

## A Randomised Comparative Study Between Direct Trocar Insertion Versus Veress Needle Technique For Creating Pneumoperitoneum In Laparoscopic Cholecystectomy

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### ABSTRACT

**BACKGROUND:** The ability to establish pneumoperitoneum has long been regarded as the integral first step to any successful laparoscopic procedure. Direct trocar insertion (DTI) is one of the safe and an effective alternative to Veress needle insertion, Open access (Hassan's technique) and Visual entry systems (disposable Optic trocars and Endotip visual cannula) in laparoscopic surgery for creating pneumoperitoneum. The purpose of this study is to compare the safety and complications of Direct trocar insertion (DTI) with Veress needle (VN) in Laparoscopic Cholecystectomy (LC). **METHODS:** The present study was conducted in the Postgraduate Department of Surgery, GMC Jammu over a period of one year with effect from 1<sup>st</sup> November 2014 to 31<sup>st</sup> October 2015. The study was conducted on 100 patients who underwent laparoscopic cholecystectomy. Patients were divided into two groups with 50 patients in each group. In group A, Direct trocar insertion was carried out while in group B, veress needle technique was used. The variables analyzed were time taken to create pneumoperitoneum, safety and procedure related complications. **RESULTS:** In both the groups, almost equal number of people were suffering from co morbid conditions, 34% in Veress technique and 30% in Direct trocar technique. Both the techniques were able to create pneumoperitoneum in all patients; therefore there was no conversion of procedure to laparotomy in both the groups. The mean time taken (in minutes) to induce pneumoperitoneum in VN technique was 6.80±1.36 minutes where as in DT technique mean time was 3.18±0.66 minutes (p value= 0.001). Minor complications were more in Veress technique than in Direct trocar insertion. There was no major complication in both the groups. **CONCLUSIONS:** Direct trocar insertion is a fast, safe and reliable alternative to traditional techniques of primary port placement in laparoscopic procedures for creation of pneumoperitoneum.

**Keywords:** Laparoscopy, Pneumoperitoneum, Direct trocar insertion (DTI), Veress needle (VN).

### INTRODUCTION

Laparoscopy is the art of examining the abdominal cavity and its contents without making large incisions. It requires insertion of a cannula through the abdominal wall, distention of abdominal cavity with gas or air (pneumoperitoneum), visualization and examination of the abdominal contents through an illuminated telescope and/or performing operative procedures then. Laparoscopy is a common method in surgery<sup>1,2</sup>. Laparoscopic cholecystectomy is now

being commonly performed after the 1980s and has taken the place of classic cholecystectomy<sup>3,4</sup>. Compared with open cholecystectomy, apart from lower morbidity and mortality in laparoscopic surgery, patients suffer pain for a shorter period of time, and return to their daily life earlier<sup>5-7</sup>. Several techniques and technologies have been introduced over the past 50 years to minimize laparoscopic related injuries. Pneumoperitoneum is prerequisite in all laparoscopic procedures as it increases the distance between anterior abdominal wall & intra-abdominal viscera, thus creating a working space. Most of the complications occur at the time of performing pneumoperitoneum<sup>2</sup>. Various techniques used to create pneumoperitoneum are insertion of Veress needle, open laparoscopy involving opening of the

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peritoneum under direct vision (Hasson's method), Optical trocar insertion and Direct trocar insertion (DTI) as well as variants of these techniques<sup>(8,9)</sup>. Despite proper surgical education and performance, complications can occur in all of these methods. Despite the belief that using a Veress needle is safer in performing pneumoperitoneum, several complications were reported, such as injury to vessels of the anterior abdominal wall, injury to pelvic and large retroperitoneal vessels, perforation and/or insufflation of bowel, gas embolism, subcutaneous or subfascial insufflation<sup>10,11</sup>. Open access as described by Hasson in 1971<sup>12</sup> has shown to minimize vascular injuries but does not reduce bowel injury. Also open access is complicated by gas leak and port instability. **Dingfelder**, in 1978<sup>13</sup> was the first to publish on direct entry into the abdomen with a trocar. The suggested advantages of this method of entry are the avoidance of complications related to the use of the Veress needle such as failed pneumoperitoneum, preperitoneal insufflation, intestinal insufflation, or the more serious CO<sub>2</sub> embolism. Direct trocar insertion, although a blind procedure, reduces the number of "blind steps" from three with Veress needle (insertion, insufflation, and trocar introduction) to just one, that of trocar introduction. It is fast as it is a one step pneumoperitoneum. **Byron et al**<sup>14</sup> preferred Direct trocar insertion technique for trocar placement because it had fewer minor complications and less operating time. This study was performed to compare time taken to create pneumoperitoneum in both the techniques, safety and complications of direct trocar insertion (DTI) as compared to Veress needle (VN) in laparoscopic cholecystectomy (LC).

### MATERIAL AND METHOD

This prospective study was conducted in the Postgraduate Department of Surgery, Government Medical College, Jammu over a period of one year with effect from 1<sup>st</sup> November 2014 to 31<sup>st</sup> October 2015. The study was conducted on 100 patients on whom laparoscopic cholecystectomy was performed. Patients were divided into two

groups with 50 patients in each group after matching the parameters like age, sex, co morbid conditions, using simple random sampling technique. All operations were performed by one consultant. In group A, Direct trocar entry was carried out while in group B, Veress needle insertion technique was used for creating pneumoperitoneum. All patients were fully informed about the procedure and written consent obtained. Patients' information was recorded in the proforma as per annexures containing demographic details, operative techniques used, time taken to create pneumoperitoneum, minor and major complications.

### Inclusion Criteria:

- All patients undergoing elective laparoscopic cholecystectomy.

### Exclusion Criteria:

- Patients who had undergone previous midline laparotomy for any infective pathology in abdomen.
- Patients with BMI  $\geq 35$ .
- Patients with any contraindication to surgery.

### Pneumoperitoneum was created by following techniques in two groups:

**Direct Trocar Insertion-** In this method of entry, a 10 to 12mm transverse incision was given supraumbilically or infraumbilically. After placing the patient in Trendelenburg position, abdominal wall was elevated with towel clamps and the trocar was inserted into the abdominal cavity turned 30 degrees towards pelvis.

**Veress Needle group:** With the patient in the Trendelenburg position, a small 3 mm incision was given, the abdominal wall was elevated with two skin clamps, the VN was introduced at a 45° angle toward the pelvis ; two "pops" from the fascia and peritoneum were heard before entering the abdominal cavity. The needle was aspirated and verified with the saline drop test before initiating insufflations.

**Statistical Analysis:** Data was analyzed by SPSS software and expressed as mean  $\pm$  standard deviation. Chi square test was applied and p value  $< 0.05$  was considered significant.

**OBSERVATIONS**

The present study was conducted in the Postgraduate Department of Surgery, Government Medical College, Jammu over a period of one year with effect from 1<sup>st</sup> November 2014 to 31<sup>st</sup> October 2015. The study was conducted on 100 patients who underwent laproscopic cholecystectomy, patients were divided into two groups with 50 patients in each group. In group A, Direct trocar insertion was carried out while in group B, Veress needle technique was used for creating pneumoperitoneum. Following observations were made: The mean age in Direct trocar entry was 38.18±12.56 years; whereas mean age in Veress technique was 38.36±12.32 years. In both the groups, almost equal number of people were suffering from co morbid conditions; 30% in Direct trocar technique and 34% in Veress technique. Out of 10% patients in others group of co morbid conditions, 2% were having COPD, 2% suffered from Stroke, 2% had old Koch's, 2% had Hepatitis and 2% had Gilberts disease. Hypertension was found in 28% patients & Diabetes Mellitus was found in 4% patients, combinedly in both the groups. On applying chi-square test; the difference between the Direct trocar insertion and veress technique regarding the co morbid conditions was not found statistically significant. **Table 1: Distribution Of Patient According To Co-Morbid Conditions In Direct Trocar And Veress Needle Entry.**

Co-morbid conditions	Direct trocar(A)(n-50)				Veress needle(B) (n-50)			
	Male		Female		Male		Female	
	No	%age	No.	%age	No.	%age	No	%age
HTN	0	0	7	14	1	2	7	14
DM	0	0	2	4	0	0	0	0
Hypothyroid	0	0	4	18	1	2	5	10
Others	0	0	2	4	2	4	1	2
Total	0	0	15	30	4	8	13	26

**Table 2: Time taken to induce pneumoperitoneum in Direct trocar and Veress needle technique**

Technique	Number	Time Taken (Minutes)		Standard Error Mean	Statistical Inference
		Mean	SD		
Direct trocar	50	3.18	0.66	0.09	
Veress Needle	50	6.80	1.36	0.19	
					<b>P=0.0001</b>

**Table 3: Complications in both the groups**

Complications	Direct trocar insertion		Veress needle technique	
	Number	%age	Number	%age
Ability to create pneumoperitoneum	50	100	50	100
Abdominal wall hemorrhage	2	4	4	8
Extra peritoneal insufflations	1	2	4	8
Gas leak	1	2	2	4
Omental injury	1	2	3	6
Major vessel injury	0	0	0	0
Gastrointestinal injury	0	0	0	0
Solid organ injury	0	0	0	0

The mean time taken (in minutes) to induce pneumoperitoneum in Direct trocar technique (DT) technique mean time was 3.18±0.66 minutes where as in veress needle technique (VN) it was 6.80±1.36 minutes (p value = 0.0001, ). On applying independent t-test, it was observed that Direct trocar technique required less time as compared to Veress needle technique & was found to be statistically significant. Both the techniques were able to create pneumoperitoneum in all patients; therefore there was no conversion to laparotomy in both the groups. Out of 50 patients in Direct trocar entry, gas leak was found in 2% patients whereas it was 4% in Veress needle group. Extra peritoneal insufflation was found only in 2% of patients in Direct trocar technique while it was 8% in Veress technique. Out of 50 patients in whom Direct trocar technique was performed, 4% had abdominal wall hemorrhage and 2% had omental injury whereas in patients in whom Veress needle technique was performed, 8% had abdominal wall hemorrhage and 6% had omental injury as intraoperative complication. There was no major vascular injury, gastrointestinal injury, and solid organ injury in both the techniques. On applying chi-square test, difference in complications in both the groups was found to be statistically insignificant.

**DISCUSSION**

In this era of Modern Surgery, laparoscopic surgery has gained much popularity amongst the doctor and patients. The main reason for this being its advantages like minimal access approach, shorter hospital stay, early return to daily activities, minimal post operative morbidity & good cosmesis. Laparoscopic cholecystectomy has become the standard of care for symptomatic gall bladder disease and is currently almost widely used in amongst every surgical subspecialty. Despite its superiority over open surgery, it is not completely risk free and many of its complications are related to creation of pneumoperitoneum for gaining access to intraabdominal cavity. Undoubtedly, the technique implemented by Veress<sup>(15)</sup> for producing pneumoperitoneum was the key in making laparoscopic surgery the frequently used procedure. However, the complications associated with the use of the Veress needle cannot be disputed<sup>8,9,12,16</sup>, motivating the search for new techniques to avoid laparoscopic procedure morbidity. In the last three decades, rapid advances in laparoscopic surgery have made it an invaluable part of general surgery; but no clear consensus is there regarding the best method of gaining access to the peritoneal cavity to create pneumoperitoneum. Various studies are continuously being carried out. The present study was conducted in the Postgraduate Department of Surgery, Government Medical College Jammu over a period of one year on 100 patients who met the inclusion criteria. In the present study, patients who agreed to participate and signed an informed consent form were divided into two groups of 50 each. On one group, Direct trocar insertion technique was performed and in other group, Veress needle insertion technique was performed. In the DT technique, 47 patients were female and 3 patients were males.; whereas in VN technique group, 40 patients were females and 10 patients were males. The female predominance clearly reflects the higher incidence of cholelithiasis in females. In the present study, there was no statistically significant difference between the patients of two

groups with respect to the preoperative Co-morbid conditions like Hypertension, Diabetes Mellitus and Hypothyroidism. In the present study, both the techniques were able to create pneumoperitoneum equally in all 100 patients and there was no conversion to laparotomy in both the groups. These findings are in corroboration with the findings of study conducted by **Ghulam AC et al<sup>17</sup>**. The mean time taken (in minutes) to induce pneumoperitoneum in Direct trocar technique (DT) technique mean time was  $3.18 \pm 0.66$  minutes whereas in Veress needle technique (VN) it was  $6.80 \pm 1.36$  minutes (p value = 0.0001). In the study conducted by **Ertgrul I et al<sup>18</sup>**, 39 patients were placed in Direct trocar group and had insertion time of  $79.6 \pm 94.6$  seconds compared to  $217 \pm 111$  seconds in Veress needle group (with p value = .0001). In our study out of 50 patients in Veress needle technique, gas leak was found in two patients whereas it was in one out of 50 patients in Direct trocar entry. Such low rates of gas leak were found in studies conducted by **Vikash A et al<sup>(19)</sup>**, **Ghulam A et al<sup>17</sup>**. Our study reported extraperitoneal insufflation in 2% in Direct trocar technique whereas it was 8% in Veress needle technique. Out of 50 patients in Veress needle technique, 8% had abdominal wall hemorrhage and 6% had omental injury as intra operative complication whereas in Direct trocar technique, 4 % had abdominal wall hemorrhage and 2% had omental injury. Similar findings were noted by **Nezhat et al<sup>20</sup>** they showed fewer minor complications with Direct trocar insertion. In contrast to our study, **Byron et al<sup>14</sup>** in their study noted fourfold increase in minor complications using Veress needle. There was no major complication like major vessel injury, solid organ injury or gastrointestinal injury by both techniques in our study. In view of the above results, it can be concluded that the time taken to create pneumoperitoneum was less in case of Direct trocar insertion (statistically highly significant), which indirectly reduces the total duration of surgery leading to benefit both for patient and

surgeon. Also DTI is a one step procedure as compared to Veress needle technique which is three step procedure, but for ensuring successful insertion of DTI and avoiding complication certain rules have to be followed as making an adequate incision, perfectly relaxed abdominal wall, elevation of wall with towel clips, use of sharp trocar. Other advantages of D.T.I. are that pre – insufflation makes it difficult to grasp and elevate abdominal wall for counter pressure during primary trocar entry. Pressure of 12 – 15 mm Hg is high enough to distance the abdominal wall elasticity and dynamics<sup>2,13</sup>. In current study, also complications such as abdominal wall hemorrhage, omental injury, gas leak, extraperitoneal insufflation were less in DTI as compared to Veress needle (although the results is not significant).

### CONCLUSION

Our results suggest that direct insertion of the first trocar without previous pneumoperitoneum is a rapid, safe and efficient alternative procedure, easily learned by surgeons previously trained in laparoscopic cholecystectomy and resulting in a probable low incidence of complications.

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