



**ORIGINAL RESEARCH PAPER**

**General Surgery**

**A PROSPECTIVE COMPARATIVE STUDY OF OPEN VERSUS CLOSED METHOD OF CREATING PNEUMOPERITONEUM IN LAPAROSCOPIC SURGERY**

**KEY WORDS:** laparoscopy, trocar, open method, veress needle, pneumoperitoneum

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**ABSTRACT**

**Objective:** The aim of the study was to compare open and closed method in terms of time require for creation of pneumoperitoneum and to ascertain safety in laparoscopic surgery.

**Methodology:** This was a prospective comparative study carried out at a tertiary care hospital from January 2019 to December 2019. We selected 100 patients who were planned for laparoscopic surgery and divided them into two equal groups using the envelop method of randomization. Group A comprised of patients in whom we created pneumoperitoneum by classical veress needle insertion and in Group B by open method.

**Results:** In our study, the mean time require for closed method was 6.92 minutes while by open method it was 4.36 minutes. Complication rate was 18% in closed and 16% in open method.

**Conclusion:** open method is quick but comparable to closed method in terms of complications.

**INTRODUCTION:**

Laparoscopy is the type of surgical procedure that allows a surgeon to access the peritoneal cavity by minimal invasive techniques. Laparoscopy has reduced the trauma from surgery and now it is used routinely for many operative procedures.

First and critical step of this procedure consist of creating pneumoperitoneum with CO2 insufflation. Further ports are inserted to enable instruments access and their use for dissection.

There are five basic method to create pneumoperitoneum-

- (1) Blind veress needle insertion
- (2) Open method
- (3) Direct trocar insertion
- (4) Modified open method
- (5) Optical trocar insertion.

Approximately 50% of the minor operative complications occur during creation of pneumoperitoneum. Patients with low body mass index and prior abdominal surgery have chances of complications.

**AIMS AND OBJECTIVES:**

- 1. To compare time required for creation of pneumoperitoneum.
- 2. To compare safety in terms of intraoperative minor and major complications have occurred in these procedures.

**MATERIALS AND METHODS:**

The present study is a comparative prospective study carried out with 100 patients at the Department of Surgery at GCS Medical College, Hospital and Research Centre, Ahmedabad from January 2019 to December 2019.

**Inclusion Criteria:**

- 1. Patients who underwent elective laparoscopic appendicectomy and cholecystectomy between the age of 18 years to 75 years.

**Exclusion Criteria:**

- 1. Patient not fit for general anaesthesia.
- 2. Previous abdominal surgery.
- 3. Mechanical bowel obstruction.
- 4. Liver cirrhosis or Portal hypertension.
- 5. Pregnancy

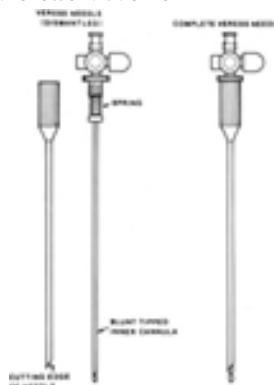
The selected patients were randomly divided into two groups-

- Group A – classical veress needle insertion followed by trocar insertion.
- Group B – open method for trocar insertion.

Detailed history was recorded from patients and thorough clinical examination was performed. The findings were recorded in the proforma. After consent for the operation and preparation of local parts, antibiotic prophylaxis and catheterisation was carried out. The procedure was conducted under general anaesthesia in sterile conditions.

**Closed Veress Needle Insertion Method:**

A veress needle is a spring loaded needle with sharp end, out of which emerge a blunt tip. The patient is position with head down at angle 10-20 degree to displace the intestine cranially. Depending upon the shape of umbilicus, either a transverse or vertical stab is made with a number of 15 or 11 knife. The shaft of the needle should be held by right hand, keeping the distal length adequate to traverse the entire thickness of the abdominal wall. While inserting the needle, the little finger and ulnar border of the right palm is propped against the abdomen. The abdominal wall is lifted midway between the pubic symphysis and umbilicus by the left hand. The needle is inserted either at a 45 degree caudal angle (in asthenic or minimally obese patient) or perpendicular (in markedly obese patient). As the needle enters the peritoneal cavity, a distinct click can often be heard. Confirmation of entry into peritoneal cavity done by Hiss test, saline aspiration test and drop test etc. After that gradual CO2 insufflation done and needle is stabilized to minimize side to side movements. Once adequate insufflations done veress needle is removed and pyramid faceted trocar inserted after the extension of incision and by lifting the lower abdomen.



**Fig 1 - Veress Needle**



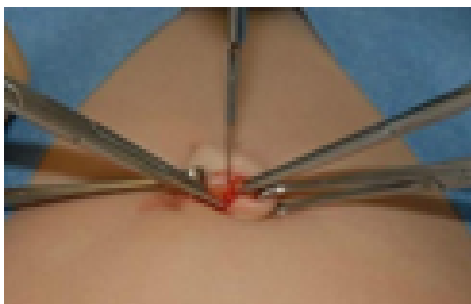
**Fig 2 - Insertion Technique In Closed Method**

**Open Method For Trocar Insertion:**

Intraumbilical incision (1-3 cm) is made and the subcutaneous tissue is bluntly dissected and retracted by curved retractors on either side. Two clamps are used to lift the linea alba. A horizontal or vertical defect of about 1.5 cm is made. The peritoneal fat is bluntly dissected till the peritoneum is identified and it is held with a haemostat and incised. Two absorbable sutures are placed on either sides of the fascial defect. The Hasson's cannula with its blunt obturator is advanced into peritoneal cavity until olive abuts the fascia. The obturator is removed and sutures are firmly attached to create a seal with the fascia. The laparoscope is then introduced for surgery.

The abdominal cavity was thoroughly inspected for complications before the intended procedure and complications were divided into minor (bruise, localized emphysema, hematoma, omental injury, bowel serosa injury, leakage of gas) and major (emphysema up to neck, bowel or bladder perforation, major vascular injury) complications depending upon the nature and severity of injuries.

All patients were given appropriate antibiotics, analgesics and iv fluids. They were kept nil by mouth till bowel sounds were heard. Regular dressing was done and sutures were removed on the 10<sup>th</sup> post operative day



**Fig 3 - Incision Through The Fascia And Peritoneum. (Open method)**



**Fig 4 - Hasson's Blunt Trocar**

**OBSERVATION AND RESULTS**

**Table-1: Time Taken For Primary Trocar Insertion**

Time taken for primary trocar insertion	Closed method (n=50) Group A	Open method (n=50) Group B
3 minutes	-	8(16%)
4 minutes	-	18(36%)
5 minutes	2(4%)	22(44%)
6 minutes	12(24%)	2(4%)
7 minutes	24(48%)	-
8 minutes	12(24%)	-
Total	50	50

**Table 2: Complication At Access**

Complication at access	Closed method	Open method
<u>Minor complications</u>		
Bruise	3	2
Localised emphysema	1	1
Hematoma	3	2
Omental injury	1	-
Bowel serosa injury	-	-
Leakage of gas	1	3
<u>Major complications</u>		
Emphysema up to neck	-	-
Bowel or bladder injury	-	-
Major vascular injury	-	-
Total	9	8

All the 100 patients that participated in this study belonged to the age group of 18 to 75 years were divided in two equal groups. Group A (n=50) underwent closed method and Group B (n=50) underwent open method. Maximum time taken for the primary trocar insertion was 8 minutes and minimum time was 3 minutes in both procedures. In group A the procedure was completed in 7 minutes for 75% of the patients where in group B the procedure was completed in 5 minutes for 95% of the patients. The average time taken for group A was 6.92 minutes while for group B it was 4.36 minutes. This result shows open method is fast and less time consuming compared to closed method. Intraoperative complications during the creation of pneumoperitoneum were 9 in group A and 8 in group B. No major complications were reported in the study. In closed technique 3 cases of bruise and 3 cases of hematoma were reported while in group B 2 cases of bruise and 3 cases of leakage of gas were reported. Complication rate for minor injury for group A was 18% and 16% for group B.

**DISCUSSION**

Among the various techniques for achieving a pneumoperitoneum and introducing first trocar, two common methods are usually performed. Closed method requires veress needle, which is inserted into the abdominal cavity for CO2 insufflation followed by blind introduction of first trocar. On the other hand open technique begins with a small incision at the umbilical site and all layers of the abdominal wall are incised and then blunt trocar is inserted under direct vision followed by gas insufflations. More than 50% of minor complications arising from a laparoscopic procedure occur before the commencement of the actual operation i.e. during the creation of pneumoperitoneum. Veress needle technique take more time because of the routine use of confirmation of entry tests like saline drop test and initial intra- peritoneal pressure test etc. The time taken to complete surgery in both method had no significant difference even after the fact that first trocar insertion was faster in open method. Minor complications were common in both methods out of which bruise and hematoma were common in closed technique and leakage of gas was common in open method. Single case of omental injury was reported in closed technique for which haemostasis was achieved. Localised emphysema was noted in this study. Complication rate for minor injury was slightly more in closed method compared to open method. The small sample size of this study is its main limitation and a larger

sample size is required to study the parameters more comprehensively. This is a single-centre study and hence these results cannot be generalised. Also, the procedures were performed by multiple surgeons so it is difficult to control the confounding variables.

**CONCLUSION**

For laparoscopic surgery access to the abdominal cavity is of equal importance to open surgery. Correct port site placement and closure are crucial for the success of the operative procedure. The umbilicus is preferred site for primary trocar insertion. In our study open method is less time consuming but in terms of complication it is comparable to closed method. However an open technique is preferred by most surgeons because it is quick, safe and efficient overall and it does not include blind puncture using verres needle which contain potential for intestinal or vascular injury.

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