Original Article

# The Efficacy of Direct Trocar versus Veress Needle Method as a Primary Access Technique in Laparoscopic Cholecystectomy

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## Abstract

**Objective:** The objective of this study was to compare the safety and efficacy of direct trocar method and veress needle as the primary entry technique to establish pneumoperitoneum. **Study Design:** This was a randomized controlled study. **Patients and Methods:** A randomized controlled study was done on 150 patients who complained from gallstones and attended to our surgical team, from the period of May 1, 2013 to May 31, 2017, the patient age range was 19–65 years with a mean age of 41 ± 0.9 years, after confirming the diagnosis of gallstones, informed consent was obtained from the patients. Those with previous abdominal surgery or serious comorbidities were excluded from the study. A total of 150 patients were divided randomly with 75 patients had the access into their abdomen by veress needle and the other 75 patients by direct trocar method. Variables comparing the safety and efficacy of the two methods were studied. **Results:** Direct trocar method was faster (2.3 ± 1.1 standard deviation [SD] min) than veress technique (5 ± 0.9 SD min), $CO_2$ leak occurs just in one case of trocar method while it does not occur in veress technique, extraperitoneal insufflations occur in four cases (5.3%) operated by veress method, and only in one case of direct trocar method, port site infection develops in two cases (2.6%) of direct trocar method and in single case of veress cannula. Only one case of port site hematoma occurs in direct trocar method. **Conclusion:** Direct trocar method is a safe, fast, and easily done technique for the establishment of primary entrance into the peritoneal cavity and hence pneumoperitoneum, there were no significant variations in minor complications and without major ones.

**Keywords:** Cholecystectomy, direct trocar, laparoscopy, pneumoperitoneum, primary access, veress needle

## Introduction

The first laparoscopy in history which made on a human was achieved by Jacobaeus of Sweden in 1910[1] since that time there was a continuous development in its procedures and techniques, many decades later Prof Dr. Erich Mühe of Germany performed the first laparoscopic cholecystectomy in 1985.[2]

Laparoscopic cholecystectomy became the standard of treatment for symptomatic gallstones worldwide.[3-6] It is effective both costly and cosmetically and associated with fewer complications.[6]

The first step and one of the challenges in any laparoscopic surgery are access into the abdomen to establish pneumoperitoneum. Complications associated with laparoscopic surgery are very uncommon and usually occur during entrance into the peritoneal cavity.[7] Most of it occurs during insertion of the 1st trocar (above or below the umbilicus),[8] the rate of these complications has remained stationary during the previous 25 years.[9]

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Quick Response Code:

Website: http://www.mmjonweb.org

DOI: 10.4103/MJ.MJ_39_18

During these years, many modalities to establish access into the abdominal cavity has been developed including closed (veress), open (Hasson), direct trocar insertion, disposable-shielded trocars, expanding trocars, and visiports,[10,11] from these multiple techniques. The widest methods used worldwide are the closed (veress needle) technique and the open (Hasson cannula),[12-14] The closed method includes the blind insertion of the veress needle into the abdominal cavity,[15] while the open technique involves incising the skin and then dissecting the subcutaneous tissue and opening of the rectus sheath to insert the Hasson cannula under direct vision.[16]

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**How to cite this article:** Abdullah AA, Abdulmageed MU, Katoof FM. The efficacy of direct trocar versus veress needle method as a primary access technique in laparoscopic cholecystectomy. Mustansiriya Med J 2019;18:47-50.

Direct trocar method before the establishment of pneumoperitoneum was first described by Dingfelder in 1978.[17] It includes the incision of the skin, introduction of a sharp trocar, and then insufflation.

As mentioned before, many complications could occur during the establishment of either two methods or it includes minor complications such as CO2 leak, extraperitoneal insufflations, and major complication such as visceral and vascular injuries. Molloy *et al*. reported on a review of veress and direct entries-related problems, the bowel injury rates were 0.04% (veress) and 0.05% (direct entry); and corresponding vascular injury rates were 0.04% and 0%, respectively.[18,19]

In this article, we shall express the safety and efficacy of the direct trocar method and compare it with the closed veress technique.

## Patients and Methods

A randomized controlled study was conducted on 150 patients who complained from gallstones and planned to undergone laparoscopic cholecystectomy by our surgical team, for the period of May 1, 2013 – May 31, 2017, after confirming the diagnosis of gallstones, informed consent was obtained from the patients in the form of history and investigations.

Those with previous abdominal surgery or serious comorbidities were excluded from the study. A total of 150 patients were divided randomly with 75 patients had the access into their abdomen by veress needle and the other 75 patients by direct trocar method, these two techniques were done by the three authors randomly as they have nearly the same experience in laparoscopic surgery. Data were collected by estimating the time of access and establishment of pneumoperitoneum. The patients were examined and followed for any complications that may occur at the time of insertion of the veress or trocar (for example, visceral or vascular injury), or after discharge from hospital, for example, wound infection. The collected data had been obtained for both veress, and direct trocar methods were classified, tabulated, and to compare between the two methods.

### Technique

After full preparation of the patient on surgical theater, it includes the incision of skin and dissection of the subcutaneous tissue down to the rectus sheath, then we grasp the sheath 2 cm below the lower edge of the umbilicus with towel clip to elevate the sheath, then we insert the sharp 10-mm metallic reusable trocar into the peritoneal cavity by 90 degrees (confirmed by hearing or feeling a single click and by direct vision with introduction of the camera) then establish the pneumoperitoneum.

For veress needle, which is a reusable 2 mm, 12–15-cm length depending on patients abdominal fat thickness (obesity), it also includes incising the skin and elevation of the fascia with towel clips and inserting it into the abdominal cavity, we use pressure and gas flow as a test for correct insertion into the peritoneal cavity.

In a study, they "compare the efficacy of manual elevation below the umbilicus and of towel clips placed within and 2 cm from the umbilicus, they reported that only towel clips provided significant elevation of peritoneum (average 6.8 cm above the internal organs)."[20]

### Statistical analysis

- SPSS version 24 (IBM Corp., Armonk, NY, USA) used for the analysis and management of the data
- The data presented with contingency tables
- Fisher's exact test used to measure the significance of association within the categorical variables
- Independent sample *t*-test used to measure the significance of the difference in means within the continuous variables
- A confidence level of 95% with a $P < 0.05$ used in the statistical analysis.

## Results

A total of 150 patients were included in this study, the patient age range was 19–65 years with a mean age of 41 ± 0.9 years, 129 patients (86%) were female, and 21 (14%) were male; its distribution in this study is shown in Table 1.

Direct trocar method was faster (2.3 ± 1.1 min) than veress technique (5 ± 0.9 min), Co2 leak occurs just in one case of trocar method while it does not occur in veress technique, extraperitoneal insufflations occur in four cases (5.3%) operated by veress method, all these four cases had their access technique changed into open technique, while only one case had (1.33%) inflated extraperitoneally by trocar method, and surgical port site infection occurs in one case (1.33%) of veress method versus two cases (2.66) in direct trocar technique, there were no vascular or visceral injury in both techniques, results are shown in Table 2.

## Discussion

Laparoscopic techniques have "revolutionized the field of surgery with benefits that include decreased postoperative pain, earlier return to normal activities following surgery, and fewer postoperative complications" (for example, wound infection and hernia) compared with open techniques.[21,22] Although it is uncommon, about 50% of major laparoscopic complications occur at the primary access technique.[23-25]

By comparing the two methods, direct trocar technique was much faster without any speed-related problems (mean time ± SD was 2.3 ± 1.1 standard deviation (SD) min and 5 ± 0.9SD min for the direct trocar and veress

**Table 1: Sex distribution according to the access technique**

| Gender | Direct trocar | Veress needle | Total |
|---|---|---|---|
| Male | 9 | 12 | 21 |
| Female | 66 | 63 | 129 |
| Total | 75 | 75 | 150 |

**Table 2: A comparison of the data collected from direct trocar and veress methods**

| Variable | Direct trocar (*n*=75), *n* (%) | Veress (*n*=75), *n* (%) | *P* |
|---|---|---|---|
| Access time* | 2.3±1.1 (SD) | 5±0.9 (SD) | 0.0467# |
| $CO_2$ leak | 1 (1.33) | - | 0.998 (NS) |
| Extraperitoneal insufflations | 1 (1.33) | 4 (5.3) | 0.366 (NS) |
| Visceral injury | - | - | - |
| Vascular injury | - | - | - |
| Port site hematoma | 1 (1.33) | - | 0.998 (NS) |
| Port site infection | 2 (2.6) | 1 (1.33) | 0.991 (NS) |
| Need for conversion^ | 1 (1.33) | 3 (4) | 0.619 (NS) |
| Mortality | - | - | - |

*Access time is the time required to establish pneumoperitoneum and insert all ports, ^Need for conversion means that we need to change into another access technique, #Statistically significant at an alpha level of <0.05. NS: Not significant, SD: Standard deviation

techniques, respectively), Zakherah[26] reported direct trocar technique time 2.2 ± 0.7 SD min and the veress method time 8.2 ± 1.4 SD min. Byron *et al*.[27] reported direct trocar technique time mean ± SD = 2.2 min and veress technique time mean ± SD = 5.9 min, the results are comparable to our study, this time variation between two techniques occur as a result of slow insufflation in veress technique due to possible multiple blind entrances and low gas flow rate.

In the veress method, there were entry problems including extraperitoneal insufflations (which was identified by obstructed gas flow, high pressure, and feeling of surgical emphysema) four cases (5.3%) while it occurred only with one case (1.33%) of direct trocar method, all cases have occurred in obese patients, similar to our study Nezhat *et al*. excluded patients with a history of previous abdominal operations but took into account the obesity (body mass index); they showed less minor complications with direct trocar technique than with the veress method.[28] Ahmed and associate study, they reported that there is no significant difference in the incidence of complications between both methods; however, extraperitoneal insufflation was avoided in direct trocar technique in comparison to veress needle approach.[10]

Three cases of veress needle (4%) need to change to another access technique, while one case (1.33%) of direct trocar technique was changed into veress needle approach. Copeland *et al*. reported eight cases (0.4%) out of 2000 with direct trocar insertion who required conversion to insufflation with veress needle, and one of these resulted in bowel injury.[29]

There were no vascular or visceral injuries in both methods, Molloy *et al*. reported on a review of veress/trocar and direct entries. Entry-related bowel injury rates were 0.04% (veress/trocar) and 0.05%, respectively (direct entry); and corresponding vascular injury rates were 0.04% and 0%, respectively. 36 case reports of major vessel injury with direct entry have been reported.[18,19]

Port site infection (which is considered as minor complications) occurs in two cases (2.6%) in direct trocar and in one case (1.33%) in veress needle technique. Al-Dhahiry[30] reported 4.3% minor complications while Zakherah[26] reported 0.4% minor complications in direct trocar technique, Hassan reported eight cases (3.38%) of port site infection with direct trocar technique and nine cases (4.28%) with veress technique.[31]

Port site hematoma occurs only in one case of direct trocar technique, it was small (caused by a perforator, not from an inferior epigastric artery) and treated conservatively.

## Conclusion

Direct trocar method is a safe, fast, and easily done technique for the establishment of primary entrance into the peritoneal cavity and hence pneumoperitoneum.

There was no significant difference in the development of complications (only minor complications) between the two methods, they have nearly the same safety profile, despite that, and direct trocar technique is still underutilized in the laparoscopy field.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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