and ovarian cysts. A 12-mm skin incision was made, and a disposable 12-mm trocar was directly inserted into the peritoneal cavity using a twisting motion. Pneumoperitoneum was then established. Patients were followed up for six months to monitor postoperative complications.

Results: Of the patients, 17 were male and 86 females, mostly aged 40-49 years. Gallstones were diagnosed in 88.4%, acute appendicitis in 8.7%, and ovarian cysts in 8.7%. Direct trocar insertion was feasible in 95.14% of cases. Surgery duration ranged from 30 to 120 minutes for gallstones and 35 to 55 minutes for appendicitis and ovarian cysts. The mean trocar insertion time was 1.6 ± 0.566 minutes, with males requiring significantly more time ($p=0.018$). Complications included omental injury (3 cases), bleeding (1 case), hematoma (2 cases), CO₂ leakage (2 cases), and infection (4 cases).

Conclusion: Direct trocar insertion without prior pneumoperitoneum is a rapid, safe, and efficient technique with a low complication rate, suitable for surgeons trained in laparoscopic cholecystectomy.

Keywords: Direct trocar insertion, verres needle, laparoscopic surgery, abdominal entry

Introduction

Laparoscopic surgery is a modern method of accessing the abdominal cavity, first performed by Jacobaeus of Sweden in 1910. It replaces a single large incision with several smaller ones, using optical visualization equipment that provides highly magnified images of surgical anatomy and pathology, enhancing precision and accuracy [1]. Despite the differences in access techniques, fundamental principles of good surgery such as gentle tissue handling, minimizing blood loss, and using tissue planes-remain crucial [2]. Over the past two decades, laparoscopic surgery has transformed surgical practices across specialties, with approximately 15 million procedures performed annually worldwide, 32% of which occur in the U.S. [3]. Laparoscopic surgery offers smaller scars, less postoperative pain, quicker recovery, and lower overall complication rates compared to laparotomy [4]. However, serious complications such as injuries to the bowel, bladder, and vascular structures can occur, with more than half of these complications arising during entry [5]. Establishing pneumoperitoneum and placing peritoneal ports are critical steps in laparoscopic surgery [6]. Various techniques and devices are available for safe entry, but there is no universal consensus on the optimal approach. Surgeons' preferences often depend on their training, geographic location, and clinical experience [7]. Among the most commonly used techniques are the classic closed technique (Veress needle) and the open classic technique (Hasson method) [8]. The Veress needle, developed by Dr. Veress in 1938, is widely used for its speed and simplicity. The needle pierces the abdominal wall, inflates the peritoneal cavity, and allows trocar insertion. Despite its safety features, incorrect insufflation and injuries to major vessels, such as the abdominal aorta and common iliac vessels, remain significant risks [9, 10]. The Hasson technique, introduced in 1971, avoids blind punctures by creating a small incision to directly enter the abdominal cavity.

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Benefits include reduced risks of bowel injury, gas embolism, and vascular injuries. However, the technique requires more time, poses challenges in obese patients, and can lead to difficulties in maintaining pneumoperitoneum [11, 12]. Dingfelder described direct trocar insertion (DTI) in 1978 as a faster alternative to the Veress needle. This technique involves one blind step instead of three, minimizing complications such as failed pneumoperitoneum and CO₂ embolism. Despite its advantages, DTI is less commonly performed due to the perceived risk of injury, as it is a blind procedure [13].

Aim of the study

This study tries to assess the safety and feasibility of direct trocar insertion without a pre-existing pneumoperitoneum in patients undergoing some types of laparoscopic procedures for Iraqi patients.

Methods

This observational study included 103 patients undergoing elective and emergency laparoscopic abdominal procedures using the direct trocar insertion technique. Conducted between February 2020 and May 2021 at Al-Yarmouk Teaching Hospital and private hospitals in Baghdad, Iraq, the study focused on patients with gallstones, acute appendicitis, and ovarian cysts. The research received approval from the Scientific Council of General Surgery/Arab Board for Health Specialization, and written consent was obtained from all participants. Patients were selected from outpatient clinics and emergency departments. Inclusion criteria encompassed both genders requiring laparoscopic abdominal surgery for the specified conditions.

Exclusion criteria included a history of abdominal surgery, ascites, chronic renal disease, umbilical or peri/para-umbilical hernia, infection, and pregnancy. Procedures were performed under general anesthesia with patients in a supine position. Following local anesthetic injection at the umbilical or supra-umbilical area, a 12-15 mm skin incision was made to introduce a 12-mm disposable trocar perpendicular to the fascia. The trocar was inserted using a twisting motion to enter the peritoneal cavity, followed by the removal of the sharp trocar and the establishment of pneumoperitoneum. The operative procedure or exploration was then carried out. Patients were followed up at 1 week, 1 month, 3 months, and 6 months postoperatively to monitor complications. Data were analyzed using SPSS version 26. Continuous variables were presented as mean, median, and standard deviation, while categorical data were expressed as frequencies and percentages. Fisher's exact test was used for categorical comparisons, and one-way ANOVA tested continuous variables among groups. Linear regression analysis and Pearson correlation evaluated relationships between continuous variables. A p-value <0.05 was considered statistically significant.

Results

103 patients who have been selected and undergone laparoscopic procedures for various etiologies. The general characteristics of the study groups are examined and illustrated in table 1. The mean age of patients was 42.32±7.62 years ranging between 20 and 57 years. In terms of body mass index (BMI) it was ranging between 21.77 and 35.19 kg/m² with a mean of 26.68±1.74 kg/m².

Table 1: General characteristic of the study group

	Mean	STD	Minimum	Maximum
Age (years)	42.32	7.62	20	57
BMI (Kg/m ²)	26.68	1.74	21.77	35.19

Regarding gender distribution and demographic data of the patients, 17 patients (16.5%) were male while 86 (83.5%) patients were female. Most of them (59 out of 103) aged between 40 to 49 years old with 64.7% of male and 55.8% of

females were within this age group as shown in table 2. Most of the patients (90.3%) had a BMI between 25.00 to 29.90 kg/m² with 88.2% of males and 90.7% of females categorized as obese patients.

Table 2: Demographic data of the study groups

Age (years)	Male	Female	Total
	Frequency (% within gender)		
30	2 (11.8%)	4 (4.7%)	6 (5.8%)
30-39	1 (5.9%)	25 (29.1%)	26 (25.2%)
40-49	11 (64.7%)	48 (55.8%)	59 (57.3%)
≥ 50	3 (17.6%)	9 (10.5%)	12 (11.7%)
BMI (kg/m²)			
Normal weight	0 (0.0%)	5 (5.8%)	5 (4.9%)
Obese	15 (88.2%)	78 (90.7%)	93 (90.3%)
Morbid Obese	2 (11.8%)	3 (3.5%)	5 (4.9%)
Total	17 (100%)	86 (100%)	103 (100%)

The patients underwent laparoscopic surgeries due to various etiologies. 85.4% of them had gallstones, 5.8% had acute appendicitis, and 8.7% had ovarian cyst. The surgery was elective in 94.2% of the total number of surgeries as illustrated in table 3.; 11.8% of male patients and 4.7% of female patients had an emergency surgery. In terms of the site of torcher entry; 87 patients (84.5%) had the trocar entered at the umbilicus while 16 patients (15.5%) at the supra umbilical site. Male patients had trocar entry in 82.4% and 17.6% at the umbilical and supra umbilical sites respectively while females had the trocar inserted in 84.5% and 15.5% at those sites respectively.

The duration of laparoscopic surgery varies with different types of etiologies. It ranged from 30 to 120 minutes in cases of gallstone while it was between 35 to 55 minutes in both cases of acute appendicitis and ovarian cyst as shown in table 4. The mean time for laparoscopic cholecystectomy was higher than laparoscopic appendicectomy or ovarian cystectomy as it was 45.57±13.464, 43.33±6.831, and 42.22±5.652 respectively. When examining the duration of first trocar insertion; its mean was 1.57, 1.67, and 1.89 for cholecystectomy, appendicectomy, and ovarian cystectomy and 1.71 minute as overall.

Table 3: Cause for laparoscopy and site of trocar insertion

Etiology	Male	Female	Total
	Frequency (% within gender)		
Gallstone	15 (88.2%)	73 (84.9%)	88 (85.4%)
Acute Appendicitis	2 (11.8%)	4 (4.7%)	6 (5.8%)
Ovarian Cyst	0 (0.0%)	9 (10.5%)	9 (8.7%)
Type of surgery			
Elective	15 (88.2%)	82 (95.3%)	97 (94.2%)
Emergency	2 (11.8%)	4 (4.7%)	6 (5.8%)
Site of trocar insertion			
Umbilical	14 (82.4%)	73 (84.5%)	87 (84.5%)
Supraumbilical	3 (17.6%)	13 (15.5%)	16 (15.5%)
Total	100%	100%	100%

Table 4: Duration of surgery and trocar insertion

Time (minute)		Gallstone	Acute Appendicitis	Ovarian cyst
Surgery Duration	Mean ± STD	45.57 ± 13.464	43.33 ± 6.831	42.22 ± 5.652
	Min/Max	30/120	35/55	35/55
Trocar Insertion Duration	Mean ± STD	1.57 ± 0.563	1.67 ± 0.563	1.89 ± 0.601
	Min/Max	1/3	1/2	1/3
Correlation	Correlation	0.515		
	p-value*	0.005**		

*Partial correlation used to estimate this value

** This value is controlled for age, BMI, etiology and site of trocar insertion

In terms of trocar insertion duration, it took longer time in males compared to females with a mean of 1.88±0.485 and 1.55±0.567 minutes in male and female respectively. This difference was statistically significant as the p-value was 0.018.

0.133.

Trocar insertion time and gender

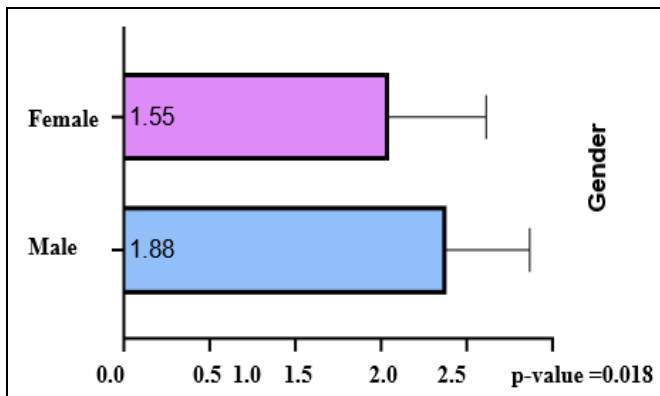


Fig 1: Trocar insertion duration and gender

Duration (Minutes)

The trocar insertion took longer time with increasing BMI but this correlation was statistically not significant with a p-value of

Table 5: Trocar insertion duration and BMI

BMI	Normal weight	Obese	Morbid Obese
	Mean ± STD		
Trocar Insertion Duration (minutes)	1.2 ± 0.447	1.59±0.536	2.2 ± 0.837
P-value	0.133		

The rates of complications associated with laparoscopy with direct trocar insertion are illustrated in table 6. In terms of intraoperative complications; there was mild omental injury in 3 cases that managed by cauterization, severe omental bleeding in only 1 case that converted to open laparotomy and managed by ligation, extra peritoneal Co2 leak in 2 cases, failure of trocar insertion in four cases (converted to Hasson method), and conversion to open laparotomy in 1 case Regarding late postoperative complications; we had 2 cases with subcutaneous hematoma and 4 cases complicated with trocar site infection that managed by antibiotics; 3 of them following cholecystectomy and 1 case following appendectomy. Our study showed that DTI was feasible in 98 case (95.14%) while 3.88% (4 patients) of cases converted to Hasson technique (due to difficulty after two trial of DTI). About 0.97% (1 patient) of cases converted to open laparotomy due to bleeding.

Table 6: Intra and postoperative complications

Surgery		Cholecystectomy	Appendectomy	Ovarian Cystectomy	Total (%)
		Frequency (%within each type of surgery)			
Intraoperative complications	Mild Omental injury	3 (3.4%)	0 (0%)	0 (0%)	3 (2.9%)
	Severe omental bleeding	1 (1.1%)	0 (0%)	0 (0%)	1 (0.9%)
	Extra peritoneal Co2 Leak	1 (1.1%)	0 (0%)	1 (11.1%)	2 (1.9%)
	Failure of trocar insertion	4 (4.5%)	0 (0%)	0 (0%)	4 (3.8%)
	Conversion to open laparotomy	1 (1.1%)	0 (0%)	0 (0%)	1 (0.9%)
Late complications	Trocar site Infection	3 (3.4%)	1 (1.1%)	0 (0%)	4 (3.8%)
	Subcutaneous Hematoma	2 (2.3%)	0 (0%)	0 (0%)	2 (1.9%)

Discussion

Laparoscopic abdominal surgery relies on successful

pneumoperitoneum, with more than half of entry-related complications occurring during this stage [5]. Direct trocar

insertion (DTI) offers an alternative with fewer blind steps compared to other techniques, but complications can still occur even with experienced surgeons and advanced equipment. Therefore, surgeons are advised to use techniques they are most familiar with [14, 15]. In our study, DTI was feasible in 95.14% of cases. Four cases (3.88%) converted to the Hasson technique, and one case (0.97%) required conversion to open laparotomy due to bleeding. Theodoropoulou *et al.* reported a higher feasibility rate of 99.5%, and Agresta *et al.* achieved 100% feasibility [16, 17]. Differences in success rates may stem from patient selection, pathology types, surgeon experience, and patient BMI. For example, Tariq *et al.* reported a failure rate of 2.5% but included patients with a lower mean BMI (24.49 kg/m²) compared to our study (26.68 kg/m²) [18]. Additionally, Theodoropoulou *et al.* and Agresta *et al.* involved diverse pathologies and multiple surgeons, unlike our study.

The mean time for trocar insertion in our study was 1.6±0.566 minutes, with durations varying slightly across procedures: 1.57 minutes for cholecystectomy, 1.67 minutes for appendectomy, and 1.89 minutes for ovarian cystectomy. These findings align with Chavez *et al.*, who reported a mean insertion time of 1.56±0.56 minutes [19]. Ghalib *et al.* noted a slightly longer mean duration of 1.79±2.39 minutes [20], while Ghulam AC *et al.* reported a significantly longer mean insertion time of 3.18 minutes [21]. Differences in patient BMI, anesthesia types, and surgical techniques may explain these variations. Our study also found that trocar insertion was more time-consuming in males (1.88±0.485 minutes) compared to females (1.55±0.567 minutes), likely due to greater muscle strength in males. This difference was statistically significant (p=0.018) and consistent with findings by Aldhahiry *et al.* [22].

Regarding complications, our study reported omental injury in 2.9% of cases, all during cholecystectomy. This rate is slightly higher than that reported by Inan *et al.* (0.7%) and Ghalib *et al.* (1.4%) but similar to Kaul *et al.* (2%) [23, 24]. Bleeding occurred in one case (0.9%), which is significantly lower than rates reported by Ghalib *et al.* (8.9%) and Kaul *et al.* (2%). Importantly, no cases of bowel or vascular injury were noted in our study.

Postoperative infection occurred in 3.8% of cases, higher than rates reported by Chavez *et al.* (2.4%) and Theodoropoulou *et al.* (1.5%). CO₂ leak was noted in 1.9% of cases, consistent with Abdullah *et al.* (1.33%) and Kaistha *et al.* (0.8%), though much lower than Ertugrul *et al.*, who reported 41.6% [25-27].

Overall, our study demonstrates that DTI is a safe and feasible technique with low complication rates, comparable to existing literature. Differences in findings across studies highlight the importance of patient selection, surgical expertise, and procedure-specific factors in determining outcomes.

Conclusion

Our results suggest that direct insertion of the first trocar without previous pneumoperitoneum is rapid than other techniques, also its nearly safe and efficient alternative procedure. It can be learned by surgeons previously trained in laparoscopic cholecystectomy and resulting in a probable low incidence of complications

References

- Garry R. Laparoscopic surgery. *Best Pract Res Clin Obstet Gynaecol.* 2006;20:89-104.
- Ahmad G, Duffy JMN, Watson AJS. Laparoscopic entry techniques and complications. *Int J Gynecol Obstet.* 2007;99:52-5.

- Wali AM, Osaghae S. Practice, training and safety of laparoscopic surgery in low and middle-income countries. *World J Gastrointest Surg.* 2017;9(1):13.
- Compeau C, McLeod NT, Ternamian A. Laparoscopic entry: A review of Canadian general surgical practice. *Can J Surg.* 2011;54:315-20.
- Nishimura M, Matsumoto S, Ohara Y, Minowa K, Tsunematsu R, Takimoto K, *et al.* Complications related to the initial trocar insertion of 3 different techniques: A systematic review and meta-analysis. *J Minim Invasive Gynecol.* 2019;26(1):63-70.
- Gemici K, Tanrikulu Y, Buldu İ, Alptekin H, Ay S, Yildiz M, *et al.* A novel safe laparoscopic entry technique in obese patients: an umbilical elevation technique. *Int J Clin Exp Med.* 2016;9:8411-8415.
- Toro A, Mannino M, Cappello G, Stefano DA, Carlo DI. Comparison of two entry methods for laparoscopic port entry: Technical point of view. *Diagn Ther Endosc.* 2012;2012:1-7.
- Taye MK. Open versus closed laparoscopy: Yet an unresolved controversy. *J Clin Diagn Res.* 2016;10:8-11.
- Ahmad R, Singh PAP. Study on entry complications of laparoscopic surgery. *IOSR J Dent Med Sci.* 2019;18:17-20.
- Ranzcog. Use of the Veress needle to obtain pneumoperitoneum prior to laparoscopy. 2020;1:1-9.
- Chapelle LCF, Bemelman WA, Rademaker BMP, van Barneveld TA, Jansen FW. A multidisciplinary evidence-based guideline for minimally invasive surgery. *Gynecol Surg.* 2012;9:271-82.
- Ahmad G, Baker J, Finnerty J, Phillips K, Watson A, Ahmad G, *et al.* Laparoscopic entry techniques (Review). *Cochrane Libr.* 2019;1:111-134.
- Ahmad A. Primary access in laparoscopic entry techniques: An update. *Pan Asian J Obs Gyn.* 2018;2:84-88.
- Toro A, Mannino M, Cappello G, Stefano DA, Carlo DI. Comparison of two entry methods for laparoscopic port entry: Technical point of view. *Diagn Ther Endosc.* 2012;2012:1-7.
- Ulusoy S. Direct trocar entry for laparoscopy: Safety and efficiency. *Laparosc Endosc Surg Sci.* 2018;3:1-5.
- Theodoropoulou K, Lethaby DR, Bradpiece HA, Lo TL, Parihar A. Direct trocar insertion technique: An alternative for creation of pneumoperitoneum. *J Soc Laparoendosc Surg.* 2008;12:156-158.
- Agresta F, Mazarolo G, Bedin N. Direct trocar insertion for laparoscopy. *J Soc Laparoendosc Surg.* 2012;16:255-259.
- Tariq M, Ahmed R, Rehman S, Sajjad M. Comparison of direct trocar insertion with other techniques for laparoscopy. *J Coll Physicians Surg Pakistan.* 2016;26:917-919.
- Chávez PDE, Chávez MJL, Ojeda GA, Prado AR, Hernández TB, Vásquez C. Direct trocar insertion without pneumoperitoneum and the Veress needle in laparoscopic cholecystectomy: A comparative study. *Acta Chir Belg.* 2006;106:541-544.
- Ghalib I. Direct trocar insertion without prior pneumoperitoneum. *J Arab Board Health Spec.* 2016;14:1-7.
- Ghanna G, Sidiqui A, Zafar S. Open versus closed method of establishing pneumoperitoneum for laparoscopic cholecystectomy. *J Coll Physicians Surg Pakistan.* 2010;19:557-60.
- AL-Dhahiry J. Laparoscopic entry using direct first trocar insertion without a prior pneumoperitoneum: A prospective

- cohort study. *World J Laparosc Surg.* 2020;13:108-112.
23. Inan A, Şen M, Dener C, Bozer M. Comparison of direct trocar and Veress needle insertion in the performance of pneumoperitoneum in laparoscopic cholecystectomy. *Acta Chir Belg.* 2005;105:515-518.
 24. Kaul R, Sharma G, Azad TP, Bhat S, Kumar B, Prashar N, *et al.* A randomized comparative study between direct trocar insertion versus Veress needle technique for creating pneumoperitoneum in laparoscopic cholecystectomy. *Int J Res Med.* 2016;5:16-21.
 25. Abdullah A, Abdulmageed M, Katoof F. The efficacy of direct trocar versus Veress needle method as a primary access technique in laparoscopic cholecystectomy. *Mustansiriya Med J.* 2019;18:47.
 26. Kaistha S, Kumar A, Gangavatiker R, Br S, Sisodiya N. Laparoscopic access: Direct trocar insertion versus open technique. *J Laparoendosc Adv Surg Tech.* 2019;29:489-94.
 27. Ertuğrul İ. A randomized controlled trial comparing laparoscopic access with the DTI and VNI. *South Clin Istanbul Eurasia.* 2019;30:135-139.

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