Original Article

موضوع أصيل

DIRECT TROCAR INSERTION WITHOUT PRIOR PNEUMOPERITONEUM

الإدخال المباشر لثاقب غشاء البريتوان بدون نفخ مسبق

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ملخص البحث

هدف البحث: لقد تم وصف تقنية الإدخال المباشر لثاقب غشاء البريتوان DTI كطريقة بديلة لتقنية إبرة فيريس Veress. ستقوم هذه الدراسة بتقييم مدى سلامة وقابلية استخدام تقنية الإدخال المباشر للثاقب دون نفخ مسبق للبريتوان عند المرضى الخاضعين للجراحات التنظيرية.

طرق البحث: تم خلال الفترة بين كانون الثاني 2011 وتشرين الثاني لعام 2012 إجراء تقييم راجع شمل 140 مريضاً (115 إناث و25 ذكور، أعمارهم بين 17 و76 سنة). خضع 70 منهم لتقنية إبرة فيريس، في حين خضع البقية لتقنية الإدخال المباشر للثاقب في غشاء البريتوان. تمت تقنية الإدخال المباشر عن طريق إحداث فتحة في السرة ورفع جدار البطن باليد غير المسيطرة للجراح مع يد المساعد، ومن ثم الإدخال المباشر للثاقب (حجم 10 ملم) باليد المسيطرة للجراح والدفع بطريقة متوازنة لتجنب إحداث جروح داخلية في البطن، أما تقنية إبرة فيريس فقد تمت عن طريق إحداث فتحة في السرة وإدخال إبرة فيريس من خلالها من قبل الجراح بمساعدة رفع جدار البطن من قبل الجراح المساعد يتبعها النفخ بغاز ثاني أوكسيد الكربون ثم إدخال الثاقب بنفس الطريقة الموصوفة أعلاه. تم تحري الاختلاطات البسيطة والكبيرة المتعلقة بكلتا التقنيتين كما تم تسجيل الفترة الزمنية للدخول إلى البطن (بدءاً من فتح الجلد حتى إدخال المنظار) لكل المرضى في المجموعتين.

النتائج: كانت تقنية الإدخال المباشر ناجحة عند جميع المرضى الخاضعين لها (70 مريضاً)، دون وجود اختلاطات كبيرة مرافقة. سجل حدوث اختلاطات آنية صغيرة عند 32 مريضاً (45.7%) في مجموعة إبرة فيريس و7 مرضى (10%) في مجموعة الإدخال المباشر بفارقٍ هام إحصائياً (p<0.001). بلغ متوسط الزمن المطلوب للإدخال في البطن 3.63±0.64 دقيقة و1.79±2.39 دقيقة لمجموعتي إبرة فيريس والإدخال المباشر DTI على الترتيب وبفارقٍ هام إحصائياً (p<0.001).

الاستنتاجات: يعتبر الإدخال المباشر لثاقب غشاء البريتوان DTI بدون نفخ مسبق للبريتوان في العمليات التنظيرية الانتخابية بديلاً سريعاً وآمناً وعملياً عن تقنية إبرة فيريس وباختلاطاتٍ صغرى أقل.

ABSTRACT

Objective: *The direct trocar insertion (DTI) technique has been described as an alternative method to Veress needle (VN) technique. This study assess the safety and feasibility of DTI without pre-existing pneumoperitoneum in patients undergoing elective laparoscopic procedures.*

Methods: *From January 2011 till November 2012, 140 patients were prospectively evaluated. Seventy patients underwent VN technique of entry to the abdomen, while the other 70 patients underwent DTI technique. Females were 115 and males were 25, age range was 17-76 years. The technique adopted for DTI was through umbilical skin incision, elevation of the abdominal wall with the grip of the surgeon's non-dominant hand and the grip of the assistant hand with direct entry of a 10 mm reusable trocar by the surgeon's dominant hand with*

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a balanced counter traction to prevent any possible overshoot, while those who underwent Veress needle technique have same umbilical incision through which the Veress needle was introduced first with the aid of abdominal wall elevation followed by CO_2 insuflation and then introduction of the 10 mm port by the same way described above. Major and minor injuries and complications related to both access techniques were observed and the time needed for entry to the abdomen (from skin incision till the introduction of the telescope) was recorded for all patients in both groups.

Results: *Direct trocar insertion was feasible in all the 70 patients subjected to this technique, no associated major complications. The immediate minor complications occurred in 32 (45.7%) patients of VN group and in 7 (10%) patients of DTI group, this difference is statistically significant ($p<0.001$). The mean time required for entry to the abdomen was 3.63±0.64 minutes in VN group and 1.79±2.39 minutes in DTI group. This difference is also statistically significant ($p<0.001$).*

Conclusions: *We concluded that DTI of the first trocar without prior pneumoperitoneum in elective laparoscopy is a fast, safe and feasible alternative procedure to VN with a fewer minor complications.*

INTRODUCTION

The first laparoscopy in a human was performed by Jacobeus of Sweden in 1910.[1] Since then laparoscopic techniques have been in constant evolution. Over the last couple of decades it has emerged as the preferred option for a multitude of operative procedures.[2] Laparoscopic surgery is effective, associated with lesser complications, cost-effective and also has cosmetic benefits.[3] Although its superiority over open surgery is established, it is not completely void of complications, many of which are related to the entry technique and the establishment of pneumo-peritoneum.[4]

One of the challenges of laparoscopic surgery is the insertion of surgical instruments through small incisions.[5] Over 50% of the complications arise during this time[6,7] and a great majority of these occur during the insertion of the primary umblical trocar.[6] To address these complications, various techniques have evolved to gain access to the peritoneal cavity, these include closed (Veress), open (Hasson), direct trocar insertion, the use of disposable shielded trocars, radially expanding trocars and visual entry systems along with their various modifications.[8,9]

There have been many studies comparing the efficacy and safety of the numerous access techniques although meta-reviews of these have turned out to be inconclusive, warranting the need for further evidence.[8,9] Given this uncertainty, the choice of method is usually left to the surgeon's preference. This works for experienced surgeons but is an area of confusion for younger surgeons.

In 1947, Raoul Palmer of France popularized the use of the Veress needle using CO_2 to induce pneumo-peritoneum for laparoscopy, and he subsequently published on its safety in the first 250 patients.[7] Palmer emphasized that the creation of pneumoperitoneum remains a vital first step, and it is one still associated with recognized complications.

Several surveys indicate that most surgeons practicing laparoscopy worldwide use the Veress needle pneumoperitoneum-primary trocar technique to access the abdomen.[10]

Dingfelder was the first to publish on direct entry into the abdomen with a trocar in 1978. The suggested advantages of this method of entry are the avoidance of complications related to the use of the Veress needle: failed pneumo-peritoneum, preperitoneal insufflation, intestinal insufflation, or the more serious CO_2 embolism. Laparoscopic entry is initiated with only one blind step (trocar) instead of three (Veress needle, insufflation, trocar). The direct entry method is faster than any other method of entry; however, it is the least performed laparoscopic technique in clinical practice today[11] .

The aims of the study was to evaluate the safety and feasibility of direct trocar insertion technique as the first entry step in laparoscopic surgery, and to compare the direct trocar insertion (DTI) technique with the Veress

needle (VN) technique regarding the time difference and the complications accompanying each technique.

METHODS

This is a prospective study carried out from January 2011 till November 2012 on patients admitted to the surgical ward in Al-Sadder Teaching Hospital in Basra for elective laparoscopic surgery. One hundred forty patients were included in this study (115 females and 25 males), their age range was 17-76 years.

Patients with upper abdominal or periumblical scars were excluded. All patients were fully informed and a written consent was taken. They are assigned into two groups randomly. Group A (included 70 patients) in whom direct trocar insertion (DTI) was performed while group B (included 70 patients) in whom Veress needle (VN) entry was performed .

All the patients underwent surgery under general anesthesia with endotracheal intubation with full abdominal relaxation. The technique adopted in both groups was performed by only one certified surgeon (second author) with a ten years experience in laparoscopic surgery and is as follows:

An initial umbilical skin incision (a transverse 1 cm long incision in the lower umbilical fold) is followed by elevation of the abdominal wall with the grip of the non-dominant hand of the surgeon and the grip of the assistant hand. A direct entry of the abdominal wall was performed by a 10 mm reusable trocar by the surgeon's dominant hand with a balanced counter-traction so as to prevent inadvertent uncontrolled entry and possible overshoot. The angulation towards the pelvis is adjusted according to the surgeon's assessment of the patient's bodily habitus. Factors such as adequate skin incision, sharp instruments, abdominal wall relaxation, naso-gastric decompression, placing of a finger as a guard along the trocar and optimal table height are ensured as necessary. The CO_2 stopcock is left open so as to relieve the negative intra-abdominal pressure caused by the abdominal wall elevation and allow apposed viscera to fall back. As soon as peritoneal penetration is perceived, the trocar is withdrawn and the telescope introduced part way into the cannula in order to detect inadvertent mal-position immediately, placement confirmed and only then CO_2 insufflation is commenced. The flow rate and pressure attained are monitored and interpreted as usual.

While the technique of Veress needle was done through an umbilical incision from which the Veress needle was introduced followed by blind CO_2 insufflation, then the 10 mm port was introduced by the same way described above.

Major and minor injuries and complications related to both access techniques were observed. The time needed for entry to the abdomen (from skin incision till the introduction of the telescope) was recorded. All the data were analyzed by using SPSS system with a p-value of <0.001 regarded as significant.

RESULTS

This study included 140 patients who underwent elective laparoscopic surgery using two techniques of entry, the Veress needle (VN) technique in 70 (50%) patients and Direct trocar insertion (DTI) technique in 70 (50%) patients.

The age distribution is shown in Table 1. The patient's ages ranged from 17 to 76 years.

The gender of the patients participating in this study was; 115 (82%) females and 25 (18%) males.

Age (years)	No.	%
10-20	3	2.1
21-30	55	39.3
31-40	45	32.2
41-50	31	22.2
51-60	3	2.1
61-70	2	1.4
>70	1	0.7
Total	140	100

Table 1. Age distribution of the study population.

The commonest laparoscopic operation done in this series was laparoscopic cholecystectomy in 123 (87.9%) patients followed by 14 (10%) diagnostic laparoscopy, 2 (1.4%) elective laparoscopic appenedicectomy and 1 (0.7%) laparoscopic assisted orchiopexy.

The creation of pneumoperitoneum was feasible in all patients subjected to DTI technique, while failed in 3 patients subjected to VN technique. Fortunately, there was no major complication in both groups.

Minor complications occurred in 39 (27.9%) patients of both groups as shown in Table 2. The difference in the minor complications between both groups is statistically highly significant (p-value<0.001).

Type of entry	Complications		p-value	OR
	Present No. (%)	Absent No. (%)		
Veress needle	32 (45.7)	38 (54.3)		
Direct trocar insertion	7 (10)	63 (90)	<0.001	7.58
Total complications	39 (27.9)	101 (72.1)		

Table 2. Minor complications according to type of entry.

In VN group, the minor complications were present in 32 (45.7%) patients, as shown in Table 2, which includes; port-site bleeding in 12 patients, preperitoneal insuflation in 8 patients, periumbilical bruising in 6 patients, failed pneumoperitoneum necessating other type of entry in 3 patients, subcutaneous emphysema in 2 patients and omental laceration in 1 patient, while in DTI group the minor complications are lower and occurred only in 7 (10%) patients which included; port-site bleeding in 5 patients, periumblical bruising in 1 patient and omental laceration in 1 patient only as shown in Table 3.

The mean time required for entry in patients subjected to VN technique was 3.63±0.64 minutes, ranged from 3 to 6.45 minutes, while the mean time of DTI technique is shorter (1.79±2.39 minutes) ranged from 1.5 to 2.25 minutes and this difference is statistically significant (p-value <0.001) as shown in Table 4.

Complication	VN No. (%)	DTI No. (%)	Total No. (%)
Port-site bleeding	12 (8.4)	5 (3.5)	17 (11.9)
Preperitoneal insuflation	8 (5.6)	0 (0)	8 (5.6)
Periumbilical brusing	6 (4.2)	1 (0.7)	7 (4.9)
Failed pneumoperitoneum	3 (2.1)	0 (0)	3 (2.1)
Subcutaneous emphysema	2 (1.4)	0 (0)	2 (1.4)
Omental laceration	1 (0.7)	1 (0.7)	2 (1.4)
Total	32 (45.7)	7 (10)	39 (27.3)

Table 3. Minor complications in each group.

Type of entry	Time (Minutes) Mean±SD	p-value
Veress needle	3.63±0.64	
Direct trocar insertion	1.79±2.39	<0.001

Table 4. Time difference between the two techniques.

DISCUSSION

The establishment of pneumo-peritoneum is the first and inevitable step in laparoscopic surgery.[12] The technique implemented by Veress for producing pneumo-peritoneum was key in making laparoscopic surgery, the frequently used procedure that it is becoming today. However, the complications associated with the use of Veress needle cannot be disputed, motivating the search for new techniques to avoid laparoscopic procedure morbidity.[13-16]

In this study, the DTI technique was feasible in all patients with no major complications, a fewer minor complications and shorter laparoscopic entry time in comparison to VN technique.

This data was similar to that found by E. Prieto-Diaz et al., who reported a percentage of complications from DTI and VN as 2.3% and 23.8% respectively in 84 patients,[17] and it also similar to that found by Neszhat et al., who reported DTI and VN complication percentage of 6% and 22% respectively.[18]

Pneumo-peritoneum creation with DTI technique

is more beneficial to the patients as there is only one blind step involved in the procedure, whereas in the VN technique there are three blind steps (VN puncture, insufflations and trocar insertion).[17]

Whoever to ensure adequate DTI results, the following simple rules must be followed: Obtain a perfectly relaxed abdominal wall elevation, make an adequate incision and use a sharp (and preferably disposable) trocars.

Direct trocar insertion also result in a shorter duration of surgery since the technique eliminates the time used for previous placement of Veress needle as well as the slow creation of pneumoperitoneum due to reduced diameter of the needle.[17]

Until now there is no method of entry to the peritoneal cavity which is completely free of complications, but DTI technique is seems to have a lower complication rate.[12-15]

The port-site bleeding treated by compressing the bleeding point against the abdominal wall by the trocar.

Other complication like (periumbilical bruise, preperitoneal insufflations, subcutaneous emphysema and omental laceration) were treated conservatively with analgesia and antibiotics.

Failed insufflation via VN necessates the use of alternative procedure like open technique or use of palmer points to introduce the Veress needle.

Direct trocar insertion relies more on skill and knowledge of abdominal wall anatomy and dynamics rather than on secondary tests as in case of VN technique which are not always reliable.

More and more general surgeons and gynecologists are using the DTI technique in laparoscopic surgery, the increase in its use is principally due to the fact that there are fewer complications with this procedure, and it is likely to be the technique of choice in the near future.[17]

CONCLUSIONS AND RECOMMENDATIONS

Our study concluded that direct trocar insertion (DTI) of the first trocar without prior pneumoperitoneum in laparoscopic surgery is a rapid, safe and feasible alternative procedure to Veress needle (VN) with a fewer minor complications. So, we recommend the use of DTI for entry to the abdomen as a safe alternative method to VN in laparoscopic surgery.

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