

Direct Trocar Insertion for Laparoscopy

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ABSTRACT

Background: The Veress needle (VN) technique for establishing pneumoperitoneum in laparoscopic surgery is widely used and yet is associated with slow insufflation rates and potentially life-threatening complications. Although these complications have been rarely reported, they represent a major source of morbidity and mortality from laparoscopic procedures and a major reason for conversion to open surgery. The open laparoscopy (OL) is an alternative to the VN technique, being relatively safer, even if considered cumbersome by many authors. Recently, the direct trocar insertion (DTI) technique of establishing pneumoperitoneum has been reported as an alternative to both techniques, but it is largely confined to gynecologic procedures. We report a case-series study where we evaluate the patients who underwent a DTI entry for laparoscopy during a recent 5-year period, focusing attention on feasibility, safety, and the benefits of DTI.

Methods: This is a case series of 2175 different laparoscopic procedures (1456 [66.9%] scheduled cases and 719 [33%] emergencies). In 2091 (96.1%) of them (1425 [68.1%] scheduled cases and 666 [31.8%] emergencies), pneumoperitoneum was established with DTI, either in the umbilicus or in Palmer's point.

Results: There were no injuries, either minor or major. Peritoneal access and the creation of a laparoscopic workplace were obtained quickly and efficiently by DTI.

Conclusion: Our results suggest that DTI is a fast, safe, and reliable alternative to traditional techniques for pneu-

moperitoneum establishment and should be regarded as a part of the surgical armamentarium of a trained laparoscopic surgeon.

Key Words: pneumoperitoneum, laparoscopy, abdominal entry.

INTRODUCTION

The establishment of pneumoperitoneum is the inevitable first step in laparoscopic surgery. Bleeding, subcutaneous emphysema, gastrointestinal tract perforation, and minor and major vascular injury are the potential complications associated with abdominal access and creation of pneumoperitoneum.¹⁻⁹ Four basic techniques are used to create pneumoperitoneum: blind Veress needle (VN), direct trocar insertion (DTI), optical trocar insertion, and open laparoscopy (OL).¹⁰ DTI was first reported by Dingfelder in 1978, but so far it is probably the least-used entry technique, and it is mainly used by gynecologists.¹¹⁻¹⁶ The literature contains proponents of both the open and the closed technique: some proponents of the closed technique for the Veress needle and some for the DTI. They all suggest that one or other technique is superior without, up to now, sufficient corroborating evidence.^{1-3,6-8,10,12-21}

Our institution, a community hospital in the north east of Italy, has routinely practiced laparoscopy over the last 18 years for basic and advanced procedures, in both elective and emergency situations, using the VN closed method of entry to the abdomen up to the year 2004. In 2004, we did a randomized prospective study of DTI vs VN in nonobese patients.²² Due to the good results we had with DTI, we have, since then, used it routinely in all cases where there are no contraindications.

The aim of this case-series study is to evaluate the patients who underwent a DTI entry for laparoscopy during a 5-year period, focusing attention on feasibility, safety, and the benefits of having general surgeons carry out DTI. We also want to discuss some technical aspects, such as the site of the trocar insertion.

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MATERIALS AND METHODS

Between January 1, 2005 and January 1, 2010, a total of 2175 patients underwent elective or urgent laparoscopic procedures at the "Civil Hospital" in Vittorio Veneto (TV), Italy, a community hospital serving a population of 100,000. Of the total of 2171, 2091 (96.1%) had pneumoperitoneum established by DTI; the remaining 84 cases (3.8%) had OL. It is now our routine practice to establish pneumoperitoneum by the closed method, by DTI, both in scheduled and emergency cases, unless, of course, there are contraindications. Exclusion criteria for this approach are massive bowel distension and presence of any kind of scars in the left ipocostal area. Obesity and thin build have never been considered contraindications to DTI. For all the procedures where the operative theater was in the lower abdomen, the DTI site was normally the umbilicus. For the upper abdomen or when the umbilicus area was considered not safe due to previous major laparotomies or fear of adhesive bands, Palmer's point was used.

Table 1 shows the demographic characteristics of the study population, while **Table 2** shows all the pathologies treated according to the way in which pneumoperitoneum was established. The outcome measures were defined as (1) minor complications: those that did not influence the length of the postoperative hospital stay, and (2) major complications: those leading to death, those requiring conversion to an open procedure, or reintervention, and those leading to the prolongation of the hospital stay. It was agreed that unsuccessful DTI attempts were to be converted to the OL technique and ultimately to an open operation. For evaluation purposes, the trocar insertion time was defined as the interval between skin incision and introduction of the laparoscope.

Technique

After adequate patient relaxation in a supine position and with all the optical instruments already set up, the umbilical or the left subcostal area—namely the Palmer's point—is injected with local anesthetic. If any scars are

present, the injection should be made as far away from them as possible to avoid intraabdominal adhesions. A 5-mm skin incision is made allowing the introduction of a 5-mm disposable trocar (Endopath XCEL dilating tip, Ethicon Endo Surgery, Cincinnati OH, USA), the tip being directly perpendicular to the fascia. The tip of the trocar is covered after it has entered the peritoneal cavity to reduce the risk of injury to the internal organs.

When the surgeon feels the resistance offered by the fascia layer, the abdominal wall is grasped and lifted up to form "a tent" and so distance the abdominal wall from the contents. The trocar is then easily advanced by using a continual gentle twisting action into the peritoneal cavity. Peritoneal penetration can easily be felt by the surgeon, and entry into the abdominal cavity is confirmed by the audible click of the lock of the shield on the trocar. The correct positioning of the inserted trocar can be immediately confirmed by the insertions of the camera and direct visualization of the abdominal cavity. Insufflation is then instigated at first with a low-flow rate up to 6mm Hg intraabdominal pressure and then a high-flow rate is commenced. These last steps are taken to avoid damage to the phrenic nerves and to avoid sudden distension of the abdominal wall.

RESULTS

DTI was feasible in 100% of cases, and no conversion to OL was necessary. Duration of DTI was 55 ± 13 seconds, while for OL it was 180 ± 36 seconds. There were no major complications, as already defined, in either the DTI or the OL patients. There were no minor complications, as already defined, in the DTI patients and only one minor complication, that of bleeding in the OL patients which was treated with a hemostatic suture. No complications of any kind have been observed in any of the DTI patients at 6-month follow-up (mean follow-up of 40 ± 9 months in almost 60% of patients).

DISCUSSION

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.^{6,7,20} Therefore, optimizing the entry technique is essential.

Any possible change in any step of a proven, tested surgical technique has to be shown to the surgical world to be easy, feasible, and reproducible in almost every situation. It has to have the lowest possible rates of mor-

Table 1.
Patient Demographics

	DTI	OL
Mean age \pm SD (yr)	47.2 \pm 18.7	51.3 \pm 16.5
Mean BMI \pm SD (kg/m ²)	26.1 \pm 4.4	25.5 \pm 3.8
M:F	855:1236	35:49
Previous abdominal operations (%)	1236 (59.1)	72 (85.7)

Table 2.
Pathologies

Pathologies-Scheduled	DTI/umbilicus ^a	DTI/Palmer ^a	Open
Inguinal hernias	310	0	0
Colorectal pathologies	280	52	12
Cholecystectomy	0	762	0
Abdominal hernias	0	9	19
Miscellaneous	3	9	0
Subtotal	593	832	31
Pathologies-Emergency			
Inguino-femoral hernias	6	0	0
Colon-perforation	6	2	2
Small bowel occlusion	0	17	39
Cholecystectomy	0	118	0
GU ulcers	17	0	0
Appendectomy-gynecological -NSAP	493	7	12
Subtotal	522	144	53
Total (%)	1115 (51.2)	976 (44.8)	84 (3.8)

^aDTI/umbilicus: direct trocar insertion at the umbilicus; DTI/Palmer: direct trocar insertion at Palmer's point.

bidity and mortality together with an acceptable cost/benefit ratio. The method of directly inserting the first trocar for laparoscopy without establishing pneumoperitoneum was first described by Dingfelder more than 32 years ago, but so far, it has been used mainly by gynecologists.^{12-17,22} The reported 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.⁶⁻²²

To date, there is still no evidence in the most respected and nonbiased international literature as to which method, open or closed, is the best for establishing pneumoperitoneum.^{4,6-8,10,20} Some claim that the method they do not use is inferior or even hazardous, but the fact remains that there is no evidence to support their views.

As we have no proven data to settle the argument as to which is the “best” method, it is important that all reported surgical experiences, including case series such as ours, are reviewed and analyzed according to the standards of evidence based medicine. It is essential to keep in mind what it demands of us as surgeons: “Evidence based medicine demands that the right patients received the right surgery done in the right clinic and performed by the right surgeons.” (S. Sauerland, Institute for Research in

Operative Medicine, University of Witten/Herdecke, Ostmerheimer Strasse 200, D 51109 Cologne, Germany—personal communication—June 2005).

The Right Surgery/Way to Establish Pneumoperitoneum

There is sufficient evidence at present to show the feasibility and effectiveness of DTI—evidence that shows that it is similar to, if not superior to the VN, especially concerning cost and complication rate.^{12-17,22} It is undoubtedly true that, although still a blind technique, it reduces the number of “blind steps” from 3 with the Veress needle (insertion, insufflation, and first trocar introduction), to just one, the one of trocar introduction. It is correctly reported that with DTI it is possible to immediately recognize any injury caused by DTI and to laparoscopically repair that injury at once.^{12-17,22} Some surgeons report the OL technique as the gold standard technique. Yet in the international literature, it is shown that in cases where the midline is not safe to approach, the Veress needle technique is used as a valid alternative with good results and no morbidity.²³ In fact, it is clear to everyone that OL does not eliminate injury to the bowel, particularly in cases where the bowel is abnormally situated. Up to 50% of patients have a

midline incision and 20% have a low transverse incision, which will result in some degree of periumbilical adhesions.⁶ It is also reported in the literature that the safest initial entry site in high-risk patients is the left upper quadrant or Palmer's point.²⁴ This site (3cm below the left costal margin in the mid-clavicular line) is rarely affected by adhesions and, with splenomegaly and stomach distension excluded, has been shown to be safe even in obese patients.⁶⁻²⁴ It is our policy to use Palmer's point to establish pneumoperitoneum with a DTI for all the upper abdominal procedures even in the presence of midline scars and even if there are any suspicions of periumbilical adhesions. However, we are not dogmatic: we do of course consider OL in every situation where it might be hazardous to establish a pneumoperitoneum with a closed technique. In our experience, we found it necessary to use it in only 3.8% of patients.

Some authors¹⁸ recommend using OL routinely to minimize the risk of complication during the setup procedures for laparoscopy. This opinion relies mainly on the conclusions drawn by Bonjer.¹⁹ This report was published 13 years ago, and we agree with all the criticisms made of that paper by Chapron⁸: it is neither a metaanalysis nor a prospective randomized study but just a nonexhaustive review of noncomparable literature. The same authors, in a letter to the editor,²⁵ wrote:

We fully agree that open laparoscopy is an important means of preventing complications in laparoscopic surgery, but we do not think all complications related to the Veress needle and trocar insertion can be prevented by this method....

It is also everyone's experience that OL does not necessarily allow good visualization of the peritoneal cavity at the point of entry, because the incision is only 10-mm long. This is particularly true in obese patients. As a consequence, there might be a need to make a larger incision, thus invalidating the pain reduction advantages of laparoscopy and increasing the risk of trocar-site hernias.⁶ Almost all the major international associations, both of general surgeons and of gynecologists, in setting down their guidelines for abdominal entry, do not recommend one method over the other as the preferred method.^{13,10,11,26,27}

Right patient

It is confirmed in the literature that DTI is not contraindicated in either thin or obese patients in nonemergency situations.⁶⁻²² In all these patients, Palmer's point for the DTI should be the chosen site of entry.⁶

The right clinic

Determinants of surgical outcomes depend on the volume of laparoscopic surgery undertaken by both the hospital

as a whole and of each individual surgeon. Most if not all complications are preventable with proper adherence to technique and ongoing education.²⁸ Laparoscopy is our preferred approach to abdominal surgery in basic and advanced scheduled cases and also in emergency situations, unless of course, there are no contraindications. We have gained a great deal of experience with laparoscopy and our learned method establishing pneumoperitoneum was the closed one. In the beginning, we used VN, but now our preferred method is DTI. We do understand that this preference for the closed method may be a bias that affects our good outcomes, but we are all also trained in the use of OL, and of course we all use OL when it would be inadvisable and not in the patients best interests to use the closed technique. We all now have great experience in the use of DTI and also in using the Palmer's point of entry.

The Right Surgeon

For every kind of surgical procedure, an experienced surgeon is a must. This particularly applies to laparoscopy and to the way of establishing pneumoperitoneum. In our experience, DTI has been shown to be a rapid, reliable, and safe method of primary port placement, but the balance of our own evidence and of that in the international literature suggests that each surgeons must stay with the technique with which he is most familiar and in which he is most practiced, as the safety of these procedures depends more on skill, education, and a clear appreciation of the anatomy and physics of the abdominal wall than on the technique itself.¹⁰ However, it is necessary for all surgeons to have broad experience in all the different ways and sites for creating pneumoperitoneum, both closed and open, in order not to jeopardize our patients' safety through lack of knowledge of all the possible techniques.¹

CONCLUSION

This study was carried out to confirm the safety and efficacy of the DTI technique in accordance with our previous experience. Our last findings are comparable to those reported in the literature with no major complications and a total (100%) feasibility rate being observed. Currently, none of the available methods of entry into the peritoneal cavity for creation of pneumoperitoneum is free of complications. Each has its individual advantages and disadvantages and similar morbidity when performed in patients with appropriate indications by experienced operators. One may feel our results are encouraging but lack any real evidence in the literature; however, we are sure everyone will agree with us that every surgeon should assess his own experience and in the light of this experience decide which is the

best method for him to establish pneumoperitoneum taking into account the particular clinical situation and his own proficiency in each of the specific techniques.

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