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Direct Trocar Insertion without Previous Pneumoperitoneum in Laparoscopic Gynecological Surgery

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Abstract

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.

Aim: To evaluate the patients who will undergo a Direct Trocar Insertion (DTI) for laparoscopy, focusing attention on feasibility, safety, benefits and risks of DTI.

Methods: This was a prospective observational study had been conducted on 300 gynecological patients admitted for either scheduled or emergency laparoscopy at Mataria Teaching Hospital during the period between June 2017 to June 2019.

Results: Showed that successful pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI, parity. Mean time to induce pneumoperitoneum was 100.6 ± 19.27 sec in all patients. 30 patients 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. Six patients had an injury to uterine fundus.

Conclusion: This study concluded that DTI is safe, rapid and efficient alternative procedure with low incidence of complications.

Keywords: Direct trocar insertion; Laparoscopic entry; Laparoscopy complications; Pneumoperitoneum

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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 [1]. 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 [2]. 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 [3]. 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 [4]. DTI without pneumoperitoneum was reported to be associated with minimal complications and preferred by some laparoscopic surgeons [5]. 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 [6].

The aim of this study is to evaluate the patients who will undergo a DTI for laparoscopy, focusing attention on feasibility, safety, benefits and risks of DTI.

Subjects and Methods

This was a prospective observational study had been conducted on 300 gynecological patients admitted for either scheduled or emergency laparoscopy at Mataria Teaching Hospital during the

Figure 1: Technique of DTI surgical procedure.

period between June 2017 to June 2019.

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.

All patients had been subjected to full history taking, clinical examination and ultrasound examination for any abdominal or pelvic masses.

Technique of DTI surgical procedure

- After a good anesthetic relaxation of the patient's abdominal wall before the insertion, a transverse or vertical umbilical incision of 1 cm to 1.5 cm 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 (Figure 1).
- The trocar (Ethicon XCelV® model) 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.

Ethical approval

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 General Organization for Teaching Hospitals.

Statistical analysis

After data collection, verification and revision. We analyzed tabulated data statistically using SPSS statistical package version (19). Data were expressed as number and percentage for qualitative variables and mean ± standard deviation for quantitative one. Data were summarized using the arithmetic mean, the standard deviation and median. The comparison was done using the student "*t*" test and chi-square test. For all above-mentioned statistical tests done, the threshold of significance was fixed at 5% level (P-value). P value of >0.05 indicates non-significant results and P value of <0.05 indicates significant results. The smaller the P value obtained, the more significant are the results.

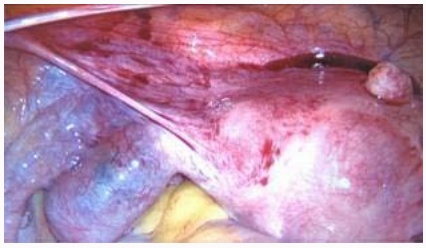

Figure 2: A case of left ectopic pregnancy. Before salpingectomy.

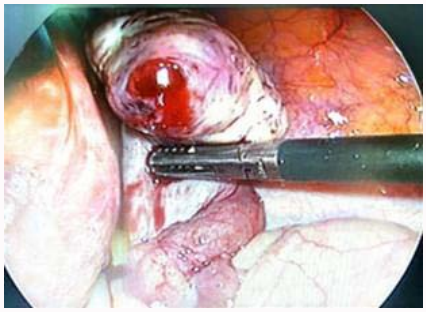

Figure 3: Stigma during ovulation in a case of severe abdominal pain.

Results

Table 1 showed that the mean age of the included patients was 36.9 ± 1.9 years old with range (36-44) years old. The mean BMI of patients was (28.04 ± 3.68) kg/m^2.

Table 2 showed that most of patients were paraous two (56.3%), three or more (40.3%) and one (3.4%). 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.

Table 3 showed that 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 4 showed that 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.

Table 5 showed that successful pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI,

Table 1: Shows the baseline demographic characteristics of the included patients.

Variables	Patients (N =300)	
	No	%
Age in years		
- Mean ± SD	36.9 ± 1.9	
- Median (IQR)	40 (36–44)	
BMI		
- Mean ± SD	28.04 ± 3.68	
- Median (IQR)	28 (21–35)	

Table 2: Parity of the included patients.

	Patients (N =300)	
	No	%
- One	10	3.4
- Two	169	56.3
- Three or more	121	40.3

Table 3: Previous Surgery of the included patients.

Variables	Patients (N =300)	
	No	%
Zero	153	51
One	50	16.7
Two	54	18
Three or more	43	14.3

Table 4: Type of Laparoscopic Surgery of the included patients.

	Patients (N =300)	
	No	%
Laparoscopic Tubal ligation	30	10
Laparoscopic pelvic adhesolysis	30	10
Laparoscopic endometriosis	60	20
Laparoscopic ovarian cystectomy	60	20
Laparoscopic ectopic pregnancy	120	40

Table 5: Complications among the included patients.

	Patients (N=300)	
	No	%
- Abdominal wall hemorrhage	0	0
- Extra peritoneal insufflations	0	0
- Omental injury	30	10
- Major vessel injury	0	0
- Intestinal injury	0	0
- Solid organ injury (uterus)	6	2
- Need for laparotomy	0	0
Time to induce pneumoperitoneum$_{(Second)}$ - Mean ± SD	100.6 ± 19.27	

parity. Mean time to induce pneumoperitoneum was 100.6 ± 19.27 sec in all patients. 30 patients 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. Six patients had an injury to uterine fundus.

Discussion

Laparoscopic abdominal surgery requires the implementation of successful pneumoperitoneum in the vast majority of patients with more than half of all complications occurring at the time of entry [7].

Any possible change in any step of a proven, tested surgical technique has to be shown to the surgical world to be easy, feasible, and reproducible in almost every situation. It has to have the lowest possible rates of morbidity and mortality together with an acceptable cost/benefit ratio. The method of directly inserting the first trocar for laparoscopy without establishing pneumoperitoneum was first described by Dingfelder more than 32 years ago, but so far, it has been used mainly by gynecologists [4]. The reported benefits of this method are a shorter operation time, near exclusion of entry failure, and above all the possibility of the immediate recognition of any kind of intraabdominal iatrogenic injuries [8].

In our study we found that successful pneumoperitoneum was established in 100% patients irrespective of previous surgery, BMI, parity and Mean time to induce pneumoperitoneum was 100.6 ± 19.27 seconds in all patients.

Our results are supported by study of Godara et al. [9] who found that the mean time taken in 100 patients with direct trocar entry was 1 min (42 sec-3 min. 0 4 sec) and concluded that DTI is fast and reliable alternative to traditional technique of primary port placement [9].

Another study conducted by Ertugrul et al. [10] on 39 patients the mean time taken for direct trocar entry was 79.6 ± 94.6 sec. According to them, direct trocar entry in obese patients significantly shorten entry time in comparison to Veress needle technique, but there can be severe complication with it [10].

The antecedents of a previous laparotomy are considered to be an important risk factor for complications associated to the adhesion they produce. Brill et al. [11] 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 [11].

The current study shows that 30 patients 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. Six patients had an injury to uterine fundus.

Another study done by Choudhary et al. used DTI in 175 Indian women undergoing laparoscopy. They did not experience any vascular or visceral injury in any patient. Researchers are further trying to modify DTI to make it safer for patients [12].

A study of Gunenc et al. randomized 578 subjects to VN or DTI as a method of entry. They described a modification of DTI by elevating of rectus sheath instead of skin. The investigators found significant difference in complication rates of VN and DTI (15.7% *vs.* 3.3%, $p<0.05$) and concluded that DTI is easy, safe and effective [5].

A meta-analysis of randomized clinical trials also shows 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 [4,13].

Ahmed et al. 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 0.26), and omental injury (Peto OR 0.28, 95% CI 0.14 to 0.55) [14].

Regardless of what was previously described, a Cochrane review (which includes 28 randomized clinical trials with 4,860 laparoscopic surgeries), concludes that there are no differences in terms of safety between the different entry techniques, although it does reiterate some advantages of DTI such as the lower number of unsuccessful access attempts or the lower percentage of extraperitoneal insufflation problems [15].

In conclusion, 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.

Conclusion

This study concluded that DTI is safe, rapid and efficient alternative procedure with low incidence of complications.

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