E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2021; 5(2): 355-358
Received: 19-04-2021
Accepted: 23-05-2021

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Comparative study of direct trocar entry versus Veress needle entry for laparoscopic surgery

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DOI: https://doi.org/10.33545/surgery.2021.v5.i2f.822

Abstract
Introduction: Laparoscopy has revolutionised Surgery with its widespread acceptance as predominantly minimally invasive to intraabdominal surgical procedures. Laparoscopy is the art of examining the abdominal cavity and its contents. It requires insertion of a cannula through the abdominal wall, distention of the abdominal cavity with gas or air (pneumoperitoneum), and visualization and examination of the abdomen's contents with an illuminated telescope.
Material and Methods: This is a prospective and observational study conducted in the Department of General Surgery at Prathima Institute of Medical Sciences over a period of 1 year. All the cases who underwent laparoscopic tubal ligation procedure during this time were taken into account. The traditional technique of Veress Needle entry (Group A) and Direct trocar entry (Group B). Inclusion Criteria: Patients which are posted for planned laproscopic surgeries irrespective of age and sex. Exclusion Criteria: Emergency surgeries. ▪ Patients having abdominal scars crossing umbilicus. ▪ Immunocompromised patients ▪ Seropositive patients.
Result: In our present study, a total of 90 patients were included in both the groups out of which 21 (23.4%) were males and 69 (76.6%) were females in Group A and in Group B: 19 (21.1%) were males and 71 (78.9%) were females. The mean time taken to create Pneumoperitoneum in case of Veress Needle entry was 4 min 01 sec, of which maximum was 7 min 10 sec and minimum was only 3 min 05 sec. The mean time taken to create Pneumoperitoneum in case of Direct trocar entry was 1 min 43 sec, of which maximum was 3 min 20 sec and minimum was 1 min 15 sec. Complications arising during procedures were identified and recorded. Group A patients 6 patients witnessed omental emphysema was commonest complication followed by 5 patients preperitoneal insufflation while as the most common complication in group B was omental emphysema in 2 patients.
Conclusion: Direct Trocar entry is a safe alternative to the Veress needle entry technique for the creation of pneumoperitoneum. One of the main advantages of this technique is the reduced number of the blind insertions required to gain abdominal access. Other benefits are rapid creation of pneumoperitoneum, less gas use and decreased operating time. In laparoscopic surgeries, it is a more reliable and less time-consuming method.

Keywords: Direct trocar entry, verses needle entry laparoscopic surgery

Introduction
Laparoscopy (Gr: Laparo-abdomen, scopein-to examine) is the art of examining the abdominal cavity and its contents. It requires insertion of a cannula through the abdominal wall, distention of the abdominal cavity with gas or air (pneumoperitoneum), and visualization and examination of the abdomen's contents with an illuminated telescope [1]. With the advent of videocameras and other ancillary instruments, laparoscopy rapidly advanced from a being a diagnostic procedure to one used in fallopian tubal occlusion for sterilization and eventually in the performance of numerous surgical procedures in all surgical disciplines for a variety of indications [2].
Laparoscopy has revolutionised Surgery with its widespread acceptance as predominantly minimally invasive to intraabdominal surgical procedures. With its advent to lighter our toil comes a responsibility to ensure safety of the patient [3]. A massive record of over 50% of the operative complications occur during creation of pneumoperitoneum or in other words on initial entry to abdomen [4]. Creation of pneumoperitoneum is indispensable primary step of the procedure as it allows creation of operative field. It can be achieved by various techniques viz Classical open method as described by Hasson, Classical closed method by Veress needle, direct

trocar insertion and by visual entry method with optical needle or a trocar [5]. The direct trocar insertion is also a modified closed technique with advantage of bringing down steps in blind from 3 (needle insertion, insufflation and trocar insertion) to single step (trocar introduction) [6].

The unfortunate part of the laparoscopy is the risk associated with initial entry depending upon any of the above methods adopted [7]. Complications like bowel perforation, major intraabdominal vessel injury or ventral abdominal wall vessel injury are the mostly encountered but very rarely. Bowel perforates in about 0.1% to 0.5% and vessel injury occurs in about 0.01% to 1% [8].

Failure to achieve and maintain pneumoperitoneum may predispose to complications. Establishment of pneumoperitoneum with the Veress needle may be associated with a recognized incidence of complications such as preperitoneal insufflation which makes the procedure more difficult and time-consuming [9].

The direct trocar entry without pneumoperitoneum was reported to be associated with minimal complications and preferred by some laparoscopic surgeons [10]. Direct trocar may be safer than Veress needle 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, both of which have been identified as being crucial in reducing laparoscopy-associated mortality [11].

This study included all the patients admitted for routine elective laparoscopic surgeries, we compared classical closed method of creating pneumoperitoneum by a veress needle with modified closed technique of creating pneumoperitoneum by direct trocar insertion among patients who underwent laparoscopic surgery for various surgical disorders.

Material and Methods

This is a prospective and observational study conducted in the Department of General Surgery at Prathima Institute of Medical Sciences over a period of 1 year. All the cases who underwent laparoscopic tubal ligation procedure during this time were taken into account. The traditional technique of Veress Needle entry (Group A) and Direct trocar entry (Group B).

Inclusion Criteria: Patients which are posted for planned laproscopic surgeries irrespective of age and sex.

Exclusion Criteria: Emergency surgeries. ▪ Patients having abdominal scars crossing umbilicus. ▪ Immunocompromised patients ▪ Seropositive patients.

Veress needle insertion method: With patient under general anaesthesia, a small 5mm incision in the skin was made in the skin just infraumbilical. Veress needle was introduced into the incision through the layers of ventral wall after properly lifting the ventral abdominal wall at or near the umbilicus. Position of the needle tip was confirmed in the peritoneal cavity by saline drop and aspiration test. The peritoneal cavity was insufflated with CO2 until the peritoneal cavity distended with average intraabdominal pressure of about 10 to 12 mmHg or at least 2.5 L to 3 L of gas was introduced. The trocar was then introduced followed by introduction of camera cope to inspect for any possible injuries. The intended operation was then carried out.

Direct trocar insertion method: In this method, infraumbilical incision is made just over 10 mm in length. Anterior abdominal wall is held up at or near umbilicus and trocar is introduced with graded progression into general peritoneal cavity in a twisting maneuver until peritoneum is felt to have been pierced. The stop cock of the trocar canula is ensured to remain open during insertion to allow air rush in on entry to peritoneum to counter the negative pressure inside potentiated by lifting of anterior abdominal wall thereby decreasing the chances of injury to vital structures. Once the trocar is introduced the camera scope is introduced and the intended operation is carried out. Time taken from infraumbilical incision to introduction of camera scope was recorded and compared. Immediate intra operative complications and post-operative complication with regard to the techniques involved in creation of pneumoperitoneum.

Result

In our present study, a total of 90 patients were included in both the groups out of which 21 (23.4%) were males and 69 (76.6%) were females in Group A and in Group B: 19 (21.1%) were males and 71 (78.9%) were females in Table-1.

Table 1: Distribution of gender

Gender	Veress Needle entry No. of patients (Percentage)	Direct trocar entry No. of patients (Percentage)
Male	21 (23.4%)	19 (21.1%)
Female	69 (76.6%)	71 (78.9%)
Total	90 (100%)	90 (100%)

Table 2: Distribution of different age groups of patients

Age	Veress Needle entry No. of patients (Percentage)	Direct trocar entry No. of patients (Percentage)
<30 years	9 (10%)	13 (14.4%)
31-50 years	41 (45.5%)	42 (46.6%)
51-70 years	33 (36.6%)	29 (32.2%)
>71 years	7 (7.7%)	6 (6.6%)
Total	90 (100%)	90 (100%)

In table 2, in our study, most of the patients were 31-50 years i.e., 41 out of 90 (45.5%), followed by 51-70 years, i.e., 33 out of 90 (36.6%) in Group A. In Group B maximum 42 (46.6%) patients were belonging to 31-50 years of age followed by 29 (32.2%) 51-70 years.

Table 3: Distribution of type of Surgery

Surgery	Veress Needle entry No. of patients (Percentage)	Direct trocar entry No. of patients (Percentage)
Cholecystectomy	54 (60%)	52 (57.7%)
Appendectomy	19 (21.1%)	21 (23.3%)
Intraperitoneal onlay mesh repair	11 (12.2%)	13 (14.4%)
Hydatid cystectomy	3 (3.3%)	2 (2.2%)
Varicocelectomy	2 (2.2%)	1 (1.1%)
Gastrectomy	1 (1.1%)	1 (1.1%)

Table 4: Time taken to create Pneumoperitoneum (In Minutes)

	Veress Needle entry Mean±SD	Direct trocar entry Mean±SD
Time in minutes	4.01 ± 1.13	1.43 ±0.4

The mean time taken to create Pneumoperitoneum in case of Veress Needle entry was 4 min 01 sec, of which maximum was 7 min 10 sec and minimum was only 3 min 05 sec. The mean time taken to create Pneumoperitoneum in case of Direct trocar entry was 1 min 43 sec, of which maximum was 3 min 20 sec and minimum was 1 min 15 sec.

Table 5: Complication between Veress Needle entry and Direct trocar entry

	Veress Needle entry No. of patients	Direct trocar entry No. of patients
Failed Pneumoperitoneum	2	1
Preperitoneal insufflation	5	0
Gut Perforation	2	0
Mesenteric Injury	3	0
Port site bleeding	3	1
Omental injury	4	1
Omental emphysema	6	2
Abdominal wall haematoma	3	2

Complications arising during procedures were identified and recorded. Group A patients 6 patients witnessed omental emphysema was commonest complication followed by 5 patients preperitoneal insufflation while as the most common complication in group B was omental emphysema in 2 patients. In group A number of patients suffering complications as failed pneumoperitoneum, preperitoneal insufflation, gut perforation, mesenteric injury, port site bleeding, omental injury, omental emphysema and Abdominal wall haematoma were 2, 5, 2, 3, 3, 4 and 6 respectively. In group B number of patients suffering complications as failed pneumoperitoneum, preperitoneal insufflation, gut perforation, mesenteric injury, port site bleeding, omental injury, omental emphysema and Abdominal wall haematoma were 1, 0, 0, 0, 1, 1, 2 and 2 respectively in table-5.

Discussion

In todays, era of laparoscopic surgery, despite numerous recent technical advances in minimally invasive surgery, the potential exists for serious morbidity during initial laparoscopic access. Safe access depends on adhering to well-recognized principles of trocar insertion, knowledge of abdominal anatomy, and recognition of hazards imposed by previous surgery [12]. Creation of the pneumoperitoneum is the first and most critical step of a laparoscopic procedure because that access is associated with injuries to the gastrointestinal tract and major blood vessels and at least 50% of these major complications occurs prior to commencement of the intended surgery [13].

The existence of numerous techniques for creation of pneumoperitoneum at laparoscopy indicates that none has been proven totally efficacious or complication free. These methods include the standard technique of insufflation by insertion of the Veress needle, open laparoscopy, optical trocar, and direct trocar entry without prior pneumoperitoneum [14]. 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 [15].

Access to the abdominal cavity in laparoscopy is the most crucial step. The safety of Direct trocar entry has been documented by some authors. However, the insertion of the Veress Needle itself is not free of complications. Pneumoperitoneum with Veress Needle insertion has actually three blind steps opposed to one with Direct trocar entry [16].

Several reports have pointed out that Direct trocar entry without pneumoperitoneum is a safe alternative to Veress Needle entry. The advantages of Direct trocar entry are the avoidance of complications related to the use of the Veress Needle such as failed pneumoperitoneum, preperitoneal insufflation, intestinal insufflation, or the more serious $C0_2$ embolism. [17] The Direct trocar entry method is faster than any other method of entry, however, it is the least performed laparoscopic technique in clinical practice today [17].

In our study, the majority of the patients included were a higher number of female patients as shown in Table1. Our findings corresponds to age distribution and male: female ratio found in the study done by Mehm*et al*.i Yerdel *et al*. in 1999 [18]. Laparoscopic cholecystectomy was the most frequent procedure done, followed by laparoscopic appendicectomy, which correlate with the findings of the study of K. Theodoropoulou *et al*. [19]

The mean time taken to create pneumoperitoneum was less in Direct trocar entry (1.06 ±0.3 mins) than Veress Needle entry (3.94 ± 1.21 mins). Pneumoperitoneum creation by Veress needle insertion, insuflation and takes longer than direct introduction of trocar where in the steps to create pneumoperitoneum are reduced and hence the time. This is in agreement with the observations of Prieto-Diaz-Chavez. [20] The decrease in operating time and amount of $C0_2$ used is expected to be in favor of patient safety by decreasing the complications associated with prolonged insufflation and in turn with less

patient discomfort. The intraoperative complications encountered in both groups but less complication in Direct trocar entry. Similar findings were seen by Issam Merdam *et al*. [21]

Conclusion

Direct Trocar entry is a safe alternative to the Veress needle entry technique for the creation of pneumoperitoneum. One of the main advantages of this technique is the reduced number of the blind insertions required to gain abdominal access. Other benefits are rapid creation of pneumoperitoneum, less gas use and decreased operating time. In laparoscopic surgeries, it is a more reliable and less time-consuming method.

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