

Comparison of Direct Trocar versus Veress Needle Insertion in Creation of Pneumoperitoneum in Patients Undergoing Laparoscopic Cholecystectomy

Zafar Ali Choudhry, Muhammad Saleem Iqbal, Muhammad Latif, Kamran Hamid

ABSTRACT

Objective: Comparing outcome of Veress Needle (VN) versus Direct Trocar insertion (DTI) for creation of Pneumoperitoneum in laparoscopic Cholecystectomy. **Study Design:** Randomized Controlled Trial. **Settings:** Khawaja Muhamamd Safdar Medical College Surgical Department, Faisalabad medical university surgical department, Allama Iqbal Memorial Hospital and Govt. Sardar Begum Teaching Hospital, Sialkot. **Duration:** 27-09-2017 to 26-09-2018. **Methodology:** A total number of 608 patients, having age 30 and 75 years planned for laparoscopic Cholecystectomy were selected. Detailed history, clinical examination & baseline investigations were carried out. Patients were divided into two groups. Group A (DTI), Group B (VN). All trocars and veress needle used were disposable, with a safety shield. Maximum 3 attempts were made and in case of failure open technique were used. The collected data was stored and analyzed in SPSS version 22. Chi-square test was used to compare no. of attempts between the groups. **Results:** Mean age of patients in present study was 47.99+11.01 years. There were 211 (34.70%) male patients and 297(65.30%) female patients. In DTI group, Pneumoperitoneum was created successfully in first attempt in 278 (91.4%) patients, in 2nd attempt in 20 (6.6%) patients and in 3rd attempt in 6 (2.0%) patients. While in VNI group Pneumoperitoneum was successful in first attempt in 256(84.2%) patient sin 2nd attempt in 38 (12.5%) patients and in 3rd attempt in 10 (3.3%) patients (p-value 0.02). **Conclusion:** Direct trocar is a safe alternative to veress needle insertion in laparoscopic cholecystectomy. It requires less number of attempts for successful creation of Pneumoperitoneum as compared to the veress needle. **Keywords:** Laparoscopic cholecystectomy, veress needle insertion, direct trocar insertion, Pneumoperitoneum, Surgical Instrument, Laparoscopy.

Corresponding Author

Submitted for Publication: 29-12-2018

Accepted for Publication: 19-02-2019

PROF. DR. ZAFAR ALI CHOUDRY, Professor of Surgery, Vice Chancellor, Faisalabad Medical University, Allied Hospital, Faisalabad-Pakistan
Contact / Email: +92 321-6563321, drsaleemiqbal@yahoo.com

Citation: Choudhry ZA, Iqbal MS, Latif M, Hamid K. Comparison of Direct Trocar versus Veress Needle Insertion in Creation of Pneumoperitoneum in Patients Undergoing Laparoscopic Cholecystectomy. APMC 2019;13(2):126-9.

INTRODUCTION

Creation of pneumoperitoneum is the one of the challenges of minimal access surgery and in which surgical instruments are inserted through small incisions; and may cause injuries related to the gut and major blood vessels. Thus, major complications occur prior to commencements of planned procedures. Laparoscopic Cholecystectomy is most commonly performed procedure after the 1980s and it has replaced classic Cholecystectomy. Development of video cameras and other auxiliary instruments led to rapid developments in laparoscopy from diagnostic tool to a specialized field in surgery for variety of surgical procedures.²

To decrease access related trauma, multiple techniques, numerous gadgets, and multiple approaches have been applied. These include the Veress Pneumoperitoneum- trocar for "classic" or closed entry, the open (Hasson's) technique, direct trocar insertion without prior Pneumoperitoneum, use of shielded disposable trocars³, optical veress needle and optical trocars. Veress needle is equipped with a spring-loaded obturator. Each of above-mentioned access instrument enjoys preference by individual surgeon, according to training and easy availability. Hasson technique has been safest when comparison was made between open versus closed entry to established Pneumoperitoneum.⁴

In a Canadian study constituting 407 obstetricians and gynecologists, most of them always established Pneumoperitoneum before advancement of primary trocar. Furthermore, among them, few had encountered vascular or organ injury attributable to the Veress needle insertion 25.6% and 15.0% experienced vessel or organ injury from the primary and secondary trocars, respectively veress needle number of attempts can be a factor in increasing number of complications at first attempt complication rate was 0.8%-16% at 2nd attempt 16.3%-37.5% and at more than three attempt 86%-100%.²

Ding elder was the first to utilized and publish in 1978 on direct entry into the abdomen with a trocar; it is a sharp metallic device with 10mm diameter that is made up of an obturator, a cannula, and a seal. Trocar insertion was superior to Veress needle insertion, as it is faster & avoided following complications: failed Pneumoperitoneum, peritoneal insufflations, intestinal insufflations, or the more serious CO₂ embolism. Procedure is started by single maneuver (trocar).⁵ Instead of 3 (VN, insufflations, trocar) the DTI method is quicker than any other method of entry.^{6,7} DTI and open technique when compared with Veress needle use have resulted in fewer complication like wound infection, omental injury and port site bleeding⁸.

Previous studies conducted in Pakistan have compared safety and efficacy of open versus blind techniques but no local study has compared mean number of attempts to create

Pneumoperitoneum between two blind procedures (direct trocar and Veress needle). A study conducted to compare direct trocar insertion has created Pneumoperitoneum in 92.7% cases in first successful attempt, second successful attempt in 6.3% cases and third successful attempt in 1.1% cases⁹ and maximum of three attempts after which open technique was used.⁹ Meta-analysis conducted by jiang et al reported more than 2(2.99[2.11-4.23]) attempts of Veress needle when compared with Hasson's cannula.¹⁰ Rationale of study is comparison of both techniques in our domestic level as locally Veress needle is more commonly used as compared to Direct trocar insertion and this study will provide guidelines. It will locally garner support from our surgeons for Direct Trocar Insertion.¹¹

METHODOLOGY

Study Design: Randomized Controlled Trial.

Settings: Khawaja Muhamamd Safdar Medical College Surgical Department, Faisalabad Medical university Surgical Department, Allama Iqbal Memorial Hospital and Govt. Sardar Begum Teaching Hospital, Sialkot-Pakistan.

Duration: 27-09-2017 to 26-09-2018.

Sample Technique: Non-probability Consecutive Sampling.

Sample Size: Sample size of 608 cases (divided equally in two group) is calculated with 95% confidence interval, 80% power of the test and taking expected percentage of success in 3rd attempt as 1.1% cases of direct trocar insertion and in 5.0% cases in veress needle.

Inclusion Criteria: 1. Patient of 30-75 years old and both male and female genders. 2. Patient with history of Cholelithiasis with Ultrasonographic evidence of Gallstones evident as echogenic structures having posterior acoustic shadows.

Exclusion Criteria: 1. Patient with history of advanced procedure. 2. Chronic liver disease detected on Ultrasound abdomen and with coexisting deranged Liver function tests (bilirubin > 1.1, AST, ALT > 45IU, Serum Albumin < 3.3), ischemic heart disease (evident on ECG in form of Q waves). 3. Para-umbilical hernia. 4. History of previous laparotomy.

Data Collection Procedure: The study was carried out after approval from hospital's ethical committee. After consent, all patients in the study were divided into two equal groups via lottery method. Each selected case was performed by General Surgery specialist having postgraduate qualification such as (FCPS, FRCS, FACS, MS) in Surgery and have performed more than 50 laparoscopic procedures in a year.

Insertion into the abdomen was made with patients in a 20° Trendelenburg position, the abdominal wall elevated with hands and the tip of the trocar was turned 30° towards the pelvis at supraumbilical fold and veress needle at 45°. Disposable trocars and veress needle were used. Maximum 3 attempts were made and in case of failure open technique were used. After surgery patients were kept in ward. All the information was recorded on a proforma. Outcome variable were recorded.

Data Analysis Procedure: SPSS version 22 was used for data analysis. Mean and standard deviation were calculated for numerical variables like age and BMI. Frequencies and percentages were calculated for categorical variables like

gender, number of attempts during DTI & VN. Numbers of attempts creating Pneumoperitoneum were stratified among DTI and VN to see the effect modifications. Chi-Square test was applied in which p value < 0.05 was considered significant value to compare the outcome in both groups. Data was stratified for age, gender, BMI to address effect of modifiers. Post stratification Chi square test was applied with p value < 0.05 considered statistically significant.

RESULTS

1) Age & BMI: Mean age of patients in study was 47.99 + 11.01 years. Minimum age was 30 years & maximum age was 75 years. Mean BMI of study patients was 26.18+ 3.88 kg/m². Minimum BMI was 17.28kg/m² and maximum of study patient was 37.189 kg/m².

Table 1: Descriptive statistic of patients

Parameter	Mean	SD	Minimum	Maximum
Age	47.99	11.01	3.0	75.0
BMI kg/m ²	26.18	3.88	17.26	37.18

2) Gender: Regarding gender of the patients, there were 211 (34.70%) male patients and 297 (65.30%) female patients in this study. There was female predominance in this study.

3) Number of attempts for Pneumoperitoneum: It was successfully made in first attempt in 534 (87.33%) patients, in 2nd attempt in 58(9.54%) patients and in 3rd attempt in 16(2.63%) patients. Comparison of number of attempts was made in DTI and VNI groups. In DTI group, pneumoperitoneum was created successfully in first attempt in 278 (91.4%) patients, in 2nd attempt in 20 (6.6%) patients and in 3rd attempt in 6 (2.0%) patients. While in VNI group, pneumoperitoneum was successful in first attempt in 256 (84.2%) patients, in 2nd attempt in 38 (12.5%) patients and in 3rd attempt in 10 (3.3%) patients (p-value 0.02) (table 2).

Table 2: Comparison of no. of attempts in DTI versus VN

No of Attempts	DTI [N (%)]	VNI [N (%)]	P-Value
1	278 (91.4%)	256 (84.2%)	0.024
2	20(6.6%)	38 (12.5%)	
3	6 (2.0%)	10 (3.3%)	

4) Age stratification: In patients having age 30-45 years, pneumoperitoneum was successful in 114 patients in 1st attempt and in 7 patients in 2nd attempt. While it was successful in 1st attempt in 110 patients and in 2nd attempt in 19 patients in VNI group with p-value 0.06 (table 3A).

Table 3A: Stratification to determine the effect of age on number of attempts between the groups

No of Attempts	DTI	VNI	P-Value
	N	N	
1	110	256	0.06
2	7	19	
3	3	3	

In patients having age 46-60 years, pneumoperitoneum was successful in 1st attempt in 133 patients in DTI group and in 131 patients in VNI groups. It was successful in 2nd attempt in 4 patients in DTI group and in 10 patients in VNI group with p-value of 0.04 (Table 3B).

Table 3B: Age group 46- 60 Years

No of Attempts	DTI (N)	VNI (N)	P-Value
1	133	131	0.04
2	4	10	
3	1	7	

In patient having age 61-75 years, pneumoperitoneum was successfully created in 1st attempt in 31 patients DTI group and in 15 patients in VNI group and it was successfully created in 9 patients in DTI group and in patients in VNI group (Table 3C).

Table 3C: Age group 61-75 Years

No of Attempts	DTI (N)	VNI (N)	P-Value
1	31	15	0.15
2	9	9	
3	2	0	

5) Gender stratification: In male patients, pneumoperitoneum was created successfully in first attempt in 103 patients and in 87 patients in VNI group (Table 4A).

Table 4: Gender stratification for number of attempts between the groups

(A) Male Gender

No of Attempts	DTI (N)	VN (N)	P-Value
1	103	87	0.31
2	7	10	
3	1	3	

In female patients, pneumoperitoneum was successful in first attempt in 175 patients in DTI group and in 169 patients in VNI group. It was successful in 2nd attempt in 13 patients in DTI group and in 28 patients in VNI group (Table 4B).

(B) Female Gender

No of Attempts	DTI (N)	VNI (N)	P-Value
1	175	169	0.06
2	13	28	
3	5	7	

6) Stratification of BMI: Stratification of BMI was also performed. In normal weight patients, pneumoperitoneum was created in first attempt in 112 patients in DTI group and in 106 patients in VNI group. Pneumoperitoneum was created in 2nd attempt in 8 patients in DTI group and in 16 patients in VNI group (Table 5A).

Table 5: Stratification of BMI

(A) Normal Weight (BMI < 24.99 Kg/m²)

No of Attempts	DTI (N)	VNI (N)	P-Value
1	112	151	0.245
2	8	16	
3	3	03	

In overweight patients, pneumoperitoneum was successful in 1st attempt in 130 patients and in 2nd attempt in 09 patients in DTI group and in VNI group in first attempt in 119 patients and in 2nd attempt in 16 patients (Table 5B).

(B) Over Weight (BMI 25.0 to 29.99 kg/m²)

No of Attempts	DTI (N)	VNI (N)	P-Value
1	130	119	0.155
2	09	16	
3	02	05	

In obese patients, pneumoperitoneum was created successfully in 36 patients in first attempt and in 03 patients in second attempt in DTI patients and in first attempt in 31 patients and in 2nd attempt in 06 patients in VNI group (Table 5C).

(C) Obese (BMI > 30.0 Kg/m²)

No of Attempts	DTI (N)	VNI (N)	P-Value
1	36	31	0.42
2	03	06	
3	01	02	

DISCUSSION

Pneumoperitoneum can be achieved by multiple techniques. An optical trocar can be blindly inserted into the peritoneal cavity, or a Veress needle may be inserted through the abdominal midline or a trocar inserted directly without creation of pneumoperitoneum. The latter is the most frequently used technique.⁴

Debates of safety of laparoscopic surgery generally focus primarily on procedure-specific complications, such as biliary injury and secondarily non-biliary injury, i.e. vascular or enteric injuries. Access-related injuries are usually evaluated in separate studies; major vessel or gut injuries caused by entry are as infrequent as 0.1-0.4%.⁵ It has been found that 83% of vascular injuries, 75% of gut injuries, and 50% of local hemorrhaged injuries were caused during primary trocar insertion. It is anecdotal, but very possible true, that these complications are underreported, especially as the minor complications associated with entry have minimal impact on the overall outcome.

Increasingly more general surgeons and gynecologists are using the DTI technique in laparoscopic surgery. The rise in its use is principally due to the fact that there are few complications, each major and minor, with this procedure, and it is likely to become the most suited alternative in the near future. One of the benefits of DTI is early recognition of any major complication before insufflations of abdomen. Other advantages are avoidance of complications associated with Veress needle (VN) like preperitoneal or intestinal insufflations, failed pneumoperitoneum and CO₂ embolism as direct visualization with laparoscope precludes above mentioned complications.

In present study, we compared the number of attempts for successful creation of pneumoperitoneum in DTI group and VNI group of patients. In DTI group, pneumoperitoneum was created successfully in 1st attempt in 278 (91.4%) patients, in 2nd attempt in 20 (6.6%) patients & in 3rd attempt 6(2.0%)

patients, while in VNI group, pneumoperitoneum was successful in first attempt in 256 (84.2%) patients, in 2nd attempt in 38 (12.5%) patients and in 3rd attempt in 10(3.3%).

In a study conducted by Ertugural et al. pneumoperitoneum was created successfully in 1st attempt in 74.3% patients and in 2nd attempt in 15.6% patients in DTI group versus in 54.76% patients in 1st attempt and in 30.95% patients in 2nd attempt in VNI group. The main difference in our study and in this study is due to the reason that these authors only included morbidly obese patients in their study and access is difficult in obese patients.

A study conducted by Agresta et al. found a success rate of 100% for creating pneumoperitoneum in DTI and in 98.7% patients in VNI group. While Borgatta et al. reported a peritoneal success rate in 1st attempt in 92.2% patients in DTI group and in 78.2% patients in VNI group. The results of our study are comparable to the results of these studies.

The society of Obstetricians and Gynecologists of Canada has recommended that direct trocar insertion may be considered as a safe alternative to the Veress needle technique. Among studies conducted in Pakistan a similar study comparing DTI insertion and complications on 200 patients by Tariq et al reports entry 1st attempt in 176 cases (92.6%) in 2nd attempt in 1 case (6.3%), and in 3rd attempt in 2 cases (1.1%). These results are similar to those in our study but there is randomization and comparison with other methods of entry.

A study conducted at Akhtar Saeed Medical College Surgery department enrolled 30 patients each in DTI and VN were allocated and complication rates of both groups were studied. Study reported 100% creation of pneumoperitoneum in both groups; these results due to small sample size at best are unreliable.

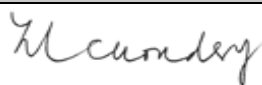

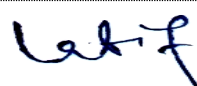
CONCLUSION

Direct trocar insertion is a safer alternative to veress needle insertion in laparoscopic cholecystectomy. It requires less number of attempts for successful creation of pneumoperitoneum as compared to the veress needle.

REFERENCES

1. Jansen FW, Kapiteyn K, Trimbo-Kemper T, Hermans J, Trimbo JB. Complication of laparoscopy: a prospective multicentre observational study. Br J Obstet Gynaecol. 1997;104(5):595-600.
2. Viols GA, Ternamian A, Dempster J, Labere PY, Vilos G, Lefebvre G, et al. Laparoscopic entry: a review of techniques, technologies, and complications. J Obstet Gynaecol Can. 2007;29(5):433-47.
3. Nevler A, Har-Zahav G, Rosin D, Gutman M. Safer trocar insertion for closed laparoscopic access: ex vivo assessment of an improved Veress needle. Surg Endosc. 2016;30(2):779-82.
4. Shayani-Nasab H, Amir-Zargar MA, Mousavi-Bahar SH, Kashkouli AI, Ghorban-Poor M, Farimani M, et al. Complications of entry using direct trocar and/or Veress needle compared with modified open approach entry in laparoscopy: six-year experience. Urol J. 2013;10(2):861-5.
5. Dingfelder JR. Direct Laparoscope trocar insertion without prior pneumoperitoneum. J Reprod Med. 1978;21(1):45-9.
6. Hameed F, Iqbal MS, Iqbal Z, Liaqat K. Safety of Direct Trocar Insertion for Laparoscopic Procedures. APMC. 2018;12(3):211-4.
7. Kummur R, Hastir A, Bandlish MK. Pneumoperitoneum by direct trocar insertion: safe laparoscopic access. J Evolution Med Dental Sci. 2015;4(15):2432-7.
8. Angioli R, Terranova C, Nardone CD, Cafa EV, Damiani P, Portuesi R. et al. A comparison of three different entry techniques in gynecological laparoscopic surgery: a randomized prospective trial. Eur J Obstet Gynecol Reprod Biol. 2013;171(2):339-42.
9. Tariq M, Ahmad R, Rehman S, Sajjid M. Comparison of Direct Trocar Insertion with other Techniques for Laparoscopy. J Coll Phys Surg. 2016;26(11):917-9.
10. Cakir T, Tuney D, Esmailzadem S, Aktan AO. Safe Veress needle insertion. J Hepatobiliary Pancreat Surg. 2006;13(3):225-7.
11. Channa G, Siddique A, Zafar S. Open Versus Closed Method of Establishing pneumoperitoneum for Laparoscopic Cholecystectomy. J Coll Phys Surg Pak. 2009;19(9):557-60.
12. Schwartz S, Brunicaudi F, Andersen D, Billiar TM, Dunn D, Hunter J et al. Schwartz's principles of surgery. 10th ed. New York; 2015.
13. Snell R. Clinical Anatomy by regions. 9th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2012.
14. Brill A, Cohen B. Fundamental of Peritoneal Access. J Am Assoc Gynecol Laparosc. 2003;10(2):286-97.

AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Prof. Dr. Zafar Ali Choudry Professor of Surgery, Vice chancellor Faisalabad Medical University, Faisalabad	Main Author & Researcher, Study Design Processing of Data	
Dr. Muhammad Saleem Iqbal Assistant Professor, Surgery Allied Hospital, Faisalabad	Proof Reading,	
Dr. Muhammad Latif Assistant Professor of Surgery Khawaja Muhammad Safdar Medical College, Sialkot	Data Collection	
Dr. Kamran Hamid PGR, Surgery Khawaja Muhammad Safdar Medical College, Sialkot	Statistical Analysis	