

# Safety of Direct Trocar Insertion for Laparoscopic Procedures

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## ABSTRACT

Creation of pneumoperitoneum is first step in laparoscopic surgeries. Four basic techniques are used to create pneumoperitoneum i.e. blind veress needle (VN), direct trocar insertion (DTI), optical trocar insertion (OTI) and open method. **Objective:** The objective of the study is to determine the safety of direct trocar insertion for laparoscopic procedures. **Setting:** Department of Surgery, Allied/DHQ Hospital and Mujahid hospital Faisalabad. **Duration of study:** From 01-01-2013 to 31-12-2017 over a period of five years. **Study design:** Prospective randomized study. **Methodology:** A total of 1500 cases undergoing laparoscopic procedures were included in study. 1470 (98%) patients had pneumoperitoneum established by DTI at umbilicus, 25 patients by DTI at palmer's point and only 1 patient has pneumoperitoneum established by open method. **Results:** Out of 1500 cases, 1280 were females and 220 were males, male to female ratio was 1:5.8. The age of patients varied between 16-70 years mean age was calculated as 33.22±9.31 years. Pneumoperitoneum by DTI at umbilicus was achieved successfully in 1474(98.26%), while it was established by DTI at palmer's point in 25 (1.6%) patients. In only 1(0.06%) patient pneumoperitoneum was created by open method. 1(0.06%) patient developed visceral injury, 1(0.06%) patient developed port site hernia and 10(0.66%) patients developed port site infection. **Conclusion:** DTI is a safe and reliable technique for establishing pneumoperitoneum and should be used routinely.

**Keywords:** Laparoscopic procedures, direct trocar insertion, pneumoperitoneum, safe.

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## INTRODUCTION

Creation of pneumoperitoneum is the first step in Laparoscopic surgery. Four basic techniques are used to create pneumoperitoneum, Blind Veress Needle (VN), Direct Trocar Insertion (DTI), Optical Trocar Insertion (OTI) and Open Method (Hasson's Technique).<sup>1</sup> DTI was first reported by Dingfelder in 1978 but so far it is probably the least used method for creating pneumoperitoneum. It is mainly used by gynecologists.<sup>2-7</sup>

Laparoscopic intraperitoneal access is associated with injuries to the major blood vessels and gastrointestinal tract. At least 50% of these injuries occur before start of operation.<sup>8</sup> In spite of significant advances in endoscopic techniques and instrumentation, inadvertent and potentially avoidable complications related to abdominal entry continue to occur,<sup>9</sup> including life threatening complications such as damage to major blood vessels, bowel injuries, bladder injuries, extraperitoneal emphysemas and post-operative infections.<sup>10</sup>

DTI has many benefits as shorter operation time, immediate recognition of vascular and visceral injuries, decreased incidence of entry failure<sup>11</sup> and less insufflation related complications such as gas embolism.<sup>12</sup>

The rationale of this prospective study is to evaluate the patients who underwent DTI for various laparoscopic procedures during 2013 – 2017 with emphasis on the safety and reliability of the direct trocar insertion. Because this technique is not commonly practiced in Faisalabad, by sharing our experience we want to give guidelines to future surgeons for its safety.

## Objective

The objective of the study is to determine the safety of direct trocar insertion for laparoscopic procedures.

## METHODOLOGY

This prospective study was carried out between January 1, 2013 & Dec 31, 2017 over a period of 5 years. A total of 1500 patients underwent various elective laparoscopic procedures at Allied hospital, DHQ hospital and Mujahid hospital, Faisalabad. Out of 1500 patients 1470 (98%) patients had pneumoperitoneum established by DTI at umbilicus, 25 patients by DTI at palmer's point and only 1 patient has pneumoperitoneum established by Open Method.

**Study Design:** Prospective Randomized Study.

**Settings:** Surgical Units 3 & 4 of Allied & DHQ hospitals & Surgical Ward of Mujahid hospital, Faisalabad

### Inclusion Criteria:

All patients between 18 years to 70 years of age, whether obese or of thin build, undergoing for some laparoscopic surgery like;

1. Laparoscopic Cholecystectomy (LC).
2. Transabdominal Preperitoneal Inguinal Hernia Repair (TAPP).
3. Diagnostic Laparoscopy.
4. Laparoscopic Appendectomy.
5. Laparoscopic Varicocelelectomy.

### Exclusion Criteria

1. Decompensated Chronic Liver Disease (DCLD).
2. Patients receiving anticoagulants or anti platelet agents.

3. Acute Intestinal Obstruction.

4. Patients with ejection fraction (EF) < 30.

### Surgical Technique Of DTI

Informed consent of patient included in this study was taken. Patients were admitted through OPD, emergency in government and private sector. After adequate relaxation under general anesthesia in supine position umbilical or left subcostal area known as Palmer's point is injected with local anesthetic. A 10mm skin incision is made allowing the introduction of the 10mm trocar the tip being directly perpendicular to fascia. The tip of the trocar is covered after it has entered the peritoneal cavity to reduce the risk of injury to internal organs.

The abdominal skin is grasped with two towel clips and lifted up to form a tent and so distance of abdominal wall from its contents is increased. The trocar is then easily advanced by continual gentle twisting action into the abdominal cavity. Peritoneal penetration can be felt by the surgeon easily and entry into the cavity is confirmed by the audible click of the lock of the shield on the trocar. The correct position of the trocar is immediately confirmed by the introduction of 10mm telescope and direct visualization of the abdominal cavity. Insufflation of CO<sub>2</sub> is then started at first with low flow rate up to 7 mmHg intraabdominal pressure and then a high flow rate is commenced. These last steps are taken to avoid damage to phrenic nerve and also to prevent sudden distention of abdomen.

## RESULTS

Out of 1500 patients, 1280 were female and 220 patients were male, Male to female ratio was 1:5.8. The age of patients varied between 16 years to 70 years mean age was calculated as 33.22±9.31 years. Most of patients (1279) included in this study was having diagnosis of symptomatic gallstones.

**Table 1: Pathological diagnosis of laparoscopic procedures**

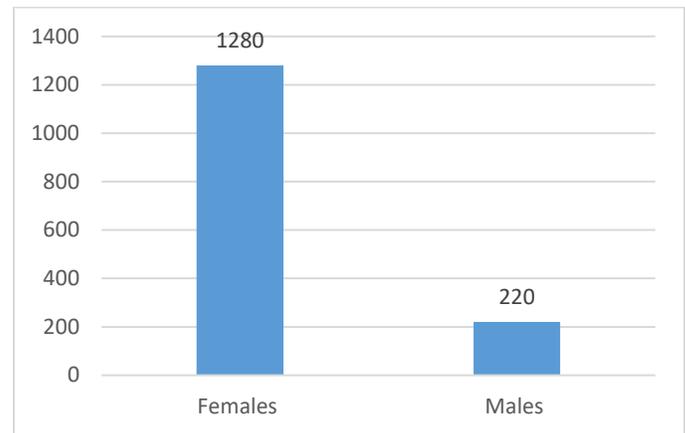
Diagnosis	DTI/umbilicus	DTI/Palmer's point	Open Method (Hasson's Technique)
Cholelithiasis / Cholecystitis	1279	20	1
Inguinal Hernias	100	-	-
Acute Appendicitis	50	-	-
Diagnostic Laparoscopy	25	5	-
Undescended Testis	20	-	-

Pneumoperitoneum by DTI at umbilicus was achieved successfully in 1474 patients (98.26%), while it was established by DTI at palmer's point in 25 patients (1.66%). Only in 1 patient (0.06%), pneumoperitoneum was created by Open method. In only 1(0.06%) patient pneumoperitoneum was created by open method. There were no major complications in the DTI patients

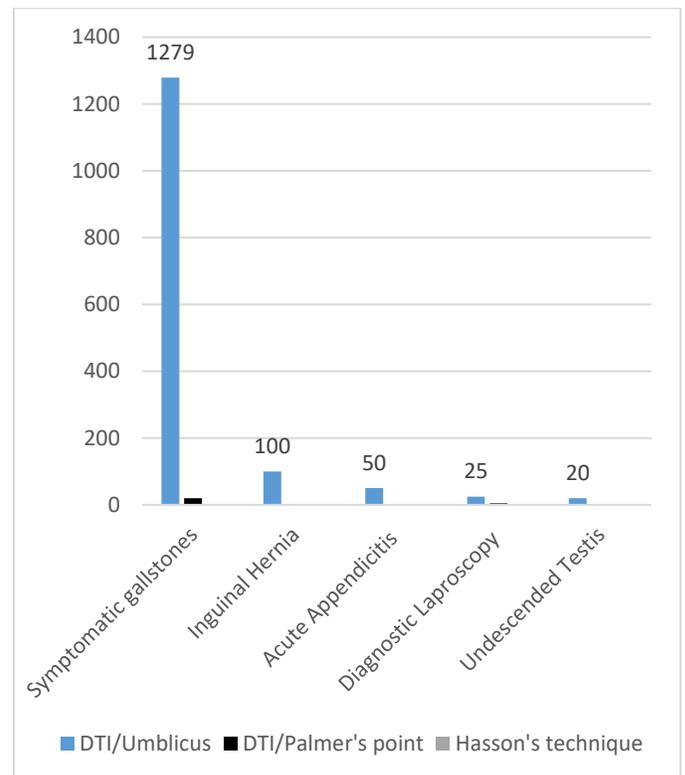
except for 1(0.06%) patient in which an iatrogenic perforation of ileum occurred, that was managed by primary repair laparoscopically .1(0.06%) patient developed port site hernia and 10(0.66%) patients developed port site infection

**Table 2: Complications**

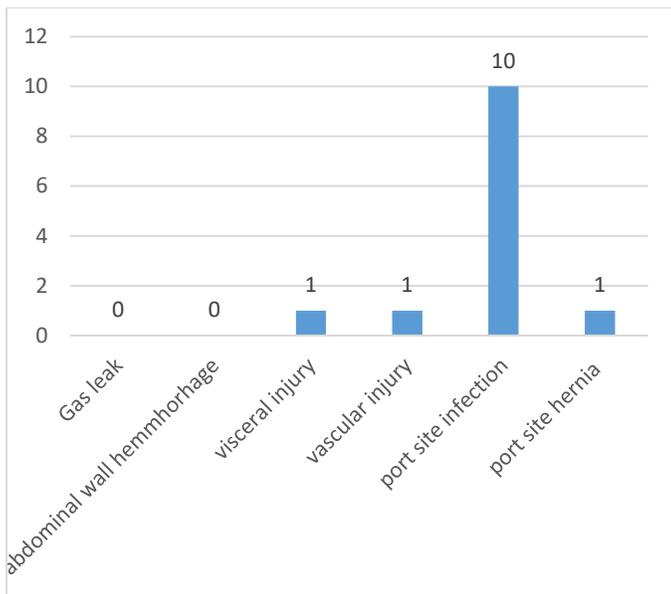
Name	Number	%age
Gas Leak	-	-
Abdominal Wall Hemorrhage	-	-
Visceral Injury	1	0.06
Vascular Injury	-	-
Port Site Hernia	1	0.06
Port Site Infection	10	0.66



**Figure 1: Sex distribution**



**Figure 2: Pathological diagnosis of laparoscopic procedures**



**Figure 3: Complications**

## DISCUSSION

Laparoscopic surgery requires creation of successful pneumoperitoneum with more than half of all complications occurring at the time of entry.<sup>1,4,5</sup> Any possible change in any step of a proven tested technique has to be shown to the surgical world to be safe, easy & reproducible in any situation. It has to have the lowest rate of morbidity & mortality with an acceptable cost / benefit ratio. The method of direct insertion of first trocar (DTI) for laparoscopy for establishing pneumoperitoneum was first described by Dingfelder more than 32 years ago but so far it has been mainly used by gynecologists.<sup>2-7</sup> The benefits of this method are: a shorter operation time, near exclusion of entry failure and above all, the possibility of the immediate recognition of any kind of intraabdominal iatrogenic injuries.<sup>3,6</sup>

Still there is no evidence in the most respected & non-biased international literature as to which method open or closed is the best for establishing pneumoperitoneum.<sup>7</sup> At present there is sufficient evidence to show safety & effectiveness of DTI. According to it, DTI is similar to if not superior to the Veress Needle (VN), concerning complication rate.<sup>1,3-6</sup> Although undoubtedly it is a blind technique but it reduces the number of “blind steps” from three with the VN (insertion, insufflations of first trocar insertion) to just one, the one of trocar introduction. It is correctly reported that with DTI, it is possible to recognize any injury immediately & to repair that injury laparoscopically at once.<sup>2-5</sup> In our study we had only one patient with ileal injury that was repaired at once laparoscopically. Some surgeons report the Open Method (Hasson’s Technique) as the gold standard technique. In fact it is clear that OL technique doesn’t eliminate injury to bowel especially in cases where bowel is abnormally situated after midline incision or low transverse incision previously.<sup>13</sup>

It is also reported in literature that safest first entry point in high risk patients is the left upper quadrant or Palmer’s point – 3cm

below the left costal margin in the midclavicular line. This point is rarely affected by adhesions & with gastric distention & splenomegaly excluded has been shown to be safe even in obese patients.<sup>6,8</sup> We use Palmer’s point to create pneumoperitoneum with DTI for all the upper abdominal procedures even in the presence of midline scars and if there are any suspicions of paraumbilical adhesions. In this study, however, we used Palmer’s point in 25 patients for DTI.

OL technique was used where it might be dangerous to establish pneumoperitoneum with a closed technique. In our study, we did OL technique only in one patient in whom huge midline scar was present up to the epigastrium. In our study, regarding the complications of DTI, visceral injury was found in one patient (0.06%). These results are almost comparable with other studies with no significant difference.

In 2017, Society of Obstetricians & Gynecologists of Canada reviewed all publications on entry techniques in laparoscopic surgery and made their guidelines. These guidelines were reviewed in June 2013 and reaffirmed for continued use. They also recommended “Direct insertion of the trocar” without prior pneumoperitoneum, may be considered as a safe alternative to Veress needle technique.<sup>2</sup> In our experience DTI is a very convenient and safe method of creating pneumoperitoneum.

## CONCLUSION

This study was carried out to evaluate the safety & reliability of DTI in accordance with our experience. Currently none of the available methods of entry into peritoneal cavity for creation of pneumoperitoneum is free of complications. DTI is a very safe and reliable technique for establishing pneumoperitoneum & should be routinely used. However, every surgeon should assess his own experience and in the light of his experience decide which is the best method for him to establish pneumoperitoneum taking into account particular clinical situation and his own proficiency in each of the specific techniques.

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### **AUTHORSHIP AND CONTRIBUTION DECLARATION**

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