



A COMPARATIVE STUDY OF PERITONEAL ACCESS BY OPEN VS CLOSED TECHNIQUE FOR CREATINNG PNEUMOPERITONEUM IN LAPAROSCOPIC SURGERIES

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ABSTRACT

Introduction: Establishing pneumoperitoneum is the most critical and high-risk step in laparoscopy, often performed using one of four techniques: Veress needle, direct trocar insertion (DTI), optical trocar, or open (Hasson) approach. Each method carries risks, particularly of gastrointestinal or vascular injury, with over 50% of complications occurring before surgery begins. Despite advancements, no single technique has proven superior or risk-free. The Veress needle allows gradual insufflation but is slower; DTI is faster but riskier; the open approach is safer but considered cumbersome. This study evaluates the effectiveness of the three most common techniques-DTI, Veress, and open-based on literature comparisons. **Objective:** To compare efficacy of intra peritoneal creation, time required for port site entry of pneumoperitoneum, complications at entry level and evaluation of complications in post op period by open and closed method. **Results:** nsertion times were significantly longer in the Open group (mean 350 ± 127.9 s) compared to the Closed group (mean 180.1 ± 39.8 s), with a p-value < 0.001 . Most Open group insertions exceeded 300s, while the Closed group had faster times, primarily between 120–240s, indicating a statistically significant difference in efficiency. The Open group showed significantly higher rates of subcutaneous emphysema (8% vs. 6%, $p = 0.001$) and gas leaks (34% vs. 12%, $p < 0.001$) compared to the Closed group. Intra-abdominal injuries were equal in both groups (2%), with no significant difference ($p = 0.364$), indicating better outcomes in the Closed group. In our study gas leak observed: in close method (veress needle) , and open approach was 12, and 34 patients respectively. subcutaneous emphysema is observed in 6, and 4 patients respectively. **Conclusion:** In this study of 100 patients, age distribution varied between laparoscopic open and closed access groups. A significant difference was noted in patients aged ≤ 15 years ($P = 0.027$). Mean ages were similar: 33.8 ± 17.6 years (open) and 32.5 ± 15.5 years (closed) with no significant difference ($P = 0.126$). The study found no significant gender distribution difference between open and closed laparoscopic techniques ($P = 0.686$). Trocar insertion time was significantly shorter in the closed group (180.1 ± 39.8 sec) compared to the open group (350 ± 127.9 sec) ($P < 0.001$). Direct trocar entry offers advantages like fewer blind insertions and no gas leakage. However, further research comparing Veress and direct entry techniques, particularly in obese patients, is recommended to assess safety and time efficiency.

KEYWORDS :

INTRODUCTION

Incision and closure of the abdominal wall are some of the most commonly performed surgical procedures. The abdominal wall is anatomically bordered superiorly by the xiphoid process of the sternum and the costal margins, while its inferior boundary is formed by the iliac and pubic bones of the pelvis.¹⁴

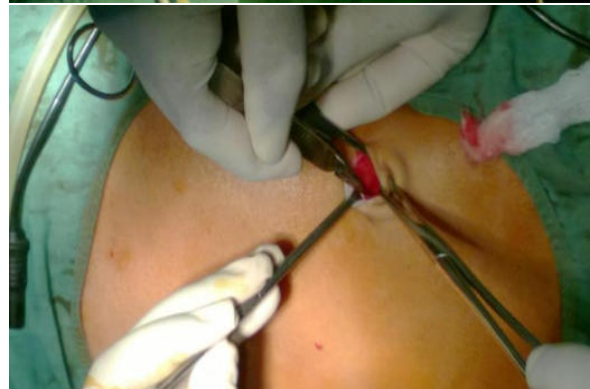
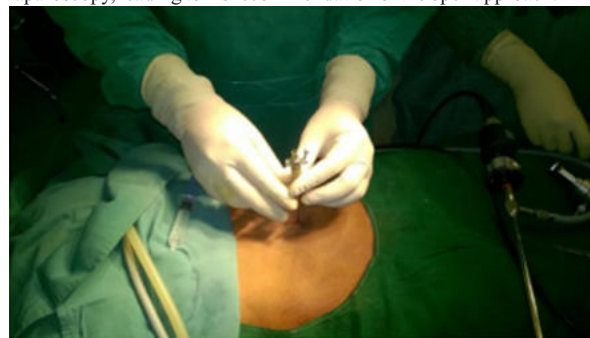
The strength and stability of the Anterior Abdominal Wall largely rely on the Abdominal muscles and their conjoined tendons. Understanding the layered composition of the Abdominal Wall is essential for ensuring a safe and efficient entry into the peritoneal cavity. The primary layers, from superficial to deep, include the skin, subcutaneous tissue, muscles with their aponeurosis, and the transversalis fascia. The deeper layers of the abdominal wall include the transversalis fascia, preperitoneal fat, and peritoneum, with nerves, blood vessels, and lymphatic structures distributed throughout. This review will emphasize the clinically relevant anatomy of the Anterior Abdominal Wall, highlighting key structures essential for surgical practice.

LAPAROSCOPIC ENTRY TECHNIQUES

Over the past century, various laparoscopic entry techniques have been developed to minimize injury, including the Veress needle method, closed (classic) entry, open (Hasson) technique, and direct trocar insertion. The choice of method typically depends on the surgeon's training and preferences. The **classic closed entry** involves making a skin incision, creating a pneumoperitoneum with gas, and inserting a sharp trocar and cannula, followed by a telescope for internal visualization. This approach was first performed in 1910 by Jacobeus in Sweden and introduced in Canada in 1970 by Drs. Gomel, Rioux, and Yuzpe at leading Canadian universities.

The open laparoscopic entry technique, or Hasson method, introduced in 1971, involves a small umbilical incision to access the peritoneal cavity under direct vision, reducing risks of gas embolism, preperitoneal insufflation, and major injuries. A blunt obturator and cone-shaped cannula are used, secured with sutures to maintain a seal. Insufflation begins after laparoscope insertion. Often preferred by general surgeons, especially for patients with prior abdominal

surgeries, this technique shows lower complication rates. In a review by Hasson, open laparoscopy had fewer infections (0.4%), bowel (0.1%), and no vascular injuries, compared to higher rates in closed laparoscopy, leading to his recommendation of the open approach.



METHODOLOGY

Source Of Data

All patients came to SARASWATHI INSTITUTE OF MEDICAL SCIENCES, HAPUR and admitted and operated by laparoscopy.

METHOD OF COLLECTION OF DATA:

Source Of Data

All patients posted for laparoscopic surgeries in to **SARASWATHI INSTITUTE OF MEDICAL SCIENCES, HAPUR** are included in the study. The period of study is from March 2022 to February 2025.

METHOD OF COLLECTION OF DATA

This prospective study includes all patients referred for laparoscopic procedures from March 2022 to February 2025, randomized into three groups: direct entry, Veress needle, and open (Hasson) technique. All surgeries are performed by experienced surgeons. Data is collected using a structured pro forma, recording detailed history, clinical examination, and investigations. Key variables include mean trocar insertion time, CO₂ gas leak, conversion to laparotomy, mortality, and complications such as abdominal wall hematoma, subcutaneous gas insufflation, port site infections, hernia, and intra-abdominal injuries. Patients in all groups are followed up postoperatively at 15, 30, 60, and 90 days to assess outcomes and complications.

RESULTS AND OBSERVATION

Distribution of Trocar Insertion Time (Sec) by different procedures.

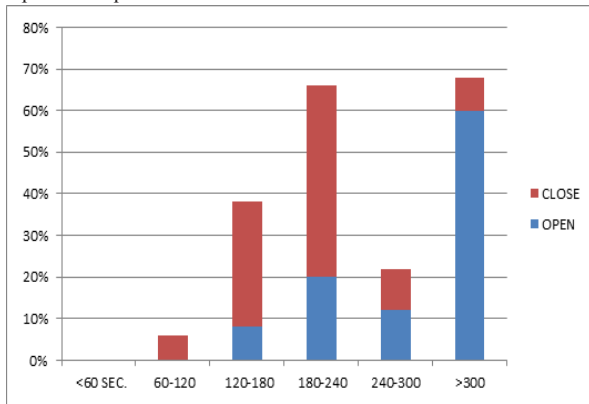
Trocar Insertion Time (Sec)	OPEN		CLOSED		P Value
	N	%	N	%	
<60	0	0	0	0	<0.001
60-120	0	0	3	6	
120-180	4	8	15	30	
180-240	10	20	23	46	
240-300	6	12	5	10	
>300	30	60	4	8	
TOTAL	50	100	50	100	
Mean±SD	350±127.9		180.1±39.8		

The study compared trocar insertion times between Open and Closed laparoscopic groups, each with 50 participants. No one had insertion times under 60 seconds. In the 60-120 second range, 6% were in the Closed group only. Between 120-180 seconds, 8% were Open, and 30% Closed. For 180-240 seconds, 20% Open and 46% Closed. In 240-300 seconds, 12% Open and 10% Closed. Over 300 seconds, 60% Open and 8% Closed. The Open group had a significantly longer mean insertion time (350±127.9 seconds) compared to the Closed group (180.1±39.8 seconds), with $p < 0.001$.

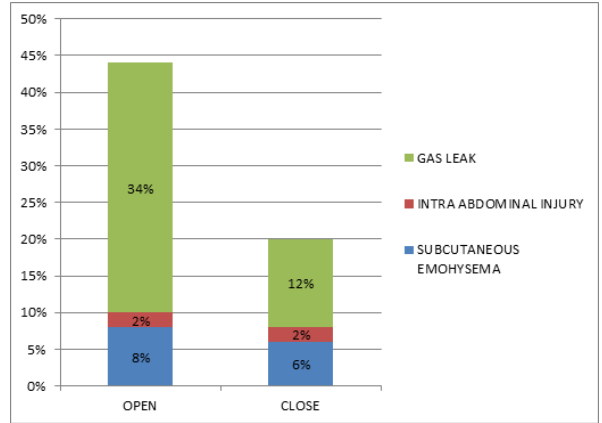
: Distribution of Complications by different procedures

COMPLICATIONS	OPEN		CLOSED		P Value
	N	%	N	%	
SUBCUTANIOUS EMPHYSEMA	4	8	3	6	0.001
INTRA ABDOMINAL INJURY	1	2	1	2	0.364
GAS LEAK	17	34	6	12	<0.001

The study compared complications between Open and Closed laparoscopic groups. Subcutaneous emphysema occurred in 8% of the Open group and 6% of the Closed group, with a statistically significant difference ($p = 0.001$). Intra-abdominal injuries were equal in both groups, with 2% each, showing no significant difference ($p = 0.364$). Gas leaks were significantly higher in the Open group, with 34% of cases compared to 12% in the Closed group ($p < 0.001$). These results indicate that while intra-abdominal injury rates were similar, subcutaneous emphysema and gas leaks were more frequent in the Open technique.



Distribution Of Trocar Insertion Time (Sec) By Different Procedures



Distribution Of Complications By Different Procedures

In our study gas leak observed: in close method (veress needle) , and open approach was 12, and 34 patients respectively. subcutaneous emphysema is observed in 6, and 4 patients respectively

DISCUSSION

Comparison of Mean trocar insertion time of different studies

Hamid Shayani-Nasab reported an open value of 331.02 ± 64.405 and a close value of 176.94 ± 96.426, while our study found an open value of 180.1 ± 39.8 and a close value of 77.6 ± 22.4.

TECHNIQUE	Hamid Shayani- Nasab	Our study
OPEN	331.02 ± 64.405	180.1±39.8
CLOSE	176.94 ± 96.426	77.6±22.4

Complications

In this study, subcutaneous emphysema occurred significantly more in the open technique group (10%) compared to the closed group (2%) with a p-value of 0.001. Intra-abdominal injuries were reported in 4% of the open group and 2% of the closed group, showing no significant difference ($p = 0.364$). Gas leakage was equally observed in both groups, affecting 4% of patients each. These findings highlight a higher risk of subcutaneous emphysema with the open technique, while other complications were similar.

Complications	Open technique		Close technique		P value
	n	%	n	%	
SUBCUTANEOUS EMPHYSEMA	5	10	1	2	0.001 (Sig)
INTRA ABDOMINAL INJURY	2	4	1	2	0.364
GAS LEA	2	4	2	4	

Comparison Of Subcutaneous Emphysema Of Other Studies

Hamid Shayani-Nasab et al. reported complications in 3.0% of patients using the open technique and 1.0% with the closed technique. In our study, 5.2% experienced complications with the open technique, while no complications occurred in the closed technique group, indicating a higher complication rate with the open approach. Gas leak is observed more in open approach.

Technique	Hamid Shayani- Nasab et al	Our study
Open	27 (15%)	11 (11.5%)
closed	27 (15%)	39 (40.6%)

CONCLUSION

This prospective study involved 100 patients undergoing laparoscopic surgery, with 50 using the open technique and 50 the closed technique. Age distribution varied significantly only in patients ≤15 years ($P = 0.027$), with no significant difference in mean age or gender distribution. Trocar insertion times were significantly longer in the open group (350 ± 127.9 seconds) compared to the closed group (180.1 ± 39.8 seconds, $P < 0.001$). Direct trocar entry offers advantages like fewer blind insertions, reduced gas leakage, and less subcutaneous emphysema, but further research comparing it to the Veress needle, especially in obese patients, is needed.

REFERENCES

- The referenced studies cover various laparoscopic entry techniques, comparing safety, efficacy, and complications associated with each method. Philips and Amaral (2001) review abdominal access complications in laparoscopy, highlighting risks during initial entry. Agresta et al. (2004) conducted a prospective randomized study comparing direct trocar insertion and Veress needle in non-obese patients, emphasizing the advantages of

- direct trocar access. Agarwala and Liu (2005) evaluated safe entry via the left upper quadrant in 918 procedures, focusing on reduced injury risk. Vilos et al. (2007) provided comprehensive guidelines on laparoscopic entry techniques and associated complications.
2. Other studies, including Altun et al. (2007), compared direct trocar and Veress needle techniques in laparoscopic cholecystectomy, while Simforoosh et al. (2012) analyzed complications in urological laparoscopic access comparing open and blind entry methods. Mousavi-Bahar et al. (2008) discussed laparoscopic-assisted nephrolithotomy in ectopic kidneys, reflecting specialized applications. Hamid Shayani-Nasab et al. (2013) reported on complications using direct trocar, Veress needle, and modified open approaches. Prieto-Díaz-Chávez (2006) compared direct trocar insertion without pneumoperitoneum versus the Veress needle.
 3. Additional studies, such as Pawan Lal (2004) and Siavash Falahatkar (2009), examined open port placement and compared direct trocar with Hasson's open technique, assessing ease of use and safety. Collectively, these studies contribute valuable data guiding optimal laparoscopic entry technique selection tailored to patient and surgical factors.
 4. The cited references encompass a wide range of studies on laparoscopic entry techniques, abdominal wall anatomy, and surgical safety. Liu Hai-fang (2009) reported on a large multicenter study of a modified open trocar technique in over 17,000 patients, highlighting safety and efficacy. Several anatomical studies (Flament, Ellis, Tobin, Tokita) detailed abdominal wall structures relevant to surgical incisions and trocar placement, including fascia, nerves, and blood vessels, emphasizing the importance of anatomy to minimize complications.
 5. Multiple papers (Palmer 1974, Hasson 1971, Dingfelder 1978, Byron 1989, Nezhat 1991) investigated laparoscopic access methods such as direct trocar insertion, open techniques, and Veress needle use, assessing complication rates and procedural efficiency. Advances in optical trocars and radially expanding systems were explored by Kaali, Mettler, Turner, and others, aiming to improve safety and ease of entry.
 6. Several studies focused on specific populations and techniques, including entry through alternative anatomical sites like the left ninth intercostal space (Agarwala 2005, Reich 1995) or transfundal approaches (Sanders 1994, Morgan 1979). Reviews and guidelines by Vilos et al. (2007) and systematic analyses (Merlin 2003) summarized best practices and risks. Additional references address nerve injuries related to trocar placement and postoperative complications, highlighting the critical need for anatomical knowledge and technique refinement to reduce laparoscopic entry risks.