



Comparison of Complications between Direct Trocar Insertion Versus Veress Needle for Creation of Pneumoperitoneum in Patients Undergoing laparoscopic Cholecystectomy: A Randomized Control Trial

**Kamran Hamid¹, Shabbir Ahmad², Bahzad Akram Khan³,
Muhammad Faheem Answer⁴, Amer Latif⁵, Syed Mazhar Ali Naqvi⁶,
Muhammad Afzal Bhatti⁷, Muhammad Asim Rana⁸,
and Muhammad Mansoor Hafeez^{9*}**

¹Department of Surgery, Islam Medical College, Sialkot, Pakistan.

²Department of Surgery, Khawaja Muhammad Safdar Medical College, Pakistan.

³West Surgical Unit, Mayo hospital/King Edward Medical University, Lahore, Pakistan.

⁴Department of Surgery, CMH Medical College, Lahore, Pakistan.

⁵Department of HPB Surgery, Shaikh Zayed Hospital, Lahore, Pakistan.

⁶Department of Pulmonary and Critical Care Medicine, Services Institute of Medical Sciences, Lahore, Pakistan.

⁷Department of Hepatology and Gastroenterology, Bahria International Hospital, Lahore, Pakistan.

⁸Department of Internal and Critical Care Medicine, Bahria International Hospital Lahore, Pakistan.

⁹Department of Medicine, Expert Doctor Private Limited, Lahore, Pakistan.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To compare the outcomes in term of complication of Veress Needle Insertion (VNI) to Direct Trocar Insertion (DTI) for creation of pneumoperitoneum in laparoscopic cholecystectomy.

Design: Randomized controlled trial

Place and Duration of Study: The current analysis was conducted at Khawaja Muhammad Safdar Medical College Surgical Department, Allama Iqbal Memorial Hospital and Govt. Sardar Begum Teaching Hospital, Sialkot from September 27, 2017, to September 26, 2020.

Methodology: A total of six hundred and eight (n=608) patients, having age 30 to 75 years planned for laparoscopic cholecystectomy were included in this study. Patients were randomly divided into two groups, Group A (Direct Trocar Insertion), Group B (Veress Needle Insertion). Both groups had age and sex matched males and female. All trocars and veress needle used were disposable, with a safety shield. The primary outcome of our study was to compare the complications to assess the safety levels, while total time taken by the procedure and mean time for laparoscopic entry were the secondary end points. The collected data was analyzed by using software SPSS version 22. Chi-square test was used to check the significance of variance. *P*-value less than 0.05 remained the statistically significant.

Results: The complication rate in VNI group were significantly greater than the DTI group ($p < 0.01$), the duration of surgery between the two groups was not significantly different ($p > 0.05$), but we found statistically significant difference in mean laparoscope insertion time (DTI 3.4+ 1.4 versus VNI 4.8+ 0.7 minutes, $p < 0.001$).

Conclusion:

From the results of our study, it can be concluded that the direct trocar insertion is a safe alternative to veress needle insertion in laparoscopic cholecystectomy as it is associated with fewer complications.

Keywords: *Laparoscopic cholecystectomy; veress needle insertion; direct trocar insertion; Pneumoperitoneum.*

1. INTRODUCTION

Evolution of laparoscopic surgery started in 1910, when a Swedish surgeon Jacbeus performed a first laparoscopic surgery. In past few decades this technique has gained primary importance in various surgical procedures, laparoscopic cholecystectomy is one of them. Now for uncomplicated symptomatic cholelithiasis, it has considered the gold standard around the globe [1]. Laparoscopic surgery has many beneficial effects as compared to the conventional surgical methods such fewer number of attempts to create pneumoperitoneum, cost effectiveness and cosmetic benefits. Although it is superior then the open procedures but still has complications during the creation of pneumoperitoneum. More than 50% complication occur during the insertion of trocar [2]. Different techniques such as Veress, direct or with disposable shield trocars, radially expanded trocars and visual systems were used to overcome the complications [3]. But literature showed none of the technique clearly indicate the beneficial effect over the others. So mostly it is decided by the surgeon at the time of operate which technique should be adopted. The

current RCT was an attempt to assess the efficacy and safety level of direct trocar insertion versus veress needle insertion techniques to create a successful pneumoperitoneum with minimum complications, so that we can develop some local guidelines for junior surgeons.

2. MATERIALS AND METHODS

In this current Randomized control trials was conducted from September 27, 2017, to September 26, 2020. Total of six hundred and eight (n=608) patients of uncomplicated symptomatic cholelithiasis with planed laparoscopic cholecystectomy were included after taken the written consent from Khawaja Safdar Medical College Surgical Department, Allama Iqbal Memorial Hospital and Govt. Sardar Begum Teaching Hospital Sialkot. Both male and female with age ranging 30-75 years old were divided into two equal groups. Group A contained 304 patients in which the pneumoperitoneum was created through direct trocar insertion (DTI) and Group B had same number of age and sex matched patients undergone veress needle insertion (VNI). Patients having history of advanced gastrointestinal or gynecological

procedures, chronic liver disease detected on ultrasound abdomen and coexisting deranged Liver function tests, ischemic heart disease (evident on ECG as Q waves), para-umbilical hernia, and previous laparotomy were excluded from the study. All patients underwent a full history, which was followed by a thorough routine examination and baseline investigations. During laparoscopic operations to create pneumoperitoneum with veress needle or direct trocar insertion, patients were randomly split using a lottery technique. Each chosen instance was carried out by an experienced General Surgeon. During direct trocar insertion technique, the patient is positioned in the same manner as in veress needle insertion, that is supine with a 20- to 30-degree Trendelenburg tilt. The collected data was analyzed by using the software SPSS version 22. Mean and standard deviation were calculated for numerical variables like age and BMI. Frequencies and percentages were calculated for categorical variables like gender. Chi square test was applied in which p value ≤ 0.05 was considered as significant value to compare the outcome in both groups. Post stratification Chi square test was applied with p value ≤ 0.05 considered statistically significant.

3. RESULTS

In this study there were 211 (34.70%) male and 397 (65.30%) were the female patients. Mean age with standard deviation of patients was 47.99 ± 11.01 years (minimum age was 30 years and maximum age was 75 years). Mean body mass index (BMI) of study patients was $26.18 \pm$

3.88 kg/m^2 (Minimum BMI was 17.26 kg/m^2 and maximum was 37.18 kg/m^2).

Complication rate was noted significantly higher in the group B (VNI) as compared to group A (DTI), (21.67% and 2.88% respectively, $P < 0.01$). In our study the minimal subcutaneous and omental emphysema taken as complication. Among all complications, gastric perforation and iliac artery laceration were considered major complication and were managed by open surgical procedure. We found statistically significant different in complication rate in two groups, shown in Table 2.

The time to set up pneumoperitoneum was less in the direct trocar's technique as compared to veress needle technique (3.4 ± 1.4 minutes and 4.8 ± 0.7 minutes respectively, $p = < 0.001$), but no difference was found in total time take by the laparoscopic cholecystectomy.

4. DISCUSSION

The DTI method progressively becoming the method of choice by the surgeons and gynecologists for creation of pneumoperitoneum. The increased use is mostly because of this treatment has fewer problems, both major and minor, and it is expected to be the technique of choice soon. The veress method for producing pneumoperitoneum is still a regularly used technique by the surgeons [1]. The complications associated with the use of the veress needle, on the other hand, cannot be denied, and prompting

Table 1. Demographic Variables

Variables	Construct	N (%)	Mean \pm S. D
Gender	Male	211 (34.70%)	
	Female	397 (65.30%)	
Age (Years)	Minimum	30	47.99 ± 11.01
	Maximum	75	
BMI (kg/m^2)	Minimum	17.26	26.18 ± 3.88
	Maximum	37.18	

Table 2. Comparison of complications between both groups

Complications	Group A	Group B
Subcutaneous emphysema	4 (1.31%)	30 (9.83%)
Omental emphysema	2 (0.59%)	24 (7.92%)
Omental laceration	3 (0.98%)	8 (2.63%)
Gastric perforation	0	1 (0.31%)
Iliac artery laceration	0	0
Total	9 (2.88) *	66 (21.67%) *

* $P < 0.01$

the quest for novel techniques to reduce laparoscopic operation morbidity [2-4]. Pneumoperitoneum can be mostly created by the following three techniques, A) the veress needle closed method; B) the Hasson open approach; and C) direct trocar insertion without prior pneumoperitoneum [5-7]. We have embraced this third approach in our practice due to the fewer related problems and the ease with which it creates pneumoperitoneum. The percentage of complications from DTI and VNI in the current research was 2.9 percent and 21.4 percent, respectively. This result is remarkably comparable to that obtained by NESZHAT et al., who reported DTI to VNI complication rates of 6% and 22%, respectively, in obstetric surgery [8]. It is now generally accepted truth that the veress group had a higher level of complexity as indicated by our findings, in consistent with the finding of the other research [9-13]. In terms of the DTI technique in cholecystectomy, a reference of YERDEL et al., can also be given who discovered DTI and VNI complication percentages of 0.9 percent and 14 percent, respectively, statistics that are quite comparable to those obtained in our study [14-16]. Debates on the safety of laparoscopic surgery generally focus primarily on procedure-specific complications, such as biliary injury in laparoscopic cholecystectomy, and secondarily non-biliary injury, i.e., vascular, or enteric injuries caused by the main procedure. Access-related major vessel or bowel injuries caused by entry were noted in our study ranging 0 to 0.3% as infrequent as report in another study 0.1 -0.4% [Arif, 2021 #6][17-19]. It has been reported that 83% of vascular injuries, 75% of bowel injuries, and 50% of local hemorrhage injuries were caused during primary trocar insertion [20-23]. It is anecdotal, but very possibly true, that these complications are under reported, 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 now a days. The rise in its use is principally because there are fewer complications, each major and minor, with this procedure, and it is likely to become the most suited alternative soon. One of the benefits of DTI is early recognition of any major complication before insufflation of abdomen. Other advantages of DTI are avoidance of complications associated with veress needle insertion like frequent preperitoneal or intestinal injuries, failed pneumoperitoneum and CO₂ embolism [12,24,25]. In the study by Inan A et al,

concluded that direct trocar entrance also reduces the operation time, but in our study the mean time for surgery was not differ in two groups. A study conducted at Akhtar Saeed Medical College Surgery department enrolled 30 patient each in DTI and VNI group were allocated, and complication rates of both groups were studied. In their study there was less time taken in DTI group to create pneumoperitoneum similar to the results of our study [26].

5. CONCLUSION

From the results of our study, it can be concluded that the direct trocar insertion is a safe alternative to veress needle insertion in laparoscopic cholecystectomy because it is associated with less number of complications as compared to the Veress needle and also required less time to create safe pneumoperitoneum.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

ETHICAL APPROVAL

The study was approved by the institutional review board of Khawaja Safdar Medical College.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Veress J. Neues Instrument zur Ausführung von Brust-oder Bauchpunktionen und Pneumo thorax behandlung.

- DMW-Deutsche Medizinische Wochenschrift. 1938;64(41):1480-1481.
2. Mitchell M, Stiegmann G, Mansour A. Improved technique for establishing pneumoperitoneum for laparoscopy. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*. 1991;1(3):198-199.
 3. Oshinsky GS, Smith AD. Laparoscopic needles and trocars: an overview of designs and complications. *Journal of laparoendoscopic surgery*. 1992;2(2):117-125.
 4. Rana MA, Pervaiz R, Arif B, Tariq F, Tabassum SA, et al. Beneficial effects of awake Prone positioning in covid-19 patients with moderate to severe hypoxemic respiratory failure. *Pakistan Journal of Intensive Care Medicine*. 2021; (1):e002.
 5. Bonjer H, Hazebroek E, Kazemier G, Giuffrida M, Meijer W, et al. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. *Journal of British Surgery*. 1997;84(5): 599-602.
 6. Wolthuis AM. Veress needle creation of a pneumoperitoneum: is it risky? Results of the first Belgian group for endoscopic surgery-snapshot study. *Journal of Laparoendoscopic & Advanced Surgical Techniques*. 2019;29(8): 1023-1026.
 7. Jiang X, Anderson C, Schnatz PF. The safety of direct trocar versus Veress needle for laparoscopic entry: a meta-analysis of randomized clinical trials. *Journal of laparoendoscopic & advanced surgical techniques*. 2012; 22(4):362-370.
 8. Nezhat FR, Silfen SL, Evans D, Nezhat C. Comparison of direct insertion of disposable and standard reusable laparoscopic trocars and previous pneumoperitoneum with Veress needle. *Obstet Gynecol*. 1991;78(1):148-150.
 9. Biojò RG, Manzi GB. Safe laparoscopic surgery: tubal ligation without prior pneumoperitoneum. *Surgical laparoscopy & endoscopy*. 1995;5(2):105-110.
 10. Djokovic D, Gupta J, Thomas V, Maher P, Ternamian A, et al. Principles of safe laparoscopic entry. *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 2016;201179-188.
 11. Giampaolino P, Morra I, Tommaselli GA, Di Carlo C, Nappi C, et al. Post-operative ovarian adhesion formation after ovarian drilling: a randomized study comparing conventional laparoscopy and transvaginal hydrolaparoscopy. *Archives of gynecology and obstetrics*. 2016;294(4):791-796.
 12. Godara R, Bansal A, Verma S, Yadav S, Verma N, et al. Direct trocar insertion without the pneumoperitoneum in laparoscopic surgery-Is this a safe technique? *Hellenic Journal of Surgery*. 2015;87(5):415-418.
 13. Ertugrul I, Kayaalp C, Yagci MA, Sumer F, Karagul S, et al. Comparison of direct trocar entry and Veress needle entry in laparoscopic bariatric surgery: randomized controlled trial. *Journal of Laparoendoscopic & Advanced Surgical Techniques*. 2015;25(11):875-879.
 14. Yerdel MA, Karayalcin K, Koyuncu A, Akin B, Koksoy C, et al. Direct trocar insertion versus Veress needle insertion in laparoscopic cholecystectomy. *The American Journal of Surgery*. 1999; 177(3):247-249.
 15. Ashfaq F, Ali Q, Haider MA, Hafeez MM, Malik A. Therapeutic activities of garlic constituent phytochemicals. *Biological and Clinical Sciences Research Journal*. 2021; 2021(1):e007.
 16. Rana MA, Qayyum A, Hashmi M, Saif MMU, Munir MF, et al. Mortality and COVID-19: a snapshot of a tertiary care facility in Pakistan. *Pakistan Journal of Intensive Care Medicine*. 2021;(1): e001.
 17. Shayani-Nasab H, Amir-Zargar MA, Mousavi-Bahar SH, Kashkouli AI, Ghorban-Poor M, et al. Complications of entry using direct trocar and/or veress needle compared with modified open approach entry in laparoscopy: six-year experience. *Urology Journal*. 2013;10(2): 861-865.
 18. Malik A, Hafeez K, Nazar W, Naeem M, Ali I, et al. Assessment of controversial risk factors in development of breast cancer: a study from local population. *Biological and Clinical Sciences Research Journal*. 2021; (1) e003.
 19. Khalid S, Ali Q, Hafeez MM, Malik A. Perception regarding self-medication of antibiotics in general public sector University of Southern Punjab: a comparison between medical and non-medical students. *Biological and Clinical Sciences Research Journal*. 2021; (1):e005.
 20. Dingfelder J. Direct laparoscope trocar insertion without prior pneumoperitoneum.

- The Journal of reproductive medicine. 1978;21(1):45-47.
21. Hafeez MM, Yasin T, Safdar U, Waquar S, Rana MA, et al. An evidence based assessment of most common risk factors of myocardial infarction: analysis from a local population. Biological and Clinical Sciences Research Journal. 2020; (1):e044.
 22. Amir B, Javed Y, Manzoor M, Fatima G, Raza S, et al. Culturing, identification and drug resistance of Mycobacterium tuberculosis in sputum specimen. Pakistan Journal of Intensive Care Medicine. 2021; (1):e003.
 23. Siddique A, Idrees N, Kashif M, Ahmad R, Ali A, et al. Antibacterial and antioxidant activity of kiwi fruit. Biological and Clinical Sciences Research Journal. 2021;(1): e028.
 24. Nadeem U, Anjum N, Farooq F, Gillani SA, Qurratulain. A sonographic evaluation of pediatric acute abdominal pain: A systematic review. Biological and Clinical Sciences Research Journal. 2021;(1): e013.
 25. Shahzad M, Anjum N, Siraj S, Omer MA, Shabbir R, et al. Effectiveness of radiological imaging techniques (x-rays, mdct, and mri) for diagnosis of pelvic fistula: A systematic review. Biological and Clinical Sciences Research Journal. 2021;(1): e014.
 26. Kumar R, Hastir A, Bandlish M. Pneumoperitoneum by direct trocar insertion: safe laparoscopic access. Journal of Evolution of Medical and Dental Sciences. 2015;4(15): 2432-2438.

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