

# Direct Trocar Insertion Technique: an Alternative for Creation of Pneumoperitoneum

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## ABSTRACT

**Objectives:** The direct trocar insertion technique (DTI) for the creation of pneumoperitoneum has been described as an alternative to open and Veress needle (VN) techniques. This study assesses the safety and feasibility of direct trocar insertion without a pre-existing pneumoperitoneum in patients undergoing elective laparoscopic procedures.

**Methods:** From November 2001 to February 2006, we retrospectively studied 196 (146 women and 50 men) consecutive patients. A single consultant laparoscopic surgeon performed all operations. The mean patient age was 57 years (range, 22 to 81). The procedures included 186 laparoscopic cholecystectomies, 3 laparoscopic appendectomies, 1 laparoscopic Nissen, 5 laparoscopic groin hernia repairs, and 1 conversion to open surgery.

**Results:** Creation of pneumoperitoneum with DTI was feasible in 99.5% of patients. No major complications were associated with the technique. Immediate minor postoperative complications included 1 (0.5%) wound infection and 3 (1.5%) hematomas. At mean follow-up of 23 months, 4 (2%) umbilical wound stitch granulomas and 1 (0.5%) incisional hernia from the umbilical port site were observed.

**Conclusion:** This study shows that that when performed by an experienced laparoscopic surgeon the direct trocar insertion technique is a safe and effective alternative for creation of pneumoperitoneum.

**Key Words:** Pneumoperitoneum, Direct trocar insertion, Laparoscopy.

## INTRODUCTION

Laparoscopic abdominal surgery requires the implementation of successful pneumoperitoneum in the vast majority of patients with more than half of all complications occurring at the time of entry. Therefore, optimizing the entry technique is essential. The method of directly inserting a trocar for laparoscopy without pneumoperitoneum was first described in 1978.<sup>1</sup> The reported benefits of this method are a shorter operation time, immediate recognition of visceral vascular injuries, and near exclusion of entry failure.

Direct trocar insertion (DTI) although still a blind technique reduces the number of "blind steps" from 3 with Veress needle (insertion, insufflation, and trocar introduction) to just one, that of trocar introduction. This study reports the experience of a single consultant surgeon in the creation of pneumoperitoneum using the DTI technique over a 5-year period.

## METHODS

From November 2001 to February 2006, 196 consecutive patients who underwent elective laparoscopic operations were studied retrospectively. The study was limited to the period for which detailed data were available. All 196 operations were performed by one consultant surgeon. All patients had a pneumoperitoneum created by the DTI technique. More than 2 abdominal incisions (at least one of which was midline) was the sole contraindication to using the DTI technique. After adequate patient relaxation, a 10-mm skin incision is made at the level of the umbilicus to allow the introduction of a 10-mm disposable trocar (various types used). With the patient in a supine position, 2 nylon sutures are used to suture both skin and subcutaneous tissue on either side of the umbilicus. The abdominal wall is elevated by pulling the 2 sutures upward. The umbilical region is infiltrated with local anesthesia. Care is taken to make the incision length slightly greater than the diameter of the trocar, and all layers of skin must be cut down to the peritoneum through the entire length of the umbilical incision. These simple maneuvers allow easier introduction of the trocar with minimal force and maximal control. Once the tip of the trocar

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is freely inserted through the incision, the tip is directed straight to the midline without any angulation. Then the trocar is easily advanced by using a continual twisting motion into the peritoneal cavity. In contrast to Veress needle insertion, where one can feel the penetration through the fascia and peritoneum separately, a distinct and single “pop” signifies that the trocar has pierced the fascia and peritoneum. At this stage, it should be emphasized that this technique is a potentially semi-open technique. The first step of peritoneal cut down is a blind step, but the trocar insertion is under direct visualization as the incision is large enough that you can see into the peritoneal cavity. The proper positioning of the inserted trocar is confirmed by insertion of the camera and direct visualization of the abdominal cavity.

## RESULTS

This study reports the experience of one laparoscopic surgeon using the DTI technique in 196 consecutive patients who underwent elective laparoscopic operations. One hundred and eighty-six (94.9%) underwent laparoscopic cholecystectomy, 3 (1.5%) laparoscopic appendectomy, 5 (2.6%) laparoscopic groin hernia repair (2 right inguinal hernia, 2 bilateral inguinal, and 1 femoral), 1 (0.5%) Nissen fundoplication. Direct trocar insertion was feasible in 195 patients (99.5%) with conversion to open necessary in only one patient (0.5%). No major complications were observed using the DTI technique. Immediate minor postoperative complications included 1(0.5%) wound infection and 3(1.5%) hematomas. At mean follow-up of 23 months, 4 (2%) umbilical wound stitch granulomas and 1 (0.5%) incisional hernia from the umbilical port site were observed.

## DISCUSSION

The establishment of pneumoperitoneum is the first and inevitable step in laparoscopic surgery. Bleeding, subcutaneous emphysema, gastrointestinal tract perforation, minor and major vascular injury, and intraperitoneal adhesions are the potential complications associated with abdominal access and creation of pneumoperitoneum. Four basic techniques are used to create pneumoperitoneum: blind Veress needle, direct trocar insertion, optical trocar insertion, and open laparoscopy.<sup>2</sup> The DTI technique was first reported by Dingfelder in 1978<sup>1</sup> and later described by Copeland et al in 1983,<sup>3</sup> but so far it has been used mainly by gynecologists.<sup>4</sup> According to Copeland et al,<sup>3</sup> the keys to a successful DTI are adequate wall relaxation, proper skin incision, and the use of a sharp trocar.<sup>3</sup>

Other authors advise elevation of the rectus sheath.<sup>2</sup> The introduction of shielded trocars has encouraged some surgeons to adopt DTI,<sup>5</sup> but no experimental or clinical study has shown the superiority of the shielded trocar over the nonshielded trocar.<sup>1</sup> The rationale for DTI without pneumoperitoneum is based on the fact that many complications reported during laparoscopic procedures are directly related to the use of the Veress needle (VN).<sup>3,6</sup> DTI has been reported as a safe alternative to VN insertion.<sup>7,8</sup> Direct insertion of the trocar has been reported to be associated with fewer insufflation-related complications, such as gas embolism, and to be a faster technique than the Veress needle technique.<sup>9</sup> In a randomized prospective study of 84 patients, Prieto-Diaz-Chavez et al<sup>7</sup> reported complication rates of 2.3% and 23.8% ( $P=0.009$ ) after DTI and VN insertion, respectively. In another study of 1,567 patients, Mehmel Ali Verdel et al<sup>8</sup> reported complications of 0.9% and 14.4% ( $P<0.01$ ) after DTI and VN insertion, respectively.

Argesta et al<sup>10</sup> found that in a population of 598 thin and very thin patients, DTI is safe, has a slightly higher feasibility rate compared with the VN technique and is associated with fewer minor complications but reported no differences in the incidence of major complications. Other randomized studies<sup>1</sup> comparing the VN and DTI techniques have failed to show any advantage for either method in the overall population or in select patients. A paper released by the American Food and Drug Administration<sup>11</sup> stated that the literature does not indicate a difference in complication rates for direct entry versus a preliminary pneumoperitoneum. Although the open trocar technique with a Hasson cannula is considered a safe alternative, it is not complication free,<sup>10,12</sup> and its time-consuming nature and cost have made many laparoscopic surgeons use it very selectively.

This study was carried out to assess the safety and efficacy of the DTI technique. The findings are comparative with those from the literature with no major complications and a very high feasibility rate (99.5%) being observed. Currently, none of the available methods of entry into the peritoneal cavity for creation of pneumoperitoneum are free of complications.<sup>5,10,12,13</sup> Each has its individual advantages and disadvantages and similar morbidity when performed by experienced operators with appropriate indications.<sup>14</sup>

## CONCLUSION

In this study, DTI was found to be free of major complications and has a very high feasibility rate. There remains

no clear evidence as to the optimal form of laparoscopic entry; however, direct entry may be an underutilized and safe alternative to VN and open entry techniques.<sup>15</sup>

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