

DIRECT TROCAR INSERTION IN GYNECOLOGICAL LAPAROSCOPY; A CASE SERIES OF 300 CASES

By

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ABSTRACT

Background: Laparoscopy is a diagnostic and surgical procedure used in all surgical disciplines.

The rationale for DTI, without prior pneumoperitoneum, is based on the difficulty of grasping and lifting the abdomen after it is distended with gas and the fact that the VN accounts for many complications. It was noted that complications of laparoscopic surgery are mostly entry-related and independent of the complexity of surgery. DTI without pneumoperitoneum was reported to be associated with minimal complications and preferred by some laparoscopic surgeons.

Objective: The study aimed to evaluate the patients who will undergo a DTI for laparoscopy, focusing attention on feasibility, safety, benefits and risks of DTI. We also want to discuss some technical aspects, such as the site of the trocar insertion.

Patients and Methods: A prospective cohort study had been carried out in El-Galaa Teaching Hospital during the period between August 2015 and December 2019. Three hundred gynecological patients admitted for either scheduled or emergency laparoscopy. The following methods were done: Direct trocar insertion during laparoscopy had been the standard entry for all selected cases without prior pneumoperitoneum. The entry had been performed at the umbilical level.

Results: successful pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI, parity. Mean time to induce pneumoperitoneum was 100.6 ± 19.27 seconds in all patients. 10 patients had a minor omental injury as there was 10 (3.3%) omental adhesions to anterior abdominal wall due to previous surgery. These injuries were very small and managed by laparoscopy.

Conclusion: DTI is a very safe and reliable technique for creation of pneumoperitoneum, and should be used routinely instead of closed Veress needle technique.

Keywords: Direct Trocar Insertion, Gynecological Laparoscopy complications.

INTRODUCTION

Laparoscopy is a diagnostic and surgical procedure used in all surgical disciplines. As a minimally invasive procedure, it has many advantages for patients, health care systems, and society,

in the last decade, an increasing number of gynecologists can perform basic and advanced endoscopic procedures (*Pascual-Pedren˜o et al., 2013*). For benign gynecological surgery, laparoscopy has a risk of minor

complications which is 40% less than that of laparotomy, although the risks of major complications are similar (*Chapron et al., 2011*).

Access to the abdomen is the main challenge of laparoscopic surgery. To minimize entry-related injuries like, subcutaneous emphysema, gastrointestinal tract perforation, and minor and major vascular injury for creation of pneumoperitoneum. Several techniques, instruments, and approaches have been introduced. Despite widespread awareness of laparoscopic entry guidelines, considerable variation in the techniques was adopted in clinical practice (Varma and Gupta, 2013). The existence of numerous techniques for creation of pneumoperitoneum in laparoscopy indicates that none has been proven totally efficacious or complication free. These methods include the standard technique of insufflations by insertion of the Veress needle (VN), open laparoscopy, optical trocar, and direct trocar insertion (DTI) without prior pneumoperitoneum (*McKernan and Finley, 2012*).

Although DTI was first reported by Dingfelder in 1978, yet it is probably the least-used entry technique, and it is mainly used by gynecologists (*Zakherah, 2010*). The rationale for DTI, without prior pneumoperitoneum, is based on the difficulty of grasping and lifting the abdomen after it is distended with gas and the fact that the VN accounts for many complications (*Jacobson et al., 2012*). It was noted that complications of laparoscopic surgery are mostly entry-related and independent of the complexity of surgery. Several studies suggest that the initial trocar insertion is the most

dangerous aspect of trocar use, and possibly the most dangerous step in minimally invasive surgery. Failure to achieve and maintain pneumoperitoneum may predispose to complications. Establishment of pneumoperitoneum with the VN may be associated with a recognized incidence of complications such as preperitoneal insufflation which makes the procedure more difficult and time-consuming (*Jacobson et al., 2012*).

DTI without pneumoperitoneum was reported to be associated with minimal complications and preferred by some laparoscopic surgeons (*Gunenc et al., 2011*). DTI may be safer than VN entry in accessing the abdominal cavity at laparoscopy as it reduces the risk of gas embolism by insufflating only after intraperitoneal replacement has been confirmed and allows immediate recognition and rapid treatment of major blood vessel laceration which is crucial in reducing laparoscopy-associated mortality (*Vilos et al., 2013*).

The study aimed to evaluate the patients who will undergo a DTI for laparoscopy, focusing attention on feasibility, safety, benefits and risks of DTI. We also want to discuss some technical aspects, such as the site of the trocar insertion.

PATIENTS AND METHODS

A prospective study, the present study had been carried out in El-Galaa Teaching Hospital. During the period between August 2015 and December 2019. Three hundred gynecological patients admitted for either scheduled or emergency laparoscopy.

Inclusion criteria: Direct trocar insertion during laparoscopy had been the standard entry for all selected cases without prior pneumoperitoneum. The entry had been performed at the umbilical level.

Exclusion criteria: Massive bowel distension. Previous midline laparotomies: for fear of adhesive bands.

Methods:

Patients had been subjected to:

Full history taking:

- Personal history including: Name, Age, marital state, address.
- Present history: of chronic diseases and medication.
- Past history of HTN, DM.
- Family history of similar condition.
- History of allergy to any medication.
- Surgical history of operation.
- Obstetric history.
- Menstrual history including LMP.

Examination:

A. General examination: Evaluation of vital signs. Measurement weight, height (BMI): Obesity and thin build will not be considered contraindications to DTI.

B. Clinical examination and ultrasound examination: All patients had been subjected to full clinical examination and ultrasound examination for any abdominal or pelvic masses.

Study intervention:

After a good anaesthetic relaxation of the patient's abdominal wall before the

insertion, a transverse or vertical umbilical incision of 1–1.5cm with the scalpel was made to easily accommodate the first trocar.

The trocar was inserted until it came into contact with the muscular fascia at an angle of 90°. Subsequently, the abdominal wall was elevated, caudal to the umbilical scar, creating a tent between the parietal peritoneum and the intracavitary structures.

The trocar was gently inserted into the abdominal cavity at an angle of 45° towards the pelvis, until the click of the security system was perceived. This indicates the retraction of the blade secondary to the pressure change produced by its entry. There was hissing sound of air gushing in peritoneal cavity was heard and as air entered the cavity all content fall from the abdominal wall.

Then sharp trocar was removed and laparoscope with a light inserted to confirm, correct, safe placement and confirmed any injury.

Protocol Approval by Ethical Committee:

Before the beginning of the study and in accordance with the local regulation followed, the protocol and all corresponding documents were declared for Ethical and Research approval by Al-Azhar Medical Institutional Review Board (IRB).

Ethical consideration:

Study protocol had been submitted for approval by Al-Azhar Medical research ethics committee. Approval of the managers of the hospital in which the study had been conducted. Patients only

had been chosen from vulnerable population. All should have already undergone operative intervention and informed written consent had been obtained from each participant sharing in this study. Personal privacy had been respected in all levels of this study. Collected data had not been used for any other purpose.

Statistical Analysis:

Data entry, processing and statistical analysis was carried out using MedCalc ver. (MedCalc, Ostend, Belgium). Tests of significance (Kruskal-Wallis, Wilcoxon's, Chi square, logistic regression analysis, and Spearman's correlation) were used.

Data were presented and suitable analysis was done according to the type of data (parametric and non-parametric) obtained for each variable. P-values less than 0.05 (5%) were considered to be statistically significant. Descriptive statistics: Mean, Standard deviation (\pm SD) and range for parametric numerical data, while Median and Inter-quartile range (IQR) for non-parametric numerical data. Frequency and percentage of non-numerical data. Analytical statistics: Kruskal-Wallis test was used to assess the statistical significance of the difference of a non-parametric variable between more than two study groups.

RESULTS

This table showed that mean of age and BMI found to be 32 ± 1.9 and 28.04 ± 3.68 respectively (**Table 1**).

In this table most of patients were paraous two (40%), three or more (23.3%), one (26.7%) and nullipara (10%) (**Table 1**).

In this table elective operations were 66.67% and emergency operations were 33.33% (**Table 1**).

In this table most of patients had no previous surgeries (51%). A total of 147 (49%) patients had previous one or more surgeries. one (16.7%), two (18%) and three or more (14.3%) (**Table 1**).

In this study, hysterectomy done for 1.8% of patients, Myomectomy done for 8.3%, 33.3% patients were for

laparoscopic ectopic pregnancy, 26.7% patients were for ovarian cystectomy, 13.3% Laparoscopic endometriosis, 13.3% patients were for Laparoscopic pelvic adhesolysis, and 3.3% patients were for Laparoscopic Tubal ligation (**Table 1**).

In this study successful pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI, parity. Mean time to induce pneumoperitoneum was 100.6 ± 19.27 seconds in all patients. 10 patients had a minor omental injury as there were 10 (3.3%) omental adhesions to anterior abdominal wall due to previous surgery. These injuries were very small and managed by laparoscopy (**Table 1**).

Table (1): The baseline demographic characteristics, parity, classification of type of operations, previous surgery and type of laparoscopic surgery and complications among of the included patients

Variables	Patients (N =300)	
	No	%
Age in years		
- Mean \pm SD	32 \pm 1.9	
- Median (IQR)	40 (26 – 44)	
BMI		
- Mean \pm SD	28.04 \pm 3.68	
- Median (IQR)	28 (21 – 35)	
Parity:		
Nullipara	30	10
One	80	26.7
Two	120	40
Three or more	70	23.3
Classification of type of operations:		
Elective	200	66.67
Emergency	100	33.33
Previous Surgery		
Zero	153	51
One	50	16.7
Two	54	18
Three or more	43	14.3
Type of Laparoscopic Surgery		
Laparoscopic salpingectomy	10	3.3
Pelvic adhesolysis	40	13.3
Endometriosis	40	13.3
Ovarian cystectomy	80	26.7
Ectopic pregnancy	100	33.3
Myomectomy	25	8.3
Hysterectomy	5	1.8
Complications:		
Abdominal wall hemorrhage	0	0
Extra peritoneal insufflations	0	0
Omental injury	10	3.3
Major vessel injury	0	0
Intestinal injury	0	0
Solid organ injury (uterus)	0	0
Need for laparotomy	0	0
Time to induce pneumoperitoneum (Second)	100.6 \pm 19.27	

SD: standard deviation; IQR: Interquartile range

This table showed that mean of VAS in 2, 4, 6 hour postoperative found to be 2.44, 1.89 and 1.27 respectively (**Table 2**).

Table (2): VAS (Visual Analogue Scale) score for pain of the studied patients postoperatively

Postoperative time	Patients (N =300)
2hr Mean \pm SD	2.44 \pm 0.832
4hr Mean \pm SD	1.89 \pm 0.746
6hr Mean \pm SD	1.27 \pm 0.550

This table showed that mean of preoperative hemoglobin was 10.48 g/dL while postoperative hemoglobin was 9.95

g/dL and Blood loss within 24 hours was 306 cc (**Table 3**).

Table (3): Blood loss and hemoglobin in studied patients

	Patients (N =300)
Preoperative hemoglobin (g/dL) mean \pm SD	10.48 \pm 0.95
Postoperative hemoglobin (g/dL) mean \pm SD	9.95 \pm 1.02
Blood loss within 24 hr (cc) mean \pm SD	306 \pm 115.72

DISCUSSION

Regarding baseline demographic characteristics of the included patients, the mean age of the included patients was 32 \pm 1.9 years old with range (26-44) years old. The mean BMI of patients was (28.04 \pm 3.68) kg/m².

Regarding Parity of the included patients, most of patients were paraous two (40%), three or more (23.3%), one (26.7%) and nullipara (10%).

In our study, elective operations were 66.67% and emergency operations were 33.33%.

Regarding Previous Surgery, most of patients had no previous surgeries (51%). A total of 147 (49%) patients had previous one or more surgeries. one (16.7%), two (18%) and three or more (14.3%).

In patients with high parity, abdominal wall was lax, so it was easier to insert trocar. In nulliparous patients it was sometime difficult to lift the abdomen as tone of muscle is high. In this case towel

clip on both sides of the umbilicus is helpful (*Pascual-Pedren˜o A et al., 2013*).

In our study, pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI, parity. These results was consistent with *Shatta and Girbash (2020)*, who made their study on 300 gynecological patients admitted for either scheduled or emergency laparoscopy to evaluate Direct Trocar Insertion without Previous Pneumoperitoneum in Laparoscopic Gynecological Surgery. They concluded that previous surgery, BMI, parity had no negative effect on the successful entry. Successful pneumoperitoneum was achieved in 100% Of patients.

In contrast to our results, *Tariq et al. (2016)*, reported that, Increase in BMI had a relation with number of unsuccessful attempts of DTI, so obesity was the main reason of failure of DTI.

Our study came also in agreement with results of *Godara et al. (2015)*, they found that the mean time taken in 100 patients with direct trocar entry was 1 min (42 sec-

3 min. 04 sec) and concluded that DTI is fast and reliable alternative to traditional technique of primary port placement with no negative impact of parity or BMI.

The antecedents of a previous laparotomy are considered to be an important risk factor for complications associated to the adhesions they produce (*Ertugrul et al., 2015*), surprisingly in our study entry was achieved successfully in patients who had previous surgeries. However, *Brill et al. (2010)* studied 360 patients undergoing laparoscopic surgery after a previous laparotomy. Of the 102 patients with a midline laparotomy, 58 had adhesions; while 70 out of the 258 patients with a history of Pfannenstiel incision, presented with adhesions. In addition, 28% (21 patients) suffered injuries in hollow viscera and/or omentum during the entrance.

In a wider scope related to our study, *Pantoja-Garrido et al. (2019)* made a comparative study on direct trocar insertion without previous pneumoperitoneum versus insertion after insufflation with Veress needle in laparoscopic gynecological surgery. They concluded that, DTI can be a safe alternative for access to abdominal cavity in gynaecological surgery, compared to the traditional versus technique.

Use of the direct trocar entry technique has been mainly reported in virginal abdomens and non-obese individuals; however *Altun et al. (2010)* described the direct abdominal entry in 155 morbidly obese patients as a safe and quick approach for laparoscopic bariatric surgery. Direct trocar insertion is the fastest abdominal entry technique. Upon muscular relaxation, bladder drainage and

an intra-umbilical skin incision, the anterior abdominal wall is elevated by two towel clips or manually, and a sharp trocar/cannula is directly introduced aiming towards the hollow of the pelvis (*Sabeti et al., 2013*).

The indications for laparoscopy are the same in pregnant and non-pregnant women. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) guideline on laparoscopy in pregnancy suggest that laparoscopic interventions can be safely performed in any trimester of pregnancy (*Pearl et al., 2011*).

Laparoscopic surgery has evolved over the years from being a simple diagnostic aid to evaluate acute and chronic pelvic pain, assessment of amenorrhea and for fertility work-up, to being a major surgical tool used to treat a multitude of gynecological problems ranging from treatment of ectopic pregnancy, dealing with lower abdominal masses, performing hysterectomies for menstrual disorders, staging and treatment of gynecological cancers (*Brummer et al., 2012*).

The reported overall complication rates range from 0.2 % to 10.3%⁶. Major complications of laparoscopy include trauma to bowel, bladder, major blood vessels and anaesthesia related risks due to increased intra- abdominal pressure, such as aspiration and difficulty in ventilating the patient. Minor risks include surgical site infection and port site hernia (*Efetié et al., 2013*).

Improved anesthesia and cardiovascular monitoring, together with advanced laparoscopic surgical skills and experience, justifies operative laparoscopy for surgical treatment of ectopic

pregnancy (EP) even in women with hemodynamic instability, laparoscopic treatment (salpingostomy or salpingectomy) of EPs offers major benefits superior to laparotomy in terms of less blood loss, less need for blood transfusion, less need for postoperative analgesia and a shorter duration of hospital stay (*Tariq, 2013*).

Laparoscopic hysterectomy is associated with reduced blood loss, shorter hospital stays, earlier return to normal activities, and fewer infections. Its major advantage over vaginal hysterectomy is the possibility to simultaneously treat comorbidities, such as endometriosis or adhesions. Laparoscopic supracervical/subtotal hysterectomy is a useful alternative. Its advantages and disadvantages need to be discussed with the patient; the final decision is made jointly by the doctor and the patient (*Alkatout, 2018*).

In our study, regarding type of Laparoscopic Surgery of the included patients, hysterectomy done for 1.8% of patients, Myomectomy done for 8.3%, 33.3% patients were for laparoscopic ectopic pregnancy, 26.7% patients were for ovarian cystectomy, 13.3% Laparoscopic endometriosis, 13.3% patients were for Laparoscopic pelvic adhesiolysis, and 3.3% patients were for Laparoscopic Tubal ligation.

In the study of *Shatta and Girbash (2020)*, they concluded that, regarding indications of 40% of patients were for laparoscopic ectopic pregnancy, 20% patients were for ovarian cystectomy, 20% Laparoscopic endometriosis, 10% patients were for Laparoscopic pelvic adhesiolysis,

and 10% patients were for Laparoscopic Tubal ligation.

In the study of *Begum (2015)*, the most common cause for diagnostic laparoscopy in the study was fertility deprivation. Primary fertility deprivation in 29 (60.4%) patients was more than double of secondary fertility deprivation, seen in 13 (27.1%). Cases investigated for primary amenorrhea were 3 (6.25%) and same number of patients, 3 (6.25%) underwent diagnostic intervention for pelvic pain, in Operative laparoscopies, ovarian masses formed a major group i.e. 43(48.3%) of total laparoscopic surgeries, which included 20 cases of simple ovarian cysts, 15 endometriotic cysts, 5 dermoid and 3 par-ovarian cysts. Out of 31 patients of ectopic pregnancies, 12 were ruptured and 19 intact.

In our study, mean time to induce pneumoperitoneum was 100.6 ± 19.27 seconds in all patients. Which near the results of *Ertugrul et al. (2010)*, *Varma & Gupta, (2013)* and *Shatta & Girbash (2020)*.

Regarding complication 10 patients (3.3%), had a minor omental injury as there was omental adhesion to anterior abdominal wall due to previous surgery. These injuries were very small and managed by laparoscopy.

In the study of *Shatta and Girbash (2020)*, 10% of atients had a minor omental injury and 2% of patients had an injury to uterine fundus.

Another study done by *Choudhary and Kaman (2017)* used DTI in 175 Indian women undergoing laparoscopy. They did not experience any vascular or visceral injury in any patient.

In comparing to Veress Needle entry, A meta-analysis done by *Jiang et al. (2012)* of randomized clinical trials also showed a statistically significant higher percentage of complications associated with Veress Needle entry when compared to DTI, especially with regard to minor complications, although in other articles this difference is not observed or, at least, does not show such important statistical significance.

In their study *Ahmed et al. (2015)* stated in his study that there were three advantages with direct-trocar entry when compared with Veress Needle entry, in terms of lower rates of failed entry OR (odds ratio) 0.21, 95% CI (Confidence Interval) 0.14 to 0.31, extra peritoneal insufflation (Peto OR 0.18, 95% CI 0.13 to and omental injury (Peto OR 0.28, 95% CI 0.14 to 0.55).

The main cause of complications in laparoscopic surgery is associated with the manoeuvres of insufflation and placement of trocars (both optical and accessory). In laparoscopic gynecological surgery, DTI is an access method to the abdominal cavity at least as safe as Verres entry with respect to the risk of complications. On the other hand, DTI has some advantages such as the shorter duration of access manoeuvres or the lower number of failed entry attempts (*Shatta and Girbash, 2020*).

Regarding VAS (Visual Analogue Scale) score for pain of the studied patients postoperatively, mean of VAS in 2, 4, 6 hour postoperative found to be 2.44, 1.89 and 1.27 respectively. Also the mean of preoperative hemoglobin was 10.48 g/dL while postoperative hemoglobin was 9.95 g/dL and Blood loss

within 24 hours was 306 cc. these results similar to the results of (*Ahmed & Girbash, 2020* and *Shatta et al., 2015*).

CONCLUSION

DTI is a very safe and reliable technique for creation of pneumoperitoneum, and should be used routinely instead of closed Veress needle technique.

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الدخول المباشر بالتقنية فى جراحة مناظير النساء: سلسلة من 300 حالة

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خلفية البحث: تنظيف البطن هو إجراء تشخيصي وجراحي يستخدم في جميع التخصصات الجراحية. كإجراء طفيف، فإنه يتمتع بالعديد من المزايا للمرضى وأنظمة الرعاية الصحية والمجتمع، في العقد الماضي، يمكن لعدد متزايد من أطباء أمراض النساء إجراء إجراءات التنظير الداخلي الأساسية والمتقدمة. تم الإبلاغ عن الإدخال المباشر للمبزل بدون استرواح الصفاق أنه مرتبط بحد أدنى من المضاعفات ويفضل من قبل بعض الجراحين بالمنظار. قد يكون الإدخال المباشر للمبزل أكثر أماناً من دخول ابره فيرس في الوصول إلى تجويف البطن في تنظير البطن لأنه يقلل من خطر الانصمام الغازي عن طريق النفخ فقط بعد تأكيد الاستبدال داخل الصفاق ويسمح بالتعرف الفوري والعلاج السريع لتمزق الأوعية الدموية الرئيسي وهو أمر حاسم في تقليل تنظير البطن، الوفيات المرتبطة بها.

الهدف من البحث: هدفنا في هذه الدراسة هو تقييم المرضى الذين سيخضعون للإدخال المباشر للمبزل لتنظير البطن، مع التركيز على جدوى الإدخال المباشر للمبزل وسلامتها وفوائدها ومخاطرها. نريد أيضاً مناقشة بعض الجوانب الفنية، مثل موقع إدخال المبزل.

المرضى وطرق البحث: تم إجراء دراسة جماعية مستقبلية في مستشفى الجلاء التعليمي خلال الفترة من أغسطس 2015 إلى ديسمبر 2019. تم قبول ثلاثمائة مريض في أمراض النساء لإجراء تنظير البطن المجدول أو

الطارئ. تم تنفيذ الطرق التالية: كان الإدخال المباشر للمبزل أثناء تنظير البطن هو الإدخال القياسي لجميع الحالات المختارة دون وجود استرواح صفاق سابق. تم إجراء الإدخال على مستوى السرة.

النتائج: في هذه الدراسة تم إنشاء استرواح الصفاق الناجح في 100% من المرضى بغض النظر عن الجراحة السابقة، مؤشر كتلة الجسم، التكافؤ. كان متوسط الوقت اللازم للحث على استرواح الصفاق 100.6 ± 19.27 ثانية في جميع المرضى. 10 مرضى تعرضوا لإصابة نثرية طفيفة حيث كان هناك 10 (3.3%) التصاق ثرثي بجدار البطن الأمامي بسبب الجراحة السابقة. كانت هذه الإصابات صغيرة جدًا وتم التعامل معها عن طريق التنظير البطني.

الخلاصة: يعد الإدخال المباشر للمبزل إجراءً بديلاً آمناً وسريعاً وفعالاً مع حدوث مضاعفات منخفضة.

الكلمات الدالة: الدخول المباشر بالقنية – جراحة مناظير النساء .