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ORIGINAL ARTICLE

Intraoperative Safety Outcomes of Veress Needle versus Direct Trocar Insertion during Laparoscopic Surgery: A Prospective Comparative Study

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ABSTRACT

Background: *Abdominal access is the stage of laparoscopy at which many injuries are sustained and the relative safety of Veress needle (VN) insertion and direct trocar insertion (DTI) remains debated. This study aimed to compare intraoperative safety outcomes, including access-related complications, major bowel or vascular injury and estimated blood loss, between VN insertion and DTI in elective laparoscopic abdominal surgery.* ***Methods & Materials:*** *This prospective comparative study was undertaken in the Department of General Surgery, Bangladesh Medical University, Dhaka, from August 2024 to July 2025. Thirty-eight patients scheduled for elective laparoscopic surgery were purposively enrolled and divided equally into a VN group (n=19) and a DTI group (n=19). Safety events and estimated blood loss were documented during surgery and analyzed in SPSS version 26 (p<0.05 considered significant).* ***Results:*** *Baseline characteristics were similar between the groups. Access was completed without a recorded complication in 14 (73.7%) patients in the VN group and 17 (89.5%) in the DTI group (p=0.405). Any access-related complication occurred in 5 (26.3%) and 2 (10.5%) patients, respectively. Preperitoneal insufflation was the most frequent event (21.1% versus 5.3%; p=0.150). No major bowel or vascular injury was recorded in either group. Median estimated blood loss was 5 mL in both groups (p=0.293) and most patients lost more than 3 to 6 mL.* ***Conclusion:*** *Both techniques showed an acceptable intraoperative safety profile, with no major injury and comparable blood loss. Minor access events were numerically more frequent with VN insertion, but the differences were not significant. Larger studies are required to confirm these results.*

Keywords: *Laparoscopy; Pneumoperitoneum; Veress needle; Direct trocar insertion; Intraoperative safety.*

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INTRODUCTION

Laparoscopic surgery has reduced postoperative pain, wound morbidity and hospital stay when compared with open operations and it is now the preferred approach for many abdominal procedures[1]. Its safety, however, depends heavily on the first step of the operation. The peritoneal cavity is entered through a small incision, usually at the umbilicus, without direct sight of the structures beneath and this is the point at which a large proportion of laparoscopic complications arise [2,3]. Injuries sustained at entry include omental and mesenteric tears, bowel perforation and lacerations of major retroperitoneal vessels. They are uncommon, but they can be life threatening and are sometimes recognized only after the operation [4,5].

Several access strategies are in use. The Veress needle, a spring-loaded device adapted for pneumoperitoneum, became a routine closed entry method largely through the reports of Palmer on its safety[6]. Hasson later described an open technique performed under direct vision and Dingfelder introduced direct trocar insertion without prior pneumoperitoneum in order to remove the blind needle step[7,8]. Veress needle insertion and direct trocar insertion remain the two closed techniques used most often today and the selection between them is frequently based on surgeon preference rather than on firm evidence[9].

The available comparisons do not settle the question. A Cochrane review of 57 randomized trials could not show that any entry technique prevents visceral or vascular injury better than the others[10]. A meta-analysis of seven randomized studies that included 2,940 women compared the safety of direct trocar and Veress needle entry and later pooled analyses concluded that the Veress needle is associated with more minor complications, particularly extraperitoneal insufflation, omental injury and failed entry, whereas major complications occur at similar low rates[11-13]. Individual trials point in different directions. Kirti et al. observed comparable complication rates in 114 patients,[14] while Ertugrul et al. described two mesenteric injuries after blind insertion of a

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bladed non-optical trocar in bariatric patients, even though overall complication rates were similar between groups[15].

Safety at entry is not limited to the presence or absence of a named complication. Blood loss at the access site, although small in most patients, provides a simple indicator of tissue and vessel trauma and it is not consistently reported alongside access complications when the two techniques are compared. Results from gynecologic and bariatric series also cannot be transferred automatically to general surgical patients undergoing elective abdominal procedures in resource-limited tertiary centers, where devices, operator experience and case mix differ. A combined assessment of complications, major injury and blood loss in such a population is therefore needed to describe how the two techniques perform in everyday practice and to inform the choice of entry method by surgeons who use both. In addition, surgeons must weigh the speed and simplicity of direct insertion against the theoretical risk of injuring underlying structures with a sharp trocar passed before gas has been introduced.

The present study compared intraoperative safety outcomes, comprising access-related complications, major bowel or vascular injury and estimated blood loss, between Veress needle insertion and direct trocar insertion in patients undergoing elective laparoscopic abdominal surgery.

METHODS & MATERIALS

This prospective comparative study was conducted in the Department of General Surgery, Bangladesh Medical University, Dhaka, Bangladesh, over one year from August 2024 to July 2025. Patients scheduled for elective laparoscopic abdominal surgery in the department formed the study population. Using purposive sampling, 38 patients were enrolled and divided equally into the Veress needle (VN) group (n=19) and the direct trocar insertion (DTI) group (n=19); this size was derived from the standard formula for comparing two proportions at 95% confidence and 80% power, using previously reported complication rates of 46% and 10%[9]. Patients who gave written informed consent were included, whereas those with a previous abdominal operation leaving a central abdominal scar, severe abdominal wall or intra-abdominal sepsis, abdominal cocoon, or an emergency presentation were excluded. Information was recorded on a semi-structured questionnaire and a structured data collection sheet covering demographic details, anthropometry, clinical findings, investigation results, the surgical indication and operative notes. After standard preoperative preparation and anesthetic assessment, pneumoperitoneum was created with conventional non-optical devices. In the DTI group, a 1 cm transverse umbilical incision was followed by elevation of the abdominal wall and direct introduction of a 10 mm reusable trocar with balanced countertraction, with the CO_2 stopcock open until peritoneal entry. In the VN group, a 2 to 3 mm umbilical incision was used for blind needle insertion and CO_2 insufflation, followed by the 10 mm port. During surgery, failed pneumoperitoneum, subcutaneous emphysema, preperitoneal insufflation, omental injury, port-site bleeding, periumbilical bruising, gas leakage, gut perforation and intra-abdominal vessel injury were monitored and documented and estimated blood loss was recorded. To ensure accuracy and consistency, every case was documented on the same researcher-prepared checklist and the data were checked for consistency before entry. Ethical clearance was obtained from the Institutional Review Board of Bangladesh Medical University and the study followed the Declaration of Helsinki. Participants were informed of the aims, procedures and their right to withdraw, written informed consent was obtained, identities were protected through coded identification numbers with restricted access to records and no financial incentive was offered. Continuous variables were summarized as mean and standard deviation, blood loss additionally as median with interquartile range and categorical variables as frequencies and percentages. The independent t-test, chi-square test, Fisher's exact test and Mann-Whitney U test were used as appropriate, the analysis was performed in SPSS version 26 and $p<0.05$ was considered statistically significant.

RESULTS

A total of 38 patients undergoing elective laparoscopic abdominal surgery were included, comprising 19 patients in the Veress Needle Group and 19 in the Direct Trocar Insertion Group. The baseline demographic characteristics of the study participants are presented in *Table I*.

Table I: Baseline demographic characteristics of the study participants

Variable	Veress Needle Group (n=19)	Direct Trocar Insertion Group (n=19)	p-value
Age (years), mean ± SD	39.21 ± 10.66	44.32 ± 13.57	0.205
Male, n (%)	6 (31.6)	7 (36.8)	0.732
Female, n (%)	13 (68.4)	12 (63.2)	
Weight (kg), mean ± SD	61.37 ± 9.78	61.42 ± 7.21	0.985
Height (cm), mean ± SD	158.68 ± 7.68	159.89 ± 4.97	0.57
BMI (kg/m^2), mean ± SD	24.52 ± 2.01	25.01 ± 2.26	0.488

Table I shows that the mean age was 39.21 ± 10.66 years in the Veress Needle Group and 44.32 ± 13.57 years in the Direct Trocar Insertion Group. The majority of participants were female in both groups. Mean weight, height and BMI were similar between the two groups, with no statistically significant differences in the measured baseline characteristics.

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Table II: Intraoperative safety outcomes

Safety outcome	Veress Needle Group (n=19)	Direct Trocar Insertion Group (n=19)	p-value
Access without a recorded complication	14 (73.7)	17 (89.5)	0.405
Any access-related complication	5 (26.3)	2 (10.5)	0.405
Failed pneumoperitoneum	1 (5.3)	0 (0.0)	0.311
Preperitoneal insufflation	4 (21.1)	1 (5.3)	0.15
Omental insufflation	0 (0.0)	1 (5.3)	0.311
Port-site bleeding	1 (5.3)	0 (0.0)	0.311
Major bowel or vascular injury	0 (0.0)	0 (0.0)	—

Table II demonstrates that access without a recorded complication occurred in 14 (73.7%) patients in the Veress Needle Group and 17 (89.5%) patients in the Direct Trocar Insertion Group. Access-related complications were numerically more frequent in the Veress Needle Group. Preperitoneal insufflation was the most frequently observed complication in this group. However, none of the differences in overall or individual access-related complications was statistically significant. No major bowel or vascular injury was observed in either group.

Table III: Distribution of estimated intraoperative blood loss

Blood loss	Veress Needle Group (n=19)	Direct Trocar Insertion Group (n=19)	p-value
Negligible	1 (5.3)	0 (0.0)	0.499
≤3 mL	2 (10.5)	0 (0.0)	
>3–6 mL	11 (57.9)	12 (63.2)	
>6–12 mL	3 (15.8)	6 (31.6)	
>12 mL	2 (10.5)	1 (5.3)	
Median (IQR), mL	5 (5.0–10.0)	5 (1.0–2.0)	0.293

Table III shows that estimated blood loss was low in both groups. More than half of the patients had blood loss >3–6 mL, accounting for 57.9% of the Veress Needle Group and 63.2% of the Direct Trocar Insertion Group. The median blood loss was 5 mL in both groups. There was no statistically significant difference in the distribution of blood loss or median blood loss between the groups.

DISCUSSION

This prospective comparison examined the intraoperative safety of two closed entry techniques in 38 patients undergoing elective laparoscopic abdominal surgery. Access was completed without a recorded complication in 73.7% of the VN group and 89.5% of the DTI group, an absolute difference of 15.8 percentage points that did not reach statistical significance (p=0.405). The groups were comparable in age, sex, weight, height and body mass index, so the difference in uncomplicated access is unlikely to reflect patient characteristics.

All recorded events were minor. Preperitoneal insufflation was the most frequent, occurring in 21.1% of the VN group and 5.3% of the DTI group and the same direction has been described in pooled analyses. Marchand et al. found significantly more extraperitoneal insufflation, failed entry and omental injury with the Veress needle in gynecologic surgery and Taliento et al., reported fewer minor complications with direct trocar insertion without any difference in major complications[12,13]. Elnaggar et al. reached a similar conclusion[16]. Agresta et al. observed fewer minor complications with direct entry in non-obese patients and Byron et al. had earlier reported more failed insertions with the needle[17,18]. These data suggest that the higher frequency of minor events with the Veress needle reflects the difficulty of confirming intraperitoneal placement by a blind maneuver rather than a greater danger to deep structures. Not every trial supports this view. Kirti et al. found comparable complication rates and regarded the Veress needle as a safe and efficient alternative and Rafiq et al. compared operative complications of the two techniques in a randomized trial of 400 gynecologic patients [14,19].

The absence of major bowel or vascular injury in both groups is reassuring but must be interpreted with care, because such injuries are rare. Taliento et al. found no significant difference in bowel injury or major vascular injury and earlier work on closed entry reported very low absolute risks[13,20]. A sample of 38 patients cannot exclude a difference in events that occur in a small fraction of a percent of procedures and our results should be read as showing an acceptable short-term safety profile rather than proof of equivalence. Device and patient factors also modify the risk. Ertugrul et al. recorded two mesenteric injuries with a bladed non-optical trocar in bariatric patients despite similar overall complication rates[15]. Ikechebelu et al. evaluated the effectiveness and safety of both closed techniques in obese women[21]. Our patients had normal or overweight body mass index, no patient was obese and those with a previous central abdominal scar, sepsis or abdominal cocoon were excluded, so the findings apply mainly to lower risk abdomens and to conventional trocars.

Estimated blood loss was low and similar in the two groups, with a median of 5 mL and most patients losing more than 3 to 6 mL (57.9% and 63.2%; p=0.499 for the distribution, p=0.293 for the median). Blood loss above 6 mL was recorded in 5 patients (26.3%) in the VN group and 7 patients (36.8%) in the DTI group, without a significant difference and this suggests that the small vessel injury implied by blood loss was not concentrated in one technique. Bhoyrul et al. reported fewer bleeding incidents with radially expanding trocars than with cutting trocars, Tinelli et al. reported less blood loss with bladeless optical entry than with open entry in obese patients and Erdem et al. found a smaller hemoglobin drop with direct trocar insertion in gynecologic laparoscopy[22-24]. Because we relied on estimated rather than measured blood loss, small

differences may have been missed and a laboratory measure such as postoperative hemoglobin would be more sensitive.
From a practical standpoint, the findings indicate that direct trocar insertion did not add risk in this group of patients and tended to produce fewer minor access events, which supports its use by trained surgeons in patients without a previous central scar or obesity. The Veress needle remains widely used and taught and both techniques can be performed safely when the surgeon is experienced and attentive to abdominal wall lift, insertion angle and device selection[25]. Because the study was small, the choice between the techniques should rest on surgeon experience, patient characteristics and local resources and larger multicenter studies should establish whether the numerical differences seen here are reproducible.

LIMITATIONS & RECOMMENDATIONS

- The study was conducted at a single center with a small, purposively selected sample, which limits statistical power for uncommon events and restricts generalizability.
- Only intraoperative outcomes were assessed and postoperative complications were not followed up.
- Only elective procedures in patients without previous central abdominal scars were included and no obese patients were represented.
- Blood loss was estimated rather than objectively measured.

CONCLUSION

In this prospective comparison, Veress needle insertion and direct trocar insertion showed an acceptable intraoperative safety profile in elective laparoscopic abdominal surgery, with no major bowel or vascular injury and similar blood loss in this patient group. Minor access-related events, chiefly preperitoneal insufflation, were numerically more frequent with the Veress needle, although no difference reached statistical significance. Direct trocar insertion can be considered a safe option for trained surgeons and larger multicenter studies are needed for confirmation.

REFERENCES

1. *Garry R. Laparoscopic surgery. Best Pract Res Clin Obstet Gynaecol. 2006;20(1):89-104.*
2. *Mushtaq U, Naikoo GM, Gilkar IA, et al. Classical closed technique by Veress needle insertion versus direct trocar insertion in the creation of pneumoperitoneum in various laparoscopic surgeries. Int J Contemp Med Res. 2019;6(7). doi:10.21276/ijcmr.2019.6.7.34*
3. *Syed IN, Syed NN, Naseem R, Singh-Ranger D. The Hasson versus Veress trocar wars: determining the safety index of laparoscopic surgical entry techniques. Cureus. 2024;16(11):e74073.*
4. *Alhajress GI, Al Babtain I, Alsaghyir A, et al. Complications of Veress needle versus open technique in abdominal surgeries. Cureus. 2021;13(5):e14926.*
5. *Molloy D, Kaloo PD, Cooper M, et al. Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry. Aust N Z J Obstet Gynaecol. 2002;42(3):246-54.*
6. *Palmer R. Safety in laparoscopy. J Reprod Med. 1974;13(1):1-5.*
7. *Hasson HM. A modified instrument and method for laparoscopy. Am J Obstet Gynecol. 1971;110(6):886-7.*
8. *Dingfelder JR. Direct laparoscope trocar insertion without prior pneumoperitoneum. J Reprod Med. 1978;21(1):45-7.*
9. *Merdan I, Ghleb Kadem S, Ayoob Yaqoop Y. Safety and efficacy of modified open technique as a first laparoscopic entry in comparison with direct trocar entry and Veress needle technique. Basrah J Surg. 2016;22(2):38-44.*
10. *Ahmad G, Baker J, Finnerty J, et al. Laparoscopic entry techniques. Cochrane Database Syst Rev. 2019;(1):CD006583.*
11. *Jiang X anderson C, Schnatz P. The safety of direct trocar versus Veress needle for laparoscopic entry: a meta-analysis of randomized clinical trials. J Laparoendosc Adv Surg Tech A. 2012;22(4):362-70.*
12. *Marchand GJ, Masoud A, King A, et al. Systematic review and meta-analysis of Veress needle entry versus direct trocar entry in gynecologic surgery. BMJ Surg Interv Health Technol. 2022;4(1):e000121.*
13. *Taliento C, Pontrelli G, Rondoni A, et al. Major and minor complications in Veress needle (VN) and direct trocar insertion (DTI) for laparoscopic closed-entry techniques: an updated systematic review and meta-analysis. Langenbecks Arch Surg. 2023;408(1):152.*
14. *Kirti D, Jain D, Patil K, et al. Comparison between direct trocar versus Veress needle for laparoscopic access: a randomized controlled study. Int Surg J. 2023;10(1):60-5.*
15. *Ertugrul I, Kayaalp C, Yagci MA, et al. Comparison of direct trocar entry and Veress needle entry in laparoscopic bariatric surgery: randomized controlled trial. J Laparoendosc Adv Surg Tech A. 2015;25(11):875-9.*
16. *Elnaggar AA, Diab KR, El-Hangour BA, et al. Direct trocar insertion vs. Veress needle technique in laparoscopic surgeries. A systematic review and meta-analysis. J Visc Surg. 2023;160(5):337-45.*
17. *Agresta F, DeSimone P, Ciardo LF, et al. Direct trocar insertion vs Veress needle in nonobese patients undergoing laparoscopic procedures: a randomized prospective single-center study. Surg Endosc. 2004;18(12):1778-81.*
18. *Byron JW, Markenson G, Miyazawa K. A randomized comparison of Verres needle and direct trocar insertion for laparoscopy. Surg Gynecol Obstet. 1993;177:259-62.*
19. *Rafiq A, Zafar AF, Javed M, et al. Comparison of operative complications of direct trocar access versus Veress needle insertion technique for initial peritoneal entry in patients undergoing gynecological laparoscopic surgery. J Ayub Med Coll Abbottabad. 2021;33(2):311-4.*
20. *Bonjer HJ, Hazebroek EJ, Kazemier G, et al. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. Br J Surg. 1997;84(5):599-602.*
21. *Ikechebelu JI, Eleje GU, Joe-Ikechebelu NN, et al. Randomized control trial on effectiveness and safety of direct trocar versus Veress needle entry techniques in obese women during diagnostic laparoscopy. Arch Gynecol Obstet. 2021;304(3):815-22.*
22. *Bhoyrul S, Payne J, Steffes B, et al. A randomized prospective study of radially expanding trocars in laparoscopic surgery. J Gastrointest Surg. 2000;4(4):392-7.*
23. *Tinelli A, Malvasi A, Mynbaev OA, et al. Bladeless direct optical trocar insertion in laparoscopic procedures on the obese patient. JSLS. 2013;17(4):521-8.*
24. *Erdem B, Erciyestepe SG, Aldanmaz B, et al. An open comparative randomized prospective study: direct trocar insertion vs Veress needle technique in laparoscopic surgeries. Medicine (Baltimore). 2024;103(40):e39929.*
25. *Ott J, Jaeger-Lansky A, Poschalko G, et al. Entry techniques in gynecologic laparoscopy: a review. Gynecol Surg. 2012;9(2):139-46.*